The Crypto-Museum: Investigating the impact of blockchain and NFTs on digital ownership, authority, and authenticity in museums

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Contents

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Abbreviations

CDA…….. Collaborative Doctoral Award

Dapp…….. Decentralised Application (Dapp)

DAO …….. Decentralised Autonomous Organisation

DRM…….. Digital Rights Management (tool)

GLAM …….. Galleries, Libraries, Archives and Museums

IP …….. Intellectual Property

IPFS…….. Inter-Planetary File System

LGR(7)…….. Let's Get Real (7) Project

NFT…….. Non-Fungible Token

NML …….. National Museums Liverpool

Abstract

This thesis explores to what extent blockchain technology and Non-Fungible Tokens (NFTs) impact, challenge, or support the themes of collaboration and partnership, ideas that cut across current discussions and practices of digital ownership, authority, and authenticity in museums. In doing so, this thesis considers how this technology might produce values that go beyond the monetary and are instead more social and community driven.

These questions are explored through John Chapman's (2000) archaeological theory on fragmentation and enchainment, which proposes that found artefacts in Mesolithic, Neolithic, and Copper Age sites were purposely broken as a way to symbolise a binding social contract between the parties involved. Through a collaborative doctoral research project with the National Museums Liverpool (NML), the thesis develops this theory to consider if blockchain can contribute to a process of digital fragmenting and enchainment in museums. It explores how the technology might forge new connections between the museum, the collection, and audiences by binding personalised experiences about NML objects to NFT versions of these objects. In doing so, the work also critically analyses how NFTs might embody different perspectives of a particular object and function as a personal and ownable edition of the digital collection.

This thesis argues that the process of creating NFTs from a museum's collection is a process of pseudo fragmenting the work which simulates the effects of ownership and authenticity. The simulated effect of these conditions provides the owner with control over their token because it can be exchanged or traded, which challenges traditional institutional authority over its digital collections. This also has the potential to forge a new relation between the participant and the museum that can be understood as shared guardianship or a feeling of enchainment. In turn, this thesis proposes that this can create social value for museums. However, ultimately, building enchainment is contingent on a triad of relations between the technology, the museum, and the participant, whereby these different aspects interact with each other to produce value in the digital object.

Declaration

No portion of the work referred to in the thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning

Copyright Statement

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Chapter 1: Introduction

1.1 Introduction

Digital content challenges our understanding of ownership. The term ownership is often categorised under a 'bundle of rights' an owner can claim over a work including the right to sell, control, and possess (Merrill and Smith, 2001). The digital challenges these rights because content stored online is non-rivalrous in nature. In other words, digital content is a good that can be enjoyed simultaneously by anyone, they are non-competitive (Horowitz, 2006). In turn, this leads to viewers understanding digital content as having an ephemeral nature, it cannot be easily controlled or possessed (Odom, Zimmerman and Forlizzi, 2014; Jeffrey, 2015).

Authenticity is also a concept challenged in the context of the digital space. In museums, for example, the use of digital technologies to produce digital surrogates of physical works can often lead to the perception that the digital work is 'a re-mediation of the authentic stuff' (Geismar, 2012, p. 256). Put differently, it appears to lack an 'auratic' quality, a feeling of authenticity, that is present when we view the physical work. This can lead to the digital being understood as less valuable than its physical counterpart (Atasoy and Morewedge, 2018), despite the fact that the digital can be a enhancing tool to explore the collections of a museum (Newell, 2012).

This thesis sets out to explore how these terms might be challenged through the application of a technology called blockchain and a type of token stored on a blockchain called a Non-Fungible Token (NFTs).[1] Blockchain is a type of distributed ledger technology. It is like a database spread across a network of computers that records time-stamped and linked information about transactions that have taken place in this network. NFTs are a type of token stored within this network that can be bought and sold within the space and we can use NFTs to store information about assets (both digital and physical). Hence, the technology can be used as a proof of ownership and authenticity as it traces a digital provenance for any token stored in the network.

In examining this concept, this thesis draws upon fields of inquiry such as open access policies in digital collections or 'OpenGLAM' (Sanderhoff, 2013; Kapsalis, 2016), shared guardianship (Geismar, 2008; Marstine, Dodd and Jones, 2015; Marstine, 2017), digital collaboration and shared authority (Cameron and Robinson, 2007; Ancelet, Butler and Ong, 2010; Graham, Mason and Nayling, 2013; Phillips, 2014), and investigations into digital aura and authenticity (Geismar, 2015; Jeffrey, 2015; Jones *et al.*, 2018; Kenderdine and Yip, 2019).

Open access, or 'OpenGLAM', for example, is a movement in the galleries, libraries, archives, and museums (GLAMs) sector that encourages institutions to provide their

[1] Also referred to as 'cryptocollectibles' in this thesis

digitised public domain works as openly accessible and free to download, remix, and share. At the core of this discussion is the notion that public domain cultural heritage is collectively owned, hence, its digital versions should also be free for users to access and share (Sanderhoff, 2014; Hylland, 2017). And yet some institutions remain reluctant because of the concern over a loss of control of the images as they disperse across the internet (Kelly, 2013). Under a similar pretext, this thesis considers how NFTs might create a new layer to the digital collection that could contribute to the notion of collective ownership whilst also challenging the institution's ability to control its digital content.

Shared guardianship also reflects this idea of collective ownership but considers it in a more dynamic way. Shared guardianship is not simply about sharing, it is also about building and maintaining partnerships (Geismar, 2008). Therefore, this idea could be seen as a more ethical approach to ownership, one which requires museums to reflect on the connected relations between a community and an object (Marstine, 2017). Similarly, this thesis will consider how NFTs might produce new connections between a museum and its audiences, and so it goes beyond the idea of collective ownership and considers how NFTs might build a sense of community and new relations between a museum and its audiences.

Digital collaboration and shared authority also reflect this narrative. The work of scholars such as Michael Frisch (1990) highlight a need to take a more 'shared authority' approach to the interpretation and understanding history through highlighting more personal narratives about artefacts. This idea also reflects on the notion of 'new museology' (Vergo, 1989), and the 'post-museum' (Hooper-Greenhill, 2000), where the emphasis is on audience experience and the reimaging of museum pedagogy through focusing on the role of the audience and visitor in understanding the collections. As such, shared authority focuses on collaboration as a way to inform context around museum collections and in doing so it assumes that the meaning associated with works in the collection are polysemic in nature and that the collections of a museum are formed through relational connections to different communities and people (Hooper-Greenhill, 2000; Alberti, 2005; Gosden and Larson, 2007). More recently, Phillips (2014) has outlined an 'open authority' approach to digital content which combines the participatory nature of the internet and its focus on user-generated content with the expertise of the museum. In doing so, this produces collaborative digital museum content that reflects the nature of Web 2.0,[2] whilst also distributing agency and work that is traditionally held by the museum.

The interaction between the viewer and object is also an important aspect in the development of digital aura and authenticity. The digital offers an enhancement of physical works through the ability to zoom into details, provide three-dimensional perspectives, or added layers of information (Newell, 2012; Jeffrey, Love and Poyade, 2021). Yet, and as noted above, the digital is often seen as a less valuable experience than seeing an object in

[2] Web 2.0 refers to the social media era of the internet, it takes a more user generated approach to content and sharing (O'Reilly, 2005).

its physical form. This perception challenges the idea of digital authenticity because the digital is viewed as an inferior experience. Research such as the Archaeology Community Co-Production of Research Data (ACCORD) project suggests that it is more valuable to shift focus away from authenticity in digital reproductions as an over-focus can lead to overseeing the potential value of digital cultural objects (Jones *et al.*, 2018). On the other hand, blockchain is indeed an authenticating technology, therefore, this thesis will explore to what extent blockchain might contribute to this discussion on translating authenticity into digital reproductions.

In combining these different areas, this thesis explores how blockchain technology might build upon these themes of collective ownership, shared authority, and authenticity and create new ways of understanding these ideas in the context of collaborative and digital practices in museums. However, before outlining the context and scope of the research discussed in this thesis, I will now provide a background to blockchain technology so as to explain why such a technology might be useful for museums in digital collaborative practices.

1.2 Background to the Technology

In 1991, the internet brought worldwide access to information through its digital network (Catlow *et al.*, 2017). In that same year, Stuart Haber and Scott Stornetta lay the groundwork for the start of a technology called blockchain. As noted above, a blockchain is a type of distributed ledger technology that provides a means to document transactions of any token stored within its network. But back in 1991, Haber and Stornetta were proposing a computational procedure which would digitally time-stamp any document through the use of hashing (Haber and Stornetta, 1991). Their proposal was to address the question of trust, authenticity, authority, and ownership in digital documentation (Whitaker, 2019).

It was not until seventeen years later, however, that their idea would come into fruition in the form of the Bitcoin cryptocurrency. The unknown individual or collective named Satoshi Nakamoto posted the Bitcoin whitepaper on a cryptography mailing list in late 2008. This whitepaper set out for a new type of digital cash called Bitcoin that would allow users to exchange tokens with one another without the need for a central bank nor needing to give away their identity (Nakamoto, 2008). Although the idea of digital cash was not new, and indeed there had been attempts to produce a digital currency in the past (Swartz, 2018), Bitcoin was different because it combines a blockchain with cryptography so that the technology holds the ability to address the ‘double-spending’ problem (Maurer, Nelms and Swartz, 2013).[3] As such, we can understand Bitcoin as deriving from a ‘Cypherpunk’ and ‘Crypto-Anarchist’ context in which the main pursuits of these groups is to maintain the privacy of the individual and the freedom of the market (Swartz, 2018). Certainly, this is highlighted by the embedded message in the first block of transactions stored in the Bitcoin

[3] The double spending problem refers to the reproducible nature of the digital and the inability to tell if a digital coin has already been spent. See chapter 2.7.2 for further details.

blockchain, which is a quote from *The Financial Times* stating the second bailout for UK banks in 2009 (Myers, 2017).

This is far removed from Haber and Stornetta's original intent for their concept. However, whilst the Bitcoin community has grown steadily over the years, there was also a diverging community forming in 2013 who believed that the technology could be more than a digital money infrastructure. From this community grew Ethereum, the current second largest blockchain and the most commonly used blockchain for the production of NFTs. Ethereum can be used in a broad range of ways including supply chains, finance, and the buying of selling of assets such as art and music (Kameth, 2018; Tapscott and Tapscott, 2018; O'Dair, 2019; Treiblmaier and Beck, 2019). This is made possible through the blockchain's programmable nature, or its ability to be 'Turing complete' (Antonopoulos and Wood, 2019). Therefore, developers can build smart contracts, programmable pieces of executing code, onto Ethereum to build Decentralised Apps (Dapps) and exchange NFTs.[4]

The advent of this new blockchain also brought the rise of using NFTs for the arts. Most notably was the development of *CryptoPunks* by Larva Labs and *CryptoKitties* in 2017,[5] which were catalysts for the 'crypto art' movement. For many artists, the use of a blockchain enabled them to regain artist rights such as the right to attribution and the ability to sell their work as NFTs. Meanwhile, for collectors, a blockchain could provide them with the means to buying an authenticated digital work that held a provenance through the technology. Therefore, for the arts, it is not simply about transforming art into a form of currency and commodity, it also provides a way to authenticate, identify, and trust the integrity of a digital work. Moreover, digital artists can now circumvent the traditional gallery system through selling NFTs of their work. This has the potential to redistribute the power of the traditional gallery by providing the artist with control over selling their work and receiving resale rights. The development of blockchains in the arts, then, has returned to the main principles set out by Haber and Stornetta (although whether this is truly the case will be considered in Section 2.7.4). Likewise, in this thesis I set out to explore these key principles in the context of museum practices and consider how the technology might challenge our thinking about ownership, authenticity, and authority.

1.3 Context & Background to Research

This research is a collaborative doctoral award (CDA) partnering with National Museums Liverpool (NML), a collection of eight cultural organisations based in and around Liverpool, UK, which includes: The International Slavery Museum, The Lady Lever Art Gallery, The Mersey Maritime Museum, Seized: Border Force National Museum, The Museum of Liverpool, Sudley House, The Walker Art Gallery, and The World Museum. The role of a CDA is to promote academic collaboration and innovation through work that has meaningful

[4] See Section 2.7.2 for further details.
[5] *Cryptopunks* are a character-based art NFTs, see https://www.larvalabs.com/cryptopunks (accessed 1 November 2021). *CryptoKitties* is an NFT game where players buy, sell, and breed digital NFT cats https://www.cryptokitties.co/ (accessed 1 November 2021).

and impactful outcomes for the partners involved (NWCDTP, 2021). Therefore, the objective of this research project is to provide insight into how blockchain technology might work in the context of a museum and in the particular case of NML. Indeed, the research must go beyond the theoretical and provide conclusions on the practicalities of working with an emerging technology in the museum context including the ethical and logistical implications of doing so.

The National Museums Liverpool

NML is a unique collection of museums as it is the sole national museum based outside of London and it is also the largest institution in the North West of the UK (Regeneris Consulting, 2017). In 2018, Laura Pye became Director of NML which has led to a shift in the institution's mission and branding. This includes a mission which focuses on 'creating memorable experiences for everyone – challenging expectations' and a vision to be more representative, self-sufficient, provide memorable experiences, to work with partners, and to engage and empower audiences (National Museums Liverpool, 2020). To be more representative, for example, reflects broadening audiences and displays, as well as diversifying the workforce. The focus on self-sufficiency expects NML to adapt its current business model in order to broaden its commercial income. Providing memorable experiences aims to reflect on the diverse nature of the organisation and the different experiences visitors can have in the different galleries. Working with partners calls for NML to work with the city region and work with businesses to produce more socially impactful outcomes for Liverpool. Meanwhile, the need to engage and empower establishes the idea that 'people will remain at the heart' of the organisation (National Museums Liverpool, 2020, p. 5). Whilst these are broad themes that cut across different aspects of the organisation, they provide a frame in which to present current and future work at the institution.

For example, the story of this collection of museums reflect the rise of Liverpool as a key trading city during the 'halcyon days of confidence' of the British Empire (Millard, 2010, p. 2). Hence, much of the established collection of the museums derived from colonialism of the eighteenth and nineteenth century. The World Museum is a case in point as most of its collections relate to different cultures across the world. This can also be problematic when presenting and displaying such works because they derive from contexts that include values and beliefs from those originating cultures and societies and which are different from the institution. NML has previously explored ways of addressing such contextualisation issues and presenting different perspectives through partnering with organisations such as Homotopia, a LGBT+ arts and social justice organisation based in Liverpool that also hosts the longest running LGBT+ arts festival (Homotopia, 2019).

A similar project by NML is the *Pride and Prejudice* project, funded by the Esmeé Fairbairn Foundation.[6] This project identified objects with an LGBT+ connection in the collections of The Museum of Liverpool, The Walker Art Gallery, The Lady Lever Art Gallery, and Sudley

[6] See Section 3.10 for further details on how this project relates to this research.

House and these narratives were highlighted to create an LGBT+ trail through these galleries, thus promoting an alternative narrative often neglected in museums (National Museums Liverpool, 2019c). The project also accessioned new artefacts into the collection such as Pride pamphlets, contemporary clothing of icons, and oral history interviews and these artefacts are available along with the artefacts identified within the collection under different themes to create the *Pride and Prejudice* LGBT+ collection on the NML website.

At the same time, however, the *Pride and Prejudice* collection is only available online or as a trail through the physical space, which is less impactful than had this new collection gained its own permanent physical space in one of the museums. Visitors can use the trail as a framework for their visit, but it is not immediately obvious and so visitors would need to know about the collection before their visit to the museum. Moreover, the project only covers four of the eight museums in the organisation and so it lacks a broader impact to the whole organisation. In this way, I argue that the project attempts to create a more representative collection, and in doing so, can empower specific audience groups of a museum, but it also lacks any real impactful change to the way the museum presents different perspectives in its physical galleries. This reflects the broader problems of museum partnership as often collaboration does not create any residual institutional change (Lynch, 2011; Morse, 2014). It also highlights the difficulties NML faces in being such a large institution set across different sites in the city, indeed, it shows how it can be difficult to develop projects that presents a coherent voice across the different institutions because of the vastness of the organisation.

Nevertheless, projects and partnerships such as those described so far demonstrate a more representative approach to collecting and the interpretation of works. It shows how NML has attempted to reconceptualise its collection to be more relevant to local communities and brings about a sense of 'local ownership' of the museum for these local groups (Regeneris Consulting, 2017, p. 18). More specifically, these examples also highlight an LGBT+ centred approach which is relevant to the initial investigation of this PhD project as it also took a similar focus. Therefore, the *Pride and Prejudice* project shows how NML is introspectively examining the works in its collection and exploring how to embed LGBT+ voices and hidden histories and this PhD project is a continuation of this line of enquiry.

The initial decision to focus on LGBT+ derived from the PhD's collaboration with the 'Let's Get Real' 7 (LGR) project in 2019, which challenged participating museums and galleries to use their digital channels to create more meaningful connections with its audiences. Building on this idea, the PhD project considered how blockchain might create meaningful connections and harness social value with an initial emphasis on LGBT+ audiences. Before going into further detail on the objectives of the research, the following section will outline the background and context to the LGR and LGR7 projects.

The Let's Get Real' Project

The LGR projects run by Culture24 and partners aims to support museums and galleries in carrying out collaborative action research that includes 'learning from others', 'learning by

doing', and 'learning together' (Malde, 2018). Culture24 is a charity which provides strategic advice to museums and galleries and helps them to develop skills and confidence that help them to retain resilience for future years (Culture24, 2019). Together with partners such as the Carnegie UK Trust and Common Cause Foundation, Culture24's LGR projects offer participating institutions an opportunity to collaborate and experiment outside of their working practices.

This research project was developed in partnership with the 'Let's Get Real' 7 (LGR7) project, which NML took part in between March 2019 to November 2019. LGR7 has a specific focus which examines the role of a museum's digital channels in the formation and development of deeper and more meaningful connections between a museum and its audiences. In doing so, participants take a values-led approach, an approach which focuses on the intrinsic values of people and embeds a social purpose into the digital (Malde, 2019b). Therefore, LGR7 concentrates on the concept of social value, which is a term that is examined in greater detail in Chapter 2.2. In brief, social value refers to the use of arts and culture as an experience to engage participants and build a sense of identity. Therefore, it focuses on the idea of connection and bringing people closer together through the experience of art (Simon, 2010).

These ideas relate to the new vision and mission of NML as both emphasise this idea of engaging audience in new ways. For NML, the focus is on empowering audiences and creating 'memorable experiences', meanwhile, for LGR7, the focus is on connecting audiences through an institution's digital channels. Accordingly, this PhD project attempts to connect these two concepts through the application of blockchain. In this way, the research addresses LGR7's challenge to 'use existing digital channels in a more thoughtful and socially purposeful ways, to foster more meaningful connection between people and communities' (Clarke, 2019), by exploring if an NFT can foster a meaningful connection between a museum and the audiences it serves. In doing so, social value becomes a further important theme for this research project.

1.4 Research Questions

As I noted earlier in this chapter, ownership is challenged when considering it in the digital domain because of the nature of the digital object. OpenGLAM offers a case in point since the movement argues that digitised public domain cultural heritage should not be controlled by institutions, instead, it should be open and free to anyone for share and remix. Cultural institutions need to reconsider their claim to controlling this digitised content and allow it to sit in the public domain. Therefore, the first research question to this thesis considers how blockchain might contribute to this discussion. Specifically, it aims to explore how blockchain challenges the current understandings around digital ownership and whether the ownership produced through the technology can be understood in the same way as physical ownership. In turn, this thesis asks if this newfound ownership interplays with ideas around control and shared ownership in digital museum collections.

The nature of the digital and its ability to be shared and enjoyed simultaneously also challenges our understanding of authenticity as something that it unique and original. Again, in the initial section to this chapter I highlighted the difficult nature of this term and noted how it can be challenging to view a digital reproduction as authentic. Therefore, I will examine in this thesis how blockchain might translate authenticity onto digital reproductions of a museum's collections. I will question whether blockchain as an authenticating tool might interrupt traditional perceptions about the digital and produce digital museum objects that feel valuable to own.

The thesis is also underpinned by discussions around authority and the use of collaboration and the digital as a strategy to change traditional top-down practices in museums. I will explore how decentralisation takes this a step further. Blockchain is a decentralised technology and so there is no central authority that controls the technology and any token exchanged cannot be returned. Therefore, in this thesis, I will consider to what extent this decentralisation might challenge current dynamics around authority in audience engagement practices. Can, for example, the ability to sell the NFT create new forms of agency that the museum can no longer control?

Lastly, this research works in partnership with the LGR7 project and so its core arguments build upon the basis of the LGR7 project. Therefore, social value remains a core element to this research project and this term is used as a way to understand the value of this project for NML. The final research question to this thesis frames this concept and considers how blockchain might support the formation of social value in museums.

In this respect, this thesis is founded on the following research questions:

1. To what extent does blockchain technology challenge digital ownership?
2. To what extent does blockchain technology contribute to digital authenticity?
3. How might blockchain technology contribute to work around authority and co-production in museums?
4. How might this approach produce social value?

These questions will be explored through John Chapman's (2000) theory on fragmentation and enchainment, an archaeological theory based on findings from Balkan Mesolithic, Neolithic, and Copper Age sites. In this theory, Chapman argues that found broken pieces of artefacts on these sites were purposely broken as a form of social contract between the different parties involved. Broken artefacts, then, are a symbol of relations and form an enchainment or relationship between the different parties. At the core of this argument is the process of embedding meaning into broken artefacts through fragmenting. I will develop this idea and translate it into the digital space through the use of blockchain technology. Indeed, we can use blockchain to tokenise any asset (both physical or digital) whereby the NFT is an embodiment of the work, and so it can be used as a way to distribute ownership and value across different stakeholders. In this research project, I will explore how this process of tokenisation might inform an enchainment between a museum and the audiences it serves.

Here, enchainment is the production of social value, it reflects the idea of building meaningful connections but through the digital channel of a museum's digital collection and blockchain technology.

This theoretical framework will be explored through a participatory design methodology which will explore how NFTs might work in the context of an audience engagement project at NML. The use of a participatory design approach reflects the design of LGR7 and offers the project a way in which to develop through 'learning by doing', 'learning together', and 'learning from others', and each of these themes are evident throughout the approach taken in this project (Finnis, Kennedy and Malde, 2020). In the first instance, blockchain is a new and emerging technology which, and at the time of the project's start date, has not been implemented in a museum before. Therefore, the approach taken in this research follows a 'learning by doing' focus, which reflects on how my NML colleagues' and my knowledge of blockchain evolves over time, and this allows for adaptation when needed. Secondly, the project works with a set of participants to create NFTs based on NML's collection. This reflects the participatory design approach and emphasises the role of 'learning together'. Lastly, interviews with colleagues at NML and participants from the crypto space supplement the main body of research carried out at NML.[7] The addition of these interviews reflects a 'learning from others' approach as it assumes that those with different perspectives and fields of knowledge (of the museum sector and the crypto space) can provide a more rounded understanding of the research questions explored in this thesis.

Therefore, this thesis is grounded in practice and theory, and I will investigate to what extent blockchain contributes to the social value of museums. In doing so, I set out to not only provide insight for NML, but also to the broader museum sector.

1.5 Outline of Chapters

In this introductory chapter I have briefly outlined the context and scope of this research and blockchain technology. In doing so, I have highlighted the four key themes of this research, which are ownership, authenticity, authority, and social value. These themes will frame the rest of this thesis and provide the broader context for analysing the findings from the research project with NML.

In Chapter 2, I will provide a literature review on these themes including social value, ownership, authority, and authenticity and I will reflect on how these ideas are conceived in museological literature and in museum projects that focus on the digital. The aim of these discussions is to draw out key concepts that will frame the analysis of the research project at NML. I will conclude with a specific focus on blockchain technology and provide a detailed explanation of how it works and how it has been used in the context of arts and museums. In doing so, I aim to highlight the close relationship of blockchain with these main themes.

[7] The crypto space refers to the communities of people and projects associated with cryptocurrencies and blockchain. In this thesis, this term will be used interchangeably with 'the NFT space' and 'blockchain space'.

I will draw on the literature discussed in Chapter 2 in Chapter 3, where I will present the theoretical framework for this thesis. As I will explain, the process of tokenisation creates a fracturing or fragmenting of ownership on blockchain, and this enables artists and galleries to sell portions of artwork without giving away the whole piece. In extending this concept, I develop fragmentation and enchainment theory from archaeological literature to argue that digital fragmentation using blockchain can form digital enchainment. In this respect, I argue that NFTs might be a source of social value as these tokens could bind an individual to a museum's collection through this idea of enchainment. I conclude in Chapter 3 with details on the methodology of this research so as to demonstrate how this theory was implemented at NML.

Chapter 4 is the first discussion chapter and I examine the findings of this research in this chapter through the lens of ownership. I reflect on how the NFTs produced in the project create a form of enchainment between the participant, the original object, and the museum. I consider the difference between an NFT and a 'typical' digital object and how this difference impacts ownership.[8] I also reflect on how to produce meaningful digital objects that act like 'digital fragments' in the context of Chapman's theory. Lastly, I consider how this has produced enchainment with a specific focus on collective ownership and shared guardianship.

Meanwhile, in Chapter 5, I explore the findings of this research project in the context of authenticity. In this chapter I critically analyse the term authenticity and consider to what extent the production of provenance from the use of blockchain can be the only factor in producing an 'authentic' digital object. This examination is considered in relation to the notion of digital 'thingness', a term drawn from Martin Zeilinger's (2018) work and literature on digital materiality (Kirschenbaum, 2008; Drucker, 2013). I also draw from discussions on aura and personal value and reflect on the multidimensional nature of authenticity. In other words, I consider how authenticity is formed through an interrelation between authenticating documentation and the viewer's own perceptions and value of the object in question.

In the final discussion chapter, Chapter 6, I examine the role of blockchain in co-production and shared authority. I consider if and how the use of NFTs redistributes agency when museums engage with audiences using their digital collections and I reflect on the potential risks involved in this process. I draw from themes such as 'new museology' (Vergo, 1989), and Eilean Hooper-Greenhill's (2000) 'post-museum' to contextualise this analysis. I also introduce the 'blockchain approach' to museums that considers use value and the dynamic relationship between a museum and its audiences.

Chapter 7 concludes this thesis and argues that this project builds enchainment and social value. I propose that this formed value is contingent on a triad of interconnecting relations between the museum, the participant, and the technology. Indeed, in this thesis, I show that

[8] The term 'typical' digital object is used in this thesis to identify digital objects not stored on a blockchain.

the museum can produce ‘sign value’ or an authenticity in an NFT that interconnects with the technology. Meanwhile, the technology creates exchange value. But, ultimately, the NFTs made lack a real use value for the participant which potentially obstructs the building of social value in this project.

Chapter 2: Ownership, Authority, Authenticity and Blockchain in Museums

2.1 Introduction

The intersectional nature of this thesis requires an examination of literature that interconnects museology, digital heritage, and the crypto space. In the introduction to the thesis, I highlighted four key themes which will be used to frame this examination, and blockchain technology adds an additional theme. Therefore, the fields of inquest in this chapter are as follows:

- Social Value
- Ownership
- Authority
- Authenticity
- Blockchain Technology

I will examine these themes in the context of museum-based literature and the digital space. However, importantly, the examination of these themes in a digital context will focus on the digital reproduction rather than born-digital content. In doing so, I aim to examine the interrelation between the physical and digital counterpart, which is an important aspect to the research project with NML.

I will first outline a definition of social value in this chapter, which derives from a collection of scholars. I will propose that social value forms through building a sense of identity, belonging, and community among people using the experience of art. This idea will be summarised through three museum-based examples found in literature including *Go* by the Brooklyn Museum, New York, US, *Children of the Lodz Ghetto* by the Holocaust Memorial Museum, Washington, US, and *Object Stories* by the Portland Art Museum, Oregon, US. Although these examples are only derived from the US, the aim of these examples is to simply provide insight into what social value might look like in the context of a museum-based project.

The discussion on ownership will reflect on the theme of shared guardianship which is considered a more dynamic approach to owning cultural property. Guardianship prioritises the relationships around people and objects rather than focusing on the artefact as a piece of property to possess and control. That is to say, guardianship takes a more relational approach to owning by encompassing the different stakeholders of a work into the conversation of possessing and caring for the cultural artefact.

Similar themes run within the discussion on authority in Section 2.4. There, I will consider the relationship between the museum and authority and highlight a shift in thinking that reflects a more collaborative approach to museum practices. This collaborative approach is also apparent in digital projects where museums are using the internet as a space for conversation and building knowledge. I will highlight this approach as taking a shared

authority approach and I will argue that it holds similarities with shared guardianship because it requires museums to take a more considerate and reflective approach to working with their audiences online.

In Section 2.5, I will consider the term authenticity and outline the various nuances of the term. In doing so, I will highlight two diverging and overarching themes to authenticity that work in relation to one another to develop the concept of authenticity in an object. On the one hand, there is a more constructivist notion of authenticity which includes the idea of aura and the innate authentic feeling in artworks. On the other hand, there is a more evidence-based approach to authenticity which focuses on using material clues and provenance as a source for authentication. I will discuss how digital artworks might build in these different forms of authenticity. This examination will also note the theme of migratable aura and reflect on how this idea might be translated into the digital space.

In the final discussion, I will describe blockchain technology and NFTs and explain how the technology works. I will also outline a series of examples that showcase how the technology is beneficial for the arts, however, these benefits will also be scrutinised so to show how blockchain as a technology takes on politically infused frameworks. The suggestion from the examples considered is that blockchain acts as a neo-liberal tool which is focused on the commodification of digital art. At the same time, however, this is not necessarily the whole story as blockchain has the capability to be used in a democratic model known as a decentralised autonomous organisation (DAO), where social value is rewarded with tokens, thus shifting away from the commodity exchange of cryptocurrency connected to the financial sector. This idea reflects David Bollier's (2015) notion of 'open cooperativism' which amalgamates the values of the commons model with those of a cooperative. I argue that Bollier's concept in the blockchain economy could act as a potential infrastructure for which the GLAM sector can use when engaging with blockchain technology that could create social value.

2.2 Defining Social Value

What does value mean in the context of museums? What kinds of values does such an institution produce? David Throsby (2000) notes that the basic premise of value derives from economics and the notions of exchange value or labour value, however it also reflects the idea of utility and a cultural experience. Here, the term cultural value is used to embody these others forms of value. Indeed, cultural value encompasses the 'affective' element of a cultural or art experience and considers this in the context of the broader economy and society (Holden, 2004). Thorsby goes onto propose that cultural value symbolises the 'positive characteristics' of culture such as the artistic value of an artwork, and its historical worth in the broader context of culture (Throsby, 2000, p. 27). In this way, I understand cultural value to reflect the cultural and artistic framing of an artwork.

Therefore, cultural value is an overarching term which can be broken down into different categories such as historical value, social value, symbolic value, aesthetic value, authenticity

value, and spiritual value (Throsby, 2000; Holden, 2004). Historical value refers to the historical context and significance of an artwork. Social value relates to how the work forms connections between people and build a sense of identity. Symbolic value refers to the perceived inherent meaning of a work. Aesthetic value examines the work in relation to style and taste. Authenticity value reflects upon the originality of the work. Lastly, spiritual value focuses on the religious context of the work and its significance to a particular group of people (Throsby, 2000, pp. 28–29). Of note for this thesis is this idea of social value, which focuses on this idea of building a sense of belonging and community among people through the value of art and culture.

In literature, John Holden (2004) highlights this term social value in his investigation of capturing culture value where he describes social value as a way to 'reinforce a sense of unity and identity' by making connections between different people (Holden, 2004, p. 35). In practice, he proposes that such value can form from the spaces in which works are placed. He uses Raphael's *Madonna of the Pinks* at The National Gallery, London as an example and he suggests that the openness of the public gallery informs social value in the work (Holden, 2004, p. 36). But social value can also relate to a more explicit act of social care. For example, Jocelyn Dodd connects social values to the ideas of 'social wellbeing, equity, and fairness' (Dodd, 2015, p. 29). This implies that social value needs to have a more practical and ethical focus, and indeed, there is now a wealth of literature that focuses on the role of museums in social work and care (Sandell, 1998; Dodd, Sandell and Scott, 2014; Whelan, 2015; Morse, 2020).

Carol Scott's view on social value resonates with this idea of social care. She proposes that social value is part of a museum's intrinsic values for communities which is 'experienced through museums' contribution to sense of place, community identity, and the use of civic spaces' (Scott, 2009, p. 200). In this way, social value reflects a need to make connections with the communities associated with the museum and its collections; it focuses on using the museum space as a way to enforce a sense of identity. Nina Simon also notes a similar idea as she establishes social value as a way of making 'visitors feel more connected to the institution and more confident of their ability to contribute' in collaborative projects with museums (Simon, 2010, p. 195). Therefore, her definition of social value reflects the broader perspective of museum audiences rather than working with specific community groups.

In each case, these different definitions suggest that social value is something that is innate within the work of the museum and how it engages with communities and audiences. On the one hand, it could be as simple as providing an open and free space to enter (as suggested by Holden), or it could relate more closely to the idea of social care (as suggested by Dodd), or it could actively engage visitors and building relational connections between these individuals and the collections on display (as proposed by Scott and Simon). In this thesis, I understand social value as focusing on this latter definition, where social value is about connecting audiences to the institution through the power of arts and culture in order to build a sense of community and cohesive identity.

In practice, social value can take different forms, for example, the Brooklyn Museum's *Go* project was a community-curated open studio initiative that aimed to bring together visitors, artists, and the museum.[9] It invited artists to open up their studios over a weekend in which visitors who registered could meet the artists and explore the work and then rate the artists and their studios. Visitors nominated artists through an app, texting, or on the website and they were also expected to 'check in' on the app to prove that they had visited the studios. Artists with the highest ratings would become part of an exhibition at the Brooklyn Museum which would showcase local art curated by the public. (Brooklyn Museum, 2012; Berstein, 2014).

Although the project was criticised for being heavily weighted toward artists in 'high traffic neighbourhoods' of Brooklyn (Berstein, 2014, p. 37), this project highlights this idea of social value in two ways. In the first instance, the project required visitors to go and physically explore these different artist studios in Brooklyn, hence, they had to explore different physical neighbourhoods. This combines place with community formation as visitors were encouraged to visit places that they may be unfamiliar with to connect with local artists. Therefore, this harnesses a stronger connection between the different communities and neighbourhoods, which can be understood as socially valuable (Atkins, 2012). In the second instance, the crowdsourced approach to curation through visitors voting on the app for their favourite artists reflects a sharing of curatorial authority. This has the potential to produce social value as this process connects visitors to the chosen artists and works on display, visitors will feel a sense of belonging with the exhibit as they have played a part in its production.

Crowdsourcing can also be used in other ways to promote social value. For example, the *Children of the Lodz Ghetto* project was developed by the Holocaust Memorial Museum in the US and invited online participants to carry out research on individuals in a school album from the Lodz Ghetto, where it is assumed that many of the children shown in this album were either deported or murdered during the Second World War.[10] Participants were required to choose a child's name from the different signatures in this album and investigate what happened to that individual through research using a series of subset research databases available (Simon, 2010).

Like many crowdsourcing projects, only about a third of the entries in this project were proven to be accurate, which puts into question the success of this project's research aspect (Simon, 2010, 2011). But the social value produced from carrying out a project such as this mitigates for this low quality. This is highlighted by a comment made by Devid Klevan, the project director, who notes they would rather have 'bad' data and enables visitors to learn from feedback rather than have the correct data first time around (Simon, 2010, p. 254). In other words, the opportunity for the participant to connect with this history and the museum

[9] See https://www.brooklynmuseum.org/exhibitions/go/ (Accessed 3 November 2021)
[10] See https://www.ushmm.org/online/lodzchildren/ (accessed 3 November 2021)

is more valuable than the data produced from the work. Indeed, this idea reflects more broadly on audience engagement projects where the value often derives from the process of the project rather than its intended outputs (Morse, 2014; Silverman, 2014).

Social value is also an important aspect of the LGR projects as they encourage participating cultural organisations to connect with their audiences through a process of learning from, by, and together (Finnis, Kennedy and Malde, 2020). This research project is associated with the seventh addition to these projects, the LGR7, which specifically asked participating cultural organisations to reflect on how they might use their digital channels to provide greater engagement and human connection with their audiences and surrounding communities (Finnis, Kennedy and Malde, 2020). Therefore, it calls for participants to reconsider their digital approaches through a specific purpose, it goes beyond simply having technology for the sake of it (Simon *et al.*, 2017; Finnis, Kennedy and Malde, 2020). As such, using digital technologies to produce social value requires thought and a purpose in mind and organisations need to reflect on how their digital channels offers a meaningful experience, or in other words, what do audiences gain from interacting with them.

A previous LGR project called *Object Stories* at the Portland Art Museum, offers a case in point.[11] This project was part of the Let's Get Real 4 (LGR4) project which reflected on the need for cultural organisations to respond to their audiences more meaningfully, thus making organisations which are more relevant in today's digital culture. Specifically, the project asked, 'what's the story?' both in relation to the audiences and to the organisation. It required participating organisations to develop collaborative discussions and responses which can be fed into cultural content (Malde and Finnis, 2016).

The Portland Art Museum took this as an opportunity to revitalise their *Object Stories* platform, which was initially launched in 2010 to promote a digital space for dialogue and the exchanging of ideas. The initial project also included a physical exhibition where visitors and communities could share stories about personal objects. The aim of this initial exhibition reflects Simon's (2010) 'participatory museum', where the process of interpreting and exhibition creation is shared with the museum visitor. Likewise, visitors to *Object Stories* could interact with other visitors' stories as well as produce their own and have these displayed in the exhibit (Ancelet, Butler and Ong, 2010). The project continues to exist online where visitors are again encouraged to share their stories about personal objects and these narratives are then developed to form thematic exhibitions on the platform (Portland Art Museum, 2019). In doing so, the platform promotes a conversation with their audience members by highlighting these individual's stories and objects. For LGR4, the museum chose to organise a workshop with a mixture of *Object Stories* storytellers, developers, and museum staff to explore how they could improve the platform and determine if the site was still relevant for their audiences. This workshop resulted in a set of ideas which could in turn

[11] See https://portlandartmuseum.org/learn/programs-tours/object-stories/ (Accessed 3 November 2021)

be implemented into the project such as finding ways of linking objects and stories, and incorporate digital and analogue components to encourage novel means of thinking (Malde and Finnis, 2016).

Object Stories highlights social value in two different ways. Firstly, the initial project encourages audiences to connect with each other's stories, thus making both the physical space of the museum and the digital platform a space of relatable and personal content. This builds a sense of community among visitors as they start to learn about other members of the museum's audiences; it creates a sense of identity. Secondly, the museum's focus in LGR4 also indicates a formation of social value. In this case, the collaborative approach to these discussions shows how the museum aims 'to interrupt the traditional authoritative museum voice' by promoting voices outside of the institution (Portland Art Museum, 2019, para. 1). Hence, this shared authority approach helps to build connection between the participants and the museum.

The projects described highlight different elements to creating social value. *Object Stories,* for example, reflects social value through providing a space for visitors to connect with other people's stories, thus building a sense of identity and community within the context of the museum's visitors. The museum's collaborative approach taken in LGR4 also showed social value as it took a shared authority approach and encourages the participating individuals to feel a sense of belonging to the project as their perspectives are being heard by the museum. Shared authority was also a source of social value in *Go* as visitors could vote on which artists would be part of the exhibition at the Brooklyn Museum. However, the project also shows value in encouraging visitors to explore and connect with different neighbourhoods in Brooklyn, thereby building a sense of community through place. Lastly, *Children of the Lodz Ghetto* established social value through encouraging visitors to explore and research a particular part of the Holocaust Memorial Museum's collection. Although this process did not produce accurate information, it did form social value as it encouraged visitors to learn and connect with the collections.

Therefore, social value in the context of these museum-based projects reflects this idea of connection, whether that is connecting audiences with each other, or with the museum's collections. Socially valuable projects aim to build a sense of identity, they highlight audiences as individuals and take a more personal approach to exploring or creating cultural content. At the same time, however, such projects can be time consuming and requires skills in facilitating and collaborating. In digital projects, museum staff also need strong digital skills and the institution needs to value the digital as a valuable tool (Simon, 2010; Finnis, Kennedy and Malde, 2020). As such, there are barriers to producing successful socially valuable projects, and this research will consider these points in its methodology.

2.3 Ownership

2.3.1 Introduction

With an established definition of social value, I will now focus on the term ownership. Indeed, how is ownership defined? What does the term mean in the context of museums and their collections? And how does the term change when approaching ownership over digital objects stored online? In the following section, I will consider these questions through examining themes such as guardianship, repatriation, psychological ownership, and copyright.

2.3.2 Defining Ownership in the Context of Museums

Ownership in Western law is defined in the context of property and it is categorised under a 'bundle of rights', or a collection of claims an owner has over the piece of property in question (Merrill and Smith, 2001). These claims include the right to exclude, the right to control, the right to possess, and the right to exchange or sell and such rights are the driving forces for a capitalistic economy (Dasgupta, 2007). However, ownership is not simply a binary concept in which you either own or not own something; there is more nuance to the term particularly in the context of cultural property (Renold, 2015).

Erich Matthes defines cultural property as 'the idea that something (an artefact, artwork, style, place, etc.) can be the property of a cultural group' (Matthes, 2018, sec. 2.1), and, as a topic, cultural property is often subject to contention in museums and galleries. This is often the case in the context of collections formed during the period of European colonisation around the world in the eighteenth and nineteenth centuries because these collections include works from across different nations that might have been 'acquired as a result of spoliation and/or illicit trade' (CollectionsTrust, 2021). Cultural institutions do not have the right to claim ownership over these works. Recent research such as the Sarr Savoy report (2018) and repatriation projects such as those seen at the Manchester Museum (2021) highlight a shift in thinking around such works and the move towards the return of museum-based works back to source communities. However, this process of repatriation is still subject to a Western law understanding of ownership (Brown and Nicholas, 2012), and so in other words, there is a tendency to focus on these works only as forms of property (Geismar, 2008).

Cultural property can have multiple claims to ownership which derive from innate cultural and historical values and so these claims derive from a source community's history and identity. This makes it difficult to establish ownership in the Western sense of such items. Of course, in some cases, an agreement can form in which the outcome is a shared cultural ownership, although this is rare (Renold, 2015). One case in 2011, for example, occurred between Yale University and Peru regarding some works taken to the US by the archaeologist Hiram Bingham in the re-discovery of Machu Picchu. The outcome of this dispute was the restitution of some of these works but also a newly formed partnership in which a research centre was built in Cusco, Peru and artefacts and researchers were

exchanged as part of a wider knowledge exchange partnership between the Universidad Nacional de San Antonion Abad del Cusco and Yale University (Renold, 2015, p. 167). A similar case is highlighted in an agreement between the US and Italy which led to a series of objects being returned to Italy from museums such as the Getty and the Metropolitan Museum of Art. Importantly, the agreement also opened the opportunity for continued partnership between the two countries through loans, research, and educational programming (Green, 2017). Therefore, the role of cultural co-ownership is to promote a relationship between the two parties that provides further opportunities to access more artefacts and knowledge than the original cultural property in question.

This concept of ownership as a partnership denotes a shift away from this Western approach in thinking about ownership only in the context of property. Indeed, owning cultural property is more than the specific object at hand, it is also about the individuals associated with that work (Gosden and Larson, 2007; Brown and Nicholas, 2012). Haidy Geismar (2008) emphasises this idea when she proposes the use of the term guardianship over ownership in the context of cultural property. Geismar's use of the term draws from the Māori term 'kaitiakitanga', which refers to the acknowledgement of 'both the rights and responsibilities of the museum and other owners in the care of collection' (Geismar, 2008, p. 115). Hence, guardianship is about collaboration and partnership, it is an active aspect in caring for the work.

Janet Marstine (2011, 2017) also identifies this idea of guardianship and defines it alongside the idea of ethical stewardship. She argues that guardianship is an act of communal care which acknowledges the different relationships connected to a particular object. As such, guardianship takes a post-structuralist understanding to the term as it considers people's relationships to objects rather than focusing on the notion of property and exclusivity. Such a process has the potential to connect people through prioritising their experience about the work and highlighting them as a stakeholder over a particular object (Marstine, 2017, p. 46). Therefore, this approach focuses on the polysemic nature of objects and reception theory, which argues that meaning is not fixed but instead can be understood from different perspectives (Hooper-Greenhill, 2000; Alberti, 2005; Marstine, 2011). Likewise, guardianship recognises the individuals behind a particular object and binds these people together through an ongoing relationship and acts of care. Thus, the notion of guardianship takes a more dynamic approach to ownership (Marstine, Dodd and Jones, 2015).

The idea of psychological ownership is also relevant to this discussion. Psychological ownership emphasises a different aspect to ownership, one which is embodied in a constructivist ideology. It is a term which derives from consumer research, collecting practices, psychology, and management studies (Belk, 1988, 1995; Pierce, Kostova and Dirks, 2001; Pierce and Peck, 2018), and it argues that this type of ownership is formed through personal relations to a particular object, which might be historical, cultural, or societal in nature. For example, objects are transformed into possessions through a person extending part of themselves into the work (Belk, 1988; Hodder, 2012). In doing so, these

objects help to construct a person's identity, they become a form of 'inalienable possession' which symbolises personal, historical, and cultural value (Belk, 1988; Weiner, 1992). In the context of cultural property, this definition helps to identify the deep-rooted connection source communities have to certain works as these objects are part of the people's wider narrative and history and help to build their identity. Therefore, shared guardianship is the act of recognising the different psychological ownership claims that are associated to a specific work, and it works to establish authority in those that hold a sense of psychological ownership.

2.3.3 Digital Ownership

These ideas of guardianship and repatriation have also been addressed using digital technologies. For example, in New Zealand, the *Te Whatakōrero* project was an initiative which produced an interactive CD-ROM to widen access of traditional taonga artefacts to Māori communities who have restricted access due to their geographical location (Ngata, Ngata-Gibson and Salmond, 2012). Similarly, Gwyneira Isaac (2015) explores how three-dimensional scans of cultural artefacts have been used to foster relations between the National Museum of Natural History, the Smithsonian, and the Tlingit tribe of Alaska. These examples represent forms of digital repatriation where the museum is acknowledging the source community as a co-owner of the object and using digital technologies as a means to form relations of guardianship and co-ownership (Salmond, 2012).

However, digital repatriation assumes that the digital object can act as a replacement or signify this sharing of ownership (Newell, 2012). Although in certain cultures, such as Māori and the Zuni, there is no distinction in copies and real sacred objects (Brown and Nicholas, 2012), for many, a digital copy is not enough to signify repatriation (Boast and Enote, 2013). Indeed, Carl Hogsden and Emma Poulter (2012) propose that these sorts of projects provide a form of digital reciprocation, rather than repatriation, where communities and museums come to engage with each other using the object as a social cue to interact with. This resonates with the argument of Ramesh Srinivasan, Katherine Becvar, Robin Boast and Jim Enote (2010) who conclude that such repatriation projects act as an interim step toward restitution between museums and source communities rather than as a complete solution to the process of repatriation. Therefore, in these instances, the museum is still mitigating (though arguably not relinquishing) some of its authority over to the source communities and acknowledging shared ownership, but it is considered a stretch to call this repatriation (Boast & Enote, 2013).

This prompts questions about whether a digital object be owned. Can it have meaning embedded into it? Can we psychologically own digital content? A digital object, be it stored online or on a local computer, is often consider to be less valuable than a physical object because it lacks the traditional materiality that is associated with the physical space (Denegri-Knott, Watkins and Wood, 2012; Atasoy and Morewedge, 2018). This assumption is highlighted by Heather Horst and Daniel Miller who identify that the digital is often 'used to

propagate an illusion of the immaterial' (Horst and Miller, 2012, p. 35). Hence, even though the digital holds different forms of materiality (Horst and Miller, 2012), research suggests that individuals often perceive the digital as a less valuable format in comparison to the physical because the digital is challenged by authenticity and a lack of scarcity (Odom, Zimmerman and Forlizzi, 2014; Kwon *et al.*, 2017; Mardon and Belk, 2018). Therefore, ownership is challenged in relation to possessing digital objects because it becomes difficult to enforce the right of exclusivity and the right to possess (Belk, 2014b).

In turn, this challenge to possession has prompted reflection on the idea of digital ownership, with scholars even questioning if this is the 'end of ownership' as we know it (Perzanowski and Schultz, 2016). Likewise, terms such as the 'sharing economy' and the 'post-ownership economy' have emerged as a way to understand the complex relationship between owner and digital object within the wider e-commerce and online space of the internet (Belk, 2014b). Specifically, this new online economy takes a co-participatory approach in which users become prosumers, collaboratively consuming and sharing goods using online platforms (Möhlmann, 2015). While consideration should be given as to how 'sharing' this economy truly is (Belk, 2014b), the concept highlights a shift in forms of ownership from a focus on rights to a focus on access to information and goods (Habibi, Kim and Laroche, 2016). Fleura Bardhi and Giana Eckhardt (2017) also define this as a liquid form of consumption. Here, the use of the term liquid is pertinent to the nature of digital content, which is seen to have a 'liquid quality' and a 'variability' as it is easily shared and edited (Parry, 2007, p. 12). Meanwhile, liquid consumption reflects a more fluid approach to consumption where users have the ability to access a wider selection of objects without the necessity to permanently own any of them. Thus the concept of ownership is transformed, shifting away from the traditional notion of a possession and rights, to one that is focused on access and sharing (Baxter and Aurisicchio, 2018).

However, while this might be the case for some digital objects, there is an argument that the digital space has informed a continuum of ownership structures in relation to digital objects rather than done away with formal ownership altogether. For example, digital goods accessed through subscription services or non-transferable licencing have a more unstable or 'liquid' feeling of ownership since owners buy to stream rather than to control, exchange, or possess (Watkins, Denegri-Knott and Molesworth, 2016). The example of the Amazon Kindle is a case in point. In 2009 Amazon sparked controversy when they remotely deleted e-books of George Orwell's *1984* and *Animal Farm* from certain Kindles (Stone, 2009). The users of these Kindles found that something they thought they owned had been reclaimed without their knowledge or permission. Had these books been printed, it would have been near impossible for Amazon to reclaim these books, but because Kindle works on a non-transferable licencing system, users only have a partial ownership of the book rather than a traditional sense of ownership (Perzanowski and Schultz, 2016). On the other hand, online local created content, such as photos and documents on a personal computer, can pertain to a strong feeling of ownership (Watkins, Denegri-Knott and Molesworth, 2016). This is due

to the nature of such content as owners can control, possess, and exclude others from local online content unlike digital works posted on social media or bought through subscription. Therefore, these examples show how the continuum of digital ownership extends from a liquid sense of ownership (such as access-based models) to more concrete forms of ownership that are reflective of formal ownership rights. This also contradicts the idea of a 'post-ownership economy' since the continuum indicates that there are still ways of owning something which is digital. Nevertheless, what is also evident is that the digital has popularised shared or commons-based ownership models and terms such as the 'sharing economy' and the 'post-ownership economy' emphasise this focus.

For museums and their digital collections, this transformation of ownership has been problematic. While the internet offers a space for sharing (Belk, 2014b), the use of digital rights management (DRM) tools can maintain control and copyright of digital objects online (Lessig, 2006). Tools such as watermarking and using low resolution images provide the museum with control over the digital images of their collections and limits users in their access and use of the images (Crews, 2012). In using these sorts of tools, there is an argument that museums are acting as 'moral guardians' and protecting the digital reproductions of the collections from what might be viewed as inappropriate use (Eschenfelder and Caswell, 2010)

But do museums have a right to claim this ownership? The case of the National Portrait Gallery in London against Wikipedia challenges this claim. In 2009, around 3,300 high-resolution images of the gallery were uploaded to Wikipedia without the approval or agreement of the institution. The National Portrait Gallery claimed that this was copyright infringement since these images belonged to the gallery because time, money, and effort had been invested in the creation of these images. However, the user who uploaded the images argued that in claiming this copyright the National Portrait Gallery was negating its 'public service mission' because these images are of public domain artworks and in claiming copyright the gallery was limiting access and use of these works (Fouseki and Vacharopoulou, 2013). While it is unclear how this particular case was resolved, it is interesting that in 2012 the gallery reviewed their image licencing to make more than 53,000 images free to use (Atkinson, 2012).

The well documented Bridgeman vs. Corel law case also adds to this discussion around claiming of copyright. This case involved the Canadian software business Corel selling digital artworks as a CD-ROM which were taken from the Bridgeman Art Library digital archive. In this ruling, it was stated that the library could not claim copyright of these images because they lacked the originality to qualify as copyrightable works (Petri, 2014). Put differently, originality is an important theme in establishing copyright and claims to ownership. For example, in one theory on intellectual property (IP), it is argued that, providing a person has put sufficient effort into creating the work, copyright can be attributed (Margoni, 2014a). This builds on John Locke's labour theory in which he argues that a person is entitled to the ownership of the 'fruits of their labour' (Moore & Himma, 2011: 10).

Therefore, in relation to museums and digital collections, it can become difficult to determine the level of originality involved in making digital copies of physical artworks in the public domain because these images are digital reproductions of artworks that hold no copyright (Crews, 2012; Petri, 2014).

On the other hand, OpenGLAM is an alternative to claiming copyright over digitised collections. This is an initiative that encourages GLAMs to make their digitised public domain works readily available, shareable, and reusable across the internet (OpenGLAM, 2019). Notable examples such as the Rijksmuseum in Amsterdam have released parts of their digital collections in high-resolution using creative commons licencing and this enables wider access to the collections, encouraging users to share and spread these images across the internet (Pekel, 2015). This process shows the museum acting in a more open and inclusive manner as users can now enjoy access to high quality digital reproductions of the museum's collections (Sanderhoff, 2013). Furthermore, the spread of the images increases the value of these cultural objects to both the museum and it's audiences as these images are exposed to a wider audience than was possible using just the museum's website or onsite galleries (Von Haller Grønbæk, 2014).

This focus on releasing images rather than restricting them reflects the sharing or 'post-ownership' economy. It highlights a focus on creating content available and accessible over making content exclusive and OpenGLAM indicates how museums are acknowledging this shift in perceptions around digital ownership. At the same time, this access-based ownership also produces 'a liquid, displaced form of ownership' (Hylland, 2017, p. 80), one which could produce the idea of collective ownership. This is based on the notion that cultural heritage is a form of 'common property', it belongs to everyone (Sanderhoff, 2014; Hylland, 2017, p. 80). Therefore, OpenGLAM is translating this concept of common property into the digital domain and creating digital content that is free for anyone to download, remix, or use.

However, Kimberly Christen (2009) questions to what extent open access should be orchestrated in museums as specific cultural and ritual protocols need to be considered when opening up access to certain cultural objects using the internet or digital technologies. For example, in certain Australian museums, photos and exhibits have been vandalised and hidden as they depict deceased people or sacred objects and in Aboriginal culture these things are not to be openly viewed (Christen, 2015). In respect of this, digital database systems have been developed to embed these cultural protocols in so to ensure that these cultural practices are acknowledged by the museum (Srinivasan *et al.*, 2009). Therefore, while OpenGLAM reflects the sharing economy of the internet, museums need to be considerate of each artefact they choose to share so to safeguard these artefacts on behalf the source communities. In this way, museums are taking a guardian role and respecting the shared ownership relationship with the source community of the artefacts in question.

The acknowledgement of this sacred versus access dichotomy by a museum cultivates a shared guardianship relationship. Here, the focus moves beyond claiming ownership over

the digitised works and instead focuses on producing outputs in collaboration so that the digital content reflects the needs of all of the stakeholders involved. This takes into consideration the different 'relationships among people that objects generate' (Marstine, 2017, p. 46). As such, this idea of shared guardianship reflects discussions in museum literature in the context of both ownership and digital ownership. This thesis will develop this theme and consider to what extent blockchain contributes to the idea of shared guardianship. Can, for example, blockchain support this idea through its ability to re-establish ownership in a 'post-ownership' economy? However, before examining this question, I will explore the theme of authority in the following section.

2.4 Authority

2.4.1 The Role of Authority in the Museum

When discussing authority, there is a relationship involved between those with authority (who use it to generate power) and those whom the authority is being acted upon (Vitali-Rosti, 2018). The museum has a long-standing history with notions of authority and power. Museums originated from the concept of the 'cabinet of curiosities', a collection of artefacts brought back by travellers from foreign lands which were used to procure status and wealth for the owner (Srinivasan *et al.*, 2010). In the early nineteenth century, growing out of the imperialist and colonial rule, the modern form of the public museum was established and tasked with presenting the artefacts of 'primitive' and 'other' cultures (Ames, 1992; Bennett, 1995). Examples such as the permanent exhibition of the Pitt Rivers Museum in Oxford still resemble these early formations of the museum (Bennett, 1995), where cultural objects are categorised into binary and generalised themes which become spectacles in glass cases (Geismar, 2018). Therefore, the history of the museum is entrenched in the notions of power over the presentation of culture with a tendency to display through a monolithic lens.

Scholars such as Eilean Hooper-Greenhill (1992), Tony Bennett (1995), Stuart Hall (1999) and Fiona Cameron (2008) have all used the work of Michel Foucault to show how the museum's power to present ideas to the public has been used to construct national identities, social values, and manipulate the behaviour of civil society. These ideas demonstrate how the cultural institution has the capacity to act as an instrument for soft power, where the unassailable voice of the museum is promoted as fact, mediating a singular perspective (Walsh, 1997). In the eyes of the visitor, the museum is an expert with unquestionable authority in presenting culture (Srinivasan *et al.*, 2010). This has led to a perception of the museum as 'floating above the community' where the institution's expertise has more resonance than those who are part of the culture in question (Hazan, 2007, p. 134). Thus, the museum and its authoritative voice are associated with elitism and exclusivity, which only enhances notions of 'the other' through its monolithic voice (Witcomb, 2003).

However, as Jennifer Barrett has explained, the establishment of the ‘modern museum’ brought about a paradigm shift in the museum sector where the cultural institution shifted its focus onto the public so to dilute the authoritative voice of the museum and to make the institution more inclusive (Barrett, 2012, p. 14). The grounding of this shift was based on ‘new museology’ outlined by scholars such as Peter Vergo (1989), which highlights the museum as a space for education and presenting a more multi-relational perspective on culture. Stephen Weil (1997), for instance, argued for the museum to be used as a tool for communication where objects are used as social agents to prompt a plurality in the interpretation of objects. Here, the museum shifts from a transmission model, which presents information in a linear one-way approach, to a dialogic model which encourages two-way or multi-way communication between publics and museum (Hooper-Greenhill, 2000b).

Through this, the museum’s authority diversifies, with the museums’ audiences having the opportunity to engage and contribute by becoming an active participant rather than a passive viewer. This idea resonates with research by Simon (2010) noted previously, who calls for a more ‘participatory museum’ where visitors are invited to co-produce their own interpretation of the objects on display. In doing so, Simon argues museums can reach beyond their current audiences and extend towards communities that are at the fringes of society, and this will enable the institution to act in a more democratic and open way.

There are several examples where museums are shown to be engaging with this approach through inviting communities to co-produce exhibitions and interpretations (Davies, 2010; Lynch and Alberti, 2010; Boast, 2011, see also Section 2.2). This act of co-producing often aims to turn the museum to into a ‘contact zone’ where communities and museum professionals come together to engage with one another (Clifford, 1999). Although the notion of the ‘contact zone’ has been critiqued (Boast, 2011; Hogsden and Poulter, 2012), these conversations have led to a collaboration between the ‘curatorial authority’ and the ‘community experience’, where the two become of equal importance, providing a more diverse view of the collections (Clifford, 1999, p. 208).

2.4.2 Digital Shared Authority

The introduction of the digital environment further challenges this authority and power of the museum as inferred earlier in the discussion on ownership of digital content. Early writers in digital heritage such as Peter Walsh (1997) and Jennifer Trant (1999) support this idea as they argue that the internet as a medium could challenge the unassailable voice of the museum and encourage users to engage with the digital collections. Museums, Trant (1999) argued, can move beyond their physical walls to draw in a wider audience on a global scale. This is supported by Susan Hazan who outlines how, with the use of the internet, museums are no longer ‘floating above the community’ because the internet’s decentralised and open nature is an optimum space to facilitate a form of contact zone in which users are invited to engage with the collections, co-authoring narratives of digital objects (Hazan, 2007, p. 136)

While this may be true in some cases, Charlie Gere (1997) reminds us that the internet can also raise issues around access and control. This resonates with the issues around the digital divide which refers to the unequal access to the internet among different nations with some countries heavily surveilled and censored, whereas others have poor connectivity or no bandwidth at all (Beaude, 2016). If there is a lack of access, the internet will fail to act as a tool for diversifying the authority between the museums and its audiences. Hence, the internet is limited in its abilities to challenge the unassailable voice of the museum. This is supported by the discussion of digital repatriation noted before. There, it was argued that digital repatriation fails to act as a complete shared ownership and authority because it focuses on the sharing of digital copies of the artefact rather the sharing of physical artefacts. Therefore, digital repatriation is viewed as an intermediary stage rather than a form of restitution and shared authority (Hogsden and Poulter, 2012). This example shows how museums should consider the effectiveness of the internet and digital technologies as mediators to share authority.

Crowdsourcing offers another example of museums using digital technologies to dilute their authority. As I noted earlier in Section 2.2, crowdsourcing provides a way for museums to engage users in the collections through performing tasks and activities. For example, the *In the Spotlight* project by the British Library encouraged users to contribute through identifying content in some late eighteenth to late nineteenth century playbills in the library's collections (Ridge, Mendes and Algar, 2017). Users are invited to identify titles, dates, and other details in the playbills which will improve searchability in the overall online collections. This is important work as this kind of content cannot yet be identified by automation (Ridge, Mendes and Algar, 2017). Therefore, such project show how crowdsourcing can be used to engage audience members as well as offer the museum contributions which aid the searchability and finer details of digital content.

More broadly, crowdsourcing projects demonstrate the museum engaging with Web 2.0 technologies and responding to the digital environment. However, Owens (2014) questions how successful crowdsourcing is when it comes to diversifying the audience in museums. Similarly, and as I noted Section 2.2, there are concerns of quality control in such projects where the information given by users might be false or invalid (Oomen and Aroyo, 2011; Simon, 2011). Nevertheless, and as I emphasised in Section 2.2, the social value produced from carrying out such projects can outweigh this inaccurate data. Social value forms through the culmination of collective intelligence from users and the multiple voices embedded into the production, and the curation of digital content brings users together in an active role of the making of digital content (Simon, 2011).

Furthermore, in incorporating the public and their contributions in this way, the museum is promoting a post-structuralist and post-modern approach to documentation. Fiona Cameron and Helena Robinson report how the practice of documenting holds resonance in the empiricist tradition and this describes the interpretation of cultural objects by museums as 'unadulterated "facts"' (Cameron and Robinson, 2007, p. 168), an idea which correlates to

the notion of the unassailable voice of the museum. However, post-structuralist thinking rejects this idea of a fixed pathway to an objective truth, instead it claims that there are multiple pathways in which the idea of truth and history can be constructed (Engeström and Blackler, 2005). In this respect, the meaning of an artefact can fluctuate over time, there is no single unconditional interpretation of a cultural object. In combining multiple voices into the interpretation of digital collections, Cameron and Robinson (2007) propose museums are reflecting on this post-structuralist idea of the object. This reflection cultivates a digital collection which offers multiple perspectives on the artefacts, thus diversifying the authority over the collection interpretation.

Although this sharing of authority is considered beneficial for the museum (Frisch, 2011), others have argued that the introduction of community participation and crowdsourcing projects formed a 'profound threat to the ordered workings of the museum' (Merritt, 2011, para. 3). This point highlights the concern in the museum that the role of the curator might be compromised through the engagement of co-production activities such as crowdsourcing. However, the role is not compromised, instead the role changes in these circumstances to focus on mediating the experience for the users (Kidd, 2014). This is supported by Barrett (2012), who identities the role of the curator as the dispenser of knowledge, as the cultural powerbroker, as the facilitator, and as appropriate participant. In projects which involve the sharing of authority, the curator continues to focus on all four roles but might prioritise the role of facilitator, depending on the level of control the users and the curator have in the design process (Eveleigh, 2014).

The discussions outlined above suggest a shift is taking place where online collections are being used to create a more open and, perhaps, a more democratic perspective of the museum, which reflects the notions of 'new museology' and the 'participatory museum' (Vergo, 1989; Simon, 2010). These projects make use of the Web's underlying possibilities as an open and collaborative platform. Through this, museums appear to be decentralising their power and attempting to incorporate multiple voices into their collections, cultivating a sharing of authority over the collections (Frisch, 2011).

Lori Phillips (2014) describes this shift in the museum's authority as an 'open authority' where the museum engages with an openness but still remains able to maintain its authority as the overseer to its collections. Phillips grounds his argument in the writings of two influential scholars, Duncan Cameron (1972) and Eric Raymond (2001). In his article *The Museum: A Temple or the Forum,* Cameron describes the museum as a temple, '[whose] insistence on proven excellence' upholds it as an authority in presenting ideas to the public through its collections (Cameron, 1972, p. 195). He also argues the museum should act as a forum, a space of process where there is discussion, which is reminiscent of the 'new museology' message advocating for an open and educative museum. In acting as both forum and temple the museum enables an open authority in which it performs as an overseer of knowledge but introduces a more democratic approach in the creation of knowledge.

Raymond (2001), on the other hand, describes a similar discussion on authority in the context of the internet and software development. He maintained that companies at the time of writing, such as Microsoft, act like cathedrals; a top-down, closed-off model which does not reflect the underlying open nature of the internet. The Web in its beginnings, he argued, is an open decentralised network, which promotes a collaborative culture like a bazaar. Therefore, the open-source movement acts as a more appropriate approach to software development on the Web because it reflects these principles. Although the internet has changed since Raymond's discussion, his metaphor of the cathedral and the bazaar still resonates with the current ecosystem online. Companies such as Google and Facebook form a hypercentrality and monopoly on data harvesting, they have transformed to become the cathedrals of the internet (Beaude, 2016). In contrast, the open-source movement, peer-to-peer networks such as those structured on blockchain technology, and the OpenGLAM movement noted earlier continue to flourish online acting as the bazaars of the internet.

Phillips combines the ideas of Cameron and Raymond together to describe how the museum might approach the online space. He suggests that the museum continues to act as a temple but also incorporates Raymond's bazaar analogy so to reflect a forum approach, but in the online space. Therefore, a museum approaches the internet with an open authority and Robert Stein (2012) argues that such an approach can ensure that a museum is working authoritatively rather than in an authoritarian manner. In doing so, the museum is also working in a post-structuralist manner, as proposed by Cameron and Robinson (2007), as well as taking an approach which reflects a 'new museology' (Vergo, 1989).

This notion of a shared or open authority approach reflects the discussion on shared guardianship. In both cases, the focus turns upon the participant, user, or audience member and their relationship to the artefacts in the collection. Therefore, to cultivate this dynamic approach to ownership, the methods used in this research project need to take a bazaar or post-structuralist approach with the interpretation of the object where the participant's experience of the object is highlighted in the process. This could build a feeling of guardianship towards the object and create a communal form of care for the work. Indeed, such an approach would challenge institutional curatorial authority whilst also explore different understandings around museum-based ownership.

2.5 Authenticity

As an idea, authenticity has close links to Western philosophical ideologies around the Self and Other and the historical definitions of sincerity (Trilling, 1972). These notions, scholars have argued, also associate the term with philosophical concepts outlined by Martin Heidegger and Theodor Adorno where authenticity is a transcendent idea which represents the continuous inner struggle to become a 'true' state of being (MacNeil and Mak, 2007). These early reflections on the concept of authenticity are based on a moral authenticity, which Bruce Baugh (1988) compares to the originality of an artwork. Baugh claims artworks can have a form of moral authenticity where the artist acts faithfully to their artistic endeavours. This idea also interconnects with what Denis Dutton (2003) terms as expressive authenticity, which refers to the creativity and originality implemented in the artwork. Both of these concepts take a constructivist approach to authenticity and are also deeply rooted to Walter Benjamin's 'aura' noted in his 1935 article *The Work of Art in the Age of Mechanical Reproduction*. 'Aura refers to a special quality that enables the object to hold agency over its beholder and Benjamin goes onto claim that this quality cannot be reproduced in photographic reproduction; it is a unique quality of the original (Benjamin, 1999 [1968]). Like aura, expressive or moral authenticity reflects this uniqueness of the artwork and derives from the artist being integral to their creativity (Dutton, 2003).

Art can have another form of authenticity known as nominal authenticity. This type is also embedded in the concept of originality, but it focuses on the genuineness of an artwork in relation to the style or reality it is trying to portray (Dutton, 2003). Baugh's (1988) description of Chartres cathedral exemplifies this form of authenticity, where he notes how this cathedral is considered genuine because it both belongs to and conforms to the Gothic period and the qualities associated with this era. As such, nominal authenticity is characterised by the focus on establishing a work of art to be an 'original' or authentic as opposed to a forgery. This kind of authenticity also resembles Ning Wang's (1999) 'objective' authenticity and Kent Grayson and Radan Martinec's (2004) 'indexical' authenticity where both of these terms examine authenticity through evidence, documentation, and provenance of works in order to establish if a work is connected to a particular artist, and hence, an original.

Therefore, there are two diverging themes in the definitions of authenticity. On the one hand, there is constructivist understandings of authenticity such as aura and expressive authenticity which derive from the artist and require the viewer to interact and engage with the work in order to feel this form of authenticity. On the other hand, there is this more objective or materially focused approach to authenticity that prioritises establishing authenticity through provenance and evidence. Both of these themes of authenticity work in relation to one another when identifying an authentic artwork. However, it can be difficult to determine authenticity, as well as who has the authority to do so, because there is a socially constructed element to the concept.

Ana María Sánchez-Arce (2007) describes how the validation of cultural objects in the late Middle Ages derived from ruling powers of political leaders and the Church. This also resembles the authority of the museum where the cultural institution has the power to create an 'authentic' heritage and act as validator of cultural objects (Clifford, 1999; Hall, 1999; Cameron, 2008). This idea is supported by Christine Burton and Carol Scott, who identify the museum as being 'in the "authenticity" business' (Burton and Scott, 2003, p. 58). Therefore, the museum is perceived as the mediator between visitor and cultural artefacts, which acts as the assurance to its audience that the representation of culture shown is authentic (Smith, 2003).

The role of the museum as authenticator is significant in relation to the digitisation and sharing of artefacts online and through digital technologies. For example, *The Yellow*

Figure 2.1 *The Yellow Milkmaid,* Johannes Vermeer (1660) Rijksmuseum, Source: https://tinyurl.com/34r4kd7c Accessed November 2021

Milkmaid by Johannes Vermeer, which is held at the Rijksmuseum in Amsterdam, was found to have over 10,000 digital reproductions online (Verwayen, Arnoldus and Kaufman, 2011, see Figure 2.1). This was problematic for the museum because they had no control over the quality of image, nor were they being attributed to the digital reproductions since they did not have original ownership of it. This problem has been termed as 'Yellow Milkmaid Syndrome' and it is not an isolated case, there are many artworks online which have multiple versions (Stierch, 2018). To address this issue, the Rijksmuseum released a high-resolution digital surrogate attributed to the museum which they encouraged users to share and use this image over the others available online (Europeana, 2015). In doing so, the museum was using its authority as possessor of the artwork to take control and attribution of the digital reproduction. The museum was acting as an authenticator of the digital reproduction and applying nominal authenticity onto the digital reproduction produced by the museum.

This example considers nominal authenticity, but the digital reproduction also has the capacity to challenge the expressive authenticity of the physical artefact. This challenge is prominent in the case of artworks where the physical permeates aura, which is an intrinsic part of the experience of art. For example, the *Van Gogh Alive: The Exhibition* was an experience in which well-known Van Gogh artworks were projected larger-then-life onto the walls of the gallery with classical music playing in the background (Meecham, 2013). These projections are digital reproductions but are able to create an immersive experience for the visitor. This new way of experiencing the artwork can extend the aura of the original physical work into this digital experience because the immersive environment has the potential to create a specific 'kind of experience' that is integral to an auratic quality (Quiroga, Dudley and Binnie, 2011, p. 15). Indeed, Sarah Kenderdine and Andrew Yip argue that digital aura is transmitted through a 'presence of transportive and immersive exchanges between the viewer and object' which enables the viewer to understand the historical and cultural value of the original work (Kenderdine and Yip, 2019, p. 286). Likewise, if digital works such as *Van Gogh Alive: The Exhibition* can proliferate these ideas then they also emanate aura and expressive authenticity.

The Google Arts Project also offers a case in point in which artworks such as Edvard Munch's *The Scream* have been digitised in gigapixel technology. Through this technology, these artworks can be zoomed into to see the fine details of brushstrokes and paint which would be pixels in lower-quality images (Hylland, 2017). Therefore, the use of this technology challenges the experience of seeing the physical as the digital reproduction can now offer the details of an artwork which would otherwise only be available through seeing the physical (Quiroga, Dudley and Binnie, 2011). The digital work is an enhancement of the physical; it shifts beyond being simply a digital surrogate or replication.

Together, these two examples show how the improvement in and use of digital reproductions challenges the argument that a digital reproduction lacks the qualities of the physical object and acts only as a representation of it (Cameron, 2007). This argument derives from early theorists such as Pierre Lévy who notes how the virtual is often used to refer to an 'absence of existence', and this lack of physicality of the digital implies a certain incompleteness and disconnection (Lévy, 1998, p. 23). However, these examples show how the digital can become more than a replica of the physical and begin to embody the characteristics and experience of the physical. Jean Baudrillard's discussion of simulacra is also important here as he notes how reproductions give the impression of reality and they appear 'strangely similar to the original', so much so that they give the illusion of authenticity (Baudrillard, 1983, p. 23). Thus, the simulacrum or reproduction has the potential to emanate the same characteristics as the original, creating an artificial presence which the viewer perceives as real (Schreibman, 2010).

Bruno Latour and Adam Lowe (2011) identify this idea as a 'migratable aura'. Using Benjamin's notion of aura, they explain how a person can experience similar emotions in a reproduction of an artwork as they would in seeing the physical because factors such as

context and location are influential in how a person experiences a copy (Latour and Lowe, 2011). This is supported by Haidy Geismar and William Nohns (2011) who observe that the associations and underlying meaning of a digital reproduction will also impact how the user experiences it. Therefore, aura is a migratable attribute which can be affected by varying factors, and it is through this migratable aura that a reproduction can emanate the experience associated with its physical counterpart.

For Baudrillard (1983) and Benjamin (1999 [1968]), this embodiment of the physical in the reproduction has negative connotations as the physical and the facsimile begin to merge and the aura of the original begins to decay. Therefore, the digital reproduction is seen to diminish the value of the physical artwork through this embodiment of its authenticity (Hamma, 2005). However, scholars argue that this replication of authenticity of the physical does not diminish the value, but instead enhances the value of the physical (Hamma, 2005; Sanderhoff, 2013; Jeffrey, 2015). This idea is referred to as the 'Mona Lisa Effect' and proposes that facsimiles of artworks, such as the *Mona Lisa,* do not inhibit the attraction to the original physical artwork. In fact, the facsimiles promote the artwork and might even encourage visitors to see the physical (Sanderhoff, 2013). Peter Walsh (2007) supports this idea as he suggests that Benjamin's interpretation of aura and the reproduction is misguided, it is the reproduction which creates the aura of the physical object because it enhances its originality and uniqueness (Walsh, 2007).

In this way, reproductions have an overall positive impact on the physical because it validates and enhances the authenticity of the physical. Therefore, these discussions have shown how the reproduction of an artwork can maintain a sense of aura as well as increase the aura of the original counterpart. Digital, then, does not challenge the ideas of aura and expressive authenticity, but challenges the traditional ideologies around authenticity and aura which assume that these ideas are fixed (Bolter *et al.*, 2006; Jeffrey, 2015). This is a significant point in the context of this PhD thesis as it suggests that the digital can maintain a form of authenticity, but this requires a reimagining of what we assume the authentic is in the digital. As I will highlight in the following sections, blockchain adds a new layer to this question of digital authenticity as it introduces the idea of provenance in digital tokens. As such, this thesis will explore if this emerging technology supports feelings of aura and authenticity through the reapplication of nominal authenticity in the digital space.

2.6 Shared Guardianship, Shared Authority & Migratable Aura.

The discussions so far highlight themes which disrupt the traditional binary logic that encase ownership, authority, and authenticity. The investigation into ownership emphasised the notion of shared guardianship, which takes a more collective approach to ownership by focusing on the people that surround a work rather than focus simply on the object itself. Therefore, shared guardianship involves consideration and partnership. This emphasis on building connections through shared guardianship also indicates that this approach produces social value. To reiterate, social value is experienced through building connections

and a sense of unity between a museum and its audiences. Similarly, shared guardianship has the potential to build a sense of community and connection between the different stakeholders as it aims to promote partnership.

The discussion on authority noted a similar theme. The section highlighted shared authority as a method for collaboration and disrupting the traditional curatorial structure in a cultural institution, which is defined through Phillips' (2014) proposal of taking an open authority in the online space. Open authority requires museums to approach the online domain as a space for discussion or a forum whilst also acting as a facilitator in building and establishing knowledge and understanding. Therefore, like shared guardianship, museums are required to carefully consider their approach to online projects and moderate through a considerate and reflective method. Again, this collaborative approach produces social value as it dilutes the authoritative voice of the institution by providing space for different voices in conversations around collections. In turn, this can build partnerships and connections between a museum, its collections, and the audiences it serves.

Lastly, the discussion on authenticity has provided an examination into how the digital reproduction can replicate the authenticity of the physical through migratable aura. This replicability does not aim to replace the physical but act as a way to form new experiences with the artefact. Therefore, the digital reproduction can act as an instrument in which museums can use to create new experiences with users. At the same time, this disrupts the traditional understandings around authenticity and requires the viewer to acknowledge this different experience as an authentic one.

However, there remains an inherent flaw in using digital reproductions in this way and this relates to the lack of proof or provenance that supports authenticity in digital works. Watermarking is one tool which aims to address this issue, and this acts like a fingerprint on the image appearing as a visible mark that can verify the authenticity of the digital object (Lynch, 2010). Tracking provenance has also shown to be an approach to confirm authenticity because it keeps a record of a history of ownership (Cullen *et al.*, 2000; Feigenbaum and Reist, 2012). Together, provenance and watermarking form a method that can be used to prove authenticity online. While watermarking has been common practice in authenticating digital objects, tracking provenance has proven to be more difficult. But, in recent years, blockchain technology has developed to become a more common practice in authenticating artwork online. Blockchain is a type of distributed ledger technology which records information about any transaction that takes place in its network. As such, the technology is essentially a distributed record of provenance for tokens exchanged. In the following section, I will introduce how this technology works and how it has been implemented in the arts sector. Through this explanation, I will conclude with a discussion on how blockchain technology might be used to cultivate shared guardianship, shared authority, and a migratable aura.

2.7 Blockchain Technology

2.7.1 Introduction

Blockchain has been coined as the fifth disruptive computing paradigm of the modern world (Swan, 2015),[12] a technology which could have the same impact as mobile phones, social networking, and even the computer. Indeed, as blockchain developed from its early stages of blockchain 1.0 (cryptocurrency) and 2.0 (smart contracts) to blockchain 3.0 (applications beyond currency), there is a continual belief from blockchain enthusiasts that this technology will be world changing in both the infrastructure of our lives and of the internet (Jones and Skinner, 2017; Swartz, 2017; Herian, 2018a).

The potential influence of blockchain has been compared to the potential impact the internet was perceived to produce at its inception. Theorists anticipated the internet as 'a tool for disintermediation' (Litman, 2004, p. 7), an uncontrollable, democratic, and decentralised space which would be both borderless and limitless (Barlow, 1996; Lévy, 2001; Saco, 2002). Similarly, blockchain functions on a distributed network of nodes (powerful computers). It 'eradiates' the need to trust intermediaries and centralised authorities, and power is distributed across the network as each node holds influence in the construction of the blockchain (Markey-Towler, 2018). However, the internet has now lapsed into a hypercentralised cyberspace as a small number of giant technology companies now hold the wealth of online power (Beaude, 2016). It is often argued that their power restricts the plurality and diversity of the internet as any attempt by start-ups is squashed under the authority that these giant companies claim (Beaude, 2016). Could a parallel situation happen for blockchain technology?

This PhD research began during an initial 'hype' around the technology which included the introduction of the NFT and initial exploration of the technology in the arts (Catlow and Garrett, 2018; Christie's, 2018; Gloerich, Lovink and De Vries, 2018). But since 2018, the crypto space has developed rapidly and 2021 has seen a surge in interest around NFTs in the arts space which has since led to a fluctuating market throughout the year (see Figure 2.2). This has also brought polarising opinions on the use of NFTs in the arts and museum sector; from those who support this idea (Reas, 2019; Styx, 2019; Bailey, 2021), to those that see NFTs as a new form of bubble or Ponzi scheme (Charlesworth, 2021; Ledesma *et al.*, 2021; Rivers Ryan, 2021). Like the internet, blockchain might have a lasting impression on how people live their lives online. However, it also needs to be questioned whether blockchain will be the miracle technology some claim it to be (Scrilla and Gayton, 2018), and, importantly, it is important to not let the 'hype' interfere with critical thinking about blockchain and museums. Therefore, in the following section I will examine blockchain technology through a critical lens. I aim to explore why the technology has such a 'quasi-

[12] The other four computing paradigms being the mainframe, the PC, the internet, and social networking/mobile phones (Swan, 2015, p. vii).

cyber-religion' behind it (Swartz, 2017, p. 90), whilst also investigating the criticisms of this technology.

Figure 2.2 Weekly primary sales across the Ethereum blockchain January 2021 to December 2021. Source: NonFungible.com, https://nonfungible.com/market/history Accessed January 2022

2.7.2 Demystifying the Blockchain

The principles of blockchain were first laid out in a white paper called 'Bitcoin: A Peer-to-Peer Electronic Cash System' under the pseudonym Satoshi Nakamoto (2008). In this paper, the unknown Nakamoto describes an idealised electronic cash system which solves the 'double spending problem',[13] and which could eradicate the need for centralised banking infrastructures. In brief, a blockchain is simply a type of distributed ledger technology, or a database distributed across a network of computers. This database stores information about transactions that have taken place in this network in an immutable way. Tokens are exchanged in this network of which there are two broad types: fungible tokens and NFTs.

Fungible tokens are tokens with equal value to one another. Cryptocurrencies and fiat currencies such as the pound or the dollar are an example of a fungible token. NFTs, on the other hand, are different because they hold a unique value and so these tokens can be used to store assets such as artworks (in both physical and digital formats). Importantly, NFTs only store information about these assets, hence, they act more as a receipt of authenticity rather than authenticate the work itself. The work is often stored on a decentralised storage system such as Permaweb or Inter-Planetary File System (IPFS) and linked into the

[13] The double spending problem refers to the issue created by the copying of digital goods. The cut and paste culture which the internet facilitates leads to the possibility of digital currency being vulnerable to counterfeit as users can copy and share money easily, jeopardising the integrity of the digital currency (Drescher, 2017: 49-53)

framework of the NFT.[14] In brief, these decentralised systems work by recording information as content hashes which are stored across a network of computers. This means that there is no singular point of failure in the network and so a user can always display their image even if one node is not live.[15]

An NFT is also accompanied by a smart contract, which are lines of code that will execute if a certain event occurs (Swan, 2015). Think of a smart contract as a law-binding contract but without the lawyer needed to execute it. As such, smart contracts provide the technology with autonomy and the ability to respond immediately to events (for example, paying an artist upon someone purchasing one of their works as an NFT).

Smart contracts binds the 'code is law' understanding to a blockchain because it will immediately execute if the conditions are met (Lessig, 1999). With art-based NFTs, smart contracts provide a way to embed terms and conditions into the token such as the price of sale, royalty payments, or even allow owners to append comments to their NFTs (Catlow *et al.*, 2017; Conlan, 2019; O'Dair, 2019). But smart contracts may be used for an array of circumstances. For example, in one case a smart contract was used as part of a marriage agreement where it contained the conditions of the marriage and can execute divorce should the conditions not be met (Dovey, 2018). At the same time, however, smart contracts have been criticised in recent years for their basic framework and lack of awareness of the social aspects of agreements and law contracts (Levy, 2017; Ferree, Blair and Conley Odenkirk, 2021; Ivanova *et al.*, 2021). Indeed, Vitalik Buterin, one of the co-founders of the Ethereum blockchain and the implementation of smart contracts, highlights how he 'quite regrets' calling the technology a 'smart contract' as the term implies a more law-binding concept than it actually is (Bitcoinist, 2018). Nevertheless, smart contracts are a crucial component to the NFT and how it functions within the arts and creative sectors.[16]

The best approach to understanding how a blockchain stores the transactions of these different tokens is to departmentalise the technology into three core elements: the block, the chain, and the network.

The Block

A blockchain is like a database which stores blocks of information. This information refers to transactions that have taken place in the network at a specific moment. Specifically, these transactions are stored in the form of a hash reference. A hash reference refers to a combination of hashes which are produced from inputting transaction data through a hash function. Hashes are collusion resistant, which means that each hash value produced through the function is unique to the data entered, therefore, they are like digital signatures (Drescher, 2017). This process of hashing encrypts the transaction data as a hash and this

[14] See IPFS for more information: https://ipfs.io/ (accessed 25 June 2021), for Permaweb see https://www.arweave.org/ (accessed 07 April 2022).
[15] Although such storage can be costly, and in recent years the question of who pays and maintains this storage has sparked controversy, see Nelson (2022).
[16] See Section 2.7.3.

can only by decrypted using a private key (Drescher, 2017).[17] In this respect, blockchain stores data pseudonymously.

The Chain

Each block also holds a timestamp and the hash reference of the previous block in the chain. In turn, this produces an unbreakable chain of blocks in which each block will link to the previous block – a blockchain (Figure 2.3). To explore this premise, Danial Drescher offers an example of handing a jacket into a public cloakroom. In return you receive a ticket for this jacket and this ticket is evidence that you are the owner of that jacket and where that jacket is currently. You then place this ticket into the pocket of another jacket and place this into the cloakroom. Although it seems an absurd scenario, the ticket of the second jacket provides a trail to that jacket which provides a route to the first jacket: a provenance of jackets (Drescher, 2017, p. 86). In the same way, a block which represents a group of transactions in a blockchain contains a hash reference and the hash reference of the previous block. By holding both its own hash reference and the hash reference of the previous block, the blockchain ensures that the chain is immutable.

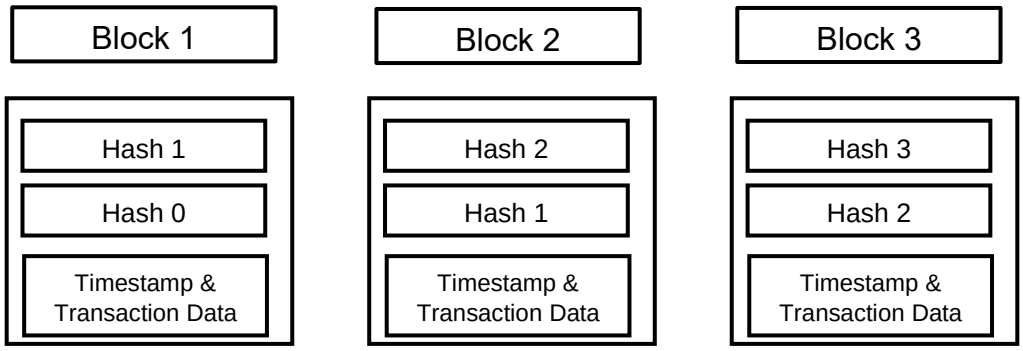

Figure 2.3 A simplified illustration of a blockchain in which the hash of the previous block is embedded into the new block along with its own hash and a timestamp with data of the transactions. Source: Author

The Network

The blockchain ledger is stored across a network of nodes (powerful computers), which ensures that it is tamper-resistant and that there is no singular point of failure. In other words, if one node went down, then the ledger can still be accessed (Swan, 2015). The network of computers also plays an important role in adding the next block of transactions to the ledger. This is a process of authenticating transactions and it is often termed as a process of 'mining' the blockchain (Zimmer, 2017; Calvão, 2019; Parkin, 2020).[18] Broadly speaking, mining is carried out using a software that competes against other miners to solve complex mathematical puzzles. This is carried out on a consensus mechanism and so once

[17] A private key relates to cryptography, an area which is too broad to be discussed here, for a simple explanation of how private keys and decryption works, see Drescher, 2017, p81 – p101
[18] Although this is sometimes known under a different term depending on the blockchain e.g., on the Tezos blockchain, miners are called 'bakers'.

a miner completes the puzzle, the rest of the miners check that this is correct and providing 51 percent of the network agree, the transactions are authenticated and added to the chain (Drescher, 2017; DuPont, 2019). The first miner to complete the block is rewarded with cryptocurrency.

There are two main types of mining protocols used in blockchains, ‘proof-of-work’ and ‘proof-of-stake’. ‘Proof-of-work’ uses cryptography as a way to prove that miners are using large amounts of computational power (resources) to work and compete with each other (Parkin, 2020). ’Proof-of-stake’, on the other hand, requires miners to make an economic stake of their own cryptocurrency in order to authenticate the next block and this process requires less computational power (Ethereum, 2020b). Currently in 2021, the two largest public blockchains Bitcoin and Ethereum are using ‘proof-of-work’, but Ethereum is in the midst of moving to a ‘proof-of-stake’ protocol. Third generation blockchains such as Tezos and Cardano already use ‘proof-of stake’.

This previous point also highlights how there are many types of blockchains available on the market. In the first instance, there are private blockchains, which work as an internal database. Secondly, permissioned blockchains, where access and the ability to record are controlled, and lastly, open blockchains such as Bitcoin, Ethereum, and Tezos, where anyone can access the blockchain and anyone can become a miner if they have the resources. Each have their different uses, for example, private and permissioned blockchains have previously been used to store legal documents such as birth certificates and deeds to property (De Filippi, and Wright, 2018). The US company Walmart has also used this to track the origins of their mango and pork and, in doing so, aim to tackle issues around food fraud, ethical production, and contamination sources (Kameth, 2018). A permissioned blockchain is also being used as part of the ongoing *Archangel* project co-run by The National Archives, University of Surrey, and The Open Data Institute. This project explores how a permissioned blockchain might embed trust and integrity into digital archives through documenting the works as hashes in a blockchain. A permissioned blockchain in this case enables users to access the digital archives but only authenticated institutions can write or add to the record, thereby embedding trust into the archive.

However, the arts sector has mostly focused on the use of public or open blockchains, with a specific focus on the Ethereum blockchain for its ability to encase smart contracts into its ledger. Therefore, the remainder of this thesis will focus on public blockchains only. In the following section, I will outline a couple of examples of how the arts has explored this technology with the aim to both showcase and critique the use value of blockchain in the art and museum sector.

2.7.3 Blockchain & NFTs in Museums & the Arts

Initial experimentations with blockchain and the arts focused on exploring the themes of the technology. The Furtherfield Gallery in London was an early adopter of blockchain experimentation and over the years the gallery has developed resources and works that examine blockchain outside of its financial characteristics, viewing it as an approach which could construct a 'commons for the arts in a network age' (Catlow and Garrett, 2018). For example, *Clickmine* (2017) by Sarah Friend (see Figure 2.4) was the gallery's recent co-commission with the NEoN Digital Arts Festival.[19] This artwork uses a clicking game which 'mines' for tokens with each click. In doing so, it uses blockchain as a medium whilst also critiquing the nature of cryptocurrency. Indeed, Friend's piece creates a 'hypercapitalist frenzy', as the clicking in the game mines numerous amounts of useless wealth (Furtherfield, 2018a). Rhea Myer's work also showcases a similar playful approach to exploring the concepts of blockchain. *Is Art* (2014/15), an early blockchain art piece, is a smart contract on the Ethereum blockchain where a person can send a transaction to the contract to change its state between being art and not art.[20] The work translates code language into a way of establishing 'art'.

Beyond these types of projects or 'blockchain art' (Fernández, Gustafsson and Lakoubay, 2019), early approaches to blockchain focused on the technology as an authenticating tool. Companies such as Artory and Verisart are two examples that leverage a blockchain to provide a service for arts organisations and artists to store and authenticate their work.[21]

Figure 2.4 *Clickmine*, Sarah Friend (2017), Source: clickmine.click, Accessed November 2021

Other approaches explored the use of blockchain as a way to commodify digital artwork. Monegraph, or 'monetized graphics', was one of the first platforms to appear using blockchain to aid artists in digital rights management. Originally presented by Rhizome as satire at the idea of creating market for digital art (Dash, 2014), Monegraph has now grown to become more commercialised considering itself somewhere between an exploratory art project, aesthetic theory, and a commercial platform (Zeilinger, 2018). For Monegraph, 'if

[19] See https://isthisa.com/clickmine (Accessed 5 November 2021).
[20] See https://rhea.art/is-art (Accessed 5 November 2021).
[21] See https://www.artory.com/ and https://verisart.com/ (Accessed 5 November 2021).

you like it, then you should put a blockchain on it' (Lotti, 2016, p. 102). In doing so, artists can authenticate and sell their digital work, without the need of a traditional gallery or a dealer (Zeilinger, 2016; Kaplinsky, 2017).

Ascribe, another example of an early adopter, although no longer active (Acribe, 2018), is also worth mentioning because the platform attempted to not only provide a means to authenticate and sell work, but also offer a visibility tool for both artists and consumer (O'Dwyer, 2017). Bruce Pon (2015), founder of Ascribe, claims that most of our IP is digital therefore it is important for us to have an approach to find the rightful owner of that property and to ensure attribution was given. The visibility tool enabled artists to keep track of who had a current copy of their artwork, and likewise, the consumer was able to know who the original artist was. This idea was then 'wrapped in licensing' (Pon, 2015, pt. 06:01 mins), so artists could clarify to the user whether the work is free to share or re-use or has restricted licensing. Ascribe was an innovative approach to using blockchain because it attempted to broaden the use of blockchain beyond its capabilities as a proof of ownership and use blockchain to locate where these images were ending up on the Web. Although unsuccessful, Ascribe has since rematerialized in the form of BigChainDB, a technology that offers developers a database that holds built in blockchain properties.[22]

In the recent years there has been a growing number of NFT platforms that offer similar services to artists and creators. Opensea, KnownOrigin, Foundation, Rarible are just a few examples of platforms that are open to users to sign up and mint (create) their own NFTs using their adaptable smart contracts.[23] Users simply need to upload a file, which is then stored on IPFS. Creators then must add metadata, a title, choose a pricing structure (such as an auction), and the number of editions available. Similarly, there are more curated platforms appearing such as Jpg, Feral File, and Well Now WTF?, which showcase new ways of displaying NFTs.[24] 2021 has also highlighted the museum sector taking notice of the NFT movement with institutions such as The Uffizi Galleries, Italy, The British Museum, London, and The Whitworth, Manchester exploring how NFTs might be used as a new source of income (Charr, 2021; Vastari Labs and The Whitworth, 2021; Whiddington, 2021).

In each of these cases, the focus is on the role of NFTs as a form of monetary and authentic device which has the potential to commodify the once uncommodifiable (the digital object). NFT platforms gives artists the freedom to sell outside of the gallery system, it is said to democratise the art market, and reinstate artists rights such as immediate resale rights and attribution.[25] Meanwhile, NFTs have been marked as a new means of income for museums, with the potential to support them in the deficits left by the COVID-19 pandemic (Ciecko,

[22] See https://www.bigchaindb.com/ (Accessed 5 November 2021).
[23] See https://opensea.io/ , https://knownorigin.io/, https://foundation.app/, https://rarible.com/ (Accessed 5 November 2021).
[24] See https://jpg.space/, https://feralfile.com/, and http://wellnow.wtf/ (Accessed 5 November 2021).
[25] See https://monegraph.com/home (Accessed: 1 November 2018).

2021). But do NFTs really support artists? Do they disrupt traditional intermediaries? And are such platforms 'democratic'?

2.7.4 Critically Reflecting on NFTs in the Arts & Museum Sector

NFTs, Copyright & Ownership

The first point to consider in this analysis is the role of blockchain in authentication and ownership, which are recurrent themes throughout the examples outlined above. For example, Ascribe attempted to provide a rights management platform that could provide 'an ownership layer for the internet' (Pon, 2015, pt. 00:10 min). The visibility tool was an experiment to address the issue of 'cutting' and 'pasting' online work as artists could now see how others were using the work. This experiment failed, which has left the NFT space still vulnerable to the 'cut and paste' culture of the internet (Lessig, 2004). Therefore, NFTs are not a DRM tool (De Filippi *et al.*, 2018), they cannot stop others from accessing the work, which suggests that NFTs fail to some extent to provide a means to own and authenticate a work as a unique commodity.

Furthermore, blockchain is a facilitator or a vehicle for proof, and the technology itself cannot prove the data it contains is by any means accurate. Primavera De Filippi and Aaron Wright (2018) elaborate on this point when they explain how blockchain could undermine copyright because of blockchain's immutableness. If a file is placed onto a blockchain under false pretences, it is extremely difficult to change. Therefore, although blockchain can act as a certificate of ownership, it can also be used maliciously to prove *false* ownership. This is also referred to as a form of 'garbage in, garbage out' problem and it is a difficult problem to solve without having some form of trusted authority (Ito and O'Dair, 2019).

On the other hand, a blockchain also offers a way to experiment with new forms of ownership such as shared or fractionalised ownership. The Maecenas gallery is an early adopter example that used the idea of tokens to fractionalise ownership of art masterpieces. Although the platform is simply a way for investors to diversify their portfolio, it also shows how blockchain might be used to share ownership of artworks. *Public Key/ Private Key* by Jennifer and Kevin McCoy also showcases this notion of shared ownership.[26] The work was a 16mm film donated to The Whitney Museum of American Art, however, the work was supported by 50 donors who each received a certificate of authenticity via a blockchain. In other words, the artists fractionalised the work into 50 pieces represented by these tokens. More recently, smart contracts are now used as a way to create shared value and fractional ownership of NFTs themselves. In this case, artists can retain some equity of the NFTs they sell so that they receive an income from works when sold on the secondary market (Whitaker and Kräussl, 2020). In doing so, the artist retains a portion of ownership, hence the NFT is technically shared between the artist and the buyer. Therefore, whilst NFTs might

[26] See https://mccoyspace.com/exhibition/174/ (Accessed 5 November 2021).

not be a rights management tool, they can provide a mean to identify, attribute, and symbolise more complex relations of ownership.[27]

Intermediaries and 'Democratisation'

Words such as 'democratisation', 'decentralisation', and 'transparent' appear across many of the examples noted earlier. In using these words, these platforms insinuate their objectives are shaped by socialist and democratic ideas, aiming to create a fairer system for artists and buyers. The Maecenas Gallery, for example, reports that their use of blockchain creates a more transparent and democratic way of buying art masterpieces. Masterpieces are ordinarily too expensive for most people to buy, but Maecenas argue that they have provided a way for anyone (with a spare $5000 US dollars) to partake in ownership of such artwork. A similar point has been made with The British Museum NFT project in partnership with a platform called LaCollection,[28] where the founder of the platform argues that producing NFTs of Katsushika Hokusai's *The Great Wave* for the museum was a way to broaden their audiences and attract a 'younger and international audience', on a platform that is suitable for both NFT collectors and 'non-crypto natives' (but again only if they have a spare €400 – 7,500 euros) (Whiddington, 2021).

Similarly, platforms such as KnownOrigin and Monegraph claim to be removing the need for a traditional intermediary such as an auction house or a gallery. For artists, this devolves the power of selling art and receiving commission to them, as KnownOrigin (2018) whitepaper explains; artists on their platform can be paid immediately upon sale using a ERC-721 standard smart contract. When a cryptocollectible artwork is sold, the code in the contract is executed and payment is sent immediately to the artist and the platform. This system acts as a more transparent and democratic way of selling art because no intermediary is needed to validate the transaction (De Filippi *et al.*, 2018). Blockchain in these cases is seen to decentralise ownership of artwork and provide more autonomy to the artist (Lotti, 2018). In doing so, blockchain supports the idea of a networked arts industry where a 'fair trade ecosystem' could be active between artist and buyer (O'Dair *et al.*, 2016).

[27] See Chapter 3.2 for further details.
[28] See https://lacollection.io/ (Accessed 5 November 2021).

But how democratic are such platforms? The price of NFTs has increased rapidly from January 2020 to December 2021, with average weekly prices of Art NFTs reaching as high as $10,000 US dollars on the Ethereum blockchain (Figure 2.5). Can such as price be considered democratic?

Figure 2.5 Weekly Average Asset Sale Value ($) on Ethereum Blockchain January 2020 - December 2021. Source: NonFungible.com, https://nonfungible.com/market/history Accessed January 2022

Similarly, the technology might provide transparency in payments, but these are still pseudonymised through hashes. NFT platforms are also not entirely transparent, with terms and conditions lacking important information such as actions if the platform were to go down, or if the link breaks between the NFT and the image stored on IPFS (Fletcher, 2020). Lastly, the notion of a networked arts industry does not do away with intermediaries altogether, as many scholars argue (O'Dwyer, 2014, 2015; Zeilinger, 2016; Brekke, 2018; De Filippi, and Wright, 2018). NFT platforms have become an alternative intermediary, 'swapping' places with the traditional art gallery (Brekke, 2018). This position is supported by Herian who in quoting David Harvey, argues that technology acts as a mask to hide 'centralised power behind a veneer of individual liberty' (Herian, 2018a, p. 49). The artist is not liberated on the blockchain but instead the blockchain acts as a shield to hide the new alternative intermediary that has emerged. This new intermediary has handed the power of payment over to the smart contract which is now liable to pay the artist if an artwork is sold. Code has become law in blockchain, as the code now carries out the tasks of traditional art dealers and galleries (O'Dwyer, 2014). Meanwhile, the artist is now dependent on the technology built into these platforms.

Commodification of Digital Art, Public Domain Works & Culture

A final point to explore is the concept of value creation and representation. Blockchain is perceived as a significant technology because it can produce value in objects that were before perceived as valueless.[29] Platforms such as Monegraph provide an environment in

[29] Valueless refers to the fact that it cannot be valued or priced.

which digital artwork or representations of physical assets can be sold as commodities, thus creating exchange value in these objects. Exchange value is associated with commodification because it is often commodities that are ‘intended principally for exchange’ (Appadurai, 1996, quoting Marx, p. 6). According to Karl Marx, the act of labour is represented through commodities which hold exchange value so labour may be exploited in the capitalist market (Nelson, 2012). Commodities in this economy are used for their economic or monetary exchange value, and they represent the same form of value as money. In this respect, digital artworks placed on platforms such as Rarible or Foundation are given an economic worth which is represented in their exchange value; they are commoditised. This is considered an advantage for commercial artists because they are now able to turn their property into capital (Sills, 2018).

But should all work have the potential to be commoditised? In his discussion on Net Art from the 1990s, Zeilinger (2016) expresses how the internet was used by artists from this movement to challenge notions such as the displaying, collecting, and distributing of art. Digital art, Zeilinger explains, was uncommodifiable because of its digital environment. Blockchain as shown in the examples above has ‘solved’ this quality as the uncommodifiable becomes commodified in the blockchain economy through the creation of exchange value. Zeilinger (2016, 2018) continues by stating that blockchain, in causing the commodification of digital art, is constraining digital art to the commercial world. This argument is supported by O’Dwyer who sees the digital art movement as an advocate for the ‘open source and free distribution model’(O’Dwyer, 2017, p. 305). Digital art, like the early Net Art, aims to challenge the idea of ownership and intellectual property. Therefore, it appears contradictory to enclose digital art into the commercial market when in fact it ‘wants to be free’ (O’Dwyer, 2017, p. 307).

Similar issues arise in the face of museums exploring NFTs as a source of income. The Uffizi Galleries sold NFTs of *Doni Tondo* by Michelangelo, a work that is in the public domain. Likewise, The British Museum sold NFTs of a series of works by Katsushika Hokusai, which are also public domain works. The use of public domain works raises ethical issues that resonates with the OpenGLAM movement; do museums have the rights to sell these works as NFTs? What are they really giving away? And can they justify the high prices of works of these NFTs that depict works readily available (and often in high resolution) elsewhere online? This financialization of culture is like an extension of the licensing fee framework used by museums over their digital collections, only the NFT does not necessarily give the owner any new rights apart from the ability to sell the NFT (unless rights are explicitly stated in the smart contract). Of course, there is still an opportunity to use NFTs to provide important income for museums, and indeed, there are potential NFT-based business models yet to be unlocked for this sector (Valeonti *et al.*, 2021). But museums need to reflect carefully on what they choose to sell and how they choose to sell it if NFTs are to be a morally sustainable approach to fundraising and income streams.

2.7.5 A Commons on the Blockchain

In the previous section, I have shown how blockchain can be beneficial for the arts sector in proving ownership, rebalancing power, and creating value in digital artwork. The critical examination around these advantages has also highlighted how blockchain can also be problematic for the sector. And the arguments of David Golumbia (2015a) and Herian (2018b) further complicate the use of blockchain in the arts. Golumbia (2015a) argues how the principles and discourse which the blockchain community adhere to needs to be examined. He claims that blockchain as a technology has been used to embody a capitalistic nature while presenting itself as a utopian alternative monetary network which rejects the centralised banking system. Hence, blockchain acts as a contradiction of itself. The same could be said regarding NFT platforms as many platforms are presented as an egalitarian alternative approach to the current commercial art market, but it is also cultivating value on digital artworks which can be sold as commodities. To repeat the argument made by O'Dwyer (2017), by commodifying digital artwork, blockchain is compressing it into the art market denying the free flow of this content. Therefore, blockchain is creating a capitalist economy for content which was originally free, but it is doing so, as noted earlier, 'behind a veneer of individual liberty' (Herian, 2018a, p. 49).

This argument is supported by Herian (2018b) who claims blockchain has been exploited by capitalistic culture. He explains how blockchain has been developed under a neoliberal organisational form, a product of the financial crisis (Herian, 2018a, 2018b). Therefore, Herian implies that blockchain was designed as a functioning contradiction of itself. As noted in Golumbia (2015b), the research of Langdon Winner (1980) is significant here as he reminds us that technologies, like artefacts, are often described using political language thus connecting these things to certain political associations and properties. Therefore, the political qualities of a technology should be understood in relation to the way people interact with the characteristics of that particular technology. This argument suggests that technologies are in some way neutral but become politically enthused by humans to promote their own agendas. In this case, blockchain has been described using language which is often associated with liberalism such as 'democratisation' and 'decentralisation', but as a tool, it is being used for underlying capitalist ventures such as the commodification of internet art, which in turn encourages a re-centralisation through the monopolies of wealth and power (Herain, 2018a). Hence, there is a mismatch of how a blockchain is being used and how it is being portrayed.

However, if technologies like blockchain only gain political qualities through the way people interact with its characteristics, this suggests blockchain can be used outside of a capitalist framework. In the context of this research, this is pivotal as it implies blockchain could be used in the context of a commons-like model which could reflect the needs of a public GLAM institution if it were to use blockchain. The research of De Filippi and Hassan (2015) provides a theoretical analysis on how this sort of model might work in a blockchain economy. In their essay, they explain how tokens could be used to reward community-based

contributions within peer-produced platforms such as Wikipedia. The tokens rewarded could then be used to reward other contributions, which gives back to the community, and create a token economy for social contribution. This is no longer just a theoretical concept; Decentralised Autonomous Organisations (DAOs) are organisations of people supported through on-chain governance (Ethereum Foundation, 2014), and in some DAOs such as the Rarible DAO, social tokens are used as a way to encourage engagement and investment into the DAO (Rarible, 2020).

De Filippi and Hassan's (2015) examination demonstrates how blockchain can be used outside of a narrow monetary sense and instead be used to materialise or represent social contribution. Thus, tokens act as money within this economy, however, this does not reflect a monetary worth but a social worth. The difficulty with this proposed model is that in creating tokens to represent social value, the model is immediately translated into an economy setting. According to David Bollier (2014), a commons community functions outside of an economy. Therefore, in using blockchain, a community like the one described by De Filippi and Hassan (2015) becomes contradictory to its nature. This is problematic as it suggests that an egalitarian framework such as a commons cannot exist within a blockchain economy, so how can blockchain be used in a non-capitalistic way that denotes collaboration (and thus in a public museum)? To explore this question further I will now turn to the idea of a cooperative and examine how this model may facilitate blockchain in a commons-based framework.

2.7.6 An Open Cooperative

FairCoop is a cooperative which aspires to create a post-capitalist economic system which is decentralised and self-empowered (FairCoop, 2018). Using its own digital currency, Faircoin, FairCoop aims to bring a paradigm shift to address the social inequalities in the financial system (König and Duran, 2016). As noted earlier, a block in a blockchain is produced through the task of mining which is a reward-based competition between nodes in the network to create tokens. Faircoin, on the other hand, is based on a cooperative network where there is no reward in mining. This creates a fairer network in which more powerful nodes do not monopolise the rewards (König and Duran, 2016). Through this fairer system, Faircoin aims to tackle market exclusion and to balance out the ratio of wealth (Scott, 2016).

Meanwhile, Resonate is a music streaming service which combines blockchain technology with a cooperative structure (Scholz, 2017). Resonate uses a 'pay for what you play' policy rather than a monthly subscription which gives more control to the user. This policy works through a '#stream2own' model where the user will 'stream it till you own it' (Resonate, 2018b). Hence, if a user plays a song frequently, they eventually become an owner of that song. This creates a fairer system in which musicians are paid directly for streams of their music and users have the possibility of owning a song rather than just having access to it (Resonate, 2018a).

Both Faircoin and Resonate are examples of cooperatives which are decentralised networks working within an economy, but in an open and collaborative model (Conaty and Bollier, 2014). These suggest that such a framework could act as a potential structure for the future of blockchain networks (O'Dwyer, 2015). Like the commons movement, cooperatives pool their resources, but they also harness the power of the economy to create capital which can then be fed back into the community (Conaty and Bollier, 2014). This engagement with the economy is what gives this model leverage as a framework for blockchain. However, the concept of a cooperative on the internet is not a new idea. Robert Murray (2012) explains how cooperative internet platforms reflect the commons movement in using collective intelligence to form community resources, when in reality they are virtual cooperatives.

Wikipedia, for example, is an open-source encyclopaedia which anyone is free to edit and add to. The platform also runs as a business maintained on donations from its users. A small group of individuals help to sustain the website, overseeing the crowdsourced editing and ensuring the website is used respectfully (Murray, 2012). Therefore, to function inside the internet economy as a working business model, Wikipedia acts like a cooperative. However, since Wikipedia's underlying framework is commons-based, Wikipedia is therefore working as an open cooperative (Bollier, 2015). Open cooperativism is the combination of the commons and cooperative movement and has been offered as an approach to creating a decentralised peer-production system (Conaty and Bollier, 2014; Bollier, 2015). Some DAOs in the crypto space also reflect this model, although it cannot be assumed that all DAOs are cooperative in nature.

Nevertheless, DAOs exemplify how blockchain might materialise this form of societal and governance model. Indeed, the synergy created from this merger could provide a strong case for using blockchain to promote a commons-based environment, and in doing so, answer the questions laid out by writers and artists who have been grappling with how to use blockchain to construct a commons for the arts (McMillan *et al.*, 2015; O'Dwyer, 2017; Catlow and Garrett, 2018; Zeilinger, 2018). Therefore, in theory, blockchain has the potential to be used in a non-commercial approach, which offers an opportunity to use this concept in a public museum. Although this thesis does not practically implement this concept, this idea will be used to examine the findings of this research in the context of authority and control.[30] In doing so, the objective of this discussion is to consider how blockchain might create social value through a sense of collaboration and shared guardianship.

2.8 Conclusion

In this chapter, I have reviewed literature on terms such as social value, ownership, authority, and authenticity. I defined social value as value formed from building connections and a sense of belonging through the experience of art and culture. This will be a key definition in the theoretical theory developed in Chapter 3. Meanwhile, in the discussion on ownership I highlighted the concept of shared guardianship, and again, this will be a crucial

[30] See Chapter 6.5

theme that runs throughout this thesis and research project. The discussion on authority outlined a similar idea defined as shared authority, which takes a collaborative and reflective approach to content and knowledge creation in museum-based projects.

I took a different focus in the discussion on authenticity as I considered how this idea might be transferred to digital reproductions through the idea of aura. This authenticity theme is important when reflecting on the role of blockchain and NFTs in this research project. In Section 2.7.5, I outlined the key premises of blockchain technology and introduced how the technology has been used so far in the arts and museum sectors. The use cases reflect on blockchain as a source of authentication and ownership in the digital context as it provides users with a way of claiming ownership over works stored as assets on a blockchain. At the same time, however, the discussion of these examples also indicates how blockchain is often used in a capitalistic manner masked in liberalist language. But blockchain, and technologies in general, are apolitical in nature. This insinuates that blockchain could also be used in a commons-based framework and I concluded by proposing the commons-based cooperative model, such as DAOs, which could be used to frame the use of blockchain in a museum or other arts organisation. In doing so, this could shift focus away from using the technology as a monetary device, and towards using it to produce new forms of values, ones which are more social and community driven.

In the following chapter, I will outline the theoretical framework and methods used in this research project with NML. This framework and methodology are informed by the themes discussed in this chapter and reflect on how blockchain might be used within a more commons-based and open authority approach.

Chapter 3: Theorising & Applying Digital Fragmentation & Enchainment Theory

3.1 Introduction

In the previous chapter I introduced some of the key themes for this thesis which included social value, ownership, shared guardianship, shared authority, and migratable aura. The discussions in this chapter will draw on these key phrases to construct a theoretical framework through which a research methodology will be created and against which research data will be discussed. This also requires a revisit to blockchain technology to discuss the concept of fragmented ownership and tokenisation and this will provide the main theoretical framework of this thesis' methodology. I will also draw on fragmentation and enchainment theory in archaeology, which is connected to the research of John Chapman (2000).

Chapman uses this concept in his consideration of found broken artefacts in Balkan Mesolithic, Neolithic, and Copper Age archaeological sites. He argues that found fragmented archaeological objects were purposely broken into pieces where each fragment comes to represent a binding contract and/or enchained relationship between the actors involved. This idea of enchainment will be used in this theoretical framework to propose how the fragmentation of tokenised artworks and artefacts can form a connection between the museum, the collections, and its audiences. In this respect, the role of enchainment is to explore how blockchain might produce social value for the museum through forging connections. I will also argue that shared authority, shared guardianship, and migratable aura all contribute to this process.

To explore this idea, I will outline in this chapter the methodology of this research and consider how enchainment could be formed at NML. The main aspect of this research took place through a workshop with participants which produced the contents for an online exhibition called *Crypto-Connections.* The theme of this exhibition explores the personal relationship to objects as each object displayed is also presented alongside a written personal description by one of the participants. The works in *Crypto-Connections* were minted into NFTs and given to each participant using a smart contract embedded into a specially devised decentralised gallery called the *Possession Galley.* Each NFT produced is represented both in this digital space and in the owner's (the participant) digital wallet.

The concept of this research is to explore how NFTs might transform into digital possessions for the participants, which in doing so, could create a sense of collective ownership and connection between the institution and the participant. This research is also supplemented with two sets of interviews. The first set were with colleagues at NML to discuss and reflect on the research project; the second set examines the project with interviewees who consider themselves part of the crypto space. The aim of these interviews is to explore whether knowledge about the institution and museums, or understanding about the technology, can impact the perception of digital ownership and authenticity in this research context.

3.2 Blockchain and Tokenisation

In the previous chapter I highlighted the cryptocollectible or NFT, a type of blockchain token that is used to store assets such as artwork in a blockchain ledger. There, I outlined and critiqued how these tokens are used in the arts as a proof of ownership and authenticity. As part of this analysis, I discussed how NFTs can be used to experiment with new forms or frameworks around digital ownership. For instance, examples such as Jennifer and Kevin McCoy's *Public Key/ Private Key* show how these tokens might be used to distribute ownership to different stakeholders, thereby creating a token that symbolises a shared ownership and a connection between these different owners. Eva Sussman's *89 Seconds Atomized* is also a case in point.[31] The artist divided her video work *89 Seconds at Alcázar* into 2,304 unique blocks as NFTs which represents an atom of the work (400 pixels with a 9:45 duration of the original video). In this case, the NFT is an explicit symbol of a specific aspect of the work and owners are part of a mosaic of owners which claim the broader work.

Therefore, the ability to control and own a cryptocollectible means that it can be used to explore ownership dynamics. There are two overarching ways to approach this idea. Firstly, the artist or creator can retain some equity of their token through embedding a function into the associated smart contract, which enables them to gain an income when their works are resold in the secondary market (Whitaker and Kräussl, 2018). At the same time, it also means that the creator will always own a portion of their work (providing they retain the keys to the smart contract's wallet), and so ownership is pooled between creator and buyer.

A different approach is to produce NFTs that are like limited editions of a work (O'Dwyer, 2018b). In this case, artists will create a number of NFT editions when putting their work up for sale. But unlike other digital editions, each NFT represents a portion of ownership over the work it represents. For example, the Maecenas Gallery noted in Chapter 2 shows how this might work in relation to physical art masterpieces. Collectors and galleries can release liquidity from their physical collection by selling portions of the work on the Maecenas Gallery. In doing so, the artworks can remain in the physical space, but the owners can interchange through the buying and selling of tokens. However, the Maecenas Gallery does not use NFTs for this process and instead uses an ERC20 protocol (also known as a fungible token). As such, this process is more reflective of transforming art into a currency with various denominations. Nevertheless, it offers one example of how blockchain might work to spread ownership of artworks across different stakeholders.

Async Art also offers an example but in the context of digital artwork. Async Art is a platform where creators can sell their digital pieces in layers.[32] In other words, they can section off their work and sell these as individual NFTs. Moreover, the platform focuses on programmable art and so each layer is set with parameters determined by the artist which allows the owner to change aspects of their portion of a work. Therefore, the fractionalisation

[31] See https://snark.art/89seconds/ (Accessed 10 November 2021)
[32] See https://async.art/ (Accessed 10 November 2021)

of the digital work into a selection of NFTs creates a community of owners who hold rights or control over different aspects of the work.

More recently, platforms such as Fractional.Art provides a means to sell fractions of NFTs after the initial creation of the work.[33] Indeed, with the different price surges in NFTs (see Figure 2.5), buying fractions of a token is now a more affordable way of owning an NFT, whilst also enabling primary owners to release liquidity from their collection without having to sell the entire token. This is different from Async Art's approach, because Fractional.Art takes and fractionalises the NFT after its initial sale. In this way, the tokens produced from fractionalising are portions of the original NFT's value.

However, both Fractional.Art and the Maecenas Gallery lack a cohesion between owners as the focus is on releasing liquidity from the artworks. In turn, this leads to the idea of fractional ownership rather than a collective or shared ownership (Schenider, 2018). Async Art also faces this challenge as the diversification of owners does not immediately create a community of owners, it simply produces multiple separate owners. But can such an idea produce a sense of belonging or connection between the different owners? How might digital fractionalising create meaningful and connecting tokens?

3.3 Fragmentation & Enchainment Theory

As briefly noted, fragmentation and enchainment are ideas introduced by the archaeologist John Chapman (2000) in his examination of found broken materials in Balkan archaeological sites. Through these ideas, Chapman was arguing that broken pieces were not mere rubbish but have significant value for archaeologists (Chapman, 2000, 2008; Chapman and Gaydarska, 2007). The idea of enchainment proposes that fragmented objects are deliberately broken to form a strong bond between the parties involved. Thus, enchainment acts as an enforcement of relations between persons, places, and objects, where the fragments act as tokens which represent an event or binding contract between the different parties (Chapman, 2008).

This theory is grounded in ideas such as personhood, objectification, and the inalienable possession. In its simplest form, Chris Fowler describes personhood as the 'state of being a person' and he identifies how personhood might be individual in nature (unique) or dividual in nature (part of a collective whole) (Fowler, 2004, pp. 7–8). Objectification in enchainment theory focuses on the role of objects in relation to these two dimensions of personhood. Chapman uses David Miller's theory on culture to show that objectification is a 'dual process' between subject and object (Chapman, 2000, p. 29). Put differently, objectification is the process of extending subject into object, thus blurring the lines between these two forms. In turn, this produces what might be described as an inalienable possession, a term deriving from Annette Weiner (1992) and her examination of gift-giving in Oceania societies; the inalienable possession is one that would 'diminish the self' if it were lost, and it holds intrinsic

[33] See https://fractional.art/ (accessed 10 November 2021)

and cultural value because of this extension of the subject into the object (Weiner, 1992, p. 6).

In combining these ideas, the idea of fragmentation and enchainment theory reflects a need to extend part of one's personhood into the fragments, thus producing a dividual nature:

> *The notion that fragments of objects transmit not only the symbolism of their complete, once-intact form but also the enchainment, or fractal, connotations of past makers and owners would account for a wide variety of fragmentation behaviour. The inalienability of valued objects (Weiner, 1992) would then be extended to that of fragments of objects.*
>
> (Chapman, 2000, p. 39).

Therefore, fragmenting is a process of objectification or extending the self into the fragment so that it gains value, inalienable value, that binds the different fragment owners together.

According to Chapman, the giving of tokens can be predated to a Greek custom known as 'symbolon' and the Roman custom called 'tessera hositalis', both of which were related to the linking of two parties in an agreement (Chapman, 2000, p. 37). Similarly, Fowler (2004) explains how tokens have often been used to create a bond between two people, typically between lovers using objects which make up a pair to symbolise the couple. Therefore, the idea that an object is broken into fragments to represent new tokens is a development of a long-standing tradition of objects acting as signifiers. Furthermore, enchainment theory has been used widely by archaeologists beyond the Balkan prehistory context. For example, Ceri Houlbrook (2017) has proposed fragmentation with enchainment as a theory to explain the concealment of post-medieval shoes separated from their pairs and hidden in unusual places around buildings. Johanna Brück (2006), on the other hand, has discussed it in the context of fragmented human bodies and objects in Bronze Age Britain to demonstrate how fragments were used to construct the human self during this time period.

In this respect, this thesis proposes that blockchain tokens could also reflect fragmentation and enchainment theory. If an artwork is digitally fragmented using blockchain into different NFTs, each piece becomes a separate entity with its own distinct value and exchangeability. Therefore, the NFT has the potential to be a vehicle for meaning in the same way as fragments in this theory. This is a significant point for this research project since it implies that the NFT can be more than a digital object, it could be a tool in which to bind a participant to the cultural institution and to its collections.

However, in turning to the criticisms of this theory, Marcus Brittain and Oliver Harris (2010) question whether fragmentation always infers enchainment and vice versa and this criticism reflects Fowler's (2004) argument that fragmentation and enchainment are not always linked. Fowler compared Melanesian gift exchange to fragmentation and enchainment to show how there are activities in different cultures where enchainment can occur without the

fragmentation of an object. Building on this premise, Brittain and Harris (2010) argue that it should not be assumed that enchainment is always an outcome of fragmentation.

Susan Gillespie's (2015) discussion of fragmentation and assemblages also connects with Brittain and Harris' argument. Gillespie argues that artefacts are assemblages of various objects where these objects are in a continuous motion, being placed together, fragmented, and then grouped again with different social associations. In this respect, fragments are not connected until the act of assembling creates relations between them (DeLanda, 2016). In discussing objects in this way, Gillespie implies that fragments of an object become separate entities in their own right, which have the potential to be embodied in new meanings as they are assembled into new forms. In other words, the value derives from this process of forging relations between the fragments rather than the fragments as entities.

More broadly, these points suggest that fragmentation and enchainment are not mutually exclusive, which is problematic for this research as it cannot be assumed that simply giving an NFT to a participant will automatically enforce a binding connection or enchainment. Therefore, the following section will consider how fragmentation might lead to enchainment through the examination of psychological ownership.

3.4 Enchainment, (Digital) Possessions, and Ownership

In Section 3.3, I outlined fragmentation and enchainment theory and showed the link between these two ideas, but I failed to explain how enchainment forms. Chapman (2000) proposed three approaches that create enchainment defined as 'presencing', 'grounding', and 'categorisation', of which the notions of 'presencing' and 'grounding' are useful for the arguments of this thesis. 'Presencing' refers to embodying the past and those that are absent, therefore, its focus reflects Weiner's (1992) discussion of the inalienable possession. Similar to 'presencing', 'grounding' focuses on embodying place and context. As such, the emphasis is also on embodying historical or cultural value, but it is centred on context rather than the past. In both cases, enchainment forms through a process of extending into the fragment. This idea of extending aspects of a person is also relatable to a term I noted in Chapter 2.3.2 from research in consumerism, collecting, and psychology, which describes a psychological aspect to ownership. This was identified as psychological ownership and it emphasises how extending into an object can create a feeling of control and connection, associated with the properties of ownership. Therefore, in what follows, I will consider the interrelationship between enchainment and psychological ownership, and I will reflect on whether this connection can support the formation of enchainment, which in turn will highlight how enchainment could form through the production of NFTs in this research project.

Psychological ownership is the cognitive perception of possession, and this feeling of possession often derives from the investment and extension of the self in these things (Jussila *et al.*, 2015). Possessions are things we call our own, we feel connected to them, and they shape our identity and our personhood (Belk, 1988). Ian Hodder (2012), in using

the example of a pebble found on a beach, explains how this psychological ownership takes shape through recognition, association, and exclusivity. Someone might see a pebble (recognition) on a beach and choose to pick it up and keep it (exclusivity). Through this act, the pebble becomes associated with that beach and that event. This association, Belk would argue, demonstrates that the person has extended their own memory onto the pebble, thus embedding themselves into the object to transform it into a possession (Belk, 1988, 2018). This notion of possession can also be handed over to others, for example, an heirloom can feel like a possession to descendants. Heirlooms are immortalisations of a deceased person, an extension of that past self (Baudrillard, 1996). Therefore, descendants might feel a strong level of psychological ownership to this possession because of the associations it holds of the deceased relative. The object transforms into an inalienable possession (Weiner, 1992).

This idea implies that psychological ownership is formed through a human/object relation in which agency is transferred from the person onto the object, thus endowing the object with meaning and association. Agency as defined in this thesis is drawn from Alfred Gell (1998), who describes how a person can be a social agent, which is 'one who 'causes events to happen' in their vicinity' (Gell, 1998, p. 16), and an object can be a secondary agent, which is 'not endowed with will or intention […] but essential to the formation [of the event/action]' (Gell, 1998, p. 36). In this respect, agency refers to this idea of an extended self and association and the process of transfer encases the object (fragment) with meaning and produces a human/object relation that can be understood as psychological ownership. This idea reconnects with the discussion on objectification in Section 3.3 which stated that objectification is the point of duality between subject and object (Miller, 1992, p. 28). Therefore, agency is the idea that is transferred in this process of objectification or extension; it embodies the convergence of subject and object, which I suggest produces a feeling of psychological ownership and connection.

Research suggests that digital objects can also embody this role of a secondary agent (Denegri-Knott, Watkins and Wood, 2012; Belk, 2013, 2018). Janice Denegri-Knott, Rebecca Watkins and Joseph Wood (2012) explain how digital virtual possessions can take on this inalienable quality through the process of connection. During in-depth interviews, the researchers asked participants about digital virtual possessions they owned, and they found that often participants would refer to a memory or experience to describe why a certain digital good was important to them. Therefore, these participants show how they have transferred agency (in the form of personal association) into these digital objects, which has transformed these objects into digital possessions. Like the pebble example noted earlier, this association represents the extension of the self but in a digital form and creates a feeling of psychological ownership.

Belk (2013) notes a similar idea when he identifies how the use of avatars in online gaming is a way of re-embodying the self digitally. An avatar is the re-embodiment of a person which is used in online spaces such as gaming and chat rooms. The avatar in this case is a fractal

version of a someone's personhood online; the user extends part of themselves into the avatar through personalisation, which can bring about a feeling of psychological ownership (Belk, 2013).

But when considering the collecting of digital possessions, not all digital objects replicate the same psychological ownership felt for physical objects (Belk, 2018). However, Rebecca Mardon and Russell Belk (2018) describe how some individuals can feel psychological ownership in certain digital objects if the digital object feels authentic and elusive. By elusive, they refer to the uniqueness and rarity of the digital object, and digital content such as those found in virtual worlds are an exemplar of this idea. Therefore, this suggests that digital objects that hold these qualities can be like digital possessions. In other words, the digital object must feel like an entity in its own right unlike digital content that is shared or spread across the internet which feels ubiquitous. This connects with Bill Brown's (2001) theorising of 'things' or 'thing theory'. In his introduction to *Critical Inquiry*, Brown describes how objects are part of everyday life, 'we look *through* objects' (Brown, 2001, p. 4, his emphasis), but things confront us, and this forms a human/object relation. Likewise, digital objects have the potential to be digital things when they are made elusive and identifiable, which in doing so, can build a human/object relation and a transfer of agency.

This suggests that blockchain offers something new to this discussion of digital psychological ownership. To reiterate, NFTs are like certificates of authenticity and ownership because the blockchain ledger acts as a provenance tool in which owners can use to identify their claim to ownership. Therefore, NFTs hold elements of scarcity, authenticity, and elusiveness that other 'typical' digital objects lack. NFTs, then, might be like digital things which can embody meaning and extensions of the self.

The discussion so far has demonstrated how the extension of the self, either through the extension of association or embodiment, is a form of agency that when transferred could build a sense of psychological ownership. Jon Pierce, Tatiana Kostova, and Kurt Dirks (2001) identify other roots that are connected to a feeling of psychological ownership which include; efficacy (this associated to control and use value), and a sense of place (this is connected to feeling at 'home'). They also note 'routes' or motivations which can cultivate a feeling of psychological ownership in an individual such as intimacy (level of knowledge someone has about the target), investment (how much time and effort someone has put into the target), and control (how much power someone has over the target) (Pierce, Kostova and Dirks, 2001, p. 301). And, more recently, Jon Pierce and Joann Peck (2018) note a further route identified as stimulation (having an attraction or appeal to the target). Along with the self-identification, these factors can determine if a person might feel psychological ownership and how they might gain or enhance this feeling.

The feeling of psychological ownership is important when considering how a person feels responsible for an object or place (Pierce, Kostova and Dirks, 2003). This feeling of responsibility is also known as stewardship, which encourages a person to become

enchained to an object through obligation. Literature in management studies have identified how stewardship can be encouraged through the psychological factors of identification and power (Davis, Schoorman and Donaldson, 1997), which are factors that are closely related to the routes and roots of psychological ownership identified earlier (Pierce, Kostova and Dirks, 2001; Pierce and Jussila, 2011; Jussila *et al.*, 2015; Peck and Shu, 2015; Shu and Peck, 2018).

For example, the notion of power is interlinked to control as a person who has power over something will be able to control it. Meanwhile, intimacy, investment, a sense of place, and self-identity are connected to identification as the more knowledge someone has about something, the more they will identify with it and feel a sense of belonging (Pierce, Kostova and Dirks, 2001; Shu and Peck, 2018). Similarly, the more time and labour invested into something, the more a person will feel a level of ownership and responsibility and this idea reflects Lockean theory on work and ownership (Pierce and Jussila, 2011). To reiterate, Lockean theory refers to an individual's rights to the attribution and benefits of their labour (Moore and Himma, 2011), and so the more effort invested into something, the more likely someone will want to be acknowledged for their work.

Research on collective psychological ownership also highlights social identity as a contributing factor to this feeling (Pierce and Jussila, 2011; Man and Farquharson, 2015; Wiggins, 2018). Collective psychological ownership refers to the group of individuals recognising themselves as an exclusive group, therefore, this aspect of ownership is different to public or common ownership, which refers to a sharing of a resource or a place. Instead, it refers to a specific community and their agreed mutual claim on a target of ownership (Verkuyten and Martinovic, 2017). In the context of this research, collective psychological ownership is important as it aims to extend the idea of fractional ownership and transform it into shared or collective ownership.

Meanwhile, social identity refers to an individual's own perception of being linked to a group and it concerns the social features that someone holds that represent their association to that group (Devos and Deschamps, 1998). As such, the term is a generalisation for a cultural identity as this refers to the 'aspects of our identities which arise from our 'belonging' to distinctive ethnic, racial, linguistic, religious and, above all, national cultures' (Hall, 1992, p. 274). Therefore, social identity is important in building social value as it closely relates to a need to connect and build relationships and, likewise, it will be a significant factor in the development of meaningful digital fragments.

In returning to enchainment, I argue in this research that these discussions on ownership and stewardship are intrinsic mindsets needed for enchainment to occur. Here, enchainment refers to the human/object relation formed through a process of fragmenting. In using Gell's (1998) argument again, the human/object relation formed interprets the individual as a social agent and the original intact artefact (pre-fragmentation) as the secondary agent. Once fragmented, however, agency is transferred to each fragment and so these also transform

into secondary agents representing the enchainment of the individuals involved. Indeed, the fragments gain an inalienable value that might be understood as a feeling of authenticity and aura. In Chapter 2.5, I introduced the theme of aura and suggested that this idea is migratable. In other words, the auratic quality of a work can shift to reproductions, thus producing new works that feel authentic. I propose that this transfer of agency has the potential to also transfer aura. In doing so, this embodies the secondary agent (fragment) with meaning and intrinsic value.

Meanwhile, the roots and routes noted previously can also be used to determine and implement enchainment. Therefore, self-identity, efficacy, and a sense of place can be used as variables to see if enchainment might occur, with investment, intimacy, control, stimulation, and social identity acting as factors which could form enchainment in individuals. The distribution of control over the object can produce stewardship, which is the potential bind between the individual and the object as it creates a sense of responsibility in the owner of the fragment, they feel a need to care for the fragment because of its symbolism.

This research transfers this theory into the digital domain and considers to what extent blockchain technology might support this idea. As noted earlier, blockchain provides a way to experiment with different dynamics of ownership because of its ability to create identifiable and ownable digital objects. Hence, the technology appears to act as an authenticating tool and produce digital object that feel like digital things. However, I wish to also investigate how the properties of blockchain technology provide this proof of authentication. Indeed, this needs to be examined in order to understand how this technology might support digital enchainment.

Therefore, the final part of this theoretical framework considers digital materiality as a theme in which to investigate nature of blockchain. In doing so, this will inform how blockchain supports or challenges our understanding of digital authenticity. Digital materiality refers to the properties that construct the digital space and I understand this term in relation to the work of Matthew Kirschenbaum (2008) and Johanna Drucker (2013) who together describe four dimensions to a digital object's materiality; formal, forensic, distributed and performative.

In the first instance, a formal perspective considers a digital object's materiality as a way to 'propagate the illusion of the immaterial behaviour' (Shep, 2015, p. 325). In this case, computers are understood to manipulate symbols to give the illusion of a seamless presentation of digital information, therefore, the formal element of the digital is what we see before us on our screens (Kirschenbaum, 2008). Secondly, digital materiality can be considered from a forensic perspective where the bits and bytes of the digital are treated as individual material things (Kirschenbaum, 2008; Blanchette, 2011). This perspective of digital materiality explores how the individualisation of bits leave traces and remnants, which can be used to analyse the infrastructure of the digital (Blanchette, 2011). Thirdly, digital materiality can be understood from a distributed perspective where the materiality of the digital is explored through the co-dependencies and networks needed for the digital to function such

as servers, systems, and hardware (Drucker, 2013). Fourthly, digital materiality can be viewed from a performative perspective, which argues that the materials of the digital should be examined for what they do rather than what they are. In this way, performative materiality explores the function of the digital so to unearth how it is produced (Drucker, 2013).

In using these different dimensions as a framework for analysis, I will examine how a blockchain might transform a digital object into a digital thing. In doing so, I will consider the role of authenticity in the creation of value and, as such, how an NFT might be transformed into a digitally fragmented artefact and a vehicle for meaning. Therefore, in this thesis I will examine to what extent blockchain can extend fragmentation and enchainment theory into the digital museum context.

3.5. Implementing Enchainment in NML

The methodology of this PhD project builds on the theoretical framework described in this chapter and it is designed to explore how blockchain might support the ownership structure discussed and create social value. Specifically, this research takes a participatory design approach to its methods, where the focus is on working collaboratively (Zuber-Skerritt *et al.*, 2002; Foster, 2016). This method reflects the approach taken in LGR projects which encourage a process of learning by doing, together, and from others (Finnis, Kennedy and Malde, 2020).

In brief, the main body of this research took place between September 2018 to July 2020 at NML and online and it consisted of four main aspects, including workshops, the development of an online exhibition, the development of NFTs, and interviews with colleagues at NML and from the blockchain community. Firstly, the project involved two workshops developed in collaboration with colleagues at NML, the first taking place in January 2020 and the second in July 2020. This involved six participants who identify themselves as LGBT+ (Lesbian, Gay, Bisexual, Transgender +) and one representative from NML, identified as Participant A. LGBT+ participants were chosen because they are likely to have a strong cultural identity and there is also an extensive LGBT+ history in Liverpool which NML has been exploring through exhibitions and a wide-ranging collections since 2006 (Collins, 2019).

Workshop 1 aimed to provide the group with understanding of the key concepts of the project including introducing them to blockchain technology using an activity called *BlockExchange*. The participants were also asked to bring a personal belonging with them to this workshop and in the afternoon of the workshop the participants were invited to choose a museum work from the Walker Art Gallery or World Museum based on this idea of personal connection. These objects formed the basis of the online exhibition called *Crypto-Connections*,[34] which presents these objects with a summary written by one of the participants on why they chose that particular item. With the help of developers from Peera Ltd, a software development company based in Manchester UK, a decentralised digital

[34] See https://www.liverpoolmuseums.org.uk/collections/cryptoconnections (access 10 November 2021)

gallery was created called the *Possession Gallery,* and this was an interface connected to the Ethereum blockchain via a specialised devised smart contract. The *Possession Gallery* hosted an admin page, which I used to create the NFTs of each object depicted in *Crypto-Connections.*

The participants were invited to attend a second workshop in July 2020, which took place via Zoom due to COVID-19 restrictions where I asked the participants to reflect on the process of the project. Each participant also received their tokens of their chosen objects during this workshop. However, one participant, Participant C could not be contacted during this time and so did not attend this second workshop.

This research embeds the motives of psychological ownership into the methodology. For example, the motives stimulation and intimacy are evident in the personal approach taken to *Crypto-Connections* as it requires participants to explore the collections based on their personal appeal and perspectives of the work. Meanwhile, the use of blockchain technology attempts to explore the idea of control and reflect on whether owning an NFT delivers this motive to psychological ownership. The decision to use LGBT+ participants in this project reflects the motive social identity, which is associated to collective psychological ownership and considers if this might contribute to a sense of communal or group connection. Lastly, the contributory and participatory nature of this research reflects the motive of investment and reflects on how audience engagement might help to harness a sense of enchainment between the museum and these participants.

However, before providing further details on this methodology, the following sections will outline a participatory design approach and its limitations, as well as examples of its use in relation to blockchain-based research.

3.6 The Participatory Design Approach

A participatory design approach is a practice which involves multiple stakeholders who work together to create an end-product or idea. According to Nancy Foster, ‘each participant contributes to the process according to his or her own expertise’ (Foster, 2016, p. 230). Originally, this approach was used as a tool to improve workers’ understanding of the instruments they use for work (Bratteteig and Wagner, 2012), however, it has been since implemented in wider fields such as the improvement of technologies (Hutchinson *et al.*, 2003), museum exhibitions (Lynch and Alberti, 2010), and urban design (Bratteteig and Wagner, 2012). In engaging with participatory design, experts and designers can create products which are more relevant to the user and thus add value to the end-product (Fuks *et al.*, 2012). It also gives more control to the user, creating a more democratic process of development because the user’s voice can be heard during the design process (Vines *et al.*, 2013). Therefore, this is a human-centred approach because it focuses on the needs of the visitor or user in the end-product rather than taking a design-focused approach which focuses on product aesthetics (Chin *et al.*, 2016).

In museums, this approach has been used to engage community groups in discussion with museum professionals and to co-produce exhibitions, which demonstrates a sharing of authority in the curation and interpretation of objects with the participants (Frisch, 2011). Of note is Simon's (2010) work and proposal for four strands of community engagement work which include 'contributory', 'collaborative', 'co-creative', and 'hosted'. Each term holds nuance, 'contributory', for example, reflects a more controlled environment of collaborating with participants where the museum 'requests content'. Meanwhile, 'hosted' reflects a more open collaboration in which the institution plays facilitator to the project rather than overseer (Simon, 2010, p. 190).

In each case, this participatory approach encourages the museum to move away from a 'one world, world view' in its projects (Chin *et al.*, 2016, pp. 244–245), to a more 'pluriverse' viewpoint. A 'pluriverse' is described as a 'world where many worlds fit' (Escobar, 2011, p. 139), and in participatory design each participant is a representative of another 'world' or voice that should be heard in the overall end-product or 'world'. Loraine Clarke, Emma Nicol and Ian Ruthven (2015) explain how this is important in the context of museum exhibitions because where a participant comes from will impact how they contribute and respond to the project and thus will diversify the exhibit so that it becomes more relevant to a wider reach of people.

However, in terms of co-production of exhibitions, research has shown that this approach is difficult to materialise fully (Davies, 2010b; Lynch and Alberti, 2010). For example, the Manchester Museum's *Revealing Histories: Myths about Race* co-produced exhibition aimed to create a multi-vocal exhibition which tackled the debate around 'Are Museums Racist?', but it is because of this contentious theme that the museum failed to truly share its authority in the creation of the exhibition (Lynch and Alberti, 2010). This problem is supported by Sue Davies' (2010a) research which notes that a key issue that limits co-production or participatory designed exhibits is the museum's fear of loss of control of the overarching voice and curatorial authority. Thus, sharing control remains problematic to the participatory design process.

Forms of participation and who benefits are also issues identified as challenging the participatory design approach (Vines *et al.*, 2013). In relation to forms of participation, roles, and the level of engagement needs to be stated clearly so that expectations are met (Davies, 2010a). In terms of benefactors, the project's inherent aim should be to co-create rather than use the project as a form of 'self-indulgency', where the institution supporting the project is promoted as challenging social norms and fostering social inclusion (Brown, 2011). As to who participates is also important as there is little to gain from a participatory design if those that are already well-represented in projects are the ones contributing towards the design. For example, John Vines, Rachel Clarke, Peter Wright, John McCarthy and Patrick Oliver (2013) recall this issue in digital platforms known as 'democratic innovation sites' which offer a way for participants to co-design ideas online. Participants can add photos, ideas, comments and vote up or down ideas of other participants and in doing so, can co-create in

a democratic format. However, if many participants are experts in the particular field, this undermines the participation of those who know little about the subject. This also questions how openly participatory such projects are if participants do not represent the selected groups and communities the project is trying to engage with.

Therefore, the participatory design approach offers a way to engage a diverse set of participants in design but the way it is executed needs to be considered carefully to ensure that it is successful in creating something which is truly participatory.

3.7 Prototypes and Probes

Within participatory design workshops, different techniques are used to prompt participants' imaginations and encourage free-flowing thought. For example, prototypes can be used to aid a participant's understanding of an idea (Clarke, Nicol and Ruthven, 2015), and probes can be used as an 'instrument that is deployed to find out the unknown' (Hutchinson *et al.*, 2003, p. 18). Together, these tools can guide participants into new ways of thinking and gain understanding in areas that they are unfamiliar with.

For example, 'The Way Detector' is a digital technology which is shaped to fit into the palm of a hand and it is a haptic feedback device which can guide someone using a 'hot' and 'cold' metaphor (Ciolfi *et al.*, 2016, pp. 18–19). This technology was used alongside a museum artefact to prompt ideas around how to combine technologies with the museum experience. In this case, the participant combined this to a museum artefact from her museum to create a navigational system which told the narrative of that particular artefact (Ciolfi *et al.*, 2016). Here, the prototype enabled the participant to consider a specific technology in the design where, without the prototype, the participant might have lacked the knowledge needed to consider technologies in the activity. Furthermore, the prototype acted as a probe to encourage the participant to find connections with the prototype in her museum so to create a new experience for museum visitors (Ciolfi *et al.*, 2016). Therefore, this example shows how prototypes and probes are useful tools in cases where participants might need some guidance in the design process.

The use of prototypes has been connected to the research to Donald Norman (1988) and his examination of conceptual models of the mind (Khairuddin, Sas and Speed, 2019). Conceptual models are needed to understand how something works and Norman explains how a user will build up a conceptual model through interacting with the product. A designer will also have a conceptual model of the product which describes how the designer perceives users might engage with it (Norman, 1988). To ensure that the product is used correctly, the designer might put visible references into the design. These references are known as affordances and these act as signifiers, prompting the user to reflect on experiences which involve using similar products and, through these, the user can reapply the same behaviour when using the new product.

In developing this idea, tools such as prototypes can be used to represent these mental models with objects or activities being used to engage the participant's mind in understanding a theoretical idea which might not be easily understood through verbal explanation. This is similar to Norman's example of a document icon on a computer, which he explains are representations of a conceptual mental model of the data and bits which are stored on the computer's server (Norman, 2013). Like computer icons, prototypes could be used to act as a materialisation of a complicated concept with probes being used as a way of imagining new applications of these complex ideas. This has been the case in blockchain workshops which have used prototypes to signify the underlying ideas of blockchain to participants so that they can begin to develop new ways of thinking and applications for the technology (Khairuddin, Sas and Speed, 2019). The following section will describe how this is carried out in various examples including the approach used in this research project.

3.8 Blockchain Participatory Workshops

As noted by multiple researchers in this field, blockchain is a difficult concept to explain to participants because there is a lack of public knowledge and understanding in how the technology works (Maxwell, Speed and Pschetz, 2017; Nissen *et al.*, 2018; Speed *et al.*, 2019). However, probes, prototypes and scenarios can all aid in comprehension of the technology and considering possible new applications for it (Nissen *et al.*, 2018; Khairuddin, Sas and Speed, 2019).

For example, scenarios have been used to create a space in which participants can freely imagine new ways to engage with blockchain as well as challenge current modes of use. In one case, Ruth Catlow and Ben Vickers facilitated a scenario in which a pseudo charity 'Cattersea Cat Home' hosted a hackathon of five different blockchain-based projects which would help to improve the lives of cats (Furtherfield, 2018b). The scenarios encouraged participants to take a playful approach to blockchain uses whilst also encouraging conversations around ethics and governance on the blockchain (Ueberschlag, 2015). Furthermore, the use of role play enables participants to think freely as autonomous individuals and imagine beyond of their own lives and social standing (Bucknell, 2018).

In another case, the *C-2 Partial Art Auction* invited 20 participants to bid on a portion of an artwork with paper acting as a representation of this fragmentation of ownership. The aim of this scenario was to examine how governance might work when artwork becomes fragmented on blockchain (Gloerich, 2019). While the experiment did not yield any clear answers, the live auction engaged the participants with the paper (the signifier), which acted as a reminder to the participants of their decision-making power over the artwork (C-2, 2019).

Prototypes have also been used to aid connection to conceptual models for blockchain. BlocKit was developed through workshops with blockchain and bitcoin experts and, using materials such as clay, plastic wallets, and metal padlocks, the kit is a tool which conceptualises the mental models needed to identify how a blockchain infrastructure works (Khairuddin, Sas and Speed, 2019). Therefore, the kit acts as a signifier to the underlying

infrastructure of cryptocurrency and can be used in participatory workshops to clarify the inner workings of blockchain. In doing so, the kit enables participants to consider blockchain beyond the current applications whilst not having to actively engage with the technology.

BlockExchange is a similar example which is a framework for a workshop using Lego blocks and resource cards to present the key ideas of blockchain technology. The workshop is set into three rounds where the time is controlled by miners. In this case, the miners are a group of participants who are set to work solving puzzles. Meanwhile, the other participants are involved in trading with each other, building up a Lego wall of transactions on a Lego baseplate (Design Informatics, 2019). Although *BlockExchange* does not aim to be a comprehensive guide to blockchain, the three rounds are designed to offer a basic overview of a blockchain and encourage ideation in what other things and processes could be used in this form of exchange (Maxwell, Speed and Campbell, 2015). Therefore, the prototype is designed to act as a probe as well as a mental mode, inspiring thinking beyond the current blockchain applications.

Similar research has also used a blockchain-inspired game to probe into the thoughts of participants in relation to blockchain applications (Maxwell, Speed and Pschetz, 2017; Elsden *et al.*, 2018). For example, *Pizza Block* was an activity which replicated the key ideas of blockchain in a game format and prompted participants to consider how blockchain can be implemented in the volunteer sector (Rankin, 2019). The game highlighted how blockchain could capture the value of a volunteer through documenting the skills, time, and effort a participant inputs in a voluntary project (Elsden *et al.*, 2018). Like *BlockExchange,* the game inspires participants to think critically about blockchain as a technology and its potential use-value for the third sector. Therefore, the game acted as a prototype to explain blockchain but also as a probe to encourage new thought from the participants. The game-based activity also reflects the scenario examples noted earlier as participants play in an imagined reality but also connecting these ideas to their own experiences (Maxwell, Speed and Pschetz, 2017).

The examples described show how researchers have addressed exploring blockchain with participants who have little to no knowledge about the technology. These cases do not aim to provide a concise interpretation of blockchain, nor do the participants involved necessarily need a detailed explanation. Likewise, this PhD research draws on these ideas in order to present blockchain technology to the participants in the workshop.

3.10 Context and Methods

Having outlined the broader context of the methodologies used in this project, in the following section I will describe the context and methods of this project and connect the theoretical framework to this research practice.

As previously stated, this is a collaborative PhD project with NML which works in partnership with the LGR7 project. To reiterate, NML's mission is to 'create memorable experiences' whilst also 'challenging expectations' with a focus on being trustworthy, respectful and inclusive (National Museums Liverpool, 2019a). As part of this mission, their ongoing strategy to engage LBGT+ people and incorporate their voice and histories into the museum collections reflects these aims as they propose to reform their collections with LGBT+ narratives. Museums are often viewed as tools for change in social discourse, offering ways to present other views outside of the norm (Hall, 1999; Cameron, 2008). Therefore, the museum can be used to re-establish a new canon of history and art history, one which integrates LGBT+ (Steorn, 2012).

Although this process of assimilation has been slow, NML began addressing the lack of LGBT+ voices in the museum since 2006 (Tibbles, 2012). Indeed, as I stated in the introduction to this thesis, NML has created a range of exhibitions and displays since 2006 including the *Pride and Prejudice* project funded by the Esmée Fairbairn Collections Fund. The *Pride and Prejudice* project explored and reinterpreted objects from the collections through the lens of LGBT+ as well as adding in additional LGBT+ materials under specific themes (National Museums Liverpool, 2019c). In four of the museums of NML, these materials and reinterpretations form a LGBT+ trail which offers visitors an alternative way to view the collections (National Museums Liverpool, 2019c). Therefore, this project is a continuation of this work by NML through working with a broader group of LGBT+ participants to explore their own personal LGBT+ perspectives of the museum collection.

This objective also reflects the aims of the LGR7 project. As described previously in this thesis, the LGR7 encourages participating museums and galleries to use their digital channels in a more socially provoking manner and, through this, create social value (Malde, 2019a). Therefore, the project asks institutions to take a values-led approach to their digital resources and use them to cultivate social value through their platforms (Finnis, Kennedy and Malde, 2020). It was agreed with colleagues from the museum that the objectives of this PhD project resonated to the objectives of the LGR7 project and of the museum and so the two projects would work in partnership.

LGBT+ participants were agreed with the museum to be suitable for the project because it is likely that they already hold a strong group and social identity This reflects on literature which states that the factor of social identity is significant in the formation of collective psychological ownership (Pierce and Jussila, 2010, 2011; Verkuyten and Martinovic, 2017). The initial call out for participants aimed to gather a mixture of individuals from various LBGT+ networks including the 'Many Hands, One Heart' LGBT+ asylum network as it was felt that those who

have arrived in Liverpool seeking a new home might play an interesting role in exploring the role of NFTs in building connections. Moreover, the mixture of participants reflects how there is no set community in LGBT+, but this is an umbrella term for different people with the same gender or sexual identity.

However, my colleagues from the museum and I initially struggled to gain much interest and we had to cancel the first workshop in November 2019 due to lack of participants. We rescheduled for January 2020 where my colleague from the museum managed to round up a total of six participants from local LGBT+ networks rather than the initial mixture.

Workshop 1 (January 2020)

These six participants were invited to participate in a workshop at the Walker Art Gallery. The first part of the workshop invited participants to consider the key themes of the project including their own relationship to a personal possession that they were asked to bring with them to the workshop, the idea of psychological ownership, and blockchain technology.

Participants were initially asked to describe their personal possession and their connection to it to the group and then were asked to draw a 'Museum of You', where they had to draw three more artefacts that would go into a museum, all about them. This was carried out as an ice-breaker activity and helped the participants to start thinking introspectively about objects that they already own and perceive as possessions. The participants were then asked to explore NML's LGBT+ digital collections and choose an object(s) based on a personal perspective. The aim of this activity was to encourage the participants to think about objects from their point of view of their specific identity and to encourage the participants to connect with each other through personal LGBT+ associations. Therefore, the role of this activity was to promote connection, intimacy, and encourage the participants explore the collection based on their choices.

As most of the participants had little to no knowledge on blockchain technology, I chose to use an adapted version of *BlockExchange* as an approach to present the key concept of blockchain and NFTs. In this way, participants could begin to apply blockchain technology to a new scenario and create new applications (Maxwell, Speed and Campbell, 2015). The original version to *BlockExchange* encourages participants to exchange resource cards with one another using Lego bricks as a currency. Upon a sale, the Lego brick is added to a central Lego base and the initials of the new owner are added to the brick. The new owner then takes a new Lego brick from the pile of bricks. There are three rounds in which the facilitator manipulates the market. The rounds are also controlled by participants acting as miners who solve mathematical puzzles (Design Informatics, 2019).

The adapted version of this activity used artworks instead of resource cards (Figure 3.1). Also, there were only two rounds due to time restraints, and the rounds were timed rather than controlled by miners due a lack of participants. I acted as the facilitator and manipulated the value of certain artworks in each round. In the first round, I asked the participants to collect a diverse collection of different artists from a selection of seven artists available. In the

second round, the participants needed to collect the most valuable collection. Some artists became more valuable in the market. For example, Pablo Picasso was worth four bricks whilst Jack Smith was one brick. Participants who managed to claim three works by the same artist also made each of their tokens twice as valuable. Throughout the rounds, participants were also asked to write their initial on the back of each card and every new card they claimed so that the works also gained a documented provenance. Although this does not exactly reflect the NFT economy, the concept enabled participants to gain an idea of how NFTs work and their key properties including provenance, ownership, and exchangeability.

The last part of this workshop asked the participants to explore the collections of The Walker Art Gallery and The World Museum (as these were the closest to the meeting room) and choose an object based on their personal relationship to it and return to the group prepared to discuss it with the group. In asking participants to reflect on their personal relationship to these objects, the task encouraged participants to reflect on extending their own personality into the object, and this created an environment in which psychological ownership could form. Using a brainstorming ideation technique, participants worked together to explore the relationship to each of their objects. Brainstorming is a tool in which either a group or an individual works to 'storm a problem' (Osborn, 1963, p. 151). This is a common tool to use for ideation and is often used following Alex Osborn's (1963) guidelines, which follow a three-part procedure of fact-finding, idea-finding, and solution finding. In this process a group or an individual will gather information on the problem, develop ideas based on this information, and through this, find a solution.

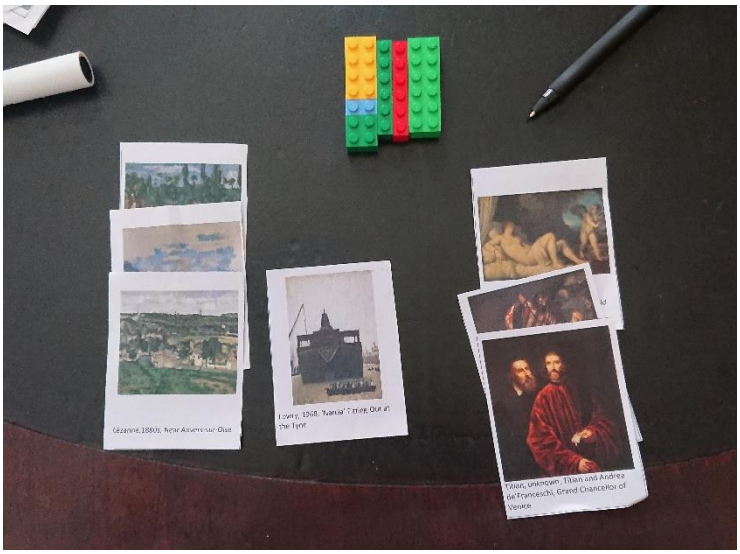

Figure 3.1 Art cards from the adapted version of BlockExchange Source: Author

While brainstorming can be an effective strategy for ideation (Paulus and Yang, 2000), the technique does have some limitations in relation to group collaboration such as production blocking, evaluation apprehension and free riding (Paulus *et al.*, 2002; Faste *et al.*, 2013). Production blocking refers to the problem that only one group member can speak at one time, and this blocks others from sharing their ideas. Evaluation apprehension is the anxiety participants might feel in sharing their ideas with large groups. There is also the issue of free riding where some participants become less motivated to contribute because other

participants are more proactive in the conversation (Faste *et al.*, 2013). However, these limitations to productivity can be overcome. For example, increased group interaction and cognitive stimulation can aid the loss of motivation and apprehension participants might feel (Paulus *et al.*, 2002). Furthermore, a facilitator in the brainstorming process has shown to improve productivity in group brainstorming sessions (Offner, Kramer and Winter, 1996). As the researcher, I facilitated throughout the workshop to ensure participants are not blocked from contributing to the conversation and to record key ideas during group work. In using a combination of individual and larger group work, this workshop provided time for participants to reflect on their own as well as share their experiences and ideas.

The final activity of the workshop asked participants to use the Lotus Blossom technique to brainstorm the related themes of their objects and encourage them to think reflectively on why they chose that object. The Lotus Blossom technique was developed by Yasuo Masumura from Clover Management Research based in Chiba City, Japan and encourages participants to ideate about a specific problem by thinking about the different themes and perspectives about the question they wish to solve (Michalko, 2014). These themes are laid out as a matrix with the problem or main idea at the centre. This research adapted the focus on this technique so that the aim was not to solve a problem, instead, the participants needed to find connections between each other's objects. They initially had to think of eight themes associated with their object and explore the other objects available and discuss any connecting themes. In doing so, the activity aimed to give the participants space to further reflect on their chosen object and use each other to develop their thoughts on a deeper level. In other words, it promoted participants to reflect more intimately with their object.

The Crypto-Connections Exhibition and The Possession Gallery

The outcome of Workshop 1 is the online exhibition *Crypto-Connections* (see Figures 3.2, 3.3, 3.4)*,*[35] which presents the different objects chosen during the discussions with the personal perspectives by the participants depicted alongside each object.[36] Participants were asked to write up their personal reflections on their chosen object and the personal possession they brought to Workshop 1. These reflections are presented with a digital version of these different objects.

[35] See https://www.liverpoolmuseums.org.uk/collections/cryptoconnections (Accessed 11 November 2021).
[36] The LGBT+ collection objects are not part of the exhibition due to the participants not wanting their stories about these works on the NML website. Also please note that participants are identified differently in the exhibition.

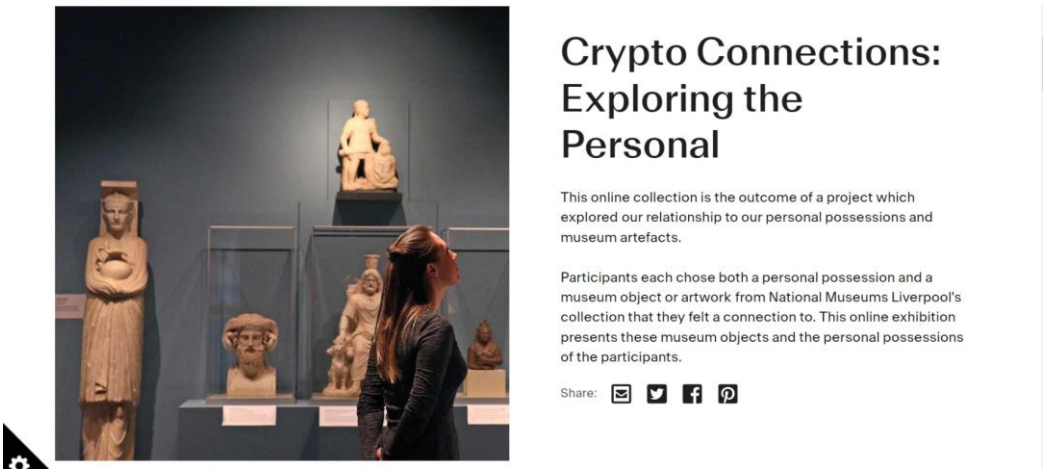

Figure 3.2 Screenshot of Crypto-Connections, Source: NML Website, https://www.liverpoolmuseums.org.uk/collections/cryptoconnections Accessed November 2021

Upon clicking on an object in the exhibition, the visitor is taken to the personal page of that object which also presents the participant's personal response to the object (see Figures 3.3 and 3.4).

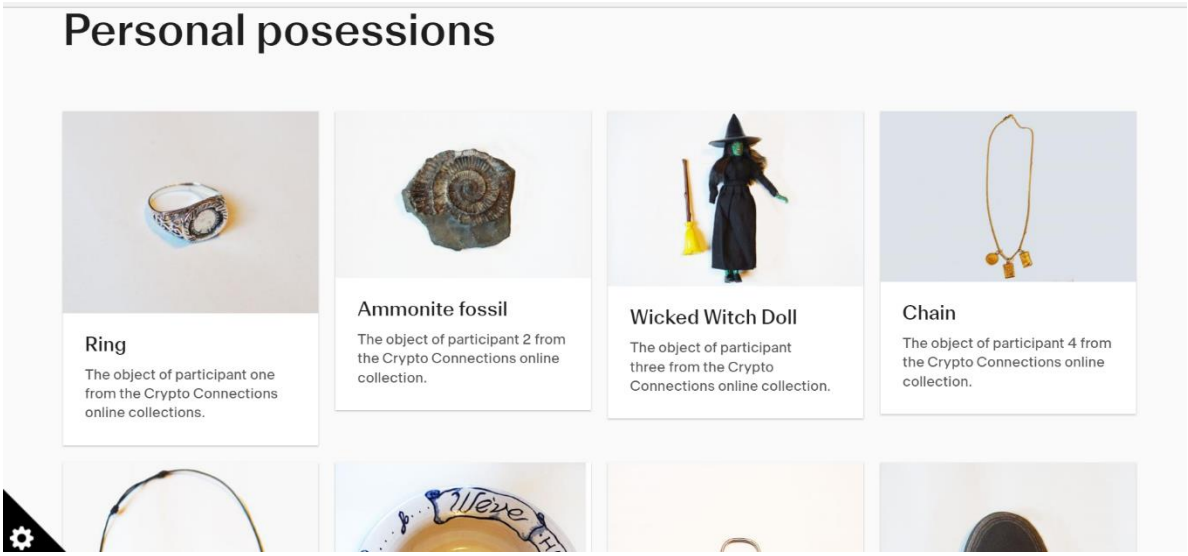

Figure 3.3 Screenshot of the Personal Possessions on Crypto-Connections, Source: NML Website, https://www.liverpoolmuseums.org.uk/collections/cryptoconnections Accessed November 2021

The information displayed in *Crypto-Connections* was used to mint NFT editions, and these were given out to the participants. In doing so, the aim was to provide the participants with a new level of control over the outputs of the project since they own these newly minted NFTs. At the same time, this required the participants to set up their own digital wallet either through Metamask or using a Trust wallet and this had to be done during a lockdown of the

COVID-19 pandemic.[37] This was a major obstruction as the participants did not have the knowledge to do this themselves. To address this issue, I provided detailed instructions on how to set up a digital wallet via email to each of the participants.

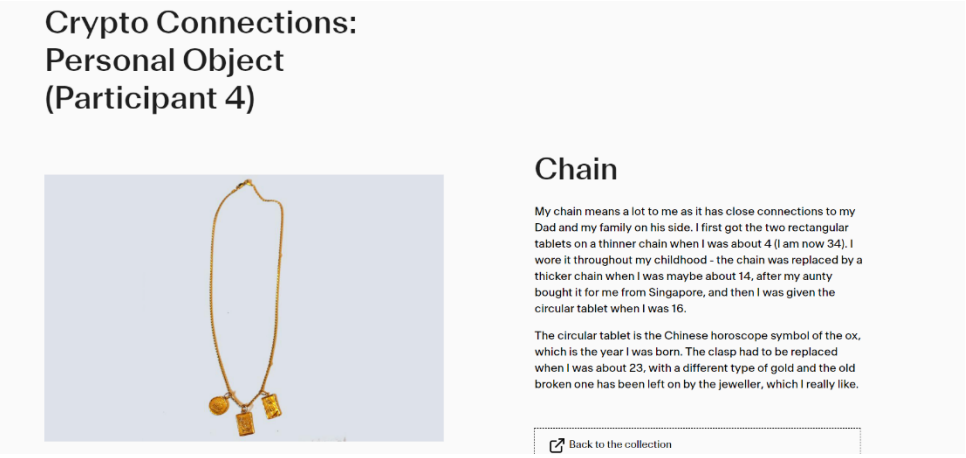

Figure 3.4 Screenshot of Personal Possession: 'Chain', Source: NML Website, https://www.liverpoolmuseums.org.uk/collections/cryptoconnections Accessed November 2021

Minting was carried out using a devised smart contract developed by Peera Ltd. The smart contract is embedded into a decentralised gallery called the *Possession Gallery* and it is connected to the Ethereum blockchain. The *Possession Gallery* is also linked to NML's website and was live through its servers from March 2020 to December 2021. The smart contract is accessed via an admin page which display a box (see Figure 3.5), which I used to mint each NFT edition. This involved copying the title and personal description from *Crypto-Connections* to the box, adding the image URL link, and applying the participant's digital wallet public address. On clicking submit, this information is hashed together and authenticated by the Ethereum network. Once completed, the NFT appears in the participant's wallet and in the *Possession Gallery.* Therefore, this digital gallery provides a central space in which to see the tokens together as a collective (see Figure 3.6).

[37] A Trust wallet and Metamask are types of digital wallets used to engage with blockchains and exchange NFTs and cryptocurrencies. See https://metamask.io/ and https://trustwallet.com/ (11 November 2021).

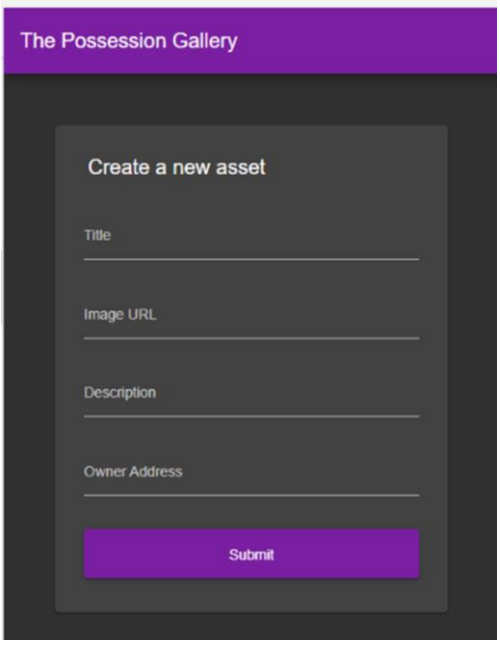

Figure 3.5 Smart contract admin page, the Possession Gallery, Source: NML Website, https://collectibles.liverpoolmuseums.org.uk/#/ Accessed November 2021

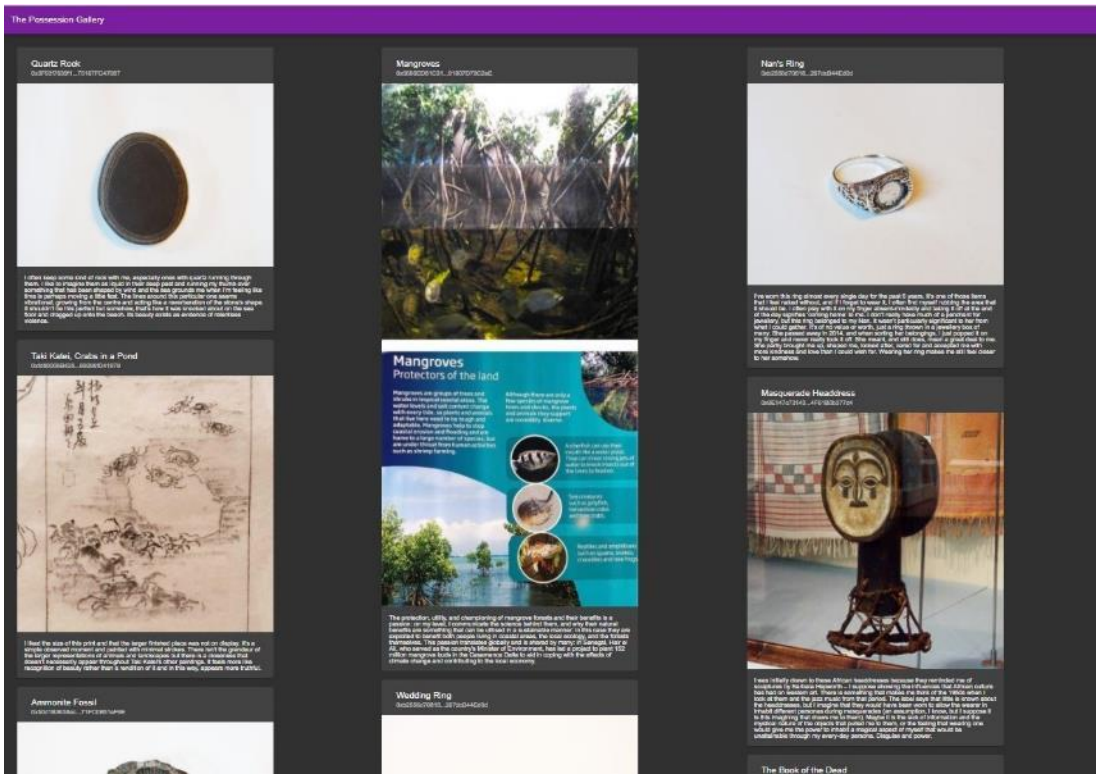

Figure 3.6 The Possession Gallery. Source: NML Website, https://collectibles.liverpoolmuseums.org.uk/#/ Accessed November 2021

Workshop 2 (July 2020)

Upon completion of the minting process, the participants were invited to a second workshop in July 2020 to discuss their reflections on owning their NFTs, and this took place on Zoom due to COVID-19 restrictions. This short discussion aimed to gain insight into the participants' perspectives on the tokens and on the project more broadly. The session followed a semi-structured approach, thus offering a more fluid and open conversation in which participants could interact with each other as well as the interviewer, which can create more diverse data (Mason, 2002).

Interviews

To support the data collected from this project, two sets of interviews were also carried out with NML colleagues and individuals from the blockchain community so to explore different perspectives on this research project. Like Workshop 2, these interviews took a semi-structured approach and implemented Steiner Kvale's (1996) notion of the traveller's metaphor, in which the interviewer and interviewees can wander on a conversational journey together discussing various themes of the project.

Interviews were carried out between March 2021 and June 2021 with colleagues at NML, and these aimed to gain a deeper understanding of how the museum professionals might perceive this project and consider whether they view blockchain as contributing to collaborative practices and digital ownership, authority, and authenticity. A total of six colleagues were interviewed Participant 1 (curator), Participant 2 (digital content producer), Participant 3 (digital content producer), Participant 4, (digital content producer), Participant 5 (partnerships department), Participant 6 (curator).

Meanwhile, there were two stages to the interviews with the blockchain community because of the surge of interest that occurred in early 2021. The first stage took place between July 2020 and August 2020. Interviewees included Participant 1 (artist and curator), Participant 2 (self-described 'Bitcoiner'), Participant 3 (everyday user), and Participant 4 (developer), These interviews aimed to gather data on whether understanding blockchain impacts someone's perception on digital ownership and authenticity. The second set of interviews took place in February 2021 and March 2021, a time when hype was building around NFTs in mainstream media, and these focused on interviewing companies that specifically use NFTs in order to gain a better understanding of the current use and challenges of using NFTs in the arts as well as gather further perspectives on attitudes towards digital ownership and authenticity from those that use blockchain in their everyday life. Interviewees included Participant 5, (Blockchain.Art Platform), Participant 6 (Async.Art Platform), and Participant 7 (Async.Art Platform).

Reflective Practice

As the researcher, I also had the opportunity to reflect on the experiences of the study in these interviews and workshops. According to Joy Amulya, 'reflection is an active process of witnessing one's own experience in order to take a close look at it' (Amulya, 2011, p. 1). For

researchers and professionals, reflection as a practice enables them to examine their own actions so to develop their processes and way of working (Bolton, 2010). Reflective practice is often discussed in relation to Donald Schön's work on reflection-in-action and reflection-on-action. Reflection-in-action occurs during the process of an activity, specifically when the activity has not produced the expected outcomes and needs to be re-evaluated (Schön, 1987). Reflection-on-action takes place after the activity has happened and aids the development of theories and ideas (Moon, 2000). Both of these concepts resonate to my own practice as I assessed my own actions and position during the research and when issues or unanticipated outcomes occurred. I used in-action notes as a comparison to my reflections-on-action when the study ended, and this comparison has informed my ongoing practice as a researcher and my experiences of working collaboratively with a museum.

Data Analysis

The various methods used in this approach produced a series of qualitative data including field notes, transcripts of recorded interviews and workshops, the *Crypto-Connections* exhibition, and the NFTs produced and stored in the *Possession Gallery.* Using Nvivo software, the transcripts underwent conversational analysis and deductive content analysis. Conversational analysis reflects the examination of how a participant discusses something before attempting to place associations or categories onto what has been said (Myers, 2006). Through this analysis, researchers can explore the dynamics of a group and the relations that are embedded into it (Onwuegbuzie *et al.*, 2009). Therefore, the transcripts of the recordings offered a way in which to further examine the group dynamics.

Deductive content analysis is an approach to examine materials using coding and categorisation based on existing theoretical ideas (Nili *et al.*, 2014). I used this approach to analyse the transcripts, the content displayed in *Crypto-Connections,* and the NFTs using Nvivo software, and I used the influencing factors to psychological ownership discussed in Section 3.4 as a guide to this examination so that I could consider whether enchainment had formed in the participants through this this process of digital fragmentation. The coding and themes found from this analysis have formed the basis of the thesis' arguments. Meanwhile, the field notes have been used to supplement these findings and have helped to construct my own reflections both during and at the end of this research project.

Ethical Considerations

The notions of identity and sexuality come with issues around sensitivity and careful consideration of people's needs for invisibility and anonymity (McIntyre, 2007; Ritchie and McNeill, 2011). Therefore, the main ethical consideration in this research depends on the acknowledgment of the rights of participants for privacy and comfort. According to ethical protocol, (reviewed and approved by the University of Manchester's Ethics Committee) all participants were given information on the study, and they had to complete a written consent form if they wished to proceed with the study. In this process, participants were made aware of the sensitive topic, that any data will be anonymised, and their right to withdraw from the

study. To ensure participants did not suffer discomfort when discussing these topics, I followed a distress protocol both in the workshops and during the design of the online exhibition. The distress protocol is designed to safeguard participants from feeling distressed and as the researcher I facilitated any conversations which might lead to misunderstandings or disagreements. Furthermore, as this research takes a participatory design, it was important that I, as the researcher, facilitated the various activities but did not create biased situations or an uneven power relation between participants and myself.

3.11 Conclusion

In this chapter, I have outlined the theoretical and methodological framework for this research project. In the first instance, the theoretical framework is contextualised using Chapman's (2000) fragmentation and enchainment theory and research on the motivations of psychological ownership. The framework argues that these ideas could be transferred into the digital space using blockchain and its ability to fractionalise work. The framework also proposes four dimensions to examining blockchain's materiality, which, in doing so, can reveal how the technology can be understood to create a form of digital enchainment. Therefore, this research project examines how blockchain tokens might embody personal value in the museum context where this value could also be used to connect audiences to the institution to produce social value. In this way, the project also reflects the practice of 'Hodling' in the crypto space, a term that denotes both a misspelling of 'hold' and the acronym 'hold on for dear life' and it is used in both cryptocurrency users and NFTs users when choosing to keep a token rather than to 'flip' or sell it on the marketplace (Frankenfield, 2021). Likewise, this theoretical framework examines how museums might produce NFTs that are also worth 'Hodling' through the value symbolised within it.

Meanwhile, the methodology outlined how this theoretical concept was put into practice at NML. The research took a participatory design approach in which the participants are invited to explore the museum's collections and contribute interpretations to the online exhibition *Crypto-Connections.* In using Simon's analysis of the different strands of participation, this research acknowledges that this is a collaborative project. In other words, the museum holds control over the project but the participants can 'steer the direction and content' of the exhibition (Simon, 2010, p. 190). Nevertheless, this approach aims to embed the factors that influence psychological ownership including the feeling of intimacy, investment, stimulation, and control as the participants have the opportunity to choose the objects for the exhibition based on their personal connection to these works. But whether these factors create enchainment remain to be examined in Chapter 4.

Furthermore, the works from this exhibition were minted into NFTs using the *Possession Gallery* and each participant received two tokens representing the two objects they chose for the exhibition with their personal story about the work embedded into the metadata. Therefore, the NFT adds a new element to this participatory project because the participants gain complete control over these outputs. In this way, the research explores how blockchain

creates new forms of control that challenge institutional authority whilst also informing a sense of psychological ownership (and thus form enchainment) over digital content.

Chapter 4: Ownership

4.1 Introduction

The following three chapters builds the case made for working with Chapman's (2000) ideas of fragmentation and enchainment to question to what extent blockchain creates a form of enchainment between a participant and the museum. There are two aspects to enchainment in this research. Firstly, it focuses on what Chapman (2000) describes as fragmentation, where artefacts are broken for a purpose and are imbued with symbolism and meaning, hence, there is a form of enchainment to the object. In this particular chapter, fragmentation is discussed in relation to psychological ownership. The second aspect to enchainment refers to a bonding or forging of connections which occurs between the owner and their fragment as well as between the two parties involved in fragmenting. The subsequent three chapters will explore this understanding of enchainment through three themes; ownership, authenticity, and authority, which draw from the key points discussed in Chapter 2. Specifically, in Chapter 4 I will consider to what extent blockchain challenges the notion of ownership and the notion of enchainment in the context of this research. This question is divided into the following sub-questions:

- What is the difference between a blockchain token and a 'typical' digital object,[38] and how does this difference influence the idea of ownership?
- Building on this, to what extent could blockchain produce digital ownership and create meaningful digital objects that act like digital fragments?[39] And are there other factors involved in this process of meaning making?
- To what extent could these meaningful digital objects support the formation of enchainment (and thus collective ownership)?

The analysis in the following discussion chapters draw from three key pieces of data, which include the following. Firstly, the *BlockExchange* activity undertaken in Workshop 1 in January 2020, where participants were given the opportunity to learn and reflect on the nature of blockchain technology. Secondly, the second workshop in July 2020, where the participants were also encouraged to reflect on their experiences of the project, their NFTs, and *Crypto-Connections*. And, lastly, two sets of interviews that I carried out from July 2020 to June 2021 with colleagues from the museum and the crypto space.[40] These interviews aim to provide a broader understanding of the project from the museum perspective, and to support and clarify technical aspects of the use of this technology as well as provide the perspective of a user who has a deep level of knowledge about the technology.

[38] To reiterate, a 'typical' digital object in this research is defined as a digital object on the internet that is not embedded onto a blockchain, for example, a jpeg on the NML website.
[39] In this case, meaningful refers to personal value and significance and this derives from personal interpretation of the object.
[40] See Section 3.10 for details

In what follows, in Section 4.2 I will begin with examining the properties acknowledged by the participants during the second workshop that differentiates a blockchain token from a typical digital image. The underlying argument of this section is that blockchain creates what Zeilinger describes as a 'new logic of thingness' in digital objects through scarcity, exclusivity, and value (Zeilinger, 2018, p. 30).[41] In this respect, blockchain supports a formal ownership in the online space and this section describes this as creating a 'decentralised ownership' in these cryptocollectibles because this formal ownership gives each participant an autonomous ownership over their tokens.

Building on this argument, in Section 4.3 I explore to what extent these NFTs could be made into meaningful digital objects through the themes of investment and intimacy. The discussion suggests that these factors and the properties of blockchain work together to create tokens which can act like digital fragments and extensions of the original physical objects. The process of creating these cryptocollectibles in this project offers a digital form of Chapman's (2000) fragmentation theory and so they also have the potential to build enchainment. This argument is explored in the context of Jon Pierce, Tatiana Kostova and Kurt Dirk's (2001, 2003) 'routes' to producing psychological ownership, and Jon Pierce, Stephen Rubenfeld and Susan Morgan's (1991, p. 124) proposal that 'ownership is multidimensional in nature' in order to determine that digital fragments are formed through a combination of blockchain, investment, and intimacy.

In Section 4.4, I explore to what extent these fragments can produce enchainment in relation to collective ownership. In the first instance, I examine this idea in the context of collective experience, arguing that viewing the *Possession Gallery,* as well as the original physical objects that are associated with this project, provides a shared and connected experience for the participants. In doing so, these NFTs and the original objects are like secondary agents in enchainment. In the second part to this section, I examine the layered ownership effect evident in this project and I argue that this has the potential to embed a collective ownership through the term shared guardianship. Shared guardianship draws from Marstine's (2011, 2017) and Geismar's (2008) use of the terms, which refer to a more fluid understanding to ownership. Indeed, guardianship approaches ownership as a dynamic and collaborative relationship and it forges new relations through prioritising the viewer's personal experience about the object. This research argues that these ideas relate closely to the way Chapman describes the process of fragmentation and enchainment. I also propose that guardianship harbours in the expectation of the participant to not sell their token and so the process of exchanging these NFTs produces a social relation between the participant and the museum that resonates with the understanding of enchainment. However, whether this social relation is ongoing remains to be examined (see Chapter 6 for further details).

[41] This idea of 'thingness' will be examined in closer detail in Chapter 5

4.2 Formal Ownership & Blockchain

4.2.1 A ‘Bundle’ of Rights

Considering how blockchain technology challenges ownership requires one to define this term. Chapter 2 offered insight into understanding ownership and there I highlighted the different ways in which to reflect on this notion in the museum context. Additionally, analysing the difference between to owning a blockchain token and to owning a typical digital object emphasises a more formal or rights-based approach to ownership.

According to Pierce, Rubenfeld and Morgan (1991, 125), formal ownership is defined under three different rights; the right to possession, the right to exercise control, and the right to information about the property. These scholars are not alone in describing ownership on the basis of rights, for example, Partha Dasgupta describes ownership under the property rights of the ability to use and the ability exchange, either through selling it or gifting (Dasgupta, 2007, p. 48). Defining formal ownership in this way indicates that this form of ownership can be classed under a ‘bundle of rights’; that is to say, formal ownership pertains to the traditional understanding of property rights, and this helps to situate ownership within a legal framework (Merrill and Smith, 2001; Ishmaev, 2017).

As the following section will highlight, blockchain contributes to this bundle of rights by simulating the concepts of exclusivity and scarcity, thereby embedding a potential exchange value into the NFT. Therefore, this section will argue that the cryptocollectibles made in this project differ from a typical digital object because they gain a perceivable value, and this in turn has the potential to transform these NFTs into digital fragments for enchainment. The subsequent section will consider this argument in the context of digital scarcity.

4.2.2 Digital Scarcity

Workshop 2 in July 2020 prompted the participants to reflect on their experiences during the project. It also offered a chance for the participants to see all of the cryptocollectibles together as well as alongside the digital images presented in *Crypto-Connections.* In looking at the NFTs, this prompted comments about owning one of these tokens, of particular note, Participant G remarked:

> *I think of them as collectibles, […] because now I’m thinking how maybe eventually all the museum objects will be made into collectibles and people are going to collect them and I am going to have this particular one.*
>
> Participant G, Workshop 2, July 2020.

Participant G’s comment suggests that they recognise a form of exclusivity over their cryptocollectible as they acknowledge that they will own ‘this particular one’. Indeed, they pose that if the museum chose to produce more NFTs, their token will grow in value as it will appear as a form of collectible. I argue that this differs from simply downloading the same image from the online exhibition because there is a singularity and uniqueness

attributed to ‘their particular one’. Participant G was not alone in this thought, when considering the use value of the tokens Participant E compared these cryptocollectibles to ‘Pokémon cards’, a popular trading card game in which users are encouraged to collect and trade physical cards depicting imaginary animals:

> *I think part of me is wondering about utility as well, like is that something I can use in the future for a kind of asset or is it something more along the lines of, like, I don’t know a Pokémon card that I can collect and add others.*
>
> Participant E, Workshop 2, July 2020.

As this participant considers the use value of their NFT, they also highlight an acknowledgement of the token’s singularity. Again, for them, the token could be a potential collectible for a wider personal collection, or a kind of ‘asset’ that holds value both of which imply this idea of scarcity.

I will return to this discussion on use value in Chapter 6, but for now, this quote along with Participant G’s remark show how they understand their NFTs to have a collectible nature. Comparing their quotes to responses from museum interviewees emphasises this acknowledgment. For example, Participant 2 from these interviews responded with the following when asked if it is possible to own a digital object: ‘not in the way that things are going. I think maybe previously you could but with things like Google Arts & Culture and Wikipedia and any other platforms like that the whole idea is that they available for everyone’ (Participant 2, Museum Interviews, April 2021).

In contrast to the workshop participants, Museum Participant 2 feels that it is no longer possible to own something that is online because of the open-source nature of the internet such as Google Arts & Culture and Wikipedia; they assume that Web 2.0 practices have challenged the ability to own something online. This is a broadly accepted view about digital ownership and supports the notion of a ‘sharing economy’ and ‘post-ownership economy’ discussed in Chapter 2.3.3. But this also shows how Participant G and E acknowledge that there is something different to the jpegs that they hold in their wallet because there is a collectable quality. Indeed, it suggests that blockchain challenges the very idea of a ‘post-ownership economy’ online.

The NFT’s collectability implies a digital scarcity, a term which is used to describe digital resources that are limited, which makes them valuable through supply and demand (Brekke and Fischer, 2020). The term has previously been used to describe virtual goods in virtual worlds and other digital spaces as these digital goods are made scarce so that users can collect and sell valuable digital commodities in game (Lehdonvirta, Wilska and Johnson, 2009; Lehdonvirta, 2012). Of course, such goods are not really scarce but only made scarce by design because they are restricted to a specific digital space. Other examples include music and film streaming where the application of DRMs instigates an artificially

scarce environment (Masnick, 2006; O'Dwyer, 2017). In other words, these digitally scarce goods can only exist within a specific platform. The scarcity enforced through blockchain, on the other hand, extends an interoperability into tokens because the file and the claim to ownership exists outside of the blockchain ledger. In doing so, this 'simulates the effects' of physical ownership (Zeilinger, 2018, p. 30).

The notion of scarcity also suggests exclusivity, which, with NFTs, derives from the application of cryptography through private keys and digital signatures which are used to unlock digital wallets that store cryptocurrencies and cryptocollectibles (Ishmaev, 2017). The person who has access to the private key is also the only person who can initiate a change in ownership, which has led to the common phrase used in the crypto space: 'not your keys, not your coins'. Therefore, blockchain tokens are described as 'digital bearer instruments' (Pernice and Scott, 2020), since the holder of the token is assumed to be the only owner and so they are entitled to ownership rights (Chen, 2020). The following quote from Participant 6 reinforces this point:

> *So non-fungible tokens, under the hood, what it really is, is a contract that specifies a list of IDs and these are token IDs and each of these IDs is going to point to an owner. So, let's say you have a 100 collectible tokens, well it's basically a list of IDs starting from 0 to 99 and each of those IDs holds the address which currently owns this token.*
>
> (Participant 6, Blockchain Interviews, February 2021).

The owner of a token is simply an attached ID (identity) to the NFT in which the owner's private key provides them with the exclusive access to exchange their token. Therefore, the application of private keys and digital wallets embeds the right to exclude into the infrastructure of blockchain because an owner can use their private key as a way to retain their exclusivity and rights.

Again, this exclusivity was also recognised by the participants during this research project. For example, Participant F commented: 'I like the idea that it's almost like my own personal wallet and I can just keep and protect my memories' (Participant F, Workshop 2, July 2020). This point on protection is significant because it indicates that the token is viewed as some form of protective barrier for their story about the object; there is an assumption of an exclusivity in this token that enables the wallet to act as an exclusive source to this story and object. However, this idea of protection is a false assumption because blockchain does not provide full exclusivity since it is not a DRM tool; for example, it is difficult to stop others from taking a screenshot of the token and sharing it online (O'Dwyer, 2017). In this way, the participant is right to view these tokens as different from that of a typical digital image, but fundamentally blockchain can only simulate the effects of exclusivity through the right to exchange.

So why bother with blockchain at all if it cannot provide the exclusivity needed to create 'true' formal ownership? Or, put differently, ownership that pertains to a full bundle of rights

including the right to sell, possess and exclude. Understanding that blockchain produces singularisation highlights that the technology can still bring a form of exclusivity that enables a token to be identified out of a potential sea of copies; it is just not the 'full' exclusivity provided in physical property. Of course, this idea challenges the idea of fragmentation and enchainment because each participant owns a token, but this token could still be copied and shared elsewhere, and so it does not replicate the same conditions of the process of physically fragmenting an artefact. Moreover, there is no limit to the making of tokens providing the smart contract is still live, and so an artefact in the museum collection could end up with multiple tokens owned by different people and so, again, there is this question over 'true' uniqueness and exclusivity in the NFT if there are other similar tokens out in the digital sphere.

However, digital copies of images might appear identical but the implementation of blockchain gives each image a unique hash and Casey Reas emphasises how this approach enables each version to 'look and perform interchangeably, but each is singular' (Reas, 2019, pt. 4). Therefore, the use of hashes and blockchain attempt to reattach originality into digital content by making it identifiable. Chapter 5 will examine this notion of originality in further detail but in the meantime the key point here is that singularity produces an ownable digital commodity.

This means that it would be more effective to think about exclusivity as a form of identification rather than focusing on directly translating the conditions of the physical into the digital. Exclusivity is now not about holding the only fragment of an artefact but owning a token that is unique to the owner, and as noted by Zeilinger, this produces a 'new logic of thingness' in digital objects (Zeilinger, 2018, p. 30). But scarcity is not the only property at play in this claiming of ownership, and in what follows the possibility of exchange value will be considered.

4.2.3 Exchange Value

This discussion on scarcity and exclusivity also highlights a point on exchange value. Again, many of the participants during the second workshop recognised this element of trading their token, in particular, Participant B commented: 'I understand that it sort of it can be translated into a kind of currency, so it feels like I own something extra', which they later said: 'it makes me want to trade it for something for some reason' (Participant B, Workshop 2, July 2020).

This comment suggests a recognition of value attributed to these tokens that is different to the value of owning a digital image copied from *Crypto-Connections*; the technology has transformed their tokens into an exchangeable commodity which the participants could sell on a crypto-market. In fact, the project involved the use of a Trust wallet, which is a Dapp that provides access to trading platforms such as OpenSea.[42] Therefore, these

[42] https://opensea.io/ (accessed 24 November 2020).

participants have the opportunity to release the exchange value in their cryptocollectible by selling it on this platform (on the assumption that there is a potential buyer and that the participants feel confident enough to do so).[43]

Chapter 6 will reflect in further detail on this ability to trade the token, but for now, this idea of exchange value in the NFT offers a means to control the token. That is to say, the participant has gained the right to control, a right which is associated with the 'bundle of rights' to ownership. Therefore, exchange value is an explicit indicator of ownership. This ability to control and sell an NFT is also a key reason behind why artists use this technology. Indeed, this was a point noted in the interviews with participants from the blockchain community as it enables artists to sell and be remunerated immediately for their work: 'you can monetise your artwork and with all of the other features like the secondary market features, it just introduces more positive things for the artist'. (Participant 1, Blockchain Interviews, July 2020).

In this way, the ability to sell an NFT is at the core of its use value for many artists and collectors. This also highlights how this ability to control the token is the foundation for the capitalistic and economic market for NFTs because it promotes a rivalrous nature to property in which the overall advantage derives from excluding others (Gürgüç and Learney, 2020). Likewise, the potential exchange value in the NFTs in this research project is also a key aspect to ownership because it provides a means to control the token.

4.2.4 Decentralised Ownership & Fragmentation

This initial analysis shows that blockchain contributes to a formal ownership by replicating different rights in a digital object and this occurs through the process of documenting and identification. Therefore, unlike with typical digital objects online, owners can claim and instigate their rights over an NFT because they have gained control and the ability to sell that token through exclusivity and scarcity.

Ownership identification also highlights how the NFT can be used for the right to attribution, which was a point made by Participant 3 during the blockchain interviews:

> [With] *NFTs you do have a way of actually getting recognition apart from anything else. You know, it's all very well talking about the money and the money will possibly come but possibly not but what you do always have is a way of showing 'I created this', 'this is something to do with me', and that's very hard in the digital world.*
>
> (Participant 3, Blockchain Interviews, August 2020).

This idea is counter to the assumption that presumes the exchange value of an NFT is its main use case as it indicates that the use of NFTs is about recognition as much as it is

[43] See Chapter 6.4 for further discussion.

about making money from sales. Therefore, it embeds artist rights into digital work as the artist will permanently be attributed to the work via the token. This note on acknowledgment is comparable to the remark made by Participant 4 during the museum interviews who noted how copyright is a barrier to digital ownership of digital reproductions: 'there's the question of who owns it because is it the artist, is it the person who took the photograph? Is it the person that actually did the work in digitising it?' (Participant 4, Museum Interviews, April 2021). Here, the participant is highlighting the difficulty in establishing ownership rights over certain content which makes it difficult for NML to use some works digitally as it is unclear who should be considered a stakeholder in ownership claims and what rights the institution holds over the digital reproductions. NFTs, then, with this ability to embed attribution rights into the work, may address some of these issues as they could be used to permanently associate the artist and/or institution to a work. Therefore, the right to attribution connected to the NFT could benefit the wider IP rights and digital ownership system.

At the same time, however, this raises a problem on the legalities of owning a token. Blockchain is not law, but, through its infrastructure and code, owners gain the rights to exclude, control, sell and be associated to a token. Blockchain is also decentralised so there is no overarching authority that monitors the production and circulation of NFTs. This means that there is a vulnerability in the system since anyone could turn anything into an NFT and own it even when they are not the rightful owner. Participant 1 in the museum interviews reflected on this point:

> *What it throws up is I suppose questions over people in the know and know how to claim ownership over these objects and the people like artists who can create an object and their property can be commandeered if you like or tagged or given a token that they weren't aware of which I think is interesting.*
>
> (Participant 1, Museum Interviews, March 2020).

The participant suggests here that NFTs could be exploited for their ownership effect as anyone who knows how to mint a token could easily create and claim works as their own property. This is also often referred to as a form of 'garbage in, garbage out' problem' (Ito and O'Dair, 2019),[44] which implies that there is a need to have an authority who oversees the process of producing tokens in order to embed trust and authenticity into these NFTs. Therefore, in this research project, how is it possible to identify these participants as the rightful owners of the tokens?

To address this question, I turn to Perzanowski and Schulz's (2016) three indicators of digital ownership, which include; permanent usage, a one-time transaction, and an openly communicated transaction. In the first instance, the scholars argue that duration and

[44] See chapter 5 for further details on this problem in relation to authenticity.

permanent usage highlight ownership, which suggests that if the person in question can continually use the digital object, then they are likely to own that object. As described above, the participants have permanent use of these cryptocollectibles since they are the only ones with access to the private key and digital wallet that stores the token. Secondly, the scholars argue that the process of a one-time transaction is another indicator of ownership. Again, this is clear in this project since the NFTs were made and handed over to the participants through a one-time transaction with the embedded smart contract in the *Possession Gallery*. Lastly, Perzanowski and Schulz emphasise that the way this transaction is communicated to the public is important, and blockchain clearly indicates sole ownership since the transaction is publicly available on Ethereum,[45] and it can be proven through the comparison of the wallet addresses to the hashes displayed in the infrastructure of the technology (Perzanowski and Schultz, 2016, pp. 76–77) (Figure 4.1). Therefore, the application of blockchain assumes that these NFTs are singular and ownable objects and these participants hold a decentralised ownership over these tokens, where decentralised ownership refers to an autonomous or separate ownership.

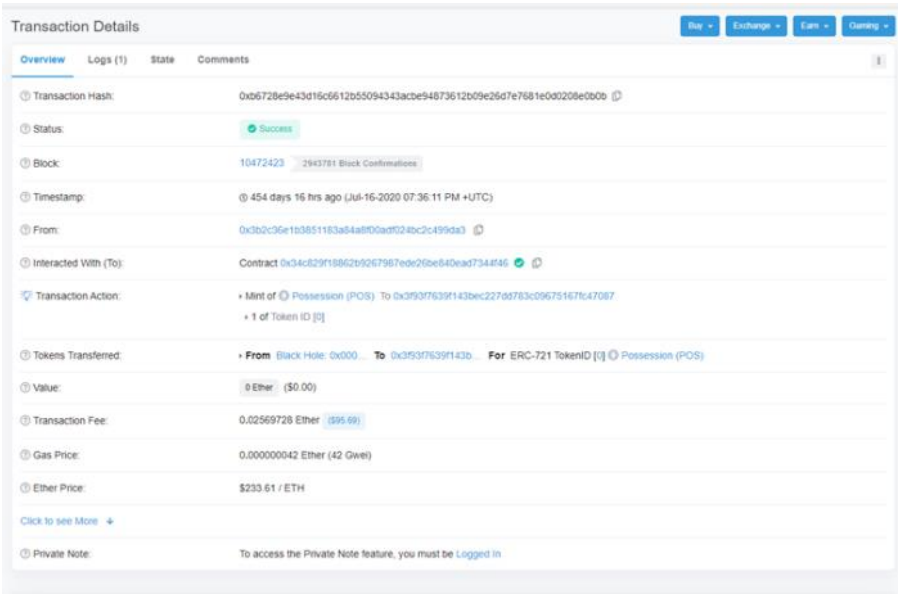

Figure 4.1 Screenshot from Etherscan displaying minting transaction data of one of the NFTs (called 'Possessions'), this identifies one of the participants as the owner of this NFT (pseudonymously). Source: Etherscan, https://etherscan.io/block/10472423 Accessed October 2021

In turning to fragmentation and enchainment theory, this decentralised ownership over identifiable digital objects offers an opportunity for these tokens to act like digital fragments that could bind these participants to the museum. As noted in the introduction, Chapman's enchainment theory relies on the process of fracturing an artefact in which each fragment binds the individual to an agreement or contract, hence, a physical or tangible object is needed as a way to materialise this forged social relation. With blockchain, these tokens

[45] This can be carried through Etherscan, which is an Ethereum blockchain explorer. Any user can search a wallet, hash, or token to find transactions stored on Ethereum https://etherscan.io/ (Accessed 18 November 2021).

have the potential to be the imitations of these fragments since the process of creating them produces a decentralised and clear ownership over the token.

In this respect, the smart contract embedded into the *Possession Gallery* is the catalyst for fragmenting, and as it engages with the Ethereum blockchain, it forms an individualised and identifiable cryptocollectible that embeds the participant's personal interpretation to that digital image from *Crypto-Connections.* This renders these tokens as singularised and in the next section I wish to explore how this process could then transform these NFTs into meaningful entities, where meaningful refers to a personal value and significance and relates to the embedded interpretation. In doing so, I will consider how this process of digital fragmenting might inform a potential enchainment.

4.3 Making Meaningful Digital Objects

4.3.1 Psychological Ownership

In drawing some initial conclusions, the previous section highlights how NFTs give the owners the capacity to claim certain rights including the right to control, sell, exclude, and attribution. This imagines a decentralised ownership that I argue has the potential to support a process of digital fragmentation and enchainment. However, enchainment does not form simply from the process of fracturing an object as there are other psychological factors involved. Therefore, this following section will reflect on two contributing influences that I believe have supported the process of enchainment between the museum and the participants in this project. These factors refer to literature that examines psychological ownership, a term used to describe the perceived sense of ownership.[46] Specifically, five 'routes' (control, investment, intimacy, stimulation, and social identity) provide a framework in which to understand how these participants might feel a sense of ownership and connection to their tokens.

Control, for example, is an important aspect to ownership as it makes the owner feel like they have exclusivity and power over the work in question. The following quote from Museum Participant 3 reflects in-part this idea:

> *If everyone has what you have and you want exclusivity over it, it becomes like annoying. So, for instance, my favourite painting is 'Nighthawks at the Diner' and I went to the Chicago Art Institute to see it and I bought a reproduction of it at the Institute but then they started selling it at Ikea and it really annoyed me and now I feel like I have to explain to everybody, my one is not from Ikea.*
>
> (Participant 3, Museum Interviews, April 2021).

In this instance, the participant feels a sense of possessiveness and a need for exclusivity over their reproduction because they chose to seek out the work at the museum rather than

[46] See Chapter 3.4 for further details

go to Ikea, hence their reproduction holds a deeper meaning and value to them because it is associated with a past experience. A similar situation is evident in the reflections from the *BlockExchange* activity during Workshop 1. Participant C noted how they spent the second round trying to buy back one of their original paintings after selling it to Participant F:

> *So, I became quite possessive about one of mine because it's the first one that I sold and when they were all laid out it was my favourite but then I didn't really realise the significance of it until the next round when I tried to buy it back and you said no* […] *I was determined to get that painting back as it's my favourite painting.*
>
> (Participant C, Workshop 1, January 2020).

In both cases, the participants indicate a need to reclaim control and exclusivity over their artwork because of their personal connection to it. Indeed, the lack of control stimulates emotion in them, making Museum Participant 3, for example, to feel 'annoyed' about the mass production of their print. In this research project, control is already evident in the previous discussion in Section 4.2 since these participants hold control over their NFT through its perceived collectability and, in doing so, this builds on the premise that they feel a connection or ownership over it. Of course, how much of this control can be exercised remains to be questioned and this will be examined further in Chapter 6. The following discussions will consider the other routes to psychological ownership under the themes of investment and intimacy, where investment will also reflect on the role of social identity and intimacy will consider stimulation.

4.3.2 Investment

According to Pierce, Kostova and Dirks, 'investing time, energy, and even one's values and identity' can contribute to psychological ownership (Pierce, Kostova and Dirks, 2003, p. 93). More broadly, investing will, personality, and labour into something can create a sense of ownership or possession over it, a point which is highlighted in the examples above with Museum Participant 3 and Workshop Participant C. This understanding is relatable to the museum sector. For example, Stuart Jeffrey (2015) reports on the findings of the ACCORD Project and found that the co-productive nature of producing three-dimensional models with a group can transform participants from consumers to co-creators and this enhances the relationship and meaningfulness of the digital replicas produced during this project. Similarly, Helen Graham, Rhiannon Mason and Nigel Nayling (2013) highlight how participants of the storytelling project *Culture Shock!* felt a moral right over the story that they contributed to the project. Moral rights are those rights that are attributed to the creator and include the right to attribution, the right to maintain integrity in the work, and the right to privacy regarding the work (Deazley, 2017). In both examples, there is evidence that the investment of participant labour produces a feeling of ownership over the outcomes of the project that are framed around moral rights. Likewise, I will argue that the process of investment has likely to have produced similar ideas in this research project.

The participants in this research project have also similarly invested labour into the project, both in terms of their time and their own identity. It is the latter of these points which is of interest for this discussion since the participants have invested personal stories into each of the objects displayed in *Crypto-Connections.* Participant F's description of their personal possession, 'Wicked Witch of the West' doll, offers a case in point. In their story about this doll, they describe how it was more than just a toy, it was a channel for thinking about their own sexuality; in their words: 'I was feeling an outsider and not relating to boys or girls, so maybe this Wicked Witch offered me an alternative, she sat in between the sexes'. (Participant F, *Crypto-Connections,* NML website, see Figure 4.2). The quote indicates an investment of self and identity, which is likely to have rendered the representation of this doll as meaningful for this participant. In turn, the NFT is an ownable version of this digital surrogate, which also embodies their personal story. And, as noted earlier, this participant saw their wallet as a way to personally protect their memories, which implies that this particular participant viewed their NFT as holding personal value. Therefore, I argue that investing the self into this project has produced a digital token that is like a digital possession for this participant because of the personal association.

Figure 4.2 'The Wicked Witch Doll' NFT, *The Possession Gallery.* Source: NML Website, https://collectibles.liverpoolmuseums.org.uk/#/ Accessed November 2021

This is comparable to Locke's discussion of property through labour: 'the labour of his body and the work of his hand, we may say, are properly his' (Locke, (1690) 2003, p. 134). In other words, a formed material will always be linked and merged with the work of the producer, an idea which might also be viewed as the producer extending part of their self into the creation (Belk, 1988). There are also similarities to Hegel's discussion on the embodiment of will or personality to form possessions and property, which he notes 'implies

a union of subject and object' (Hegel, 1967, p. 47). With both scholars, there is a suggestion that the investment or work and/or will merges with the property to form an amalgamation (Waldron, 1990). This is evident in the case of Participant F since their story is an investment of their own will and personality, and this is digitally merged with the object. This unification is also extended into the cryptocollectible, which also represents a separate entity owned by the participant, and this process of investment helps to build understanding of the participant's personal ownership over their cryptocollectible.

Of course, the possessions in this exhibition were likely to provoke such a personal response and an extension of personality since these are objects that were already considered personally connected items. But, while they might not have provoked such a deep connection, the interpretations about some of the museum objects in *Crypto-Connections* also show a personal touch and investment of personality. For example, Participant E's description about mangroves embeds some of their own personality since they note how they have a passion for these trees, and this is evident in the detailed information they give about the object: 'the protection, utility, and championing of mangrove forests and their benefits is a passion: on my level, I communicate the science behind them' (Participant E, *Crypto-Connections,* NML website). Hence, their choice in this object and their written piece about it also projects this idea of an extended personality.

It is important to reiterate here that the original premise of this project was to focus on the theme of LGBT+ through working with a group of people who associate themselves as LGBT+ as this would promote a collective social identity among the group. However, during the first workshop, the participants noted how they did not feel like they wanted some of their stories about the LGBT+ collections displayed in the museum and so more general objects were used instead. Had this not been the case and the project had used LGBT+ associated works for the project, it is likely this would have materialised stronger results in building enchainment because social identity would have been a more explicit factor.

Nevertheless, discussions in the second workshop also show how pseudonymity facilitated in this process of investment in personality, as Participant A explained, it allowed them to 'go there quite quickly […] without feeling awkward' (Participant A, Workshop 2, July 2020). Likewise, Participant E noted: 'I think it's more of a personal thing, if there is no need to give my identity away then, just keep it anonymous' (Participant E, Workshop 2, July 2020). Although the whole project was pseudonymised, these points suggest that blockchain's pseudonymity supports the process of investment because it allowed the participants to feel less self-conscious. Transactions on the Ethereum blockchain are pseudonymised using cryptographic hashes, and these are one-way, and so they produce a form of 'trap-door' where once data is embedded into a hash, it is difficult to uncover the original piece of data (DuPont, 2019, p. 61). Therefore, this permanent pseudonymity facilitated in this process of investment enabled the participants to feel comfortable in writing personal responses to their objects.

This pseudonymity is also prevalent in the notion of hidden labour. In taking a Lockean perspective on property again, it is clear that the participants have also invested their own labour and time in attending the workshops and writing up the descriptions for the exhibition. In their reflections in the second workshop, Participant E noted how this process helped them to realise the hidden labour behind the production of these sorts of projects and how this labour is hidden behind a wall of pseudonymity: 'I think it is almost embodied by the anonymity of it and the work done behind which is not necessarily shown' (Participant E, Workshop 2, July 2020). Their point here is that the finished outcomes of projects, such as the *Possession Gallery,* do not denote the work that built up to it; their work and effort is hidden behind the pseudonymity of blockchain and the exhibition even though their personal interpretations and stories are publicly available to view.

There is a link to this labour input with the labour embedded into the blockchain protocol. In both instances, this labour helps to build the overall outcome whilst being invisible to the online visitor. In blockchain, the miners function as the authenticators of transactions by solving complex mathematical puzzles to unlock the next block in the chain; their investment of time, computational power, and money helps to build and validate the blockchain and so their labour is both hidden behind the screen whilst also being visible through the public documentation of transactions onto the blockchain (Maurer, Nelms and Swartz, 2013). This labour is also the point at which value is produced in the network since the miners validate and add transaction data to the distributed ledger.[47] Similarly, these participants have worked to build the exhibition which has also formed the cryptocollectibles. Furthermore, their labour is the point of value creation in this project as it is their personal interpretations which highlight this exhibition as being different from the rest of NML's digital collection.

This highlights two points. Firstly, this process has enabled these participants to look beyond the screen, developing what might be described as going beyond a 'screen essentialist' approach as they acknowledge the underlying (and hidden) relations and work rooted into the visualisation of the objects (Kirschenbaum, 2008; Parkin, 2020, p. 65). Secondly, participant investment is the production of meaning in this project, an idea which closely relates to wider museum literature that recognises how the value is in the process rather than the output of a collaborative project (Lynch and Alberti, 2010; Morse, 2014; Janes and Sandell, 2019). However, unlike the miners in a blockchain network, this investment has likely to have supported the development of ownership through the idea of moral rights, which was actualised in this project in the participants' desire to not have the LGBT+ aspects presented in the exhibition.

[47] See Section 5.2.4 for further details.

4.3.3 Intimacy

This process of investment of personality and identity also facilitates the production of intimacy. As Pierce et al (2001, 2003) note, the route of intimacy involves getting to know the object and this could be from living with that thing or by being actively involved with it. In doing so, one extends oneself into that object which produces a connection or ownership toward it.

In this project, this intimacy is clearly shown in the personal experiences and interpretations written about each object, where each participant had to reflect on their chosen object to write up these pieces, and where the project built in a need to gain intimacy with these objects. This is evident in the data, for example, Participant E noted how their interpretations in this collection represent 'a more personal extension of me' (Participant E, Workshop 2, July 2020). Likewise, Participant D compared both their museum object and possession cryptocollectibles to 'digital memories':

> *Having that memory or having something to come back to and I suppose also by writing that little message as well it kind of, it makes that visit to the museum more memorable. If you did that every time you went you would have this sort of collection of digital memories.*
>
> (Participant D, Workshop 2, July 2020)

Here, Participant D has reflected on the potential use of the tokens as a form of digital memento that embeds their own personal connection to the museum object, and, in doing so, this could make the museum visit 'more memorable' as the cryptocollectible 'captures' the experience. This suggests an intimacy taking place in which the task is to build that association through exploring the object, and the cryptocollectible is the outcome of this process. This resonates with Keith Hart's (2000) discussion on money as token of memory or a form of 'memory bank,' in which he proposes that money is more than a symbol of our wants and desires, but also holds a social characteristic, which derives from acts of remembering and exchanges within a community. Therefore, money is a token of memory because it 'remembers' past exchanges.[48]

While Hart's point relates to money, this idea resonates with the research because both money and the cryptocollectibles are forms of tokens. Furthermore, Hart's understanding of the token as a memory of past transactions closely relates to the way blockchain documents and relates the participants' stories to the cryptocollectibles. For instance, during the process of exchange in this project, the story is documented as metadata to the image. This metadata is permanently linked to the digital object as both are merged using the smart contract. The amalgamation is documented onto Ethereum in the form of a hash. Once completed, there is no way of reversing this transaction. In this way, the metadata captures

[48] I use the term 'memory' in this context to refer to the idea of experience and exchange between a person and another person or object.

and remembers the participant's story, and the hash is used as a way to individualise the token when it is recorded onto the distributed ledger.

More specifically, the story embedded into the NFT symbolises the once physical exchange or interaction between the participant and the object when they visited the museum during the first workshop. In turn, the story embedded into the hash on the Ethereum blockchain is a symbol of this once physical exchange. Therefore, like money, these cryptocollectibles are a form of memory bank that permanently stores the relation formed between the participant and the museum through the project. This potentially activates the stimulation factor for the participants as the NFT is a way to remind themselves of that visit and of the project; as Participant D states, it is 'something to come back to', which could help to build a sense of psychological ownership.

Furthermore, this discussion reinforces the notion that these NFTs are a form of 'token', rather than say a 'receipt' or a 'certificate' of attribution. Indeed, a 'receipt' implies that the NFT is only a reference point or an acknowledgment of information, and so lacks any intrinsic value.[49] A 'certificate' suggests something which is more formal in nature with its connotations to the art market, in other words, it implies an exchange of formal ownership rights rather than symbolic ownership. Meanwhile, the term 'token' indicates that it could act as a vessel for memory or meaning just as Hart suggests that a monetary token is a symbol of past exchanges and value. Therefore, the use of the term 'token' denotes a potential intimate relationship with the work.

On the other hand, for those that visit *Crypto-Connections* and the *Possession Gallery* these stories also imply an intimacy and emotional aspect to the collections, which can facilitate in people connecting to the collection in a different way. This was a point noted during a couple of the museum interviews:

> *'I like that idea of exploring the emotions around objects and also the human connection to it because I think that makes it more interesting for a lot of people, obviously you get people who are really interested in the factual and the historical parts of the museums but then a lot of people connect with that more emotional side*
>
> (Participant 2, Museum Interviews, April 2021).

Similarly, Museum Participant 4 noted: 'I really like that aspect of it [the personal story] because it makes things feel a bit more emotional' (Participant 4, Museum Interviews, April 2021), and Museum Participant 3: 'so I think the beauty of museums is that each item has a personal link to someone and someone can tell their own story about something like that' (Participant 3, Museum Interviews, April 2021). This emotional aspect of the NFT engages viewers in a different way because it highlights a different subjective perspective on the

[49] See Section 5.3.3 for further discussion on the NFT as a receipt.

object. Indeed, these tokens emanate an intimacy, which could encourage viewers to reflect on their own experiences with the collections and eventually gain an intimacy too.

4.3.4 Creating Digital Fragments

This analysis shows that investment and intimacy are evident in this research project. For example, the participants have invested emotionally (as well as physically) to the project, and some of the participants have extended part of their own identity into the process of interpretation. The discussions in this chapter also highlight how blockchain technology has contributed to this process through its pseudonymity and the method of documenting. Pseudonymity enabled these participants to feel more comfortable with presenting personal information in such a public project. Meanwhile, the process of documenting gives the tokens a deeper sense of permanence and materiality for these participants when compared to a typical digital object, a point which will be discussed in further detail in Chapter 5. In doing so, I argue that this produces tokens that relate to Hart's concept of a token of memory, in which the technology is a way to permanently document past experiences with physical works.

Furthermore, this process has the potential to produce a feeling of moral rights over the NFT as it represents the output of the overall project and handing these tokens over to the participants represents an acknowledgment of these rights. This is comparable to a point made by Participant 6 in the museum interviews who recalled a project that they had carried out at NML with a local community group. As part of this project, participants told stories to an artist who drew up these different anecdotes on a piece of paper which was then photocopied so that each participant and the museum held a copy:

> *It was really important that the participant wanted their copy of that, they wanted something to take away having told their story and then they have a sense of ownership of that object that had been created from their story and it was divisible in a way that we could have multiple copies.*
>
> (Participant 6, Museum Interviews, June 2021).

Similarly, the participants in this research project have emotionally invested into the project and through this gained a right to own an aspect of its outcome as a form of memento or remuneration for their time and investment. In other words, the NFT is a symbol of this remuneration and association with the project because of its ability to be singular and ownable. This also indicates how these tokens could be like digital fragments that could initiate enchainment through the participants' personal attachment because the token's embedded meaning and collectability simulates the effects of a physical fragment that is broken to create a new social relation. In the same way, the NFT is minted and handed over to the participant to acknowledge their part in the project, thus creating a connection between the participant and the project.

However, do these participants feel a sense of psychological ownership over their NFTs? This remains unclear. Whilst it is apparent many of the participants understood their tokens to be a form of collectible,[50] I argue that it is only participant F who clearly shows a feeling of possession and psychological ownership over their NFT. Moreover, blockchain's applied pseudonymity might not always facilitate ownership, indeed, it could be a barrier to moral rights. For example, Alesja Serada, Tanja Sihvonen, and Tuomas Harviainen (2020) emphasise how NFTs are bought and sold pseudonymously on the blockchain, which means that users can only claim a 'pseudo-ownership' of their tokens since their claim to ownership cannot be validated outside of the blockchain. In this respect, pseudonymity obstructs the right to be attributed to an NFT and so it is a barrier to moral rights.

These findings create ambiguity around this research project and highlight how there are other variables that impact the creation of ownership in cryptocollectibles. This point is supported by comparing these findings to a remark made by Participant 7 from the blockchain interviews. Participant 7 works for Async Art, a platform that enables artists to sell fragments of programmable art as NFTs. Each digital artwork is fractured into ownable programmable layers and so a piece might contain multiple different owners who each have control of their part of the work. The participant noted how they had initially owned a couple of layers of a charity piece, but soon found that they gained an emotional attachment to the work so much so that they did not want to sell their layers when it came to the charity auction:

> *The emotional attachment I have for my own layers I didn't want to sell them at all […] I think the innate community that each artwork can potentially generate and all of the interactions that goes into it, just procures a little bit more of an emotional tie*.
>
> (Participant 7, Blockchain Interviews, March 2021).

This indicates that an individual can grow an emotional attachment to an NFT. Indeed, digital goods can also hold personal value and feel like possessions but it is the individual's perception of the digital and its properties that impacts this attachment (Denegri-Knott, Watkins and Wood, 2012). Similarly, the individual's perception of blockchain is likely to be the contributing factor in producing meaningful cryptocollectibles. As such, this discussion supports the idea that ownership is 'multidimensional in nature' (Pierce, Rubenfeld and Morgan, 1991, p. 124), but it also shows how the technology cannot produce digital fragments alone, nor can embedding the 'routes' to psychological ownership guarantee this either.

[50] See Section 4.2.

4.4 Recognising Enchainment

4.4.1 Understanding Enchainment

Although I have concluded in the previous section that individual perception about blockchain impacts the transformation of these NFTs into digital fragments, I will argue in this final section that enchainment is still evident in this research project, which also proves that these cryptocollectibles share a resemblance to Chapman's (2000) fragmented artefacts.

To reiterate, Chapman's theory argues that purposely broken fragments of artefacts could forge social relations in a form of enchainment. His arguments circulate around two ideas of enchainment. Firstly, enchainment derives through a process of objectification whereby a person extends himself/herself into an object and embodies it with symbolism and meaning. The previous section analysed this aspect so to explore whether enchainment is formed through a development of psychological ownership to the digital token and personal connection to the original object. Secondly, enchainment refers to an exchange of the object which forges a relation between the giver and the receiver and enchaining them together. This implies that enchainment is more than simply filling an object with personal meaning, it is also about an exchange taking place that supports the formation and maintenance of social relations. In this way, enchainment is not simply a personal experience, it also needs to be recognised by others.

The following section will focus on this second aspect of enchainment. Here, I will consider to what extent blockchain could contribute to this understanding in the context of collective ownership and stewardship. In the first instance, I will explore how the participants recognised enchainment and this will be discussed using the understanding of collective experience. The outcome of this discussion will highlight how shared experience can support enchainment between the participants. In terms of blockchain, the technology digitally records this enchainment onto its distributed ledger as it combines story to object in the form of a permanent and ownable cryptocollectible, and this acts as a channel for shared experience. Meanwhile, in Section 4.4.2 I will explore how the museum recognises enchainment and this will be discussed using the notion of stewardship and shared guardianship. In this case, blockchain helps to extend the idea of a layered or collective ownership between the participant and the museum, and this returns to the understanding of digital scarcity formed from the application of the technology. As such, these themes of discussion will highlight how cryptocollectibles could be digital tools of enchainment.

4.4.2 Collective Experience

During the discussions of the second workshop in July 2020, the participants were asked to consider if the process of doing the project created a sense of collective ownership between them and their cryptocollectibles, Initially, the participants did not think so since they each only owned their own objects rather than own a token of every object in the exhibition. Moreover, they had no affiliation to the other objects since they had not written up a personal

experience about that object. However, Participant E later compared their involvement to the project and this idea of collective ownership to the contributions of an edited book:

> *Maybe in terms of contribution but maybe only if by the way collecting works of poetry by different authors, like contributory in that way I guess since it shows the different items.*
>
> (Participant E, Workshop 2, July 2020).

This quote suggests that the participant views their contribution as an individual experience that is part of a wider whole like an edited volume; each token is like a separate chapter that is bound together as a collective entity, and this is depicted in the *Possession Gallery* space. Participant G agreed with them and noted how the pseudonymity of the project gave them an authority in knowing which object related to whom: 'one thing that we all know about it is that we're the only people who know Participant 1 is or Participant 2, and so forth are' (Participant G, Workshop 2, July 2020).[51] Participant D also agreed with these ideas noting 'it's just like a collective memory, isn't it?' (Participant D, Workshop 2, July 2020). Similar ideas were also noted during the museum interviews, for example Museum Participant 2 compared the *Possession Gallery* to a Pinterest board, which is a social media platform that allows users to pin pages online to a digital board to create a mood board. Comparing the gallery to this platform implies that they see a community element to the work where different people can share their interests and personal connections with others.

These comments show how the *Possession Gallery* represents a form of shared experience between the participants since it is a space that collectively depicts these separately owned tokens. Participant G's comment also highlights how this collective experience is unique to these participants as they are the only people who know the identities behind each object and interpretation. Indeed, both the *Possession Gallery* and the *Crypto Connections* exhibition are not visible on the opening page of NML and instead users need to access these pages through the URL link. This suggests an exclusive access point that only those that know about the project can even access the digital works.[52]

However, at the same time, this space also represents a distinction between the participants because they are enchained to a specific object rather than the whole collection. Parkin's description of the nodes in the Bitcoin network certainly resonates with this combination of autonomy and collective representation when he uses the term stigmergy, a word used to describe the behaviour in ant colonies where each insect works individually but for a collective whole, to explain how the nodes in a blockchain work both separately but builds towards a collective blockchain (Parkin, 2020, p. 146). Similarly, these participants are also working in a stigmergic way, their invested labour focuses on the individual cryptocollectible

[51] To reiterate, participants are identified differently in *Crypto-Connections*
[52] Although this also suggests a lack of accessibility, see Section 6.2.2

that builds up an understanding of collective experience in the form of the *Possession Gallery.*

This idea of shared experience can also be linked back to Hart's analysis of money as a form of memory bank. As discussed in Section 4.3.2, these NFTs are a form of memory token that permanently records the encounter between the participant and the physical object onto the Ethereum blockchain. This highlights one of the key reasons for applying blockchain since the technology extends Hart's argument to produce a digital and immutable historical record. In this way, the cryptocollectibles made in this project do not only simply relate the participant's story to the object, but a permanent digital link that is stored across the Ethereum network, which gives it a certain validity because it cannot be tampered with. Therefore, the *Possession Gallery* is like 'an instrument of collective memory' (Hart, 2000, p. 234), as it is a space that gathers these different permanent experiences together, thereby depicting the different relations between the participants and these objects.

In thinking back to Gell's (1998) discussion on social agency noted in Chapter 3.4, these points also indicate that the physical museum objects are secondary agents for shared experience. For example, Participant A, the representative from NML, commented during the second workshop on how the experience of doing this project has changed how they will view the physical museum objects:

> *For me as someone who works in the museum, I now will probably forever associate those objects with the people who have taken part here […] I think that's the inevitability of taking part in this project now is the association with those things with those people.*
>
> Participant A, Workshop 2, July 2020.

Participant E agreed with them, noting: 'I guess there's some kind of emotive and communal association' (Participant E, Workshop 2, July 2020). This suggests that the project has applied an additional social relation to these museum objects' networks of social relationships, which is only evident to those who took part in the research. In other words, the physical museum object has gained an interpersonal relation to the participant who wrote about it for the exhibition, and this highlights a form of collective intimacy since only the participants in this project know which object relates to whom, as highlighted by the previous comment from Participant G. Therefore, the *Possession Gallery* is a digital materialisation of this collective experience/intimacy and blockchain reinforces this through its pseudonymity. In situating this discussion in the context of enchainment, the experience channelled through encountering either the physical museum object or its digital versions reinforce the notion of enchainment in the participants through the act of remembering. Therefore, both the physical object and its digital counterparts are agents of enchainment.

In turn, this could also change how viewers of the exhibition read these objects, as noted by Museum Participant 4:

> *If you have that information that they've attached to it and you're reading that alongside the other information I think it would definitely change the way you see objects and, in my head, I see it as a positive thing because I would hope that people would get involved and give a perspective that most people wouldn't usually get when they walk round a museum.*
>
> (Participant 4, Museum Interviews, April 2021).

This quote supports the argument made in Section 4.3.3, which proposed that the emotional content will encourage those that see this content to also reflect introspectively on their understanding of these objects. Likewise, it shows how the NFTs and the *Crypto-Connections* exhibition are potential secondary agents that can affect viewers and alter how they view works in the collection.

In this respect, both the physical object and the cryptocollectible version are significant agents in the production of enchainment and both facilitate in building a sense of collective experience and intimacy between the participants. The use of blockchain applies a permanence to these connections by recording these social relations to the infrastructure of the Ethereum blockchain. In doing so, this produces permanent and ownable tokens of experience.

4.4.3 Shared Guardianship

Having examined enchainment in the context of collective experience, this section turns to enchainment from the perspective of layered ownership. Layered ownership refers to a convergence of ownership claims that were apparent in this study in relation to the museum object cryptocollectibles. This idea is highlighted by Participant E's comment when they reflected on taking ownership of their museum object NFT: 'I don't know. I think it exists in an intersect of it's my own thing, but it is a representation of something that is not owned by me' (Participant E, Workshop 2, July 2020). Here, the participant reflects on how the technology produces a digital entity that is a form of extension of the museum that also exists as their 'own thing'. One interpretation of this point is that blockchain creates ambiguity over ownership when it comes to museum NFT artworks because it creates something that is at the 'intersection' of a museum object and a digital commodity. This makes the participant unsure about whether they truly own this token. This contradicts the idea of decentralised ownership discussed previously because it implies that there are other forces that obstruct the technology being able to provide a clear ownership identification.

This also relates to the wider discussion of the separation between physical and digital ownership. For example, Participant A noted in the first workshop how NML has cases where it owns the physical painting but not the digital rights, meaning that they do not have the right to share the image on their social media, but they can show the physical painting in their gallery such is the case with their David Hockney painting:

> *We own the painting, but we don't own the digital rights to it so we can't post it on social media websites or media or without them, they [the estate] have to sign off every crop, and every time we use it*
>
> (Participant A, Workshop 1, January 2020).

This emphasises the distinction between physical and digital ownership and shows how owning one aspect does not give automatic right to own the other. Museum Participant 4 also noted a relatable point when reflecting on the barriers to owning a digital object: 'if you purchase something and it's in a contract and you do get ownership of it what does that mean? Can you manipulate it? Can you change it? Or do you have to keep it as a whole thing?' (Participant 4, Museum Interviews, April 2021). This highlights how digital ownership also requires terms and conditions embedded into the agreement because of the non-rivalrous nature of digital content. These points are important in the context of these NFTs as it suggests that the museum cannot presume to own these tokens just because they own the physical object represented within them. Indeed, cryptocollectibles establish a third layer to ownership (physical, digital, and crypto), which creates further ambiguity when considering rights and control. Therefore, blockchain might dictate that the participants are the owners of these tokens, and yet, Participant E's comment suggests that there is more to ownership than simply having a means to prove ownership.

Returning to the ideas of investment, intimacy, possession, and psychological ownership offers some insight when investigating this point. For example, NML has invested time, money, and effort into the project; blockchain developers were needed to make the *Possession Gallery*, transaction fees had to be paid to create each cryptocollectible, and the online exhibition and the cryptocollectible also took time and effort to produce. As such, we can establish that NML has invested labour and resources into the project, which, in the context of Lockean theory, would suggest a formation of ownership and sense of property.

But NML has also invested in other ways since half of the contents in *Crypto-Connections* derives from its collections. Therefore, NML is associated to the project through the works that form the basis of the NFTs. In taking the understanding that a museum's collection is part of its 'identity' or 'self', this implies that NML has extended part of its own 'identity' into this online exhibition. This idea of extending one's identity draws upon Belk's (1988) discussion on possessions as well as Hegel's discussion of property and the embodiment of will briefly noted in Section 4.3.2. Belk (1988) argues that the process of extending part of oneself into an object transforms that object into a possession, or an object with intrinsic value. This also reflects Hegel's discussion on property in which he proposes that a being can distinguish property by transforming it with their will. In doing so, the property is informed by their personality, it is associated with that being, and it 'marks' that object (Hegel, 1967, 49). However, Waldron is careful to emphasise that this idea of informed or embodiment denotes a reflection of will rather than the object being a vessel of will (Waldron, 1990, 22). Put differently, the possession is a representation rather than a simulation of personality.

Nevertheless, in both cases the focus is on the role of embodiment or extension of will as a way to explain a feeling of ownership or claim to property, and this idea is often understood as a 'personality-based' justification or theory for property (Penner, 2000; Moore and Himma, 2011). Similarly, NML can claim ownership over the NFTs made in this project because they reflect contents from its collection and, as such, embody the 'will' or identity of the institution.

At the same time, however, NML's collection is a nationally owned set of works and so, symbolically, the nation also has a claim of ownership. This was a point made by Participant A as they said about the project: 'it goes back to that idea that it is a national museum therefore its owned by the nation' (Participant A, Workshop 2, July 2020). This is not an isolated idea, the understanding that national collections and cultural heritage are collectively owned is an argument used elsewhere in literature such as in discussions for an open access policy of GLAM digital collections (Sanderhoff, 2014). However, the open access debate argues for institutions to relinquish rights over their digital collections that are in the public domain and it focuses on a collective ownership that relates to a 'liquid, displaced form of ownership' (Hylland, 2017, p. 80). This plays on the idea of media having a 'variability' that challenges ownership and authority in the museum context (Parry, 2007, p. 102); digital media is always shifting and evolving. Whereas, in this project, no rights are relinquished as such and blockchain informs a permanence and a new layer of ownership through these NFTs. The technology captures each object in *Crypto-Connections* at a particular point in time and permanently stores this moment. This also grounds collective ownership through exchange value and digital scarcity and establishes a more concrete form of collective ownership through the digital and ownable extensions of the digital museum collection.

Furthermore, the participants also have a claim of ownership as noted throughout this chapter. Hodder's (2012) discussion of claiming ownership can also provide detailed examination of the participants' claim. To reiterate from Chapter 3, Hodder (2012) considers how ownership is formed through a process of recognition, association, and exclusivity. In this case, the participants recognise the NFT as a form of property (as highlighted in Section 4.2) as they understand that these tokens have a collectability and an exchange value. The embedded story in the NFT's metadata creates association as the participant is connected to that token through their personal documented experience of it. Exclusivity, however, is more difficult to ascertain as noted earlier in this chapter. The NFTs are both rivalrous and non-rivalrous goods in that they hold scarcity and are limited commodities (rivalrous), but they can also be easily shared and experienced online by multiple viewers without compromise (non-rivalrous). This requires the owner to understand exclusivity from a different perspective, one which not all viewers will perceive as valuable or create the idea of property. Therefore, the participants hold a claim to ownership, but this ownership might not be universally recognised.

But the participant's claim to ownership also derives from their ability to trade their token if they wished to. In Chapter 6.4, I will explain this aspect in further detail, but for now, I wish to emphasise this right as a way to reflect on the changing state of ownership in this project. The participants can sell their NFT but none of them have so far, and this suggests a new dynamic to ownership, one which is embodied in the act of care or a feeling of duty. Indeed, as I will explain in further detail in Chapter 6.4, many of the museum interviewees highlighted an unease about these participants having the capability to sell their token without the museum knowing. In turn, this has led to an expectation that the participants should not sell their token. This expectation was not explicitly said to the participants but, certainly, because of the personal nature of the NFT and its association to NML, there is an underlying understanding that they are unlikely to sell their NFT. This upends the idea of decentralised ownership because the act of owning one of these NFTs has forged a relation between the participant and NML. In other words, the exchange of the NFT is not as clear cut and instead it forms an implicit contract that suggests that it would be unethical for the participant to sell the NFT.

I understand this to reflect the idea of shared guardianship or stewardship, which were points noted in Chapter 3.4. Like stewardship, guardianship approaches ownership as a dynamic relationship; it is about safeguarding, forming a partnership, and building dialogue, and a social relationship is integral to this process (Geismar, 2008). It also requires institutions to centre objects around the knowledge and relations they create for different stakeholders rather than viewing cultural objects as simply property (Marstine, Dodd and Jones, 2015). This is a crucial point in this research because the potential guardianship produced in this exchange obliges participants to not sell their token as a form of property and instead care for them.

In this way, shared guardianship is a product of an underlying contract, which has the potential to build new relations between a museum and its audiences. The NFT is a symbol of partnership and a duty of care. This idea connects to the role of fragments in Chapman's (2000) theory because the NFTs are representations of a social contract between the two parties. Both NML and the participant have invested into the NFT which transforms the token into a digital bind that links these parties and shared guardianship is the implicit expectation that maintains that newly forged relation. This offers future opportunities to build partnerships in museums using NFTs, a point that Participant 5 from the museum interviews agreed with: 'there's definitely something in it and I could definitely see it as a way of engaging students or engaging with people through certain programmes' (Participant 5, Museum Interviews, May 2021). The NFT is both a way to remunerate, engage, and build specific relationships around a museum's collection. Moreover, the smart contract associated with the NFT could embed certain terms and conditions, thus creating more explicit expectations associated with a shared guardianship agreement.

But this also requires the viewers to see the NFT as an entity in its own right, which is a point that is entwined with the discussion on exclusivity noted earlier. If a participant does

not hold total exclusivity over their NFT, then it might be thought that the museum has not relinquished anything since they still hold the original digital file on the website.[53] This idea also reflects the criticisms of a digital 'sharing economy', where scholars have argued that initiatives embedded into this economy are not really sharing, instead they represent the illusion of sharing described as 'pseudo-sharing' (Belk, 2014a; Habibi, Kim and Laroche, 2016). Geismar's (2013) discussion on 'digital returns' also points to a similar argument as she emphasises the need to acknowledge the power relations at play in digital returns and the 'keeping-while-giving' hierarchies of such objects (Weiner, 1992). In using Weiner's terminology, Geismar argues that digital objects may circulate online but the ownership claim remains centralised and so, like the sharing economy, digital objects are presented under an illusion of shared ownership when in fact the claim and rights linked to ownership remains centralised and far from shared.

Of course, Geismar's argument was alluding to the physical object remaining centralised but in this project the ownership over the physical object was never meant to change. However, Geismar's argument could also be used in the context of the main digital image on NML's website where this main image remains centralised. In this case, the control and use value of the NFT is a critical point that could help reduce the risk of 'keeping-while-giving'. This point will be discussed further in Chapter 6 in the context of authority, but, for now, the key argument highlighted in this data indicates a potential relation forming between the institution, collection, and participant through this exchange.

4.5 Conclusion: Claiming (Shared) Ownership

This chapter has outlined how blockchain technology creates tokens that project formal ownership; in other words, it has the potential to create personal property in the online space. This is formed from digital scarcity that facilitates in producing a sense of exclusivity and exchange value in these tokens and I argue that these attributes formulate a sense of ownership. This chapter has also investigated other contributing factors to ownership in the context of psychological ownership. The discussion noted how investment, intimacy, and pseudonymity might all support a feeling of ownership in the participants through encouraging them to invest personally into the process so that the NFT represents something personal and intimate. Together, these two discussions highlight the multidimensional nature of ownership, where the technology produces a digital object that is different from a typical digital object because they can be identified as owned and sold, whilst the process of investment informs a psychological aspect of ownership. However, it remains unclear as to whether this is the case in every participant in this project, and I proposed that individual perception about the technology could be a barrier to this idea of psychological ownership.

At the same time, the intertwinement of blockchain and the routes to psychological ownership has also developed an aspect of Chapman's (2000) understanding of

[53] See Chapter 6.3 for further details.

enchainment. In this case, the focus is on the second understanding of enchainment investigated in Section 4.4.1 and I outlined how this is evident in two aspects of the project. Firstly, enchainment is recognised in relation to shared experience where the *Possession Gallery* is a documentation of the participants' experience of the project. However, the *Possession Gallery* might be openly available, but it was a temporary digital space meaning that this source of collective experience will disappear. This raises questions on the permanence of this enchainment. Although I argued that the physical objects and NFTs gain new associations and so are also secondary agents of enchainment, I question whether these participants will only be reminded of their individual experience rather than the collective experience of the project. For example, will the participants remember the other objects on display in the exhibition? Therefore, it remains to be seen whether such a process embeds a permanent feeling enchainment and collective experience.

The second aspect of enchainment discussed layer ownership and shared guardianship and I proposed that shared guardianship is the outcome of an underlying contract that is forged between the participant and the museum during the point of exchange. Although in this project the idea of shared guardianship is only apparent in the act of not selling the NFT, my argument here is to consider how the NFT might be used in the future in the context of audience engagement. This project shows how NFTs minted from museum collections have an ongoing association with that institution, and this connection could be utilised to create a more explicit set of terms and conditions around the NFT that could build new relations between the museum and its audiences.

However, perceptions around NFTs remains a problem in this practice and I have introduced in this chapter how blockchain requires owners to examine their assumptions around exclusivity and ownership. This also highlights problems relating to authenticity and in Chapter 5 I will explore this theme and consider how blockchain technology challenges our understanding of authenticity in the digital space by establishing a different understanding of originality. In doing so, this will highlight why some individuals in this project do not see their blockchain token as a valuable entity.

Chapter 5: Authenticity

5.1 Introduction

In the previous chapter, I highlighted how blockchain technology can reproduce property ownership in the digital domain, I also introduced the concept of 'digital thingness' in relation to the NFT's digital scarcity and exchange value. But what does this thingness really refer to? What makes an NFT different from a 'typical' or non-blockchain digital object? I outlined thingness in Chapter 3.4 in the context of Brown's (2001) 'thing theory'. A thing confronts the viewer; its condition of thingness implies an ambiguity, and the theory that underpins these terms requires the viewer to critically examine the human/object relationship. As such, looking at the thingness of NFTs requires an analysis of not only the materials of a blockchain, but also how the viewer responds and interacts with this digital materiality.

Therefore, the analysis in this chapter will consider the following research questions:

- In what ways does blockchain produce digital thingness?
- What other factors impact thingness and authenticity?
- What are the challenges to a blockchain's thingness?

This chapter is split into the following sections. In using themes and data collected from the workshops and the blockchain interviews, the first section will focus on the properties of digital thingness and will explore these properties through digital materiality. As I noted in Chapter 3.4, digital materiality is understood through four dimensions; forensic, formal, distributed and performative, of which the two former terms derives from Kirschenbaum's (2008) work in this field, and the two latter draw from Drucker's (2013) discussions on digital materiality. I use each dimension in my analysis of blockchain's materiality, so as to show how the technology embeds scarcity, permanence, and value into recorded tokens. In doing so, this informs a nominal aspect of authenticity in which the technology can be used to identify specific information online. This discussion shows how an NFT's materiality or thingness informs an understanding of authenticity that is not prevalent in other typical digital objects, and in turn, this has the potential to contribute to forging new connections or an enchainment.

Meanwhile, in the second section I challenge this one-sided view of authenticity and instead takes a constructivist approach to understanding the term. Specifically, this section will look at how the participants of the project (the participants, museum interviewees, and the blockchain interviewees) respond to this thingness. This will be examined through three themes: originality, permanence, and value. In doing so, these discussions outline some of the challenges faced by using blockchain. At the same time, however, this will also highlight the role of the museum and its institutional authority in propagating a sense of authenticity in these NFTs. In this section, I will argue that there is a potential entanglement of the technology with the museum that impacts how others perceive these cryptocollectibles.

The conclusion will build on this final premise, and there I will argue that authenticity is formed through interrelating factors that are nominal and constructivist in nature. As such, blockchain simply 'simulates the effects' of authenticity (Zeilinger, 2018, p. 30), which requires viewers and owners to recognise this condition and perceive it as valuable.

5.2 The Properties of Digital 'Thingness'

5.2.1 Digital Materiality

The first part of this chapter will explore authenticity in relation to 'nominal' authenticity. Nominal authenticity refers to considering the evidence of an artwork, such as its materiality and documentation, in order to ascertain if it is a forgery or authentic (Dutton, 2003). In this respect, nominal authenticity focuses on the type of authenticity that is prioritised by the art market. Focusing on blockchain's digital thingness correlates to this notion because this requires analysing how the technology produces a provenance of ownership and gives tokens a sense of permanence and exchangeability. In other words, it requires exploring how a blockchain's materiality offers material evidence for authenticity. This entails going beyond a 'screen essentialist' approach (Kirschenbaum, 2008; Parkin, 2020), or, a need to look beyond the interface of the NFT and examine how the technology functions underneath so that we can understand how authenticity is bound to a digital object using blockchain. In the following section, I will examine blockchain's contribution to the concept of authenticity through the four dimensions of a digital object's materiality with support from data collected from interviews with participants from the crypto space.

5.2.2 Forensic and Formal Materiality

To reiterate, the forensic element of a digital object's materiality treats the bytes and bits of the digital as individual elements that leave traces (Kirschenbaum, 2008; Blanchette, 2011). This dimension is evident in these NFTs through scarcity, a term which I have already introduced in the discussions of Chapter 4.2. Scarcity is an important factor in blockchain tokens because they give the illusion of exclusivity, or, as Blockchain Participant 1 noted, the idea of being a 'limited edition': 'you pay the artist and are supporting them, and you are a collector as you have a limited edition' (Participant 1, Blockchain Interviews, July 2020). Blockchain Participant 6 provided a more detailed explanation about how this scarcity is produced through a blockchain ledger:

> *A digital token is basically just a ledger entry to say what token is owned by which address; every identity on the network has a unique address and so you can have a token that represents a piece of artwork and then the owner of that token is basically changing as people transfer it.*
>
> (Participant 6, Blockchain Interviews, February 2021).

This highlights how the token needs to be departmentalised in order to understand its scarcity on a more holistic level. Indeed, the NFT cannot simply be understood as a digital 'thing', instead, it is made up of different pieces of information. Specifically, the information that forms an NFT includes a link to an image file, metadata, and, as Participant 6 highlights, a unique address associated with an owner. Figure 3.5 (pp.77) exemplifies this as it shows the screenshot of the admin page to *The Possession Gallery*. The information needed to make each one includes metadata (a title, the participant's description), a URL link to the image stored on NML's website, and the unique address associated with the participant's wallet. This unique address individualises the token as it identifies that NFT with a particular account, thereby giving scarcity.

More broadly, this data is bound together to make up a single piece of transaction data which is stored with other transaction data in a block in the blockchain ledger. Together, these transaction data are stored in the form of a hash, which is like a digital fingerprint because it individualises this collection of transactions on the blockchain by giving them a unique identifier that is both deterministic and collision-resistant (Drescher, 2017). This means that any hash made for this data will always yield the same hash and it is unlikely that a separate piece of data will produce that same hash. Figure 2.3 (pp.44) depicts the simplified version of a blockchain ledger. Here, each block is made up of the following; a hash containing a collection of transactions that have taken place in the network, a timestamp, and the hash of the previous block in the sequence (Franceschet *et al.*, 2019).

Therefore, the hash stored in a particular block also creates scarcity in the blockchain tokens because it individualises a particular token and documents the NFT with a particular owner in a particular point in time. In other words, blockchain tokens, be it cryptocurrencies or cryptocollectibles, gain scarcity through this process of keeping track of transactions in a distributed ledger.

Returning to the idea of forensic materiality, the process of documenting the exchanges of tokens builds up a store of bits and bytes that recreate an understanding of thingness in NFTs. The ledger, and the hashes stored within this ledger, is a record of these bytes of information and is used as a way to relate a token to a specific address. As such, the traces of exchanges left on a blockchain ledger reflect what Blockchain Participant 2 terms a 'reference point for information' (Participant 2, Blockchain Interview, August 2020). This forms referential scarcity in tokens, where scarcity derives from the point of reference rather than from traditional exclusivity (Brekke and Fischer, 2020). Therefore, scarcity derives from two points; the unique address associated with the token at a particular point in time, and the process of documenting the transaction or exchange between two unique addresses.

In turn, this forensic element forms a formal materiality in a blockchain token, which refers to the formalised nature of the digital that appears before us on our screens (Kirschenbaum, 2008, p. 13). This is evident in the NFT as it feels ownable and collectible;

in other words, it gives the illusion of ‘stability as digital ‘things’’ (Parkin, 2020, p. 147). Indeed, Quinn DuPont argues that the hashes in blockchain allow digital objects to be ‘ontologically reified’ (DuPont, 2019, p. 150), which suggests that this process creates tokens that feel ‘real’. But this is an illusion of stability because the scarcity enforced through the technology is only referential in nature, rather than deriving from total exclusive control over the token. That is to say, referential scarcity gives the appearance that the NFT is a rivalrous good (a competitive and exclusive commodity), however, it does not implicate the non-rivalrous nature of digital objects (its ability to be enjoyed by multiple people simultaneously).

5.2.3 Distributed Materiality

Building on this previous discussion, the blockchain ledger is distributed across a network of nodes. This gives the ledger a permanence since it is difficult to destroy all of the copies once it is shared across the network. Therefore, there is no singular point of failure. This is also evident in the responses of the blockchain participants. For example, Blockchain Participant 4 remarked the following about Ethereum smart contracts: ‘if something goes wrong it’s impossible to take it back so it’s kind of like once you release it into the wild’ (Participant 4, Blockchain Interviews, August 2020). Likewise, Blockchain Participant 1 noted: ‘so, like to delete the technology and to erase it you would delete all the hosts’ (Participant 1, Blockchain Interviews, July 2020).

There is, therefore, a distributed element to a blockchain that supports a permanence in any token exchanged in the network. Distributed digital materiality refers to the different components that help to build a digital entity, which can include servers, networks, and hosting environments (Drucker, 2013, para. 21). In the case of a blockchain, this includes the miners or nodes that form the distributed network as each hold a ledger of transactions.

To re-summarise, miners ‘mine’ the network and act as the authenticators in a blockchain. They release new tokens and validate exchanges within the network by contributing computational power and resources to solving complex mathematical puzzles that unleashes the next block in the chain. This process is done on a consensus mechanism, so once a miner has solved the mathematical puzzle, the other miners check that the miner is correct, and on being proven correct, the winning miner is awarded with cryptocurrency (Zimmer, 2017; Calvão, 2019). The authenticated transaction is then added to the copies of the ledger stored across the other miners and nodes in the network. In this way, the miners and the nodes form the distributed layer to a blockchain’s materiality because they store the provenance of transactions. In turn, this record of information builds the formal materiality or thingness of the NFT.

5.2.4 Performative Materiality

Lastly, blockchain technology produces tokens that can be identified and so accumulate value; indeed, this is why Don Tapscott and Alex Tapscott define the technology as an 'internet of value' (Tapscott and Tapscott, 2018, p. 6). This ability to accumulate value is an integral part of the NFT and why organisations are using them in the arts, as noted by some of the participants during the blockchain interviews: 'it is a way of actually holding value' (Participant 2, Blockchain Interviews, August 2020): '[artists] they're creating, they're expressing themselves and at the same time they have a tool for tokenisation, for monetisation' (Participant 1, Blockchain Interviews, July, 2020).

Clearly, the ability to sell the token, or its ability to accumulate wealth, is an important property of a cryptocollectible. This value creation derives from two processes within a blockchain. Firstly, it derives from the tracking of transactions in the ledger.[54] Secondly, it derives from inserting value into the system. This added value is known as a gas fee on Ethereum and it is the transaction fee required when making or exchanging tokens on the Ethereum blockchain; it is like the fuel that powers the blockchain. This transaction fee goes to the miners as compensation for their role in authenticating transactions so that they are added to the blockchain (see Section 5.2.3., Ethgasstation.info, 2019). Miners do not have to perform this maintenance role if they do not wish to, for example, if the reward is less than the cost of mining. This means that the price of the transaction fee can fluctuate according to the number of miners working and the amount of congestion in the network at a given point, hence their choice in being an active participant holds influence over the value of the tokens stored within the network (Ethereum, 2020a).

For example, at the time of making the cryptocollectibles for the project the gas price had increased substantially with crypto news outlets attributing this to the introduction of De-Fi, which are platforms for decentralised finance working off the Ethereum blockchain, and this led to heavy congestion in the Ethereum network (Baker, Keoun and Godbole, 2020; Chong, 2020; Young, 2020). The cryptocollectibles for the project contain a large amount of data because of the embedded metadata and so required a large amount of computational power to be processed, hence, along with the congestion in the network, the gas fee for making some of the cryptocollectibles went up to as much as $14 US dollars.[55] However, this value is not embedded into the cryptocollectible, indeed, the cryptocollectible is worth nothing and instead that monetary value is only associated with the gas fee (see Figure 5.1).

This highlights how value input initiates the authentication process in which a miner inserts the data about the transaction into the blockchain. The miner is an actor in the creation of blockchain's materiality; they perform the action which forms the infrastructure of blockchain. This resonates with the concept of performative materiality since this dimension explores

[54] See Section 5.2.2.
[55] This is a 433.33% increase in price when compared to the price on the day of the first workshop in January 2020.

how digital materials function in order to determine what the material is (Drucker, 2013). Therefore, this process involves examining actor-engagement with a digital entity in order to determine its materiality. In a similar approach, the miners in the blockchain network can offer insight into how the materials of blockchain are formed because their actions in validating transactions builds and maintains the blockchain ledger. As such, value is not only produced through the materials of blockchain, but it is also needed to initiate the production of blockchain's materiality.

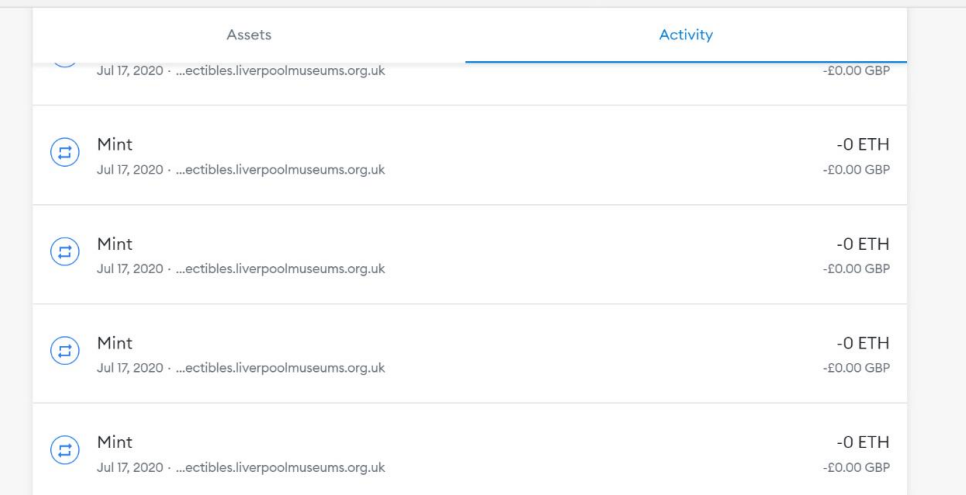

Figure 5.1 Screenshot from the Smart contract's wallet activities, it depicts the price of the NFTs '0' Eth, NML Smart Contract's Metamask, Accessed November 2021

5.3 Responses to an NFT's 'Thingness'

5.3.1 Originality

Section 5.2 has shown how the technology creates an idea of thingness in NFTs. However, was this thingness recognised by the participants of this project? I have already highlighted in Chapter 4.2 how some of the participants in the workshops recognised the collectability of their NFTs and, in doing so, this suggests that they recognise their NFTs as having scarcity and an exchange value. However, I also introduced in this chapter the issue of exclusivity in NFTs since the technology cannot act as a DRM tool and stop others from accessing the digital file. In turn, this challenges the NFT's originality.

Participants from the museum interviews also noted this problem when discussing ownership and NFTs:

> *I have a question which is if people can make copies is the value of these objects, is it kind of like art where you can have copies of the artwork, but you also have the original piece or how are these valuable when other copies could be made?*
>
> (Participant 2, Museum Interviews, April 2021).

> *I think it's incredibly difficult to own a digital object given how easy it is to copy something from the internet and that is one of the reasons that I don't really get, even though I know the news story, the owning that tweet and the benefits of that but then I suppose I don't know did people have the same conversation about reproductions of artwork when it first started.*
>
> (Participant 3, Museum Interviews, April 2021).

Both participants question how an NFT is valuable when it is still a non-rivalrous good. They are assuming that ownership requires exclusivity. However, NFTs sit in between a rivalrous and non-rivalrous good since it can be claimed (rivalrous) but also enjoyed simultaneously (non-rivalrous) and so NFTs challenge this assumption about ownership.

This criticism was also raised during the blockchain interviews:

> *We had a period last year where we had several newcomers in this space, and they're affectionately referred to as the 'right-click and save group' where their argument is 'why is this jpeg going for $3,000 US dollars when I can just right-click and save it to my desktop and enjoy it there?'* [… but] *you know, it's not really the image almost at the end of the day, it's the fact that you got this token from this artist, it has re-sell ability, there's no question about its authenticity and for some hard-core fans, it's like owning a piece of the artist themselves. It's more that they are buying into this idea that is just out of faith and backed up by code.*
>
> (Participant 7, Blockchain Interviews, March 2021).

Blockchain Participant 7 highlights the 'right-click and save group', who question the value of the NFT because of its ability to be copied and pasted. However, the participant also addresses this criticism by arguing that people do not always buy NFTs for exclusive control but rather for its cultural value and authenticity because it is connected to a specific artist. Indeed, for some 'hard-core fans, it's like owning a piece of the artist themselves'. The same could be understood when it comes to reproductions of works, as suggested in the quote from Museum Participant 3. Likewise, I have previously argued in Chapter 4 that the personal association connected to these NFTs gives them meaning. Therefore, it is this personal nature attached to the token that gives the NFT value (but whether the participants see them as valuable is yet to be examined, I will investigate this question in Section 5.4 in the context of migratable aura).

For now, I want to keep with this notion of originality, because these responses do not address the core of the criticism about an NFT's originality status. Arguments in the literature understand that there is no such thing as originality in the digital. For example, David Levy (2000) argued the case that digital objects, like coins from a mould, are copies of one another and so there is no 'original digital' since it is difficult to establish which was the first

one. More recently, Reas notes ‘with digital media, each so-called *copy* is identical to the so-called *original*. The very idea of an *original* with digital work isn’t applicable’ (Reas, 2019, sec. 3, his emphasis). In this case, it appears meaningless to try and define a digital copy as an original because each copy is alike.

But what exactly does the term ‘original’ refer to? The term has four different definitions which could be summarised under two themes. Firstly, the original can refer to the first thing or the thing that precedes all others and is therefore used as the source for reproductions. Or secondly, original can refer to something which is unique and different. In building on these two definition themes, Levy’s (2000) work describes the idea of an ‘*original* digital’ or, in other words, an original that is trying to be the first and used as a source for reproductions. I argue that this is relevant in NFTs because the term can be used to distinguish the original image file which is linked to the token. To reiterate, an NFT is made up of information, which includes metadata, a unique address, and a linked file (see Figure 3.5 pp.77). The linked image file is used to formally materialise the token on our screens, the embedded transaction data metamorphosis into a visual representation of this information.

On the other hand, the second definition of originality is also relatable to NFTs because the technology produces a digital entity, which is singularised via the hashes embedded into the distributed ledger as well as the unique address embedded into the NFT which symbolises the owner.[56] Therefore, I call the token produced through minting a ‘digital *original*’ since the NFT is made identifiable and unique by documenting it onto the blockchain ledger.

However, in viewing the cryptocollectibles, identifying the difference between these two forms is difficult, as highlighted by the following dialogue between myself and Participant G:

> *Participant G: Are they not the same thing?*
>
> *Researcher: They are in a way, but you actually own the cryptocollectible*
>
> *Participant G: Okay yeah, I didn’t quite realise that I thought the thing displayed in the online exhibition is the cryptocollectible, or is it not?*
>
> […]
>
> *Participant G: So, I don’t possess the cryptocollectible in the way that I could withdraw it from the website.*
>
> (Workshop 2, July 2020).

The clarification between the two comes through identifying which digital ‘thing’ the participant owns and so can give it away. The participant could sell the token and so would no longer have access to the digital *original,* but this would not impact the *original* digital since this will remain online in *Crypto-Connections.* Therefore, the NFTs require a reconceptualisation of what is assumed about digital originality, because these tokens are

[56] See Section 5.2.2

vehicles of information that are materialised before us on our screens. But this differentiation is difficult to establish because both the original file and the token appear the same.

5.3.2 Permanence

The discussion on distributed materiality provided insight into the permanence of a blockchain token which derives from the ledger being distributed across the network so that there is no singular point of failure. Many of the participants recognised this trait in their token as they assumed the token to be a way to store their objects 'forever'. For example, Participant F compared the fragility of their personal possession to the permanence on the cryptocollectible: 'that doll could so easily just end up in the bin at some point or disappear whereas like in this form, it could live forever' (Participant F, Workshop 2, 2020). Similarly, Participant A noted in the second workshop that these tokens enable these objects to be 'cemented forever in history'. In both cases, the use of the term 'forever' emphasises that they both recognise this attribute of permanence.

This is in contrast to responses from some of the participants of the museum interviews who highlighted immateriality as a characteristic of the digital objects, which suggests that digital objects are more ephemeral or impermanent in nature because they cannot be pinned down (Odom, Zimmerman and Forlizzi, 2014):

> *Another key feature is I want to say is immateriality but behind all of that there is an incredible infrastructure of materials that sustain the internet and create a lot of energy in terms of keeping those things going and sustaining them so it's similar but it's just not necessarily visible to you or within your frame of mind when your access it, so I think there is this perceived immateriality which is key to digital things.*
>
> (Participant 1, Museum Interviews, March 2021).

'[…] I think it's a very complicated issue because it's harder to feel like you own something that's not tangible, that you can't touch' (Participant 2, Museum Interviews, April 2021). Although Museum Participant 1 acknowledges that there is a material element to digital things, both participants imply that there is an assumption that digital content is immaterial in nature, and this derives from the inability to touch or control digital content, particularly when it resides online. In turn, this suggests that typical digital materials feel less permanent as they lack a presence or tangibility. But unlike a typical digital object, the NFT appears more materially permanent because the participant can possess their token in their own secured wallet and their claim to ownership will continue to exist until the Ethereum blockchain no longer exists. Therefore, the NFT feels more tangible because of this permanent documentation.

However, there is a fragility to the NFT made in this research project. The cryptocollectibles in this project were minted using a smart contract and web interface, and as explained previously, the NFT is made up of different pieces of information (for example, see Figure

3.5 pp.77). Submitting these different bits of information combines it together as one piece of transaction data and sends it out to the network to be authenticated and added to the next block in the chain.[57] Therefore, the image is connected to the NFT via a URL link which is associated with NML's website. This link is a point of vulnerability in the token because it relies on NML's website to stay live, and so, if it were to go down or the image from *Crypto-Connections* was archived, the NFT would no longer be able to display the image.

In this respect, the URL link is fragile because it is a single point of failure, and this could put the token's authenticity in jeopardy since a broken link will mean that the token no longer displays the image. In this way, the pieces of information stored onto the Ethereum blockchain that make up the forensic materiality of an NFT also embed a weakness into the permanent state of the token. There is only an illusion of stability in these cryptocollectibles.

In order to address this issue, the image file needs to be stored in a decentralised network. For example, Blockchain Participant 7 explained how they store their NFTs on a peer-to-peer storage system known as IPFS to store the files which can then be linked to the NFT. On IPFS, files are split into smaller segments and hashed using content hashes and these are stored across the network of nodes. Decentralising storage in this way means that if one server goes down, the file can be retrieved from another access point. In turn, this reinforces the distributed nature of an NFT's materiality because both the information about the transaction and the linked image file (the *original* digital) are stored across a network of nodes rather than on one server. Consequently, the formal materiality of the token (what we see on our screens) is more permanent and stable. In contrast, the NFTs made in this project only appear more permanent and stable than the *original* digital on *Crypto-Connections* because there is still a centralised element to its materiality.

5.3.3 Value

The discussion on the performative element of a blockchain's materiality noted how miners perform and authenticate transactions which produces value in the tokens. Specifically, mining computers will solve mathematical puzzles in order to add the next block of transactions to the ledger. In doing so, this validates these transactions and transfers of ownership by storing it in the distributed ledger of a blockchain.

This also implies that the value of a blockchain token is intrinsic and so the technology builds value into each token created in the network. For example, Bitcoin theorists have argued for this notion, comparing Bitcoin tokens to that of gold and commodity money theory (Maurer, Nelms and Swartz, 2013; Ferry, 2016; Zimmer, 2017). However, this idea cannot be immediately translated to other blockchains such as Ethereum because they function in other ways. Therefore, it is more applicable to think of a blockchain's value as deriving from its ability to be a 'bookkeeping system' (Bjerg, 2016), because blockchain tokens, be it

[57] See Section 5.2.2 for a more detailed explanation

cryptocurrencies or cryptocollectibles, hold a value that is based on the technology's ability to prove provenance and singularity.

Participant B's comparison of a cryptocollectible to a receipt also supports this idea, as the participant explained in both workshops: 'I just sort of thought of [NFTs] as receipts, like there isn't necessarily a value but just proof that it exists' (Participant B, Workshop 1, 2020): 'I still sort of see it as a receipt system' (Participant B, Workshop 2, 2020). As I discussed in Chapter 4.3.3, receipts do not hold an intrinsic value, rather they document a transaction that has taken place acting as proof of purchase and so the value of a receipt derives from their ability to be a bookkeeping system.

Furthermore, and as I have indicated in previous sections, artists and creators do not directly store files onto a blockchain but instead link the file via a URL link or a link to a file on decentralised storage such as IPFS. In this respect, the value of the NFT derives from this process of storing this link permanently with the other transaction data. Therefore, Participant B was correct in understanding their NFT as a form of receipt because the token is a digital reference to a file stored somewhere else. Its value is based in this process of documenting the linked file and so it is not inherent in the token as a unique entity.[58]

However, this process of documentation only produces an 'artificial' value as noted by Participant G: 'you have collectability and artificial creation of value on this basis of collectability' (Participant G, Workshop 1, January 2020). By using this term, they refer to how the technology creates an idea of value through exchangeability but the work in question might be 'valueless', or in their words, 'the actual object could be like nothing, a hair or people collect stamps, and all that matters is rarity' (Participant G, Workshop 1, January 2020). A similar point was noted by Participant B in response to their NFT: 'I don't know where that orbits around me. So, it's definitely something else but I don't know where it is' (Participant B, Workshop 2, July 2020). The participant acknowledges that their NFTs are valuable because of the technology, but they are unsure of where that value is situated.

Later in the same workshop, Participant B also noted the following:

> *That* [the NFT] *has got the value on it but there's less of a tactile value, it feels like something I've gained, it feels like a duplicate. So, we talked about Pokémon cards before, in the same way that it feels as if I've got two of the same thing; I would want to keep the original because that's the thing that made me want it whereas the secondary thing is an extension of it, um you know, there is a certain nostalgia that I can't quite attach to binary.*
>
> (Participant B, Workshop 2, July 2020).

[58] Although this is only value that is exchangeable in nature, the other forms of value in the NFT derives from its potential to act as a vessel for meaning, see Chapter 4.3.3. and Section 5.4.

This quote emphasises how Participant B viewed their token as simply a duplicate of the original objects. Put differently, they do see the NFT as a tangible valuable commodity in comparison to the original physical work because, for them, the token feels like something that they have gained; it is a reproduction that does not hold the authentic value that might be attributed to the original. This is reinforced by their comment stating that they do not attach certain 'nostalgia' (personal value) to 'binary' (digital works), which suggests that there is more to value than the artificially created kind from using blockchain technology.

5.4 The Role of (Personal) Value

But what are these other values? I previously outlined in Chapter 4 the idea of meaning and value in the context of psychological ownership. There, I argued that the value of these NFTs derives from them acting as 'tokens of memory'. I will continue with this line of thought to consider the role of personal value in the development of authenticity. One of the key aspects of this research project is the addition of personal narrative inserted into the metadata of each NFT. This means that each token is permanently personalised to the participant who chose that item for *Crypto-Connections,* and so the token has the potential to be personally valuable to that specific participant. This idea is supported by Participant F, who suggested in the second workshop that this added context provides the token with additional value:

> *I suppose it gives context to it as well, well if one day if I'm popping my clogs or whatever and someone finds the doll in my loft, they won't know what the context is, but I suppose here it's always got my story attached to it, you know the memories are probably actually more valuable than the object is.*
>
> (Participant F, Workshop 2, July 2020).

Here, they note how the permanent context embedded into the cryptocollectible will be like a legacy when they pass away, and they highlight that this connected memory is 'probably' more valuable than the physical object itself. This suggests that the context is the key component to value for them and so there is the potential for this value to be transferred to the token if the context is permanently connected to it. We can understand this added value through context as a form of personal authenticity in which the NFT is transformed into something that feels connected by being permanently attached to a personal narrative.

Of course, such a premise disregards the role of materiality and the haptic sense in building authenticity. There is a misperception that the digital is something ephemeral and immaterial and this presents challenges to its ability to be a form of authentic collectible (Mardon and Belk, 2018). In contrast, a physical object can be touched, we can understand it as something which is 'real' through our senses. This was emphasised by Participant C noted this point during the first workshop:

> *The physical aspect makes it feel more real. Because I still have a sort of thing about digital things whether that's photographs or videos or anything like that, once you've taken it and you've looked at it then it just goes into the nothingness for me, it almost doesn't have any worth.*
>
> (Participant C, Workshop 1, January 2020).

Participant C did not continue to the final stage of this research project and so it is not possible to compare their thoughts on their cryptocollectible in comparison to Participant F, however, this quote shows how Participant C values the material element of things because, for them, the digital feels like 'nothingness' to them.

The materials of the objects also appear frequently in the participants' descriptions of their chosen objects. For example, Participant B describes their rock thus: 'I like to imagine them as liquid in their deep past and running my thumb over something that has been shaped by wind', likewise Participant E describes their fossil in the following way: 'the ammonite was broken - its swirls, shiny with minerals' (see Figures 5.2, 5.3). Therefore, these quotes suggest that the materiality of the object bears meaning for the participant and so we cannot assume that the NFTs of these objects will immediately reflect the value of the original items as it appears to do so for Participant F.

Figure 5.2 Participant B's Possession NFT: 'Quartz Rock' Possession Gallery. Source: NML Website, https://collectibles.liverpoolmuseums.org.uk/#/ Accessed November 2021

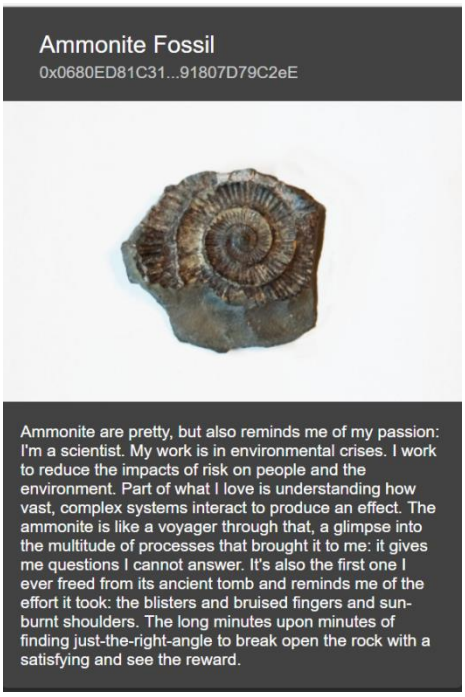

Figure 5.3 Participant E's Possession NFT: 'Ammonite Fossil' Possession Gallery. Source: NML Website, https://collectibles.liverpoolmuseums.org.uk/#/ Accessed November 2021

This is further supported by a quote from Participant B noted earlier which refers to them not being able to attach connection to their cryptocollectible: 'that [the token] has got the value on it but there's less of a tactile value, it feels like something I've gained, it feels like a duplicate […] there is a certain nostalgia that I can't quite attach to binary' (Participant B, Workshop 2, July 2020).

This indicates that they do not feel like the digital version can fully represent the personal attachment or desire behind the original physical object because there is less of a tangible value associated with the NFT.

In Section 5.2, I previously discussed how blockchain creates a thingness in NFTs through its digital materiality which could be understood as bringing a 'material' element to these digital tokens. However, material in this discussion refers to the physical material and textures of these objects, and this raises the following question: could the quality of the digital surrogate (NFT) impact this transfer of value at all, where quality refers to the high resolution and technical aspects of the image? For example, this point on quality was noted in the museum interviews when reflecting on whether the NFT might change how the viewer understands the physical object:

> *I think it would depend on the quality of the token, so I feel like if the token and the physical object that you have are explorable in a way which, so let's just say with that wedding ring, that would not have changed the way that I would look at the actual object in the museum but if it was inscribed and you were able to explore like in a three-dimensional world where you could zoom into it or with any of the paintings you could zoom into it and examine further than could see it in the real world then I think that would make a huge, a different perspective on it in the museum.*
>
> (Participant 3, Museum Interview, April 2021).

Museum Participant 3 proposes the idea that a high quality and explorable digital image could impact how we view the physical object. As they suggest, this could include exploring the work in three-dimensions or the use of deep-zooming and, in doing so, this would enable the viewer to see the minute details of the object's physical materiality.

Literature indicates that such an approach could help to 'migrate' aura to the digital surrogate (Latour and Lowe, 2011; Jeffrey, 2015; Jones *et al.*, 2018; Kenderdine and Yip, 2019; Jeffrey *et al.*, 2020). As I noted in Chapter 2.5; 'aura' derives from Benjamin's (1999[1968]) seminal 1935 essay on *The Work of Art in the Age of Mechanical Reproduction* where the scholar argues that the role of reproductions degrades the 'aura' or ritualistic and sublime-like quality of an artwork because the reproduction loses all context and the original 'presence in time and space' (Benjamin, 1999 [1968], p. 214). However, Lowe and Latour (2011) propose that the 'aura' is not exclusive to an 'original', instead it can migrate depending on the quality of the reproduction. In the context of this research, the cryptocollectibles made in this project are not of high-quality since the participants

cannot zoom into the work nor be immersed in the object's materiality. Therefore, this suggests that the quality of these cryptocollectibles could negatively impact the migratable aura in these works for these participants.

But quality is not the only underlying factor in the migration of aura. For instance, Kenderdine and Yip suggest that a digital reproduction can have auratic qualities providing it can inspire 'immersive exchanges between viewer and object that connect the viewer to the histories and traditions of the object's cultural trajectory' (Kenderdine and Yip, 2019, p. 287). If the digital copy can emanate the historical and traditional context of the work, it can inspire a sense of aura.

In the case of this research project, each work holds a permanent and personal story which enables the viewer to understand the original object in a different way, as highlighted in the following point from one of the museum interviewees:

> *I would say that the actual object is the authentic piece and that the digital object is one step away from that anyway so adding the stories to it just builds on it and develops it further, so I don't think it detracts from it in any way, it just adds these layers of connection and history to them.*
>
> (Participant 2, Museum Interviews, March 2021).

While the participant considers the physical as the 'authentic piece', they also acknowledge how the added layer of connection develops how we understand the overall object because it provides personal context. This also entices visitors to click on the object and learn more as noted by Museum Participant 4: 'I think I would be more inclined to click on them because I'm interested to know what the personal connection is' (Participant 4, Museum Interviews, April 2021). Meanwhile, the token is a singularised extension to this idea, it individualises the work and makes it ownable. María Paula Fernández, Stina Gustafsson and Fanny Lakoubay (2019, p. 21) propose that this singularity re-introduces a form of aura in NFTs that is not available in other digital media. As such, I propose that these tokens could hold an auratic quality through this individualised ownable version of the object. Specifically, I understand this to develop a personal migratable aura in the tokens because the embedded narrative provides personal context. In this way, the digital visitor could have an 'immersive exchange' with the object through this relatable quality and personal value, whilst the participant can also experience an 'immersive exchange' through owning something that is individualised.

This idea of personal aura and value is further supported by a point made by Participant A during the second workshop. They explained how they thought that they had momentarily lost their personal possession remarking: 'I was thinking if I did lose it, at least I would have this thing [NFT]. It's cemented forever in history' (Participant A, Workshop 2, July 2020). Like Participant F's comment noted earlier, they believe that the token can act as a form of preservation of their object and their connection to it, hence acting as a form of legacy. At

the same time, however, this value only comes into fruition if the original object is stolen, lost, or destroyed. Museum Participant 2 also noted this point when reflecting how the NFTs could be depicted in the physical gallery space: ‘if you didn’t have the option of the original object then this could be an alternative’ (Participant 2, Museum Interviews, March 2021).

Similar circumstances have been seen with other digital surrogates where the physical is no longer present (Jeffrey, Love and Poyade, 2021). This has also been the case with NFTs, for example, in early 2021 a company called Injective Protocol carried out a social experiment where they bought a print screen Banksy artwork, turned it into an NFT, and then livestreamed them burning the physical counterpart. In doing so, they argued that ‘the value of the physical piece will then be moved onto the NFT’ (Ennis, 2021, sec. 3). Likewise, in this project, the value of the NFT appears dependent on the availability of the physical counterpart. Furthermore, this problem appears to continue with both digital surrogates and born-digital works. For example, Blockchain Participant 1 explained how there is an inclination to disregard digital art (and thus NFTs) because it lacks the material qualities of traditional art forms such as the square frame. There is a tendency to view the physical as the ‘authentic’ which situates the NFT (digital surrogate) as inferior or less ‘authentic’, even though the token can be authenticated through the use of blockchain technology. Again, this suggests that viewer perception is a critical factor in the migration of aura even when the digital object is an authenticated token.

5.5 The Process and Authenticity

During Workshop 2 the participants were asked if owning an NFT had changed how they would view the physical object. Participant F responded with the following comment: ‘I think yes but part of that was the process of doing it in the first place and I’m relating it to that more personal perspective on it’ (Participant F, Workshop 2, July 2020). This idea of process is another potentially significant factor in the formation of value in the NFT as it suggests that the process of carrying out the workshops builds a sense of authenticity and ownership over the tokens for the participants. This is also further supported by a comment noted previously in Chapter 4, where Participant E remarked on how the token comes to embody their work behind the scenes of the exhibition: ‘I think it is almost embodied by the anonymity of it and the work done behind which is not necessarily shown’ (Participant E, Workshop 2, July 2020). In other words, the token represents their labour and input into the project.

Therefore, this suggests that investment is an important part of developing originality into these NFTs, which is also a relatable point to the idea of originality in earning IP rights. However, with IP, the definition of originality is often left ambiguous which means that it is difficult to ascertain in some cases, such as in digitisation projects, if the work is an entity in its own right or a copy of something (Margoni, 2014b). To pass the threshold of originality, one IP theory argues that investment into a new work can produce a work that is seen ‘original’ (Locke, 2003; Moore and Himma, 2011). In using this same idea, the participants in this project have also invested into the production of these NFTs, thereby producing new

digital objects that are different from the original physical work. In turn, these participants have gained moral rights over their NFTs, and the tokens can be understood as original and having value.

Findings from the ACCORD project also highlight the role of co-production in the development of aura and authenticity (Jeffrey, 2015; Jones *et al.*, 2018). Specifically, it is suggested that working with communities in the development of three-dimensional digital replicas of community archaeological sites and artefacts can support the feeling of an 'auratic quality' in works (Jeffrey, 2015). This also resonates with reflections on community engagement work in museums that highlight how the meaning often derives from the process rather than the output of the project (Morse, 2014; Silverman, 2014). Likewise, I suggest that the process of carrying out the workshops and the developing the online exhibition *Crypto-Connection* is also a factor in building value and meaning into the NFT.

5.6 The Museum as a 'Miner'

The final theme I will explore in this discussion of authenticity is the role of the museum and its institutional authority. As Burton and Scott note, 'museums have traditionally been in the "authenticity" business' (Burton and Scott, 2003, p. 58). That is to say, they hold an authority which gives status and value to any object presented within its walls. These objects do not necessarily have to be materially authentic, indeed, in historic houses, objects which do not originally derive from the historic house (hence are 'inauthentic') are sometimes used to help complete the visitor experience and the narrative told about the site (Venturini, 2020). In this respect, museums and cultural institutions hold a presence that gives the impression of authenticity to anything presented in these spaces. And in literature, this form of authenticity is known as 'iconic' authenticity, a term that Kent Grayson and Radon Martinec derive from the work of Charles Pierce to describe this manifestation of authenticity (Grayson and Martinec, 2004).

This presence and authority were apparent for some of the participants during the workshops, for example, Participant B noted the following when viewing the objects in *Crypto-Connections*: 'it's kind of like when you meet a celebrity and you realise that they're a person outside of that thing' (Participant B, Workshop 2, 2020). In describing the objects in this way, the participant suggests that the online exhibition gives the works a credibility based on presence that is similar to the level of a celebrity. This is particularly evident with the participants' possessions in the exhibition since these are not accessioned works of NML's collection. In these cases, the online exhibition has promoted these works to a level that is aligned with a museum object and, in doing so, this gives the impression that these possessions are an authenticated cultural artefact. Therefore, NML's digital space contributes a sense of authenticity and value to the digital objects by simply displaying them as if they were museum objects.

A similar point can be made about the personal stories documented alongside each object in *Crypto-Connections* because this display also reinforces an authenticity in these responses

as they appear supported by the museum. For Participant A, this was the most important aspect of the project for them: ‘for me, it is the most important part of it is the reception and the interpretation […] everyone has a say in these objects it’s not just the curator and hiding it behind the glass case’ (Participant A, Workshop 2, 2020). In this respect, highlighting the participants’ perceptions of the works on NML’s website not only validates these responses, but it also shows how the museum has used the digital to diversify the narratives and perceptions about objects. This museum support also extends to the cryptocollectibles and helps to authenticate them. For example, the NFTs are displayed in the *Possession Gallery,* but this space is also linked to NML’s domain name thereby permanently connecting these tokens to the museum’s original website. Consequently, this binds these tokens to the museum even though these NFTs do not reside within the digital space of the museum (it’s main website).

These points are comparable to the idea of contagion, a term used in literature on authenticity to refer to the transfer of authenticity and value from the physical touch of an artist, celebrity, or a cultural institution (Newman and Bloom, 2012; Newman and Smith, 2016; Venturini, 2020). Contamination can have a positive or negative impact on an object’s value, depending on the association, but here I want to focus on how the museum acts as a positive contaminator for these NFTs. Indeed, as I stated earlier, cultural institutions have a power to give the illusion of authenticity in ‘inauthentic’ objects by simply displaying them within the collection and this reflects a contamination. As such, the objects as contaminated through being associated with the institution. The same is assumed here; the cryptocollectibles are contaminated by being associated with NML and its main digital presence. In doing so, this has the potential to give the perception of authenticity in the NFTs.

This is an important point when reflecting on the limitations of blockchain technology. One such limitation is the issue that anyone can mint an NFT even when they are not the right owner, this is a form of ‘garbage in, garbage out’ problem (Ito and O’Dair, 2019, see Section 2.7.4). Meanwhile, the association with NML highlights these NFTs as official or authentic, they might be viewed as ‘legitimate’ because they derive from an NML co-organised project. Therefore, the contamination gives support that these NFTs are ‘the real thing’ as opposite to forgeries, and this informs an authenticity in these tokens. This also emphasises the museum as an actor in the authentication process of these NFTs which is comparable to the work of the miners in the blockchain network. Miners work to ‘mine’ or validate the next block into the blockchain, and so they maintain the network and ensure that transactions are authenticated and added to the chain. In a similar approach, the museum ‘authenticates’ these tokens be linking these works to the institution. The association can also be proved via the technology and tracing the history of ownership to the original address of the smart contract embedded into the *Possession Gallery*.

Moreover, the comparison between the museum and the miner suggests that the museum plays a performative role in the construction of the cryptocollectibles’ materiality. In Section

5.2, I argued that the miners work to produce the materiality of a blockchain, and this highlights a performative element to blockchain's materiality. In a similar way, the museum performs to produce the materiality of the online exhibition, not only by using its authority to authenticate these objects, but also by creating a digital space in which the tokens can exist. Indeed, the tokens use this museum website as a storage space, which avoids having to store the large data files into a blockchain. This emphasises a co-dependency forming in the production and supporting of authenticity in these cryptocollectibles. The use of a blockchain gives these tokens a materiality that extends a form of authenticity. At the same time, the museum's institutional authority enforces a validation into these tokens as being connected to this institution which produces a different kind of authenticity in these NFTs, one that is related to the authenticity of cultural heritage and artefacts. Therefore, there is a process of entanglement in the production of authenticity through the interconnection of institution and blockchain technology.

On the other hand, I also propose that this contamination has the potential to build sign value in the tokens. 'Sign value' derives from the Jean Baudrillard's work and refers to the prestige and symbolism in objects (Kellner, 2020). This was also a point raised in my conversation with Museum Participant 1:

> *Does blockchain ownership have social capital? If you think about museum collections or art collectors, or any kind of collector, their social capital from owning that comes from that network of people who understand the various permutations and issues surrounding the aura of the object if you like so if you owned an object in the collection, and you're well known for it, and people within those circles and in that world know about it, then I can imagine that for blockchain.*
>
> (Participant 1, Museum Interviews, March 2021).

Participant 1 was correct in pointing this out as there are many NFT collections which hold value and prestige in the community. NFTs such as the original *Crypto Punks* or *Bored Ape Yacht Club* are considered highly valuable in the blockchain community with often collectors putting their valuable NFTs as their Twitter profiles to show off their ownership. For example, Blake Robbins has described this as a form of social incentive to owning an NFT as it holds social authentication from the community (Duncan, 2020). Likewise, the NFTs in this research project have the potential to hold sign value.

Of course, this requires recognition by 'that network of people who understand the various permutations and issues surrounding the aura of the object', as the quote from Museum Participant 1 stated above. This suggests that those that value NFTs will see the token as having a special kind of authenticity by being associated with NML and this project. A conversation with blockchain interviewee Participant 6 also supports this point:

> *If you have an NFT, a digital token for a digital shirt or a video game, if a famous person like LeBron James owned it in his game and he wrote a message to it does it add to the value? And we think it does.*
>
> (Participant 6, Blockchain Interviews, February 2021).

Participant 6 states how they see contamination as a way of adding value to NFTs, and while they did not explicitly refer to NML in this conversation, their point implies that they might view NML's association as also adding value because of this idea of contamination. Participant 6 works with NFTs and so they are part of the 'network of people' that values blockchain and cryptocollectibles. Therefore, this supports Museum Participant 1's comment, but it also indicates that contamination will only affect those people who are part of the crypto space.

This contamination theme is also significant to consider if these NFTs were to be displayed in one of NML's museums. Unfortunately, due to COVID-19, there was not a physical display of *Crypto-Connections* in NML. However, I was able to ask the museum interviewees what they thought about this idea of displaying NFTs in the physical space and some of their responses highlight this theme of authenticity and contamination. For example, Participant 1 noted:

> *We display replicas and facsimiles of things anyway to represent them, but we do also denote that they are facsimiles because it seems to matter that it's not the 'so-called authentic object', so I think it's really interesting to think about what happens to it (NFT) when it's in an exhibition space or a museum where those ideas of authenticity are so entrenched and valued, would people care? And I think some people would care, if you displayed its authentication or its blockchain number then if someone were interested in that then maybe they would get a sense of that authenticity.*
>
> (Participant 1, Museum Interviews, March 2021).

Museum Participant 4 made a similar point: 'I think when anything is displayed in a museum that automatically adds a level of specialness to an object' (Participant 4, Museum Interviews, April 2021). Meanwhile, Museum Participant 5 questioned this point since they lacked the technical understanding to fully comprehend the meaning of the blockchain record:

> *Probably not as the technical information, if I understood what it meant, then it is relevant for me to see it so if there was somewhere in the space where it explains to me what this represents and what it means then I could find it quite easily to see but if it's just there and it's not explained to me what that it then I'll just look at it as a sort of, in the same way any object in a museum has a really long code against it, I would just look at it like that and not think anything beyond that as I would just see it as its record.*

(Participant 5, Museum Interviews, May 2021)

These points together suggest that the gallery space and the displaying of the information stored on the blockchain could work in parallel with each other to provide an authenticity, or at least a perception of authenticity, to viewers. This of course would be dependent on the viewer's understanding of what a blockchain is and how it works, as the comment from Museum Participant 5 suggests. Certainly, the block number and information would need to be clearly explained in order for someone to recognise the significance of this information. Meanwhile, the act of presenting these tokens in a physical gallery space embeds institutional authority into these tokens and give them, as Museum Participant 4 notes, a 'specialness'. Lastly, Museum Participant 1's comment highlights an important point on the use of facsimiles in galleries but, in this case, the use of the blockchain information would encourage viewers to see these tokens as a form of authentic digital extension of the physical objects.

Consequently, this indicates that the museum is an important agent in the production of authenticity and, indeed, this also highlights how the application of blockchain is only one factor in constructing digital authenticity. In turn, I argue that authenticity is formed through a network of relations and an entanglement of museum authority and blockchain technology, which, together, support the addition of value into the NFT through association and material authenticity.

5.7 Conclusion: Simulating the Effects

As I have alluded to in the previous section, I understand authenticity to have developed in this project through an interconnection between the technology and the museum and its institutional authority. These two core elements affect the participants and others who view these NFTs in different ways, which can build an understanding of authenticity and aura.

In Section 5.2, I revealed the material elements of a blockchain and described how the technology informs value and authenticity in NFTs. At the core of this argument is the idea of nominal authenticity, which prioritises provenance and material evidence in understanding something to be authentic. This discussion also highlights how the NFT could be understood to be a digital fragment because the token is both permanent and valuable, hence, it could be the foundation in which to create meaningful digital entities that could enchain individuals.

On the other hand, in Section 5.3, I explored to what extent the participants understood their NFTs to be like digital fragments, which was examined through three themes: originality, permanence, and value. These discussions highlighted how these themes challenge the nominal authenticity of blockchain. Indeed, the discussion on originality restressed the issue of exclusivity of NFTs. These tokens sit in a liminal zone between a rivalrous and non-rivalrous good, which requires viewers to reconceptualise their understand of digital originality. Meanwhile, the discussion on permanence identified this quality as a key aspect to valuing an NFT for some of the participants. In this way, permanence is a way to

distinguish an NFT from its non-blockchain counterpart (although this permanence also has its own vulnerabilities due to the use of URL links).

The examination of value reinforced the argument that the NFT is a store of linked information, its value derives from the act of storing this information into the ledger. However, this only produces an artificial value, which is not always valued by the viewer or owner of the cryptocollectible. For example, despite recognising this artificial value, Participant B felt that their NFT was a form of duplicate because they did not attach meaningful value to their token. As such, the technology might embed artificial value, but this does not necessarily create personal value.

In building on this discussion, in Section 5.4 I investigated the role of personal value in supporting authenticity by investigating personal value in the context of migratable aura. There, I argued that there is a potential to create personal migratable aura in the NFTs through embedding personal narrative into the metadata, but quality, materiality, and access to the physical counterpart are also factors in this potential value transfer. In Section 5.5, I argued that the role of investment has the potential to produce an NFT that is deemed original, and so authentic. As such, collaboration is another contributing factor to auratic quality. Lastly, I considered the museum as an actor in authenticating these NFTs. I compared this to the museum acting like a miner, authenticating these tokens through 'contaminating' them with association. Of course, this assumes that institutional contamination is positive in nature, and I proposed that this association could build sign value in the NFT. But this institutional connection could also have a negative impact on the NFT's value because value is contingent on the network of people surrounding the NFT and the project. Therefore, the association with NML could have a negative impact on value in those who do not wish to see established institutions in the crypto space, and likewise, the association with blockchain may have a negative impact on value in those who are critical of the technology.

This reinforces the argument that authenticity and value are formed through different factors in this research project, not simply through the technology. The museum and the technology have an intertwining effect that has the potential to impact viewer perception of the NFT's authenticity. It also highlights process as an important attributor of authenticity. In this sense, the process of carrying out the project and the role of investment can build value in the NFT. Meanwhile, the performative element of blockchain (the authentication of the transaction) also produces value, but one that is monetary in nature. As such, this conclusion connects to findings from research on authenticity, where it is understood that the term is multifaceted and complex (Jones, 2010; Holtorf, 2013; Carroll, 2015; Newman and Smith, 2016). For example, Siân Jones' work argues that authenticity is formed at an intersection of materiality and constructivism, specifically stating that it forms through a network of relationships between people, places and things (Jones, 2010). Likewise, there is a network of relationships between the participants and viewers of the project, the museum, and the technology that help to inform an understanding of authenticity.

In turning to the idea of enchainment, this shows how the technology can produce digital entities that are like digital fragments, but it is also required for the participants to value these tokens. Put differently, these other factors described in this chapter work in collaboration with the technology to potentially inform value but ultimately this is also contingent on the person and their views on blockchain technology. Furthermore, the discussion on originality in this chapter highlights how the digital object is not broken into rivalrous and distinct tokens, instead the process of fracturing with NFTs produces an *original* digital and a digital *original.* I term this as 'pseudo-fragmenting' because the fragmenting leaves still a once-intact digital object behind. However, there is still a potential for the token to gain meaning through the simulated effects of ownership and authenticity, thus it produces something that feels rivalrous, but this is also dependent on the viewer to see this digital object as authentic and original. In this project, it is clear that not all of the participants felt like their NFTs were valuable. Participant B, for example, indicates that they felt like their NFT is a 'duplicate',[59] meanwhile Participant F and A appear to see potential value in their NFT if they were no longer able to access the original physical work.[60]

Therefore, I propose that the NFT does not 'replicate' the physical conditions of authenticity, instead it attempts to 'simulate' the effects. In this case, I use Zeilinger's (2018) terms to carefully delineate what the NFT is in this project compared to its physical counterpart. 'Simulate' also reflects Jean Baudrillard's use of the term in which he outlines how the word interplays between the real and the imaginary. To simulate is to more than pretend or give the impression of the effects, it is to mimic these effects to such a point that it feels real (Baudrillard, 1994, p. 3). By proposing that the NFT simulates authenticity, I suggest that the token gives the illusion of originality and authenticity to such an extent that for some viewers it is difficult to distinguish this condition to other authenticated works. In other words, the simulated effects give the impression of a real authentic digital object. But this illusion does not appeal to everyone, and indeed, for some this simply mimics an imaginary condition of authenticity.

In this respect, the application of blockchain to create digital authenticity is not a universally accepted notion. It is more effective, then, to view the NFT as an extended object. Participant 5 from the museum interviews noted this idea of an extension: 'I wouldn't see them as a duplicate I think it's more of an extension and an edition, of either a different perspective or a deepening of understanding' (Participant 5, Museum Interviews, May 2021). Similarly, Museum Participant 2 noted this idea of these tokens being 'extensions' and remarked on how the added story makes the NFT into a 'a different thing then and its sort of taken on a life of its own' (Participant 2, Museum Interviews, April 2021).

Therefore, if the NFT in this research project is more of an 'extended' object rather than an 'authentic' object, I question whether the focus on NFTs should be about authenticity and

[59] See Section 5.3.3.
[60] See Section 5.4

rather about control and ownership. Indeed, NFTs require a viewer to recognise a new definition of originality and digital objects, which some viewers might choose to reject and so focusing on the role of ownership and what NFTs can do around ownership and control is a more effective approach to giving these tokens a perceived value. This conclusion draws from a similar conclusion made in the ACCORD project which emphasises how the 'binary question of whether it is or is not authentic – obscures the wider work that digital objects do' (Jones *et al.*, 2018, p. 350). Likewise, perhaps the role of digital authentication plays a too larger role in the use of NFTs. Therefore, the final discussion chapter of this thesis will examine the role of control in this project and reflect on how controlling an NFT might inform enchainment and connection.

Chapter 6: Authority

6.1. Introduction

I have already introduced the term authority in Chapter 2.4 and highlighted the theme of shared authority in both digital and non-digital museum practices. There, I argued that shared authority can cultivate collective ownership, and thus shared guardianship, as the practice promotes a more balanced approach to agency which acknowledges different stakeholders. In digital approaches, this reflects a decentralised and distributed method to decision-making and production, such as those seen in crowdsourcing projects, as noted in Chapter 2.2 and 2.4.2, and indeed DAOs, which was discussed in Chapter 2.7.6. Meanwhile, in non-digital approaches, this takes the form of co-productive methods to engagement, where museums collaborate with partners or different communities on projects with the goal of incorporating different voices into the exhibitions and practices. Therefore, taking a shared authority approach reflects a form of enchainment because it focuses on forging new relations between an institution and its audiences through collaboration. The following analysis will use the notion of shared authority as its basis and consider to what extent blockchain adds to this practice. It will also reflect on to what extent blockchain combined with this process supports a feeling of enchainment.

In particular, the chapter will be outlined by the following questions:

- How does the application of blockchain contribute (or not) to a shared authority practice in museums? And how does this application challenge the museum's authority?
- How might this approach support enchainment? What might a 'blockchain approach' to museums look like?

The first set of questions will introduce blockchain's contribution to the process and explore to what extent the technology engages with shared authority. The second set of questions builds on this evaluation and explores whether this process can be considered to build connections or a form of enchainment between the institution and its audiences. Towards that, the chapter will also reflect on whether decentralisation reflects established museological concepts such as 'new museology' (Vergo, 1989), the 'modern museum' (Barrett, 2012), the 'participatory museum' (Simon, 2010), and the 'post-museum' (Hooper-Greenhill, 2000). The discussion will relate this research to broader audience engagement approaches taken in museums and provide an examination of the idea of the 'blockchain approach' to museums. I use these various terms to highlight the different aspects of approaches to museum practice. The 'new museology' refers to a paradigm shift in museums to focus more on their role within society and the role of the visitor and their experience (Vergo, 1989). The 'modern museum' encapsulates this previous point but also considers the role of the museum in responding to social change (Barrett, 2012). The 'participatory museum' is grounded in practice and methods of how museums might go about collaborating with audiences and communities (Simon, 2010). Lastly, the 'post-

museum' establishes a theoretical understanding of these other terms, it draws on reception theory, the notion of dialogue, and views knowledge as 'fragmented' and 'multi-vocal' (Hooper-Greenhill, 2000, p. 152). Therefore, together, these questions will address how this research project and the use of blockchain can challenge authority in the museum context.

As with the previous chapters, the following chapter will draw from data collected from across the research project, including the workshops that took place at the museum, the museum-participant interviews, and the blockchain-participant interviews. In what follows, I will consider in Section 6.2 how this project promotes a shared or sharing authority approach. Here, I will draw from Frisch's use of the terms 'shared' and 'sharing' to delineate a difference in control. The present tense is used to identify a weighted decision-making, whereas 'shared' infers something which is inherently mutual (Frisch, 2011, p. 127). In the first part to Section 6.2, I will examine how the use of NFTs can promote discussion and different ways of perceiving a museum object. At the same time, however, there are implications to using NFTs such as accessibility and decentralisation, which I will outline in the second half of this section. Specifically, the use of a decentralised technology means that more caution is needed when working collaboratively, and in turn, this resulted in a more 'sharing' collaboration to this research project.

In Section 6.3, I will investigate further into a blockchain's role in this project by outlining the opportunities and ethical concerns around trading these NFTs. I will consider issues such as the commodification of culture, and I will question what exactly the museum is giving away when they mint NFTs of the digital collection. I also return to the notion of shared guardianship in this discussion in order to outline the moral duty that is associated with owning one of these NFTs which implicitly suggests to the owner to not sell their token.

However, I conclude from this section that this research project reflects a form of 'tokenism' due to the lack of use value. 'Tokenism' derives from Sherry Arnstein's (1969) ladder of citizen participation and highlights how these participants in this project had a voice but lacked agency to implement action. This prompts a final section, Section 6.5, where I will outline the 'blockchain approach' to community engagement. In this section, I propose that the use of DAOs as a framework could be a useful tool in addressing unequal control in collaborative projects. Such as concept requires community and trust, therefore, I conclude that while blockchain might provide the means for governance, it cannot produce the relations required to build and maintain a community.

6.2 Shared Authority or Sharing Authority

6.2.1 Opening the Collections

> *You only normally get three sentences on the text panel and it largely just explains what the thing is, and it's more like a physical description, but what I like about this is that it gives you an added layer of history to something as it were or you know an interpretation that you don't get in a gallery space and that for me is the most important part of it is the reception and the interpretation.*
>
> (Participant A, Workshop 2, July 2020).

One of the key aspects to this project is the role of personal interpretation embedded into each of the minted NFTs (see Figure 6.1 as an example). I touched on this feature of the project in the context of psychological ownership and migratable aura in Chapters 4 and 5, and these discussions have highlighted how the NFTs are understood to be a type of personal edition. This is supported by the following comment from Participant D:

> *Quite often when I've been to museums or galleries, you know I might buy a postcard of something I like and at the end of the day that postcard probably just sits in a drawer or something anyway so it's kind of, you know a more sustainable way of having that memory.*
>
> (Participant D, Workshop 2, July 2020).

Their comparison to a personalised postcard shows how they understand their token to be a way of making their museum visit experience more memorable. Of course, this idea of it being a more sustainable approach is questionable with the ongoing conversation about the energy consumption of some blockchains.[61] Furthermore, the postcard might sit in a drawer, but the NFT will 'sit' in the participant's wallet which is situated on their phone, therefore can we assume that they will more likely look at the NFT because it is viewable from their phone?

Nevertheless, the token is personalised and exclusively owned by the participant, thereby producing something that embodies the participant's personal experience of the museum.[62] In this respect, the additional personal metadata builds on the concept of opening up the collections through identifying different voices and so this emphasises a shared or open authority approach combined with a personalised mindset.

[61] See Chapter 7 for further details
[62] See token of memory, Section 4.3.3

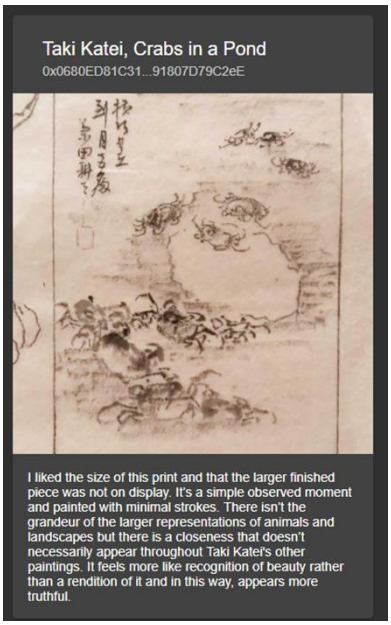

Figure 6.1: Taki Katei, Crabs in a Pond NFT, Source: The Possession Gallery. Source: NML Website, https://collectibles.liverpoolmuseums.org.uk/#/ Accessed October 2021

Building on this concept, Participant E questioned if these tokens could be a point of building associations through trading and compared these tokens to like 'reading a Wikipedia article' (Participant E, Workshop 2, July 2020). In using this comparison, the participant likens these tokens to taking a 'wisdom of the crowds' approach to building knowledge and understanding (Surowiecki, 2005). Wikipedia is a case in point as its pages are created and maintained through the public adding and editing the information. Likewise, the trading or displaying of these personal editions opens up a dialogue about the object, prompting a more open and shared authority approach to interpretation and meaning making around objects: 'being able to potentially trade with them almost seems to create a new network of associations, I guess, rather than people wandering around a gallery, they can almost wander these digital routes to learn' (Participant E, Workshop 2, July 2020). A point from Participant F further supports this idea as they noted in Workshop 1: 'I think it's almost a debate around it, opening up the debate around the objects so other people can talk about it in same sort of way would be more interesting than applying our own interpretation of it'. (Participant F, Workshop 1, January 2020). Put differently, there is more value to these NFTs in using them to spark debate about objects rather than simply being personalised digital things and trading these tokens could offer an opportunity to do so.

Blockchain Participant 6 commented on a previous project called 'Scribe' which could support this open dialogue. 'Scribe' allows the owner to add comments to their NFTs: 'if you own an NFT you could append a message to the history of the NFT but only if you're the owner' (Participant 6, February 2021). In doing so, this would enable new owners to add comments about the work and allows the current participants to add to their current stories if they felt that their experience of their objects had evolved. Therefore, there are ways of using blockchain that could allow for adaptability and conversation, whilst still providing this feeling of control and ownership.

Meanwhile, the process of exchange would be documented into the blockchain ledger, thus providing a digital and permanent provenance of these interactions:

> *I do think that the way blockchain seems to operate also does fit in a very museological way of thinking so like you say, the provenance, ownership that kind of paper trail of who's engaged with an object and how, I could easily see a Mimsy record version of a digital object that has a very similar way of approaching it and managing it.*
>
> (Participant 1, Museum Interviews, March 2021).

Here, Museum Participant 1 highlights how they see a comparison to this use of blockchain with the way collection management records might work. But blockchain provides a trail of ownership that is publicly available (although pseudonymously) rather than kept in a private system in the museum. In this respect, blockchain offers a way of publicly documenting and managing the different interactions with the object.

Such a process would also be consistent with the main reasons for the existence of digital collections. Indeed, many of the museum interviewees highlighted access as the key motive for museums having digitised collections: 'the digital collection is a way of presenting the physical collection and getting it out there to a wider audience' (Participant 1, Museum Interviews, March 2021): 'I think the role of the digital collection is to give access to as wide an audience that is humanly possible' (Participant 3, Museum Interviews, April 2021). Of course, the digital is only accessible if online visitors have access to internet and a connecting device, something which is not possible for many people across the world and even in the UK (Beaude, 2016; Chowdhury, 2021, see Section 6.2.2). However, for those that have access, the digital provides an accessible way to explore a museum's collection that exists outside of the museum's physical walls: 'it also allows a different point of entry for people to experience the museum in a way that they're comfortable with' (Participant 2, Museum Interviews, April 2021). Moreover, the digital object offers a way of highlighting multiple narratives and interactions with a certain object: 'I think digital objects give us an opportunity to capture narrative that we don't often get with the physical object (Participant 1, Museum Interviews, March 2021).

NFTs extend this idea by providing audiences with the opportunity to collect and own their personal interpretation of objects in the collection, and the exchangeability gives audiences a decentralised means to start conversations with each other about these digitised objects. In this way, these tokens experiment with ways of using digital collections to engage audiences. This idea promotes a shared authority approach because it supplements interpretation with a more diverse perspective, as highlighted by Museum Participant 4:

> *I would hope that people would get involved and give a perspective that most people wouldn't usually get when they walk round a museum because they are just looking at the facts and what the curators have offered them.*
>
> (Participant 4, Museum Interviews, April 2021).

Museum Participant 2 made a similar comment and highlighted how emotional responses can make collections more interesting for many viewers: 'I like that idea of exploring the emotions around objects and also the human connection to it because I think that it makes it more interesting for a lot of people' (Participant 2, Museum Interviews, April 2021). In other words, taking a constructivist approach to the making of these NFTs will highlight different ways of understanding the objects. This approach assumes that objects are 'polysemic' in nature and so can hold multiple meanings (Hooper-Greenhill, 2000, p. 111). It also draws on the idea of the 'participatory museum' as it involves asking audiences to engage with these objects and to actively provide their own experience and so this concept also builds on 'new museology' because it considers the role of the visitor and their experience of the collection (Vergo, 1989; Simon, 2010).

This would also have the potential to build social value. To reiterate, social value focuses on building connections and a sense of belonging, it helps 'visitors feel more connected to the institution and more confident of their ability to contribute to the institution (or project)' (Simon, 2010, p. 195). Similarly, the role of embedding personal interpretation encouraged these participants to actively engage with the collections and contribute to the project. In turn, this produces new ownable objects that are more relevant to the participant and has the potential to forge a connection between that participant and the collection. If these tokens were to be sold with the 'Scribe' smart contract embedded into them, these tokens would connect new individuals and enable them to respond to that participant. In doing so, this would support visitors in feeling more connected to the museum and confident to contribute to conversations about objects themselves.

Therefore, this idea could build a form of enchainment between individuals as it would connect different audiences together. This highlights how enchainment might be an ongoing process rather than something which is produced only at the point of minting the NFT. To reiterate, Chapman's (2000) theory proposes that enchainment forms at the point of fragmenting the artefact into different pieces. Whilst here, enchainment could form both at the point of digital fragmenting (minting the NFT) as well as at the point of exchange between the users.

Even without the 'Scribe' addition, a couple of the museum interviewees noted how this approach to NFTs reflects NML's core values and mission. To reiterate, NML's mission is 'to create memorable experiences, for everyone, challenging expectation', which Museum Participant 2 believes to involve the following: 'we strive to be bold, innovative and accessible and I think that this aligns with all of that' (Participant 2, Museum Interviews, April

2021). Likewise, Museum Participant 3 noted: ‘the idea of creating memorable experiences and challenging expectations, these things would definitely do that’ (Participant 3, Museum Interviews, April 2021). Applying the personal experience to the token produces a new type of digital collection that feels more accessible to these participants, it challenges expectations about the collections, and promotes a more open and shared authority approach to understanding the collections. Therefore, the process of handing out personalised NFTs is valuable for NML because it reflects the institution’s core aims and values.

6.2.2 Sharing Authority

The previous section highlighted the idea of sparking conversation about the collections through NFTs and a shared authority approach. There are, however, criticisms to be made about this concept. Firstly, and as I implied in Section 6.2.1, the use of blockchain is not as accessible as it might appear. Having the exhibition and NFTs online could help audiences feel more comfortable, as Museum Participant 3 suggested: ‘having it online means that more people can see it from the comfort of their own home’ (Participant 3, Museum Interviews, April 2021). This reduces what is often referred to as ‘threshold fear’, which is a term used to describe the barriers that heighten a sense of intimidation in entering physical museum spaces for some visitors (Heumann Gurian, 2005). Hence, digital exhibitions enable visitors to view the collection on their own terms without concern for their own cultural capital.

At the same time, however, the exhibition is not immediately visible on NML’s website and so visitors must have access to the URL in order to view it. The *Possession Gallery* holds even more obstacles as the visitor must have a digital wallet in order to view the NFTs. Therefore, any ‘threshold fear’ avoided from using online spaces is reinforced with using a technology that many visitors are unlikely to know how to navigate. But the *Possession Gallery* is also a reminder that NML has no control over the tokens in this space because participants hold the ownership rights, which raises the integral point on how blockchain contributes to a shared authority approach, despite the accessibility issues.

The process of relinquishing control over interpretation also brings its own risks. For instance, Museum Participant 4 remarked during their interview:

> *The only other downside is that people could flip this on its head and put content towards an object that’s really either false or controversial or disturbing, or pushing some sort of agenda and I guess that’s where you get that whole free speech thing involved and letting people have that platform, but I feel like there should be an opportunity to let them have that, you just don’t know what’s going to happen and that’s the risk.*
>
> (Participant 4, Museum Interviews, April 2021).

A similar point has been made about blockchain on a broader scale since there is no central authority to challenge or restrict communication that might promote certain agendas or hate

speech, which leads to what is described to as ‘the flip side of free speech’ (De Filippi and Wright, 2018, p. 125). Furthermore, a blockchain is immutable and so anything added to its metadata is extremely difficult to change. Therefore, trust is a key component; we must trust others to use blockchain technology fairly and ethically, just as myself and my museum colleagues had to trust that the participants would not write anything that might be as controversial or that might put the museum into difficult situations.

Unlike the broader problem of hate speech on blockchain, however, had something like this come up during the project it is likely that either myself or my colleagues at NML would have taken some form of action. For example, the same would have been the case had one of the participants chosen a work to mint that is still in copyright, since this could put the museum in a complex situation over ownership. In this way, myself and my colleagues were the final decision-makers in the project, which implies that shared authority is harder to create in projects that engage with blockchain because of its decentralised and permanent nature.

Of course, this is not to say that the participants had no influence in the project. For example, and as briefly I described in Section 4.3.2, the initial workshop in January 2020 required the participants to explore NML’s collection called *Pride and Prejudice*, which is a themed set of artworks and artefacts relating to LGBT+ identities, and they were asked to choose an object based on their personal connection to it. This highlighted some interesting but quite personal themes such as sexuality, masculinity, and community. When asked how they would feel if their stories about these objects were displayed in the museum, many of the participants felt ambivalent, for example:

> *Participant E: So, I didn’t expect to go too personal today and think like well it’s not my kind of thing, so at the same time, I don’t really feel that I want this story in a museum, but I don’t know.*

> *Participant G: Yeah, I mean I also feel, you know I wouldn’t necessarily want this or my story brought forward here but what I found useful here is that certain themes like secrecy or STDs or war or religion came up which I don’t think are represented in that collection as themes.*

In view of these responses, it was apparent that the participants found the activity useful in exploring undiscovered themes in the collection, but they would rather not have their intimate stories on display in a public space such as the museum and its website. Therefore, it was decided that these objects would not become part of the online exhibition *Crypto-Connections* and instead the exhibition comprised of two different sets of objects; the participants’ personal possessions and museum objects the participants chose during the afternoon session of Workshop 1.

Participant A and I made this decision rather than the participants, but the participants’ responses influenced the overall outcome, which suggests a certain measure of control in the overall process. That is to say, there is a sharing of authority in this decision, but this

does not reflect complete shared authority. I use this change of tense to refer to the point made in the introduction of this chapter in relation to Frisch's (2011) concept of shared verses sharing. The project represents shared agency, but this process of sharing is not equal. However, blockchain technology also offers a unique aspect to authority over digital objects because it offers the owner the opportunity to sell their token. Trading has already been discussed in this chapter as a potential way to start conversations between visitors, but in what follows, I will examine how the role of trading impacts this sharing authority approach in this research project.

6.3 Trading, Ethics, and Control

In Chapter 4.2.3, I described some of the instances where the participants recognised the token as having an exchange value. For example, the following conversation took place between Participant B and myself during Workshop 2:

> *Participant B: yeah, it makes me want to trade it for something for some reason.*
>
> *Researcher: do you think you will?*
>
> *Participant B: I don't know, it depends if someone has a nicer rock!*

Whilst their response was said jokingly, it also indicates that the participant recognises they have this ability to trade their tokens if they wanted to. This is further supported by the common theme of trade and currency during the second workshop. In particular, Participant F noted: 'I can see the link to value and online currencies really because I suppose ultimately that's what it could be, an online currency' (Participant F, Workshop 2, July 2020). Participant D also made a point about currency when they were trying to describe these tokens: 'or whatever or this new currency, I still can't quite get my head around it' (Participant D, Workshop 2, July 2020). Participant D was one of the participants who were still confused by blockchain by the end of the project: 'I'm still very confused by it, but I'm intrigued by it' (Participant D, Workshop 2, July 2020), and so it is interesting that the one thing that they did understand was that these tokens could be some form of currency.

This understanding is likely to derive from the use of *BlockExchange* in the first workshop as this required the participants to trade with one another using Lego bricks as a currency in order to comprehend the key points of blockchain. On the other hand, trading tends to be the focus on NFTs as they are largely used as a way to commoditise the internet. This point is supported by the general themes of the blockchain participant interviews, as many of the participants noted the ability to commoditise and trade as one of the integral parts of an NFT (although points such as transparency, attribution, and recognition were also noted), for example: 'scarcity, traceability, tokenisation, and the immediacy of trade I think are the really key factors of the NFT' (Participant 5, Blockchain Interviews, February 2021). This suggests that monetisation is the main motivation for creating cryptocollectibles, even though it is only a by-product of blockchain.

This ability to trade reflects the participants' control over their tokens, as they are the only individuals with access to the digital wallets that store each NFT. Of course, this control is not intrinsic to the participant since anyone who gains access to the digital wallet also gains access to the tokens stored within it. To reiterate from Chapter 4.2, a digital wallet stores an account which is controlled via a private key. This is like a digital signature that signs off any transactions that occur via the digital wallet, and this establishes that 'ownership and control of the private key is the root of user control over all funds associated with the corresponding Ethereum address' (Antonopoulos and Wood, 2019, p. 62). In essence, the NFT is a signpost to a wallet's address and whoever knows the details to access this address also has access to owning any tokens linked to it. Therefore, the participants need to store their private key and any passwords or seed phrases associated with accessing their wallets securely if they want to retain control over their token.

However, the participants' ability to trade the token also holds ethical problems. There is, for example, the question of monetising cultural objects that technically sit outside of the art market because they belong to a museum; hence, such objects no longer hold an explicit exchange value. This project, however, potentially entangles these objects with exchange value because the NFT is a symbol of the object. Meanwhile, the NFT is a thing which 'slips back and forth between art and money and managed to be both at the same time' (O'Dwyer, 2018a, sec. 1). Therefore, the NFT resembles both an artwork and a potential commodity. If the participant sold their NFT, this exchange value might become connected to the physical object as well (even though the NFT is not a direct delineation of ownership for the physical object). In this respect, the NFT might inadvertently become a symbol of the original physical object's worth, or at least, impact how others perceive the monetary value of the original physical work or vice versa.

This point also resonates with an earlier discussion in Workshop 1 where the participants had briefly discussed open data policies in museums and galleries. Such policies refer to GLAM institutions changing their protocols around digital collections so that any surrogates of public domain works in their collections are free to copy, remix, and share online, often using creative commons licensing (OpenGLAM, 2019). The discussion during the first workshop highlighted both the benefits and consequences, for example, Participant F pointed out:

> *I would be pissed off if a commercial organisation had gone in and used all these artworks and had made money off it, do you know what I mean? Because I think you're right, people should have access to everything a museum has got but that doesn't happen when others end up making money on the back of your collection.*
>
> (Participant F, Workshop 1, January 2020).

Participant F notes how there is a risk with open access that others can make money from a museum's collections without needing to seek permission or share the profits with that

institution, and this point reflects the wider concerns noted in research on open access (Eschenfelder and Caswell, 2010; Kelly, 2013). Similarly, there is a risk in minting museum works as NFTs because the owner could sell the token without needing to seek permission from the museum, nor provide the museum with any of the profits. A 'social experiment' that happened in March 2021 offers a case in point. A collection of artists under the guise of the 'Global Art Museum' took images from four cultural institutions with open access policies and minted them on the NFT platform OpenSea in an attempt to highlight to the sector the challenge of the 'garbage in, garbage out' problem and blockchain (Liddell, 2021 see also Sections' 5.6 and 2.7.4). Whilst this came out as an experiment, this exemplifies the potential ethical issue of monetising collections using NFTs without needing to seek permission.

Similar ethical concerns were highlighted in the museum interviews where this question about trading was posed to the participants. For example, Museum Participant 2 noted: 'um, *(pause)* I don't know I'm sort of iffy about it I think it would take me a while to get on board with it. It also depends on how much they're being sold for'. Likewise, Museum Participant 3 comment:

> *I think I would feel weird because it's like, it feels like someone buying a part of your life, if it was something that I had and let's say that I was offered quite a lot of money for it and I needed that money, it would feel a little bit like if someone would own a part of my soul.*
>
> (Participant 3, Museum Interviews, April 2021).

This point also resonates with Museum Participant 6's response:

> *If one person is given this digital item which a lot of other people have equal reminiscence, nostalgia, and claim to and then they decide to pass it on or sell it then I think that could become quite challenging and quite hard in terms of museum relationships. […] So, while I haven't got an issue in buying and selling things in that way, I just think it could have knock on effects in terms of relationships which are difficult to foresee where that might go.*
>
> (Participant 6, Museum Interviews, June 2021).

On the other hand, Museum Participant 1 remarked:

> *I don't know, and I suppose what really wrangles people is that they're able to create wealth from what seems like they're doing very little, so they've had no input, they've had no engagement with it, but I don't think it bothers me that much.*
>
> (Participant 1, Museum Interviews, March 2021).

And similarly, Museum Participant 4 mentioned:

> *In terms of the museum, the museum isn't losing anything that they need*

> *in order for the museum to carry out its aims, whether that's to educate, to research, or for visitors. I guess like with any copyright issue if anything is in creative commons then you let it be free for people to do what they want, they can manipulate and do whatever they want and you just have to have that sense of just letting it go.*
>
> (Participant 4, Museum Interviews, April 2021).

There are three themes of responses from the participants. In the first instance, Participants 2 and 3 feel 'iffy' or 'weird' about this potential to trade these tokens, and this hints at this uneasiness about selling cultural heritage, even though it is only an extension of the physical object. This unease also corresponds to the discomfort felt when museums and galleries consider deaccessioning works as this is viewed as in some way 'violating' the museum's role as a preserver and guardian of culture (Vecco and Piazzai, 2015; Whitaker and Glick, 2021). Under similar circumstances, tokenisation unleashes these images as potential commodities that might feel in some way counter to the museum's role as a guardian to its collections.

Meanwhile, Participants 3 and 6 reflect on the emotional or personal ethical dilemma in selling one of these tokens. Participant 3 compares selling one of these tokens to selling part of their soul since the token represents a personal connection and story about a particular object. Therefore, trading the token might be understood as compromising the personal relationship and meaning connected to the object. Participant 6, on the other hand, considers the potential implications to relationships if only one participant chose to sell their NFT. As they state, this could impact a museum's relationships with other people who also have personal associations with the object in question. Commodifying the work could undermine the museum's role as a guardian or carer of these objects, which might challenge a museum's working relationship with certain groups of people. Furthermore, if one person chose to sell their NFT, this will devalue the social and communal value of the other NFTs made in this project because the person that has sold their NFT has chosen to have the monetary value over the social value. In other words, this could disenchant these NFTs and this idea of a communal sense of collective experience.[63]

In contrast, Participant 1 recognises that this ability to trade might 'wrangle' certain people because of the feeling that the token does not in some way 'belong' to the seller since they have not done enough to earn the wealth created through the token. Put differently, the participant is situating the ability to earn wealth with the input of labour. This point indirectly refers to John Locke's theory on property and labour which argues that individuals may claim ownership over property that they develop and maintain through their labour, which, in recent years, has been used in the discussion to justify IP rights including rights over digital content (Moore and Himma, 2011). I previously used this argument in Chapter 5.5 to propose that the investment of the participants' labour in this project provides a way to

[63] See Section 4.4.1

pass the threshold of originality, and hence, provide a claim of ownership for that participant in the form of moral rights. Of course, this might be different had the original work in question not been in the public domain. Nevertheless, Participant 1 suggests that there might be a question of how much 'labour input' the participants have engaged with in order to gain as much control as they have over the token which is represented in the ability to trade and monetise the cryptocollectible.

Finally, Participant 4 highlights how the museum does not 'lose anything' in this process of trading and they allude to the point made earlier on open data policies and relinquishing control. Indeed, if the museum has agreed to relinquish control of these tokens, then the institution needs to accept the risks that come with this (the potential that these tokens might be exchanged for profit). This former point of 'losing anything' is also salient in the context of the fragmentation and enchainment theory used to examine this research because it denotes a difference between physical fragmentation and digital fragmentation. In physical fragmentation and enchainment the artefact is broken and divided into pieces so that each piece reflects the 'once-intact form' (Chapman, 2000, p. 39); the original once-intact artefact no longer exists as each party owns a fragment which connects them together. In digital fragmentation and enchainment, the *original* digital continues to exist on NML's website,[64] and each participant owns an extension of this image with the *Possession Gallery* binding these different individuals together by depicting these different tokens in one collective space (see Chapter 4.4). I have previously referred to this as 'pseudo-fragmenting' in the conclusion of Chapter 5 because this process does not reflect 'real' fragmenting. Therefore, and as Participant 4 recognises, the museum does not 'lose anything' in pseudo-fragmenting because if the participant were to sell their token the museum will continue to control the *original* digital image. What they have lost, however, is the digital *original,* or the token itself.

This final point raises issue over the enchainment process; if the image is not fractured, does the process produce any value? Moreover, if the museum retains control of the *original* digital, what does the participant really have control over? To address these questions, it is important to reiterate the following points. Firstly, the token is a personal extension of the museum object and, to reiterate the point I made in Chapter 5, the token is not simply a duplicate, instead, the process of embedding personal connection creates a digital object that feels different to the physical. This produces a new form of originality into the NFT, one which is informed by personal narrative and experience. Therefore, even though the museum owns the *original* digital, the participant gains ownership of a personal original; a token that is singularly and uniquely theirs.

This leads onto the second important point to note, that each token is created singular and unique even though they are linked to the image stored on NML's website. In this respect,

[64] *'Original* digital' is used here to refer to the image that is embedded into cryptocollectible via a URL link, hence, the image used for the production of tokens, see Section 5.3.1 for further details.

the token is a digital material extension of the image stored in *Crypto-Connections,* but the use of blockchain gives the token a unique identifier which is permanently linked to the participant's digital wallet. As such, the participant does not have control over the image stored in the exhibition, but they have control over this unique entity. In both of these points, then, the underlying argument is to treat these tokens as entities in their own right rather than comparing them to the *original* digital or to the physical object itself. Indeed, this separation between the token and the *original* digital would be ever more present if the participant did choose to sell the NFT as the token would gain a documented provenance through the Ethereum blockchain and it would start to build its own diverging object biography:

> *I like the idea of to give someone this token of almost ownership over something; it's theirs and that's, like, I wonder if it creates, I suppose the contracts within that would need to be very well thought out because does it create an idea that people can, or would people be able to create a marketplace on the back of this because I don't know how I would feel about that if you know what I mean.*
>
> (Participant 3, Museum Interviews, April 2021).

Museum Participant 3 also raises an important point about the limitations of sale. The smart contract used to create these NFTs did not contain any restrictions in what the participant could choose to do with their token. Therefore, they are free to 'create a marketplace of the back of this' if they choose to do so. However, the discussion on shared guardianship in Chapter 4.4 offers a counterargument. There, I described how the act of exchange has the potential to build a feeling of shared guardianship or stewardship. This also suggests that the inherent value of the token derives from this forged relationship rather than the ability to exchange it, and, in turn, this sense of guardianship could influence the participant to feel sense of duty to care for their token, and thus give them a feeling of control through the act of care.

Therefore, shared guardianship produces a moral duty, which could be compared with the concept of the 'moral economy' outlined by scholars such as E.P Thompson (1971) and Zeilinger (2013). For example, Thompson uses the concept to justify the behaviour of the rioters during the bread riots of the eighteenth century England, where people were acting on a sense of moral injustice caused by the capitalist economy disrupting the traditional social community norms (Thompson, 1971). Meanwhile, Zeilinger (2013) outlines the moral economy as a framework for understanding the moralistic behaviour 'chipmusic' creators who rely on creative commons licensing and appropriate attribution to copy, remix, and share their content as a community. In both cases, there is a moralistic tendency to justify actions, and, in a similar approach, there is a moralistic undertone to the question of trading the tokens produced in this research project because there is an implicit understand that by owning the NFT, the participant has a duty of care.

More recently, Nathaniel Stern (2021) has proposed a similar argument for digital art NFTs. He suggests that the value in an NFT could come from the role of custodianship wherein the collector not only gains an artwork, but also a duty to care for that digital artwork in the longer-term. In doing so, the NFT could be a potential approach to addressing the issue of digital decay and the issue of digital preservation that many digital artists face with their work. And while I do not wish to imply that the participant has a duty to conserve the digital work, I believe this idea of custodianship or guardianship offers an implicit terms and conditions of owning the NFT and an expectation to not to sell it in this particular research project. Certainly, for some of the participants, they did not foresee themselves selling their token: 'I suppose I can't see a point in my life when I might be trading them' (Participant F, Workshop 2, July 2020), which suggests that the appeal to trade is not evident in every participant in this research. Therefore, the process of tokenisation situates these ownable images in a sphere of exchange, but this does not mean that these tokens have to be treated as commodities.

However, museums do not need to rely on underlying expectations and implied agreements. There are also possible technical applications that could have been put in place to restrict or oversee the potential trading of these tokens. As I briefly mentioned above, the smart contract used to produce NFTs can embed certain conditions and parameters to ensure that the NFT is used or sold appropriately. To reiterate, a smart contract is made up of lines of code that embed rules when it is executed by a transaction. Sarah Conley Odenkirk (2021) appropriately terms these contracts 'armatures' since they only provide the basic structure of a traditional contract, which can be added to with different pieces of code to reflect different considerations. These considerations could be numerous and include how the owner might be able to display the work, who is liable if the link to the *original* digital breaks, or even where and how an owner might be able to sell their NFT.[65]

Another possibility with smart contracts is to retain artist equity upon sale. In doing so, this would allow the museum to retain some control over the token once it was given or sold to someone. Moreover, the museum would receive a cut of the earnings upon the sale as they retain part ownership.[66] This process is described as 'fractional equity' and it was developed to enable artists to gain 'droit de suite' or resale rights of their digital work (Whitaker and Kräussl, 2020). This point is no longer just theoretical. For example, Participant 7 from the blockchain interviews noted how this is common among NFT minting platforms who embed this approach into their smart contracts:

> *I know other crypto art platforms do and this is so key in sustaining an artwork is when you make an artwork yourself and a person then resells it, your wallet address automatically gets a percentage from that through*

[65] Although, currently, I am not aware of any live examples that offers this condition.
[66] See Chapter 3.3 for further details.

> *the platform that dictates it, but you get a percentage of those resells and perpetuity.*
>
> (Participant 7, Blockchain Interviews, March 2021).

If the museum were to take this approach, they would be able to 'track' the token as it was sold whilst also receiving an income, as they would be notified with a payment upon each resale. The Whitworth in Manchester, UK, is a case in point. In July 2021, the gallery minted an edition of 50 NFTs which are digital visualisations of their William Blake's *The Ancient of Days* (Vastari Labs and The Whitworth, 2021). The smart contract associated with these NFTs applies a 20 percent equity attainment of each NFT for The Whitworth, meaning that the gallery will permanently own 20 percent of each NFT and will receive 20 percent any resale of these tokens. At the same time, however, these applied conditions impact upon the owner's decentralised ownership as their ownership resides in a set of conditions. As such, what does this mean for shared authority?

6.4 Tokenism

So far, this thesis has described three approaches in which museums might engage with NFTs and ownership. The first example is the research project that took place at NML. Here, the participants are digitally given their NFT without any preconditions or any limitations embedded into the smart contract. The participant is free to do whatever they would like with their NFT, but, at the same time, there appears to be an implicit expectation that they will not sell it, which is embodied in the idea of shared guardianship. I have also discussed the possibility of manipulating the smart contract so that this expectation is made explicit through the terms and conditions. Like The Whitworth, the smart contract could also contain an artist equity so that the museum retains a certain percentage of ownership upon sale and resale. Both cases, however, disrupt the idea of decentralised ownership discussed in Chapter 4.2.4. With NML, the association with the museum challenges the participant to feel like they exclusively own their token, as I suggested in Chapter 4.4.2. The use of smart contracts would only reinforce this challenge and so the participant would not hold full control over their token.

I have also suggested in this chapter that the role of trading could prompt conversation between audiences. Combining the concept of 'Scribe' to these NFTs could offer new owners a way to respond to the previous owner and start a debate and conversation about objects and how different individuals perceive them. Whilst this could be a risky approach because of the decentralised nature of blockchain,[67] this could also give trading a different form of value rather than it being a means for financial gain.

At the core of this discussion is the question of use value for the owner, which was a point highlighted by Participant E: 'I think part of me is wondering about utility as well, like is that something I can use in the future for a kind of asset' (Participant E, Workshop 2, July 2020).

[67] See Section 6.2.2.

Without a use value, this research project reinforces the nature of 'tokenism', a term I derive from Arnstein's (1969) ladder of citizen participation. She describes this ladder as being made up of eight rungs on a ladder connected together through three overarching themes: 'nonparticipation', 'tokenism', and 'citizen power'. Each theme correlates with two to three rungs on the ladder and denote a hierarchy of participation, with 'citizen power' representing an equally shared authority and 'nonparticipation' representing the opposite. 'Tokenism', then, relates to a point inbetween this dichotomy where the participants do not have equal agency with the facilitator but hold some control over the project and decision-making. The three rungs connected to this theme are 'informing', 'consultation', and 'placation'. In each theme, participants have a voice in the project, but they lack the power to ensure that their 'views will be *heeded'* (Arnstein, 1969, p. 217, her emphasis).

Similarly, I argue that this research project reflects this aspect. Whilst I have proposed elsewhere that the token is a form of remuneration for the participants,[68] I also question the use value of these tokens because the participants can either keep or sell their NFT but this ability to sell is potentially compromised because of the layered ownership effect. Of course, some of the participants will enjoy keeping their NFT as a form of memento of the project, and with the new developments in displaying NFTs, such as through metaverse platforms like Decentraland or the use of physical frames such as those provided by Tokencast, there are now many ways for these participants to enjoy their tokens.[69] But, as I argued in Chapter 5, this requires the participant to value owning an NFT in the first place.

Consequently, this project presents an example of Arnstein's (1969) 'tokenism' but in a digital material form, since the participants receive a digital token to represent their efforts in this project. These tokens give the illusion of shared authority as the participant has control over their NFT, but as noted, factors may influence their ability to utilise their control through the act of selling, which leaves agency in this project as unequally shared and shows the application of blockchain as reinforcing this idea of 'tokenism'. This conclusion reflects the broader discussion on the topic and the problematic nature of sharing authority in museum spaces, which can bring forth various challenges (Davies, 2010a; Fouseki, 2010; Lynch and Alberti, 2010; Lynch, 2011). For example, Lynch (2011) notes how there is a tendency to reward behaviour that reflects the institution's values, which might only reinforce an echo chamber of dialogue. Likewise, Davies (2010a) suggests that often collaborators are only involved in certain elements of an exhibition rather than the whole process, and this poses questions regarding the collaborative nature of the process. Therefore, these practices give the illusion of a 'participatory museum', but, in reality, they reflect a more contributory model because the participants are only contributors rather than collaborators (Simon, 2010).

However, in the next section, I present a different approach to engaging with the technology that can provide alternative use values for an NFT that goes beyond the ability to keep,

[68] See Chapter 4.3.4
[69] See https://decentraland.org/ (accessed 15 October 2021) and https://tokencast.net/ (accessed 15 October 2021)

display, or to sell it. I define this as a ‘blockchain approach’ to museums and it considers the role of the NFT as an access token, a social token, and a governance token, each of which I will describe in further detail. In doing so, I wish to investigate how blockchain could support a new museological and ‘post-museum’ approach to audience engagement which creates social value and enchainment.

6.5 A Blockchain Approach to Museums

In developing a ‘blockchain approach’, it is salient to reiterate the key properties of a blockchain that were highlighted throughout the blockchain interviews. Firstly, Blockchain Participant 1 noted how blockchain embeds transparency into exchanges: ‘first of all, definitely it’s the transparency. You can see the whole path of your artwork’ (Participant 1, Blockchain Interviews, July 2020). Meanwhile, Blockchain Participant 2 highlighted trust and provenance: ‘I would define blockchain as a single source of trust on the internet where basically we can use it as a reference point for information’ (Participant 2, Blockchain Interviews, August 2020). Blockchain Participant 3 emphasised truth and the decentralised nature of the technology: ‘I think of it is a way of finding out the truth and a way of demonstrating consensus’ (Participant 3, Blockchain Interviews, August 2020). This notion of decentralisation was also noted by Blockchain Participant 4, who viewed the technology as a way to ‘circumvent some form of an authority’ (Participant 4, Blockchain Interviews, August 2020), and, according to Blockchain Participant 6, this also creates (theoretically) a ‘network of equals’ where anyone can enter a public blockchain network and run transactions (Participant 6, Blockchain Interviews, February 2021).

Therefore, a blockchain approach to museum practices would need to embed these properties into its methods and this would involve some form of decentralised and distributed governance system that is open, transparent, and where agency is shared amongst the museum’s network of people, places, and objects. In doing so, this would present a truly shared authority approach to practice and management, which would reflect the ethos behind museum pedagogy such as ‘new museology’, the ‘modern museum’, the ‘participatory museum’, and indeed the ‘post-museum’ (Vergo, 1989; Hooper-Greenhill, 2000; Simon, 2010; Barrett, 2012).

But, in practice, despite being a decentralised technology, blockchains are also unequally controlled as Blockchain Participant 4 points out:

> *Who owns a blockchain? Is it the developer? Is it the person who wrote the white paper? In my opinion, it is the people who are in the know, the operators, these are the people that really own it because they control it.*
>
> (Participant 4, Blockchain Interviews, August 2020).

Blockchains cannot survive without maintenance and all blockchains have a select group of developers who help to maintain the network as well as miners who mine the network and authenticate the next block of transactions. According to De Filippi and Lockluck (2016, p. 10), this creates different communities within the blockchain network; passive users, active users (miners), and a community of developers who ultimately have control over how the blockchain is developed. Parkin describes this as a 'senatorial governance' model because it is 'a (de) centralised model of bureaucratic parties who compete to change the monetary policy (codified rules) of the protocol' (Parkin, 2020, p. 93). Put differently, decentralisation simply recreates pockets of power which reinforces Villi Lehdonvirta's argument that 'blockchain technologies cannot escape the problem of governance' (Lehdonvirta, 2016, para. 15).

Indeed, even the term decentralised only gives the illusion of shared authority. As Figure 6.2 indicates, decentralisation refers to the dissolving of any central authority, but it does not immediately assume that the agency is divided equally amongst all nodes (Troncoso and Utratel, 2019). And yet, decentralisation is perceived in the blockchain space as somehow 'superior' (Baldwin, 2018). Therefore, in practice, a blockchain is not a symbol of shared authority and instead only gives the illusion of distributed agency.

This point resonates with community and audience engagement practices in museums. Morse (2014) notes how community engagement projects rarely actively change the institution and instead work on a 'contributory' level where the overall project is directed in accordance with what the participants can do for the museum rather than the other way around. I have also made similar arguments in the previous section with this idea of 'tokenism'. The NFT is simply a manifestation of the work contributed but does not offer any real return or value for the participants in this project.

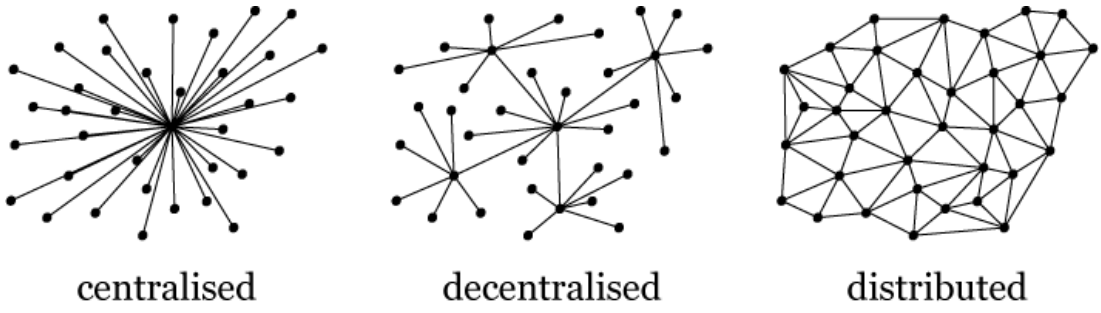

Figure 6.2 Centralised, Decentralised, Distributed Networks Diagram. Source: Wikimedia commons https://commons.wikimedia.org/wiki/File:Centralised-decentralised-distributed.png, Accessed May 2021

Morse continues by proposing 'the distributed museum', which she states 'acts like a connector, linking people, ideas, and projects back into its collections and buildings, and connecting up its collections, ideas, and staff by moving out towards different community nodes' (Morse, 2014, p. 226). Again, as seen in Figure 6.2, distributed relates to shared agency across a network of nodes, and Morse argues that in community-engagement practices this would situate the museum as another node in the network that facilitates the process of connecting people, ideas, and collections. In this respect, collaborative museum

practices should strive for a distribution model over a decentralised one, and in the context of blockchain technology, this would reflect the governance model of DAOs.

In Chapter 2.7.6, I introduced this type of organisation that runs on a blockchain where decision-making is supported through smart contracts and a distributed voting system. This makes these organisations distributed and autonomous, thus, with no central authority nor any pockets of power influencing governance. DAOs are often associated with the Ethereum DAO, which was famously hacked in 2016 and drained of its $160-million US dollar crowd-funded pot (Vickers, 2017). Since then, however, many smaller-scale DAOs have formed in different communities including groups of artists and researchers. For example, Meta Gamma Delta is a DAO that aims to empower female-led projects through funding and support. Members invest financially into a communal funding pot and any member can put forward a proposal for a project that could be funded by the DAO and other members vote to decide (Meta Gamma Delta, 2021). Therefore, tokens play a crucial role in DAOs because they are symbols of social capital and agency for each member since they offer a way to validate a member for their work and investment, and this reinforces their sense of belonging to the group through the ability to be part of decision-making.

However, not all DAOs work within the same governance framework. A developed concept on the DAO is the DisCO which takes a similar approach but focuses on the idea of distribution over decentralisation. DisCO combines open cooperativism with feminist economics to create a space where all forms of labour, care, and investment into the organisation are recognised. To reiterate, open cooperativism takes the principles of the commons and combines with cooperativism. This amalgamation produces a model that works on the fringes of the economy in order to create funds that can be used to invest in commons-based projects. DisCO works in this frame but also considers all forms of value produced in its network, and not only the monetary value produced from working within the wider economy. Voting tokens and rights, then, are not only given to those who give a monetary investment, but also to those who give time and other resources to its projects. As such, it promotes a truly distributed approach to governance because every agent has a vote (Troncoso and Utratel, 2019).

Therefore, both DAOs and DisCOs aim to bring people together as a community and use blockchain as a consensus mechanism. They also provide a space for groups of people who might not feel confident entering the blockchain space by themselves. For instance, this is why Meta Gamma Delta was formed as it provides an open space for women to enter and learn more about crypto and blockchains (Meta Gamma Delta, 2021). Exploring platforms such as DAOHaus highlights this point further as it shows the many different DAOs currently available to join each with their own agenda and mission.[70] In this way, these spaces are being set up as alternative models to the current approaches to blockchain that reflect a more individualistic and capitalist approach to investment and work (Golumbia, 2015a).

[70] See https://app.daohaus.club/explore (accessed 15 October 2021).

Indeed, looking at the motive behind Bitcoin only reinforces this traditional model. For example, Bitcoin's whitepaper might suggest a community approach to value creation, but this is done through solidarity or individual labour and the need to incentivise nodes with funds in order to participate (Nakamoto, 2008). In contrast, DAOs and DisCOs believe in the value of collaboration and community, participants are incentivised to support and maintain the network in return for being part of supportive community.

Likewise, a 'blockchain approach' to museums would also need to encompass these ideologies. In doing so, this would recognise the different forms of value created from community engagement projects, and thus acknowledge the different stakeholders in museum-based projects. The NML research project reflects this idea in part as each participant received a token of their chosen works from *Crypto-Connections.* However, these tokens lack any authoritative value since the participants have no control over decision-making through the use of their token. Put differently, the token needs to have a utility value that goes beyond the monetary; it should provide the participant with some form of agency that could be used in the museum context.

This utility value could come in the form of three types of tokens already available in the crypto space. Firstly, NFTs could be a form of access token, where owning the token represents membership or access to a specific space. The *Bored Ape Yacht Club* NFT is one such example as anyone that owns one of these NFTs gains membership to particular benefits such as access to a collaborative graffiti board.[71] A development on the access token is the social token, which allows the owner to not only access new spaces but also to interact with other users. The project *CirclesUBI* offers a case in point. In this system, everyone receives a universal basic income of Circles token which they are encouraged to use with participating individuals and businesses.[72] Although this is a fungible token, the use of NFTs could be a way of identifying individuals who earn and use social tokens. Lastly, NFTs could be a form of governance token, which combines the previous tokens with the additional ability to be part of the decision-making of the project or network. Again, like the social token, the NFT would act as a representation of governing members. The Rarible $RARI token is a recent example of a governance token.[73] These tokens are given to active members on Rarible, which is an art NFT platform. Token owners can use their $RARI to vote for changes to the platform and its protocols. As such, those that actively buy, sell, and mint tokens on Rarible gain tokens which give them access and control.

In museums, these tokens could be translated in various ways. For example, the NFT as an access token could provide owners with exclusive benefits such as access to curator talks about the work or special events. The NFT as a social token could offer owners further tokens that could be used to interact with one another. This could be beneficial when working with crowdsourced content, where users could use their tokens to vote for quality

[71] See https://boredapeyachtclub.com/#/home for further details (accessed 16 October 021).
[72] See https://joincircles.net/ for further details (accessed 16 October 2021).
[73] See https://rarible.com/rari for further details (accessed 16 October /2021).

control over contributed content.[74] Lastly, the NFT as a governance token could reflect decision-making in exhibitions and curation, where those that own have the right to vote about how a work is displayed or presented.

Of course, the use of these tokens in museums would require the participants understand and be confident with using blockchain technology, as highlighted by Museum Participant 2 (as well as throughout this thesis): 'I think it's something that people would have to get their heads round the idea and adjust to it' (Participant 2, Museum Interviews, April 2021). Maintenance is also a challenge in this process, as it is often with any partnership or community work carried out in museums, as emphasised by Museum Participant 5: 'that's the hardest thing in relationships and partnerships**,** it's the maintenance, keeping in touch' (Participant 5, Museum Interviews, May 2021). However, the main challenge faced in carrying out such a project is the approach to governance:

> *On the one hand, there is a kind of tension as the attempt to push boundaries and transcend them, or transgress them anyway, and see what is possible and play with our idea of ownership and things and then there is this reframing or even just kind a reinforcing capitalist structures that have been in play for such a long time and we don't seem to be able to escape them. Even if we have this potentially democratic infrastructure that opens it up to everybody and play with ownership but then what happens when everybody tries to sell the stuff and make as much money as possible, so yeah there is a real tension there.*
>
> (Participant 1, Museum Interviews, March 2021).

The interrelation between the NFT as a commodity and a symbol of community creates a tension and potential problem for the use of blockchain in shared authority approaches because there is a concern that a member may wish to sell their NFT for financial gain. They may also sell their NFT to an unknown agent who would gain rights to decision making. This could put social cohesion at risk if the actor wished to promote specific agendas. Moreover, the actor could remain pseudonymous because of the technology, thus they can act without having to face any consequences.

A similar point was made from Participant A from the Async Art platform. To reiterate, artists sell off 'layers' of their work as tokens on this platform, and these tokens have embedded parameters which means that the owner has control on how that layer looks depending on the parameters set by the artist:

> *Once you own a layer you can alter the final work with that layer. One of the most common ways of changing the art is state change, so the artist can say if you own the landscape or the background, the artist provides maybe two different states such as stormy night-time and*

[74] See De Filippi and Hassan's (2015) discussion of a similar idea with Wikipedia.

> *sunny day time and the owner of that background can now change between these two states on their whim.*
>
> (Participant 6, Blockchain Interview, February 2021).

This has the potential to be problematic because owners cannot dispute changes made by other owners: 'I dispute your ownership over the artwork you can now change it and I can't dispute it and if I tried to do it, you'd be like well you don't actually own that layer' (Participant 6, Blockchain Interview, February 2021). This point reminds us that decentralised decision-making does not always equate to harmony and the added layer of pseudonymity means that it becomes even more difficult to navigate disagreements because owners can hide behind their screens without any consequences. Therefore, the use of DAOs in shared authority is only the beginning of a journey into addressing control and authority as participants of DAOs must still apply their own protocols, such as establishing a ruling committee, or establishing alternatives voting approaches to address conflict and compromise.

This point highlights how the use of blockchain to address authority in community engagement requires both institutions and participants to trust one another. Despite being a 'trustless' lending system (Swan, 2015, p. 15), the use of blockchain with communities still requires people to work with other people. In this way, DAOs might run on blockchain but they are formed of people choosing to work together to reap the rewards of being part of a community. Therefore, blockchain might mitigate for some aspects of trust (such as voting fairly) but it cannot build the innate sense of trust between people.

Thus, I argue that the use of DAOs requires museums to 'radically trust' their collaborators, a term I derive from literature on community engagement projects. For example, Chan and Spadaccini (2007) use the term in the context of museum blogs, where they note how museums blogs must 'radically trust' the online community. Lynch and Alberti (2010) similarly use the term in relation to collaboration practices of exhibitions where the museum must 'radically trust' the participants in both the process and output of the project. 'Radical trust' is also needed in blockchain projects because the technology is permanent and decentralised, hence, once control is relinquished, it cannot be easily reclaimed. If this use case of blockchain is to work within museum practices, then museums must be willing and ready to radically trust, despite the potential risks that this could bring.

6.6 Conclusion: Community

In this chapter I have examined the notion of authority and considered the role of blockchain in establishing shared authority in the NML research project. Whilst this has highlighted how such an approach can open debate and conversation about the meanings and associations connected to museum objects, this discussion also indicates that a lack of use value leads to tokenism. This discussion has also included the role of trading as a use value, but this has shown how shared guardianship embodies an implicit expectation that the participant will not

sell their token. As such, what is the value in owning an NFT beyond it simply being a manifestation of labour and input?

In the final section to this chapter, I outlined the blockchain approach, which encompasses the idea of the DAO in community engagement practices in an attempt to address the unequal distribution of control in collaborative work. In this case, the NFTs are symbols of governance and belonging and are given to participants to signify their connection to the collaboration. This relates to fragmentation and enchainment theory as the NFT gains value and meaning through its use value. Like a fragment, the NFT symbolises a form of social and binding contract with the different collaborators, thus enchaining them together. This also emphasises the importance of trust and community. Indeed, it is important to reiterate that the technology can only produce the means for governance, but it cannot immediately address the innate issues of governing between people. Therefore, the technology is a framework to distribute agency, but it cannot create and maintain relationships between people.

This idea of community is important for blockchain technology on a broader scale. Blockchain Participant 4 highlighted how blockchain is built through a ‘double helix’ of community and technology: ‘everybody focuses on the technology but it’s actually like DNA, it’s a double helix, and the other aspect is community’ (Participant 4, Blockchain Interviews, August 2020). Without the community supporting it, a blockchain would cease to exist. Likewise, a ‘blockchain approach’ will only work if the participants choose to support and maintain the collaboration. Therefore, the role of blockchain in supporting enchainment and connection is contingent on the community choosing to use the technology.

Chapter 7: Conclusion: Reflecting on Social Value

7.1 Introduction

This thesis set out to examine how blockchain might contribute to collaborative projects in museums and produce social value through building connections and a sense of belonging in audiences. In doing so, this research has also investigated how this technology challenges traditional understandings around ownership, authority, and authenticity. In Chapter 2, I introduced themes that derive from these three ideas which included shared guardianship, migratable aura, and shared authority, and these themes have formed the basis of the theoretical framework and analysis of this thesis. This theoretical framework is also informed by Chapman's (2000) fragmentation and enchainment theory, an archaeological theory that considers how the purposeful fracturing of artefacts are used to form a binding social contract between the parties involved. Similarly, in this research I have considered the extent to which the point of digital fracturing could also forge new relations between a museum and a participant, thus creating shared or new connections.

This research is based on four research questions that are framed by the themes noted above:

1. To what extent does blockchain technology challenge digital ownership?
2. To what extent does blockchain technology contribute to digital authenticity?
3. How might blockchain technology contribute to work around authority and co-production in museums?
4. How might this approach produce social value?

Chapter 4 focused on the first question and there I reflected on the role of blockchain as a way to produce shared guardianship and shared experience in this research project. Meanwhile, Chapter 5 is framed around the second research question, and I considered the role of blockchain in building digital thingness and digital authenticity through the context of digital materiality. Lastly, Chapter 6 focuses on the third research question, where I critically reflected on whether NFTs support collaboration and connection, in doing so, this chapter concludes with the 'blockchain approach', which aims to harness blockchain in alternative governance structures that better support the idea of shared authority. Although all three of these discussion chapters reflect on the idea of social value, in the following conclusion I will develop the points noted and consider to what extent this project (and blockchain more generally) produces social value. Therefore, my objective here is to showcase how NFTs might be used outside of a monetary use case and consider how the NFT might be used in museum practices that go beyond fundraising and income generation.

7.2 Enchainment and Social Value

As noted above, Chapman's theory argues that purposely broken artefacts can bind the owners of these fragments together under a social contract. In this thesis, I have developed this point to explore digital fragmentation and at the core of this investigation is the role of blockchain technology in creating property ownership in the digital domain. In Chapter 4, for example, I identified this ownership as a form of decentralised ownership in which the technology gives the owner certain rights over their token such as the right to enjoy, the right to possess, the right to exchange, and, to some extent, the right to exclude. In this way, blockchain offers a digital version to the 'bundle of rights' that replicates the conditions of ownership in law.

Meanwhile, in Chapter 5 I examined how the technology provides these conditions for ownership through the exploration of an NFT's digital thingness (Sacks *et al.*, 2015; Zeilinger, 2018). This term is used in this research to examine the material elements of this technology and the discussion in this chapter highlighted how there are different aspects to a blockchain's materiality which create properties in blockchain tokens such as referential scarcity, permanence, and value. In turn, I argued that these properties are indicators of ownership because they enable an owner to retain, possess, and exchange the token in question.

The ability to sell the token is also central to the discussion in Chapter 6, which is centred on the theme of authority. The ability to control the token through choosing whether to keep or to sell the token reinforces this idea of decentralised ownership because the owner of the token has exclusive control over this right to exchange. This also reinforces an element of the right to exclude because the owner can decide whether to hand ownership rights over to someone or not. Of course, this is only an element of exclusivity and in each of the discussion chapters in this thesis I have critically examined this idea. To restate, a blockchain token is not completely exclusive because an owner cannot stop others from viewing the file nor stop them from copying and pasting the work. In other words, understanding the NFT as a form of protection or DRM tool is a false assumption. Consequently, an NFT only holds a referential scarcity since the token's scarcity derives from a point of reference in the public ledger rather than traditional exclusivity (Brekke and Fischer, 2020). So, what do we truly own when we own an NFT?

In addressing this point, I have argued that the cryptocollectible should be understood as a way to identify a work rather than to exclude others. Therefore, the technology is about connecting a specific person to a specific file whilst still allowing others to view and enjoy this piece. This is not a convincing argument for everyone (as highlighted by the mixed responses seen in this research project) because it requires owners of NFTs to change their understanding of originality and exclusivity.

I continued to discuss this idea of originality in Chapter 5 where I highlighted how blockchain reconceptualises the idea. Specifically, the technology encapsulates two definitions of the

term; firstly, it transforms the original file stored as a link in the public ledger into an *original* digital because this file is used to create the formal materiality of the NFT we see before us on our screens.[75] Secondly, the formalised materiality of the NFT is distinguished as a digital *original* because it is made unique through the process of documentation. Blockchain technology requires us to view this act of hashing and documenting as a way to make something unique even though the formal materiality of the NFT does not appear unique due to other digital copies being available. Therefore, digital originality is not the same as physical originality as it is not exclusively unique or scarce. Indeed, the technology 'does not reproduce the conditions of physical objects (scarcity and uniqueness), instead, it simulates the effects of these conditions' (Zeilinger, 2018, p. 30). I proposed here that the NFT mimics the conditions of authenticity and ownership to provide owners with a sense of claim and possession, however, I also believe that this mimicry or simulation is also a point of weakness in the NFT because it relies on the owner's perception of this state.

Building on this previous point, I considered in this research to what extent an added layer of personal value can address this weakness in the NFT. Drawing from the work of Pierce, Kostova and Dirks (2001, 2003) on psychological ownership, the methods used in this project encouraged participants to invest personally into their NFT and thereby gain an intimacy with it. This process of investment and labour would also pass these tokens over the threshold of originality, a point I discussed in Section 5.5. The added layer of the participant's investment then categorised the token as different from the original image and gave the NFT a feeling of personal uniqueness. Meanwhile, the technology provided the participants with a means to sell the token which indicated how the participants held a level of control and authority over their NFTs.

Despite this, the findings remain unclear as to whether this method contributed to a sense of ownership, enchainment, and social value. For some participants, such as Participant F, they saw the value in their NFT as a potential way to preserve their possession and personal story. Whilst with others, such as Participant B, there appeared to be a reluctance to see the NFT as something with its own value, instead, they saw their NFT as a duplicate and they felt unsure as to where this token sat in relation to the physical counterpart. In this respect, I concluded in Chapter 5 that the NFT is more of an 'extended' object of the collection rather than an entity in its own right.

Nevertheless, these findings suggest that there are different influencing actors and relations within this process. In the first instance, there is the technology that creates a nominal authenticity in the NFT. Secondly, there is the participant and their perception of blockchain technology and its contribution to originality, exclusivity, and ownership. Thirdly, there is the museum which, as the overseer of the project, plays an important role in authenticating

[75] To reiterate, formal materiality refers to the illusion of immateriality and seamless nature of the digital object.

these NFTs. Therefore, there is a triad of relations that interlace to help inform enchainment and social value through NFTs.

Taking a post-structuralist approach, this concept of a triad builds on Pierce, Rubenfield, and Morgan's (1991) argument that ownership is 'multidimensional in nature', and this research reaches similar conclusions to Jones (2010), that authenticity is formed from an interaction of people, places, and things. In both cases, the scholars understand ownership and authenticity to hold both an 'objective' and constructivist element. Put differently, ownership can derive from identifying someone as the owner of an object through their claim of the 'bundle of rights' or it can also derive from someone's emotional or psychological claim to ownership. Likewise, authenticity can be proven through provenance and material evidence as well as through the perception of aura and perceived authenticity. This triad argues that the material authentication of the technology interacts with the perceptions of the participant. The triad also adds authority into this mix by arguing that the institution has a significant part in the formation of value and enchainment into the blockchain token.

In examining this triad, blockchain technology creates the idea of digital property by enabling owners to claim their ownership and prove the authenticity of their token. I have described this as producing a nominal authenticity in digital content because the technology is used to store a digital provenance of any token exchanged in its network. For the owner, this means that they can sell their token as if it were a commodity; the token gains an exchange value and the owner gains control over their token.

Like blockchain technology, the museum also contributes to an authenticity in these NFTs through its authority particularly when it establishes the authenticity and importance of works in its collections. In Chapter 5, I identified how this aspect functions in two ways; firstly, it uses the idea of 'contagion' in which these NFTs are associated with NML. Secondly, this 'contagion' contributed to an iconic authenticity, where this connection to the museum supports viewers in perceiving these tokens as being part of the museum's collection. In doing so, this gives these NFTs a 'sign value', a term I derive from Baudrillard (1996). Sign value describes the value embedded into commodities that reflects style, taste, and power and Baudrillard developed this term in relation to Marx's definitions of use value and exchange value (Kellner, 2020). In using this term, I argue that the museum's authority also embeds sign value into these NFTs because this new association emanates the power of the institution. This sign value also works in relation to the technology to create a perception of an authentic and validated token. As such, the museum and the technology intertwine with one another to authenticate the NFT.

Nevertheless, this is contingent on the participant and their response to these two aspects. The technology might provide a materially authentic element to the NFT, but the participant must consider this to be a way in which to create something that is singular and different from the image in *Crypto-Connections* and the original physical object. The findings from this research highlight how this is not universally accepted. For example, in Chapter 5 I

examined how aura did not appear to migrate onto the NFT for every participant as perception of the digital was a contributing factor. In this respect, valuing the digital space and blockchain technology are overarching barriers to using NFTs in the process of enchainment.

Thinking about this barrier in more detail, it has also become important to ask to what extent a co-productive approach contributes to value in the NFT. In this case, the focus is on control, where the participants were able to choose the personal narrative connected with the object in *Crypto-Connections* and they also had exclusive access to their chosen objects as NFTs. The practice of working with participants to build object narrative resonates with an open authority approach discussed in Chapter 2. The objective with this approach is to cultivate a sense of stewardship through taking a more open attitude to interpretation and thus shift to a more dialogic and participatory model. In Chapter 6, however, I critically reflected on the collaborative element of the project and argued that the approach taken reflects 'tokenism' rather than shared authority since the participants have a voice, but they do not have the power to ensure that their 'views will be *heeded'* due to the lack of use value in the NFT (Arnstein, 1969, p. 217, her emphasis).

But some of the findings I discussed in Chapter 4 suggest that this collaborative approach has contributed to enchainment. The discussion on collective experience, for example, noted how the participants saw the *Possession Gallery* symbolising their experience of the project, hence, the NFTs are also symbols of the participants' work in this project and are a way to remunerate them for taking part. This same discussion also highlighted how the original objects in the museum have gained new associations for the group. Therefore, the NFTs and the original objects from the exhibition are secondary agents for the participants in which these items represent a sense of belonging to this project for each participant. Moreover, the pseudonymity of blockchain and the project also contributes to this idea as it was noted how this gave the participants a feeling of exclusive knowledge in which their labour and contributions are hidden behind the veneer of the NFT. I argue that this co-productive process to making NFTs has the potential to build a community because it encourages the participants to feel like they are members of this project and gives a feeling of belonging and inclusivity. In this way, the token is a sign of this membership, and the token has the potential to be used to imagine newfound connections between the participants and the institution.

The discussion on shared guardianship in Chapter 4 also builds on this notion. In this instance, I found that the process of giving an NFT to the participant created a layering effect of ownership. This was particularly significant with the museum-object NFTs because they represent a physical object owned by the museum. In giving the participant total control over the NFT, I argued that this opens up a contractual social relation which is forged through the museum and the participant investing into the NFT. In this way, the participant is not simply receiving an item that they have control over, instead, the token represents a binding connection to the museum where both the institution and the participant hold a level of

shared guardianship over the token. But this comes with certain parameters. I noted that many of the participants and museum staff interviewed felt uneasy about potentially selling it, which is reflective of the broader responses to blockchain in the museum sector. I compared this unease about selling to the idea of the moral economy in Chapter 6 and argued that the participants have gained a feeling of duty to care for their token because of this connection to the museum. In this respect, the sign value associated with the token via the museum has implicated its potential exchange and use value for the participant.

This idea of shared guardianship also supports fragmentation and enchainment theory as it implies that the process of 'fracturing' the original object into personal digital fragments can build connections between those that are part of this process. Therefore, I argue that shared guardianship is the principal aspect to the contractual agreement of the fragmenting process because it represents the idea of a relational and ongoing connection between the participating individuals and the cultural institution. In this respect, the token is a potential symbol of this concept and provides a feeling of membership and belonging. This idea exemplifies social value because it uses the experience of art to forge a new connection in the form of shared guardianship and group belonging. But this symbolism also limits the participant's control over their token because the use and exchange value are compromised, which raises the following question: is this symbolism enough for the participants to see these NFTs as valuable?

In this specific project, it is unlikely that this symbolism is enough for many of the participants that took part. One of the likely reasons for this is that the participants lacked a strong social identity since they had no previous relations to one another before the project started. Therefore, their sense of community only formed during the project. Moreover, and as I already noted Chapters' 4 and 6, these individuals did not want their stories attached to their chosen LGBT+ objects because of the personal and sensitive nature of the topic and so the objects chosen for *Crypto-Connections* were more generic pieces rather than pieces associated with the one commonality (sexuality) in this group of participants.

In this respect, if my NML colleagues and I had worked with an established community group and objects that were more directly related to them, then this idea of the NFT holding symbolism might have been enough for the participants to attribute these tokens as valuable. Indeed, a note made by Participant 6 from the museum interviews documented in Chapter 4.3.4 supports this idea as they remark on a case where they have worked with a specific Liverpool community at NML where each of the participants gained a copy of the work to take away with them, in other words, a memento of their time working with the museum. Likewise, the NFT is also a form of memento, but its value is ultimately dependent on the participants and their social identity and sense of belonging.

However, it is also important to reiterate the idea of 'keeping-while-giving' that I discussed in Chapter 4.5. Here, the argument is that there is a risk that the museum is not really giving anything away with these NFTs. The discussion on trading in Chapter 6.3 also emphasises

this point because if the participants do not feel like they can trade their token, what is the museum relinquishing? This returns to the question in the previous paragraph; is symbolism enough to produce value or should these NFTs have more of a use value? I proposed in Chapter 6.5 the idea of the 'blockchain approach' in response to this point which highlights different approaches where the NFT gains other values that go beyond being able to sell it as a commodity. In doing so, this section also notes a more collaborative approach to working with audiences and communities through the idea of the DAO and I argued that the DAO holds more resonance with the notion of the 'participatory museum' (Simon, 2010), or the 'post-museum' (Hooper-Greenhill, 2000), because it decentralises decision-making and consensus. It also embodies the idea of social value because it encourages ongoing relations through shared authority as the NFT provides a valuable use value. Therefore, the 'blockchain approach' has the potential to create a use value in the NFT that is more valuable than its potential exchange value.

In this respect, value remains the principal conclusion of this research project. The triad noted above describes the different relations that are required to interact with one another to produce an enchainment or new connections. Put differently, this triad describes the process of producing social value. I have argued that the technology produces exchange value through its ability to create digital property. The museum and a shared authority approach produce sign value, which gives the token a feeling of prestige and association. But, at the same time, the tokens in this project lack a real use value for the participants, apart from being a symbol of their work and belonging to this project, and this imbalance impacts the value dynamic in the NFT. Indeed, it puts the token's sign value against its potential exchange value where the participant must decide whether the NFT's associations with the museum and the project are enough to keep their token or to sell it and release its exchange value. I have argued that there are moments in this project that suggest that these tokens' sign value is enough for some of the participants. However, a use value, such as those suggested through a 'blockchain approach', could provide a counterbalance to these other two values. A use value that embodies shared authority would offer the participant something more than simply being able to enjoy the token, they would have a way to engage with the museum that goes beyond the project. Therefore, a use value has the potential to create a new connection that could be understood as social value.

7.3 Contribution of this Research: Digital Mementos, Personal Editions & Membership.

I argue that the core contribution of this research is to provide an overview of how NFTs might be used in the museum setting outside of the monetary focus. This includes exploring how the NFT could act as a digital memento, personal edition, or membership tool. Of course, this is not to suggest that there is no place for NFTs in fundraising and development strategies, but my arguments in this thesis show how the NFT can do more than create a monetary value.

With digital mementos, for example, the NFT is a way for audience members to gain a digital token that reflects their visit to the museum. Therefore, the NFT resembles the idea of a personalised digital postcard. However, the idea of a personal edition as a symbol of membership holds more social value for cultural institutions because the NFT is more than simply a reminder of a visit, indeed, it aims to be a symbol of a formed relation or partnership. I discussed this concept in Chapter 6 and proposed the 'blockchain approach', where NFTs are used as part of a wider governing system and so embody shared agency over decision making.

This approach would reflect the 'participatory museum' and embed partnership into museum processes of exhibition creating and collection interpretation (Simon, 2010). Of course, this method might not be the most effective tool for every project based in a museum. For example, it could risk simply projecting current governing structures into a digital format through the institution taking most of the control. This is the case with many art-NFT platforms where these platforms have become the new intermediaries rather than abolish the traditional gallery structure for artists (O'Dwyer, 2017). But these risks could be properly managed through the establishment of shared agreed rules and a distributed board of stakeholders, where the institution can no longer take over decision making instead it would have to go through this board of stakeholders and voted through using blockchain. In this case, the NFT would be a way to symbolise these different stakeholders and act as a means of entry into this governance system. In doing so, this could address some of the ongoing problems of sharing control with participants in curation and other consensus-based projects (providing participants are happy to interact with the technology).

The idea of a personal edition also reflects the idea of the 'polysemic' object in a digital and ownable format (Hooper-Greenhill, 2000). In doing so, this has the potential to build on decolonising conversations in the sector wherein the token could provide a means to highlight alternative voices behind museum artefacts. Using tokens in this way, however, could also encounter the keeping-while-giving problem noted earlier and so this use case would need to be applied alongside other methods in order to have an impact. For example, if the original work in question was returned to its source community as part of an ongoing partnership, the personalised NFT could be a way of representing this physical work in the gallery space.

In this case, both the museum and the source community would own an NFT, thus the token displayed in the physical gallery is a way of highlighting the relationship between institution and community that forms through repatriation processes. This would create an ethical understanding of ownership through digital property which would reflect more explicitly Geismar's (2008) understanding of guardianship used in this research. Therefore, there is an opportunity to build upon the idea of the personal edition in order to reimagine ownership structures in cultural collections which considers the different stakeholders of a work and ensures that each individual is fairy acknowledged. As such, the NFT can be used outside of its explicit monetary use case in museums

This research has also highlighted the ethical issues museums face when engaging with the technology including the problem of using a permanent and decentralised technology, the commodification of culture, the energy issue with blockchain,[76] and the question of what owning an NFT really means. The permanence of blockchain, for instance, means that the NFT cannot be changed once minted. Attaching interpretation and understanding as metadata will immutably link this meaning to the object. In this way, the NFT does not cater for adaptability or changes to understanding around an object, which is a potential issue because no meaning is ever fixed (Alberti, 2005). Although, in Chapter 6.2, I noted how comments might be added through a specific smart contract project called 'Scribe', which suggests that there is some flexibility in the NFT's metadata. But this also requires trust in the new owner to apply a comment that respects both the previous NFT owner's comment and the original object itself. Therefore, the decentralised nature of the technology requires cultural institutions to 'radically trust' because anything added to the token cannot be taken away.

In the case of the commoditisation of culture, the research emphasises a need for museums to consider the threshold of originality and creativity when producing new NFTs. In doing so, this can mitigate for ethical problems about selling works that are in the public domain and encourages museums to reflect on what they are giving away when minting and selling NFTs of their collections. This also highlights the issue of ownership and authenticity. Again, this research highlights how the technology requires individuals to perceive ownership not as a collective bundle of rights but rather as a collection of separate rights. In other words, token ownership gives the right to control, to possess, and to sell but not necessarily to exclude and this is because NFTs are both rivalrous and non-rivalrous in nature, which can be difficult to initially understand and to perceive as valuable. This produces an ethical issue because the value in owning a token requires the new owner to perceive this as valuable. That is to say, the value of an NFT is contingent on the participants involved. For museums exploring this space, this will be a pivotal aspect to any new project. Cultural institutions need to reflect on their target audience of the NFTs and consider whether this group will

[76] See section 7.4 for further details.

view these NFTs as worth owning. Without this consideration, NFTs will simply be another digital object that lacks any perceived value.

7.4 Limitations

The Theory

Chapman's theory is an archaeological theory that was formed on evidence of physical artefacts from Balkan Mesolithic, Neolithic, and Copper Age sites whilst in this project it is applied to consider digital fragmenting of artefacts from a cross-section of cultures and history. In this respect, can such as theory be adapted to the context of this research?

There are two key issues to raise in the context of this question. Firstly, each artefact in the NML project was only fractured once and so each participant received only two cryptocollectibles, one token of their chosen possession, and one token of their chosen museum object. This decision was due to the sudden high gas fees on Ethereum in July 2020, which are attributed to congestion from decentralised finance platforms (DeFi) (Chong, 2020; Young, 2020). Thus, the objects in this project are only divided between the museum and a specific participant rather than between a group of people, as implied by Chapman's theory, and this is a limitation because the study does not directly translate Chapman's argument into this digital context. At the same time, however, enchainment is the outcome for both Chapman's theory and this research project. But, in the project's case, enchainment between the participants occurs through the sense of belonging created in viewing the *Possession Gallery* rather than directly 'splitting' each digital object up and giving one fragment to each participant.

Secondly, the physical artefacts in this research project are not broken apart, but instead a digital version is fractured off and given to the participant. This challenges the essence of this theory because the physical object continues to live as an active whole. However, this thesis argues that the technology's ability to identify digital content offers a form of pseudo-fragmenting, where the feeling of ownership and authenticity in the token can simulate the effect of a fractured token. Additionally, in this research project, the *Possession Gallery* and its embedded smart contract are temporary which means that that these NFTs are completely unique as they will be the only tokens ever associated with this research project. As such, the digital aspect limits this study's ability to fully translate the process of fragmenting, but the uniqueness of an NFT attempts to address this through simulating the idea of a digital fragment.

The Technology

There are a number of limitations with the application of blockchain in this research project. For example, and as indicated in the previous section, gas fees and the volatile nature of cryptocurrency limited this project because of the increase in congestion during the minting of these NFTs. At the time of writing (2021), there are layer two options such as 'side-chains' (e.g., Polygon) or rollups (e.g., optimistic roll-ups or zero-knowledge roll-ups) that enables

buyers and sellers to exchange their NFTs on the Ethereum blockchain whilst avoiding these high fees, however, in 2020 these were not readily available nor embedded into the devised smart contract for this project.

It is also important to reiterate the point of digital originality and exclusivity with blockchain, which has been discussed throughout this thesis. Again, this limits the study because it requires participants to view the technology as a way of creating a valuable digital fragment of the object, and as the results have shown, this is not a universally accepted view. Hence, there are variables that are beyond the control of the project.

This point also highlights the problem of the technical barriers to using blockchain. My own knowledge on the technology has grown substantially over the years of this project, which has also meant that the methodology and my approach to blockchain in this research has evolved as my knowledge matured. Meanwhile, blockchain was (and to an extent still is) an unknown technology to a wide cross-section of the public and so recruiting participants was a difficult task as people were not interested in learning about blockchain. This is supported by the lack of interest in the first workshop, which meant that my colleagues at the museum and I had to cancel and reschedule the first workshop organised for November 2020. The participants that my colleagues from the museum managed to recruit also had little to no knowledge on what a blockchain was or what NFT stood for and so much of Workshop 1 in January 2020 was spent teaching the key aspects of the technology and explaining why it was significant. This required participants to grasp the technology in a morning session, and this lack of knowledge is likely to have impacted the level of enchainment formed during this research project.

Similarly, this knowledge barrier led to a time delay in the participants setting up their digital wallets as this had to be done remotely with detailed instructions. Their lack of knowledge in the space also suggests that these participants would lack the confidence in trying to sell their token even if they chose to do so. In contrast, this year (2021), we have seen an influx of NFT conversation in the arts industries which shows how there is more awareness of the technology than there had been previously and so this raises an interesting question of whether the results would be any different had this research project taken place in 2021 rather than 2020.

With this growing awareness, there has also been an ongoing discussion about the environmental impact of blockchain, which is a conversation that could negatively impact the work of museums on climate change. Blockchains such as Bitcoin and Ethereum are currently highly energy intensive technologies because of their protocols to mining known as ‘proof-of-work’.[77] The Bitcoin blockchain has no intention of moving to another type of mining protocol, however there have been ongoing discussions about how to use more green energy for mining transactions (Mir, 2020). On the other hand, Ethereum is in the midst of

[77] See Section 2.7.2

moving to Ethereum 2.0 and this will include moving to a 'proof-of-stake' protocol,[78] which is less energy intensive as it reduces the difficulty and speeds up the process of mining (but comes at the price of being more centralised and less fair (Zhang and Chan, 2020)). There are also 'side-chains' such as Polygon which work on a 'proof-of-stake' protocol and can be used to exchange tokens in the Ethereum ecosystem. However, Ethereum 2.0 has also been continually delayed and side chains such as Polygon are not yet available on every NFT platform. Therefore, cultural organisations who are interested in using the technology need to consider whether using such as technology is reflective of their mission and values. But there are also many other third generation blockchains available that can be used to produce a similar kind of token such as Algorand, Tezos, and Cardano, all of which use more environmentally friendly approaches to mining transactions. [79] In this respect, there is also a need to educate cultural organisations, collectors, and artists who are interested in using blockchain and to encourage them to use alternative blockchain models for NFTs.

The Pandemic

Lastly, the COVID-19 pandemic was also a limitation to this study as NML was forced to shut down from March 2020 until July 2020, which was the time that my colleagues and I were developing *Crypto-Connections.* This led to delays in the project as my colleagues who were based in the digital department had to prioritise other work over the project since the website became the visitors' only point of access for NML with its buildings shut. There were also further delays as I was unable to contact many of the participants during the first lockdown because they were on furlough and so were not checking their emails. In turn, the final workshop took place in July 2020 over Zoom, three to four months later than anticipated, and this time delay is likely to have led to some participants forgetting the initial workshop. Furthermore, I had discussed with colleagues at the museum about producing a temporary exhibition in the World Museum to present the project to the public, but this physical exhibition had to be scrapped because of this time delay and the uncertainty with NML being able to stay open. This physical aspect would have provided insight into the impact of blockchain in the context of the physical gallery space, a point which I discussed in Chapter 5.6. Therefore, the pandemic has impacted the results of this research project through time delays and lack of resources.

[78] See Section 2.7.2
[79] See https://www.algorand.com/, https://tezos.com/, https://cardano.org/ (accessed 3 September 2021)

7.5 Opportunities for Future Research

Building on the conclusions of this research, one opportunity for future research focuses on the role of NFTs as a system of governance. Such a concept builds on the 'blockchain approach' described above and would consider how governance structures such as DAOs could provide a more equal sharing of agency in collaborations with communities and audiences. Therefore, this future research would consider to what extent NFTs can be a tool in the maintenance and support of partnerships with museums. Specific research could focus on the recent idea of the 'constituent museum', which 'redraws relationships with local constituent groups, creating agency for them to inform the museums' collecting, curating, and presenting' (Outset, 2018, para. 2). In using this as a premise, the research could consider how the application of a DAO structure might inform this concept and produce a more efficient and equal relationship for discussion and feedback.

Smart contracts also offer another opportunity for future research. The smart contract in this research lacked any detailed information, but in Chapter 6 I proposed that museums could apply different considerations into smart contracts to create terms and conditions for NFTs. Again, as I noted in Chapter 6, smart contracts are self-executing pieces of code that act like technical agreements on a blockchain. Smart contracts execute, for example, when someone pays the expected sum of crypto for an NFT which will set off a chain of code that will enable the exchange of ownership. However, as Karen Levy (2017) notes, smart contracts are not 'street-smart', in other words, they do not consider the social aspect of law-binding contracts, they simply execute the terms when the conditions have been met. This offers an area of inquiry for future research because smart contracts are empty vessels for terms and conditions. Therefore, could these contracts embody the social aspect? What would this involve? Could a smart contract, for example, replace the artist agreement in collections? Or embed certain limitations to displaying, possessing, or selling? In this way, smart contracts could be used to investigate ownership rights associated with decentralised ownership such as the right to enjoy and the right to possess and, as the museum sector begins to explore NFTs, questions such as these will need to be considered.

Meanwhile, in Section 7.3 3, I proposed how the NFT could embody different perspectives of a museum object, which could produce NFTs that symbolise partnership and guardianship. Future research could continue in this line of inquiry by exploring the role of the NFT in building partnerships and decolonisation. Similarly, research could focus on the role of the NFT in embodying this work in the physical gallery space, particularly if the physical work were to be repatriated. How might visitors react to an NFT in the museum? Would blockchain technology give the work an element of aura? Could other technologies supplement the NFT's impact? In doing so, this would build on the findings from this research that examine the intertwinement of institutional authority and blockchain technology.

A final area for investigation involves the trading ability of NFTs. As noted throughout this thesis, there are examples of museums choosing to sell aspects of their digital collection as a source of fundraising and income.[80] The Whitworth is a case in point, however, their decision to retain 20 percent of any NFT sold also offers a new area of exploration. By retaining an equity of the work, the gallery will be continually notified when the NFT sells in the secondary market as they will receive a 20 percent cut of the sale. These exchanges will also be documented as a digital provenance for these NFTs. In doing so, the gallery can collect data on the frequency of exchange of their tokens. This data will provide important information about the wider practices of 'flipping' and selling NFTs in the secondary market, a space which is largely still under researched. At the same time, the gallery can start to collect a digital 'object biography' or 'itinerary' of the different NFTs produced, thus gaining understanding of how their value changes as they move through the crypto space (Appadurai, 1996; Kopytoff, 1996; Gillespie, 2015).

7.6 Conclusion

My aim in this research was to explore how blockchain technology might challenge themes such as ownership, authority, and authenticity and produce new forms of value in museum practices that go beyond the monetary. This value develops through a feeling of belonging and community that is bound by an ongoing relationship termed as shared guardianship. I have argued that this concept and the production of value in this project is contingent on a triad of relations that includes (digital) material, psychological, and authoritative aspects. Here, the authenticity enforced through the technology's digital materiality produces an exchange value in the NFT and this also binds with institutional authority to create a token with potential sign value. Co-production also contributes to this symbolic value as participants feel included and part of a group by participating in the overall project. However, participant perception and understanding of blockchain remains a key barrier to seeing this potential sign value as more valuable than the exchange value in the token and I have argued earlier that the introduction of a use value could potentially change this dynamic. But ultimately, there is a gap between the public and blockchain technology that will control the impact of any user-based blockchain project in the arts.

At the same time, my work with NML took place at a point of exponential growth in the crypto space. Over this period, terminology has changed (moving away from 'blockchain' and 'cryptocollectible' to 'NFT' and 'Web3'), the technology has evolved (from Ethereum to third generation blockchains such as Tezos and Cardano), and traditional institutions have started to interact with the crypto space (such as the British Museum and Sotheby's). Literature on the intersection between blockchain and art has also grown from a small selection of core books and research collectives (such as Catlow *et al.*, 2017; Gloerich, Lovink and De Vries, 2018), to a vast array of new projects, artists, and literature that examines the impact of

[80] See Section 2.7.4

blockchain and NFTs in the arts. My thesis, therefore, is a way to document this history and preserve our current understanding of the space as it stands in 2021.

I am grateful to NML for giving me the opportunity to experiment with a technology that was unknown to the sector at the time. Indeed, this CDA has challenged me to not only work with an institution but work with one with an unknown technology during a pandemic. In the first instance, NML is a large collection of different institutions with different collections, and this research is just one small project in the grander scheme of NML's work. This has been challenging at times, particularly during the pandemic when there was content and work that my colleagues had to prioritise over this project. The use of blockchain has also impacted my relationship with the institution. Like much of the work in the crypto space, my NML colleagues and I could not predict the potential challenges or concerns we might find in using this technology and so we had to tread carefully through this journey and unearth concerns and questions as the project developed. But many of these discussions had to be done remotely due to lockdowns and COVID-19 restrictions, which made it difficult at times to take a fully collaborative approach to this project. It also created difficulties when trying to ease concerns around the project when NFTs became part of mainstream conversation in the early part of 2021. As such, had this project been able to have a physical element, I wonder whether this might have alleviated concerns from colleagues about our approach and encouraged the institution to promote the project.

Nevertheless, my aim with this project was to provide an overview of how museums might wish to experiment with blockchain technology that interplays with ideas around ownership, authenticity, and authority. I have learnt a great deal through this process and hope that this research provides insight to the wider sector and highlights the beginning of a new sphere of digital experimentation in museums.

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