

Hail to the Thief

The appropriation of music in the digital age

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by Teresa Dillon, Futurelab

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1. INTRODUCTION

Our formative musical experiences, like our first memories of smell and touch, leave their imprint. Memories of primary home tape recording sessions when with my sister and neighbours we learnt the art of pressing 'play' and 'record', simultaneously. On our first attempt, we had picked up the radio's 'golden oldies' broadcast of Tina Turner's 'Nutbush City Limits'¹ plus our full-scale conversation about what we should tape next.

For this chapter, such experiences seemed like a fitting place to start. Within the 21st century new digital technologies are reinventing how we create, distribute and share music. Borrowing the title from Radiohead's album 'Hail to the Thief'², this chapter attempts to explore how digital technologies are used and repurposed by people to create new forms of musical expression and connection. Drawing on recent discussions on copyright laws and sampling culture, changes in the production and distribution of music have been lauded and denigrated by music industry professionals. Such responses clearly indicate the need for a greater understanding of how we create music, which could potentially lead to more thoughtful approaches to copyright and the use of new technologies within music. Exploring in depth how we create music, this paper illustrates with specific examples from research using existing and emerging technologies how central appropriation and the repurposing of existing material are to the creative process. This work is examined through the lens of sociocultural theory, and a brief overview of this position along with understandings of creativity and appropriation from this perspective is provided.

In sum, the chapter draws on current trends and discourses within the music industry, relating them to everyday practices of young and professional musicians, and exploring how through the use of digital technologies we are continually finding new modes through which to musically express ourselves. The chapter concludes with some final thoughts on future directions within this area.

2. THE RISE OF THE MACHINES

Since the advent of cassette tapes and home recording devices in the 1970s, the music industry has continually tried to control and legitimise the practices of music copying and distribution (Chestermann and Lipman 1988; Plumleigh 1990). The current proliferation of high-speed, wireless networks and peer-to-peer file sharing has changed and challenged the global music market (Fessenden 2002; Toynbee 2001). The music industry continually cries out that downloading and file sharing is crippling their markets, leading to reduced ticket, CD and record sales (eg Quantum 2004 report for ARIA, Australian Recording Industry Association). On the other hand independent studies (Goetz 2004; Oberholzer and Strumpf 2004) show that this 'cry of wolf' is questionable and in some cases unsubstantiated. Zentner (2004) in his large-scale study highlights how complex it is to track and predict such a link. For example he found that on average people who regularly download music online do not buy less music. However those with broadband access were found to buy less music compared to those that did not have broadband.

Despite contradictory findings, one outcome is clear; the result of our increasingly networked world is that the global music industry is pressuring governments to change copyright laws. Recent changes in the law have enabled the industry to sue individuals and organisations who are engaging in acts of music piracy via free peer-to-peer shareware. For example the

¹ Nutbush City (1973). Written by Tina Turner; produced (1973) by Ike Turner. Album: Nutbush City Limits (1973), The Collected Recordings (1994) and Simply the Best (1991; Producers CJ Mackintosh and Dave Dorrell).

² Radiohead, Hail to the Thief, Capital Records (2003).

Recording Industry Association of America (RIAA, www.riaa.com) provides a comprehensive online overview of cases it is processing as well as successful settlements. The RIAA has particularly clamped down on college networks where illegal free peer-to-peer networks are commonplace. Alongside this the recently published report from the International Federation of the Phonographic Industry (IFPI), the 'Digital Music Report 2005', provides an overview of the music industry's digital strategies for the fast-emerging market for online and mobile music distribution. The report indicates that portable players (eg iPod and mobile phones) are transforming the consumer experience of how music is enjoyed, with estimates that 50% of mobile content revenues will be from music. Such figures lead to questions about how such changes will influence the nature of music making and what kinds of interactions and practices will emerge from the everyday use of ubiquitous music devices?

2.1 The thievery corporation

Despite music industry and media hyperbole, the culture of downloading music is still in its infancy. According to the IFPI report less than one in ten people download songs, with the key sector been 16-29 year-olds. The report also states that only one in two people within this population are aware of the existence of legal ways of buying music online. With such facts and figures coming from the industry, their militant international campaign to cut down on music piracy and promote a legal downloading market is not surprising.

Running alongside the model of suing individual users and music pirates is the Creative Commons movement (creativecommons.org), pioneered among others by the eminent lawyer and cyber theorist Professor Lawrence Lessig. Creative Commons is a non-profit organisation which over the last two years has created around a dozen licenses that allow artists to make their work available to others by providing flexible opt-in licensing systems, thus providing musicians with greater control over how their music is released and used. What is interesting about the Creative Commons movement is that it recognises the link between how music is distributed and how it is made. Discussing these issues in a series of articles in The Wire magazine (November 2004), musicians and key members of the music industry, cultural commenters and politicians highlighted how musician's practices have always been involved in thieving and reusing samples from other musicians. Writing on the future of music sampling Thomas Goetz noted that:

"By nature musicians are thieves... every day, millions of music fans thumb their noses at record labels and exploit digital tech for all it's worth, wilfully swapping and - we'll say it - stealing music. In response, the Recording Industry Association of America has deployed an army of lawyers, initiating copyright infringement lawsuit against 5,400 file sharers (and counting) and lobbying Congress to boost penalties against both the scofflaws and the technologies they use..." (Goetz 2004, p182).

In attempting to provide an alternative model to the 'bust and clamp' model of the RIAA, Goetz and colleagues provide Wire readers with a free CD encouraging users to share, sample, mash up and release (not for profit or restricted profit) their new creations using the tracks provided by musicians such as the Beastie Boys, David Byrne, Matmos and so forth. What is interesting about this is how some of the most influential musicians of our time are consciously and critically engaging with the debates around how new media is transforming their profession. As David Byrne (singer, songwriter, artist and producer) noted when asked by journalist Eric Steuer, "is file sharing out of control?" Byrne replied:

"Not really. Imagine if book publishers decided they were against public libraries: oh no we don't like this because people can read books without paying for them and it's killing our sales. It's just not true. They might actually lose a tiny percentage, but they actually gain a lot more." (Byrne 2004, p186)

Byrne's analogy to traditional libraries is useful as it provides an everyday example though which the layperson can enter the debate. Musicians such as Byrne see the benefits both

culturally and commercially for an approach such as the Creative Commons. It is now becoming increasingly commonplace for musicians to release free downloadable tracks via their websites, and as highlighted by the Wire CD even provide sounds and tracks which users can manipulate to produce new music. Other forms of entertainment such as computer games often provide demonstration versions of music editing or composition packages with new releases (eg demonstration versions of the eJay Clubworld were provided with Playstation 2). Such examples are further indicators of changes in how music is produced, distributed and shared.

However, the production, distribution and sharing of music are often considered to be different aspects of the 'musical food chain' and consequently each has become a separate entity of work, study and research. An obvious reason for this division is that by and large each area has different concerns. Broadly speaking music making and the creation of new musical interfaces is generally considered as the more 'artistic' end of the spectrum, the unique expression of an individual or group. Music sharing concentrates on how people exchange music both formally and informally within and between their networks; while those working within music distribution are interested in exploiting such shared networks with the aim of selling and disseminating as much music and related paraphernalia as possible. Such distinctions are crude; these sectors are interdependent. As recent 'reality TV' talent shows have highlighted, the music business is a global machine, where artistry and creative expression are not always at the fore and where the team behind the face is the all important market force. Despite such cynicism, what is interesting about new media is how it's increasingly providing an interface through which the 'person-on-the-street' can interact with all three sectors simultaneously (eg third generation mobile phones; internet) allowing users to create their own music, distribute and share it across a wide network, at a relatively low cost.

Taking into account this cultural climate, the current chapter focuses on understanding in greater detail how digital technologies are used and repurposed by people to create new forms of musical expression and connection. Borrowing the title from Radiohead's album 'Hail to the Thief' and Goetz's reflections on the Creative Commons acts, the chapter explores the collaborative creative process through the lens of sociocultural theory, examining how people borrow and draw on existing musical repertoires, reusing them to create and distribute their musical creations.

3. OVERVIEW OF SOCIOCULTURAL THEORY

Sociocultural theorists (Cole 1983, 1990; Luria 1976; Rogoff 1990; Vygotsky 1978, 1988; Wertsch 1985) attempt to go beyond the individualistic analysis of cognition, emphasising the importance of participation in social interactions and culturally organised activities for development. Emphasis is placed on the mutually constitutive relationship between the individual and their environment and the intertwining of natural, biological process, with the mastery and use of cultural mediated tools, in particular psychological (eg speech) and physical tools (eg pens, computers, digital media). Key to this perspective is the notion that all human activity is mediated; that is, humans use tools and signs to communicate with the world.

3.1 Tweakin' it and makin' it your own: the 'art' of appropriation

Sociocultural theorists (Cole 1983; Rogoff 1990; Wertsch and Tulviste 1998) continually emphasise how all cultural tools and activities are embedded within a sociocultural milieu, that is, they are derived from situated social practices, which have evolved over time and history. Appropriation as defined from a sociocultural perspective (Engeström 1987; Newman, Griffin and Cole, 1989; Rogoff 1990; Rogoff 1995) is a key concept in understanding how we use cultural tools. Within this chapter the term has assisted understanding how we use and repurpose existing musical repertoires and cultural customs in order to create new ways of

making and sharing music.

Over time humans have learnt to use and make different tools (fire, wood, pens, cars, computers) their own. It is this process of 'making them our own' that sociocultural theorists refer to as 'appropriation'. For example, classical composers use and reuse notational forms to create new music. Similarly hip-hop composers sample and resample other people's music, to create new tracks. However appropriation is a complex process. Implicitly it involves understanding how the tool is designed and currently used by others within the community, but also how it is perceived by the individual user. For example in order for a hip-hop artist to compose a new track using pre-existing samples from another artist's tracks, they have to know a wide range of music in their genre so that they extract the samples they need; know how to manipulate the sample so as to make it sound different; have the sensitivity and musical expertise to know what works and does not work; have an understanding of copyright laws and be able to embed the treated sample in a musically interesting way into their composition.

Added to which, as the sociocultural theorist Barbara Rogoff (1990) notes, appropriation is not just about a particular individual's internal thinking processes, it is also about recognising how in actively engaging in an activity and using a tool a person can transform the practice. In this respect, Rogoff considers how the person who is participating in an activity is a part of that activity, not separate from it, once again emphasising the mutuality between the individual and their environment. In this respect appropriation is not a one-way process, as it fundamentally entails an understanding of the relationship between a society's current understanding of an activity and tool, and an individual's take on it. According to Engeström (1987) this relationship can cause tension particularly when the individual's interpretation is different to society's. Similar to Rogoff, Engeström considers how such tensions can be resolved by the creation of new artefacts and social practices.

What Rogoff and Engeström importantly highlight is that appropriation is not a one-way interaction, it's not all 'take-take', by making music our own; we in turn influence the surrounding practices. This process of appropriation was most notable in the Beastie Boys' interview with journalist Eric Steuer in the November 2004 issue of Wired magazine. As the pioneers of hip-hop and sampling culture, the Beastie Boys made headlines in the 1980s for their blatant rip-offs of various sounds and cultural references. Being white Jewish New Yorkers, their send-up's of their own cultural background changed the face of alternative rap-punk music. Their influences can be heard today in acts such as Goldie Looking Chain³, Outkast⁴ and Peaches⁵. Being one of the first groups to be sued in the US for their use of other artists' music, their reflections complement Rogoff's view on how practices are transformed and the tensions between an individual's (or in this case the band's) and society's views of music. When asked about the differences in making sample-based music in 2004 when compared to their earlier work in the 1980s, Mike Diamond (aka Mike D) from the Beasties Boys notes:

"We can't just go crazy and sample everything and anything like we did on 'Paul's Boutique'⁶. It's limiting in the sense that if we're going to grab a two-base section of something now, we're going to have to think about how much we really need it. But then the flip side is that it pushes us to be creative. We have to look for stuff to sample that is maybe more low-profile. And take what we find and manipulate and recontextualise it in

³ www.youknowsit.co.uk

⁴ www.outkast.com

⁵ www.peachesrocks.com

⁶ Beastie Boys, Paul's Boutique, Released 1989, Capitol Records, (p) (c) 1989 Capitol Records, Inc. Written and Produced by: Beastie Boys and Dust Brothers except 'Ask For Janice' Produced by Mario G Caldato Jr.

a way that makes it sound totally new. If we tweak it enough and make it our own, then it might not even be an issue..." (Steuer 2004, p186).

Mike D's comment not only reflects on how the Beastie Boys' DIY sound and attitude changed how music was made through sampling and its associated copyright laws, but also transformed their own creative processes and methods. This example demonstrates the tensions that Rogoff and Engeström discussed in relation to the tensions between individual and societal interpretations of a particular tool and how such frictions are resolved through the creation of new artefacts and social practices. Mike D's reflections on sampling as recontextualising sound highlights how the Beastie Boys resolved the issue between their approach to music making and the current climate of copyright, by further pushing their creative sampling processes into new territories by making the sampled sound their 'own'. This process of appropriation, which includes the repurposing of pre-existing published music to create not only new material but also new audiences, modes of expression and new uses of digital technologies, is cyclic in nature and highlights the essential mutuality between cultural producers and their environs. From this perspective appropriation could be considered as an essential part of the creative processes, and one that has existed between humans and their surroundings since we started banging on wood. The following section explores the relationship between creativity and appropriation in more detail.

4. CREATIVITY AND APPROPRIATION

Early research defined creativity as a linear, problem-solving process (Dewey 1910; Rossman 1931; Wallas 1926) or a particular form of intelligence (Guilford, 1959). These approaches highlighted the importance of divergent rather than convergent problem solving for creativity. However they also perpetuated the 'genius in the tower' view of creativity, overemphasising the role of the individual person and their product/s at the expense of understanding how the process and place influenced their production. Consequently, although early research did acknowledge that part of being creative was making new associations, it did not acknowledge how this was actually achieved, and therefore the possibility of appropriation and reusing someone else's ideas and making them your own was not really considered.

In critique of person-product notions of creativity, Csikszentmihályi and Getzels (1970, 1971, 1973, 1988) were some of the first researchers to discuss how previous models failed to deal with one of the most interesting characteristics of the creative process, namely, a person's ability to define the nature of the problem and the processes this involved. In addition they also highlighted the importance of the social context. Csikszentmihályi (1988) in his latter work, discussed how creativity emerges in virtue of a dialectical process among individuals of talent, domains of knowledge and practice and fields of knowledgeable judges. It is through this dialectical process that over time, what we consider creative and whom we consider creative is negotiated. Similarly during the 1980s Amabile (1985a, 1985b, 1989; Amabile, Goldfarb and Brackfield 1990) began to systematically examine how the 'qualities of environments', that is the factors outside of the individual, influenced creativity. Amabile found that extrinsic factors, such as evaluation, surveillance, reward, competition and restricted choice, constrained or deterred creativity. Although such work acknowledged the influences of the sociocultural environment on how we defined creativity and how it influenced creative production, person-product driven notions still dominated much of the discourse until the 1990s (Boden 1990; Craft 1999).

Consequently it is only within the last five years there has been an increasingly greater understanding the collaborative creative processes (Dillon 2003, 2004; John-Steiner 2000; Miell and Littleton 2004; Sonnenburg 2004). At the heart of this work is an attempt to understand the complex dialectical and interdependent process between the social and the individual, which gives rise to creative expression. It is through further understanding of the creative collaborative processes that we can begin to comprehend the role of appropriation within music making using digital technologies. The following sections discuss this in relation to

research carried out on the use of sampling software within school and community centre contexts and interconnected musical networks (Weinberg 2002a), that is computer systems which allow players to independently share and shape each others' music in real-time.

4.1 This ain't bad; this is heavy - young people's dialogues when making music together

Across all UK secondary school subject areas the proliferation of digital technologies has changed the nature of learning. Music education now includes the use of tools, such as programmable keyboards and computers, as key learning and music making instruments. Despite such usage there is relatively little understanding of the kinds of musical experiences and interactions such instruments might support. In an attempt to address this, Dillon (2003, 2004) carried out a series of four studies using sequenced keyboards and eJay, sample-based software. eJay⁷ is a CD-Rom that contains pre-recorded vocal and instrumental samples that allows users to compose, arrange, edit and record music in dance, rave and hip-hop styles. Once installed it turns your PC into a mini-editing studio. Four studies were carried out:

1. Secondary school context, during lunch break, using sequenced keyboards (involving 18 participants; 10 male, 8 female, mean age 14.06 years).
2. Secondary school context, during normal school music lessons using eJay (involving 18 participants; 12 males, 6 females, mean age of 13.6 years).
3. Boys and Girls Brigade meetings, community centre setting, using eJay (involving 18 participants; 10 male, 8 female, mean age 13.8 years).
4. Girl Band (involving 6 female participants; mean age 14.8 years) in a community centre setting, and summer music camp setting (involving 7 female and 3 male, mean age 14 years), using eJay.

The aim of these studies was to gain further understanding of the young people's creative collaborative process through analysis of their verbal dialogues.

During each of the sessions, participants' interactions were recorded on video and observational notes were made. From the videotapes, all participants' verbal dialogues were transcribed verbatim. Transcripts included all talk and relevant non-verbal action. Analysis of the dialogues was carried out on both a quantitative and qualitative level using a coding scheme developed by the author focusing on both content and affect. For the purposes of this chapter analysis the coding scheme and methodological approach will not be discussed as it distracts from the overall emphasis of this chapter, which is to discuss the appropriation of published music in new ways using technology. If readers would like to know more about the coding scheme they should refer to Dillon (2004) or get in touch directly within the author.

The results of the studies provided an overview of the kinds of collaborative creative thinking processes the young people engaged in, when making music using sequenced keyboards and eJay. The main findings discussed the qualities and characteristics of different phases of the creative cycles that participants engaged in, with detailed discussion about how important the processes of discovery and exploration were to problem finding and participants' joint creative efforts. In relation to the main themes of this current book, what was particularly interesting were the caveats of dialogue where some evidence was found to support how young people drew on pre-existing repertoires and published music to support their music-making processes. For example in the school setting where the young people were working together using sequenced keyboards, they applied and reused traditional and religious Indian tunes, rhymes

⁷ www.ejay.co.uk/home/default.asp

such as 'Mary Had A Little Lamb' and theme songs from films such as Titanic within their composition process. This rich background of musical experience allowed participants to jointly develop their compositional ideas.

Sequence 1 from the school keyboard session illustrates how participants K and P reused simple children's nursery rhythms to make up the ABACADA compositional structure that they were asked to work with. For example they used the tune of 'Mary Had a Little Lamb' as the 'last' (Line 70) section in their piece. The following sequence shows K and P working together; with K was writing down the notes on the composition sheet and P working on playing the sequences and their joint efforts to construct the piece. For example when K did not remember all the notes to 'Mary Had a Little Lamb, ("what does it go like again?" Line 72), they worked together to co-remember the notes.

Sequence 1: School setting: Keyboard collaboration: Dyad 1: Nursery rhythm sample

No	Turn	Participant	Transcribed discourse
63	2	K	Ah... in it goes
64	1	P	No, no
65	1	K	Ah right, copy that along though
66	1	P	I thought, Mary Had a Little Lamb [K and P play the tune. K then plays it again and begins to play and write down the sequence on the task sheet. P starts to play something else while K does this]
67	2	P	Did you like that one [referring to the song she was playing]
68	1	K	Many... [ie how many notes in Mary Had a Little Lamb]
69	1	P	Many [plays]
70	1	K	That can be the last one [that is, that Mary Had a Little Lamb can be the last song or sequence that they fit into their composition pattern]
71	1	P	Alright
72	1	K	What does it go like again? [P plays, Mary Had a Little Lamb]
73	1	P	No, that's not it
74	1	K	I think it went
75	1	P	Alright maybe

Similarly, Sequence 2 demonstrates how the participants' shared filmic references influenced their compositions. Participants F and M had learnt in their current school year how to play the theme tune to the movie Titanic. They explicitly referenced the film's score in Line 63, referring to one of the lines in the song, 'my heart will go on'. Again this reference explicitly showed how the participants drew on their existing published repertoires, reusing them to co-develop and create new compositions.

Sequence 2: School setting: Keyboard collaboration: Dyad 7: Film theme tune sample

No	Turn	Participant	Transcribed discourse
63	2	F	Shall we play 'my heart will go on' from the beginning [refers to the theme tune of the film Titanic]
64	3	F	r'n'b [reference to the sample they are listening to along with playing 'my heart']
65	1	M	Exactly
66	1	F	No leave it on it's funny [ie leave the r'n'b samples on]

From a different perspective, an extract drawn from the one of the eJay studies demonstrated how partners identified the sound they were producing with particular styles of popular music (Ibiza dance and 'trace' music, refer to Line 447 and 450 respectively). In using pre-existing samples drawn from dance music the software provided a platform through which users easily click, drop and drag the samples onto an arrange page and thus create their own individualised tracks. In this respect, the software in itself appropriated and repackaged a particular style of music and made it accessible for users to create dance music. As demonstrated in Sequence 3 the possibilities that this opened up for these two young women were exciting, as they began thinking about whether they had it in school and how great it would be to have at home (Line 459, "I'd love to have it in my house"). Although they wished it could have more r'n'b samples (Line 469), the possibility that you could record your voice on meant that they could create their own backing tracks.

Sequence 3: eJay Music Camp: Dyad 2: Cultural references

No	Turn	Participant	Transcribed discourse
447	2	1	This is more like Ibiza [ref to composition style]
448	1	2	No, you could have it there, OK just, all you got to do is just move everything along [discussing where to move the samples on the arrange page]
449	1	1	Yeah I know, but is it going to be good though
450	2	1	Coz this is more trancey ain't it
451	1	2	Yeah it's going to be alright [rearranging samples so to fit in new sample]
452	2	2	It'll be OK, they're all good [reference to the sample]
453	3	2	There to there [directing where to move the samples on the arrange page]
454	4	2	I wonder if we have this at school?
455	1	1	What's the effect?
456	2	1	This is better than them [pointing to particular samples]

457	1	2	Yeah I know
458	1	1	I love all those [again referring to particular samples]
459	2	1	I'd love to have it in my house [ref to eJay programme]
460	1	2	Yeah right, that would be alright
461	1	1	And then we could get our voices on to it [ie their own voices]
462	1	2	Ah, that would be, like get a beat going and hop, make a song of it
463	1	1	Can you get your voice on to it; you can, can't you, yeah, but not here
464	1	2	Oh yeah you can, yeah, have a proper studio but you couldn't do it here, they haven't got the right equipment
465	2	2	This ain't bad though; this is heavy [ie this is good]
466	1	1	It's really good isn't it, there is so many things you could do
467	1	2	I know, you could actually make a whole song
468	1	1	Yeah, this is good
469	2	1	But I wish we could have something like r'n'b
470	1	2	Yeah
471	1	1	But there doesn't seem to be anything, we could try it, but we haven't looked at everything have we so [ie they have not yet checked out all samples]
472	1	2	No [in response to not having tried looking for all the samples]

Ref =referring; r'n'b = rhythm and blues

What Sequence 3 highlights is how eJay, in repurposing particular genres of music, made dance music more accessible for a general audience. Like many similar CD-Rom-based sampling softwares, eJay reuses a particular style of music for the general entertainment market. The educational sector in turn picked up on this and began using eJay within classroom settings. What the software provides is an entry level to learn about music composition and in particular compositional arrangement. From this basis further developments and associations can occur. As demonstrated in Sequence 3, for these two young singers the software opened up new avenues of exploration which previously were not considered, such as recording their voice and laying it over the samples, thus creating their own song and accompanying backing track.

In sum the first two examples illustrated how the young people used their shared musical histories to co-create their compositions and how this shared knowledge supported them in jointly developing their musical ideas, while the third sample demonstrated how music software manufacturers repurpose existing musical styles to create packages which provide an entry through which people can create from pre-recorded samples, new musical pieces. In

addition the third extract also highlighted how in working with this software new possibilities for musical development were provided.

In many ways these examples of young learners' musical practices complement the professional practices discussed by Mike D in the previous section (refer to section 3.1), where he spoke on tweaking the samples enough, so as make them your own. In Sequence 1-3, we see evidence of the young people learning this process, as they grab, use, tweak, refine and develop new work from their shared musical repertoires and pre-existing samples. The following section continues to explore these themes by focusing on emerging networked and sensor-based technologies that are providing novel approaches to music production.

4.2 Interconnected Musical Networks

In the previous section the interaction examined occurred around the technology, in that the young people were working synchronously, side-by-side, around the keyboard or computer. As noted Interconnected Musical Networks (IMNs) (Weinberg 2002a) are computer systems that allow players to independently share and shape each others' music in real-time. What is interesting about such musical networks is that the interactions occur through the technology, facilitating not only synchronous, virtual communication but also asynchronous communication and in some cases side-by-side and face-to-face interaction. In this respect, IMNs potentially facilitate wider forms of musical collaboration.

The history of IMNs can be traced back to Cage's early experimentations with interconnected transistor radios which inspired groups like the Oakland, California, group League of Automatic Music Composers (Bischoff, Gold and Horton 1978). The League evolved into a subsequent group in 1987 called the Hub, which employed more accurate communication schemes by using the MIDI protocol to compose music by networking PC computers (Gresham-Lancaster, 1998). As the internet evolved early systems were developed to enhance joint composition processes (eg NetJam Latta 1991). NetJam allowed a community of users to collaborate and produce music in an asynchronous way by exchanging MIDI files through e-mail. Later William Duckworth's 1997 piece 'Cathedral' was one of the first interactive music works created specifically for the web where live events composed by users were broadcast online (for details of this work refer to Duckworth 1999). Further developments in this area, such as Jordà & Barbosa (2001) and 'F@ust Music On-line' (FMOL), allowed users to compose synchronously online, while Weinberg, Aimi and Jennings' (2002) 'The Beatbugs Network' allowed for interdependent musical collaboration in real-time in the same space.

Discussing the benefit of contemporary, wireless and broadband IMNs, Weinberg et al (2002) note that they are flexible enough to operate in the same physical environment and over distributed, remote networks, thus allowing designers to create interdependent frameworks where players can influence, share and shape each others' music in real-time. This can potentially lead to rich social and musical experiences that enhance collaborative musical interaction. However, as Weinberg et al discuss how IMNs have tended to be used within the domain of high-art (eg internet and network art), consequently their potential for social, collaborative music making and sharing music has yet to be fully realised. According to Weinberg et al, composers and designers of IMNs have tended to obscure their potential to support expressive and social interactions by creating overtly complex interdependent networks that do not convey the interaction to players and audiences.

4.2.1 The Beatbugs

In an effort to address the challenge of bringing IMNs to wider audiences, Weinberg et al (2002) created 'The Beatbug Network'⁸, one of a series of musical tools developed through the

⁸ www.media.mit.edu/hyperins/projects/beatbugs.html

Media Lab's Hyperinstruments/Opera of the Future group. The network is an interconnected collection of digital instruments (Beatbugs) aimed at encouraging collaboration and social play via music for children and young people, but they have also been used by adults and with people who have special needs. When networked the instruments allow users to trade, control and synchronise with each other in real-time. Along with Beatbugs the group have also created other hyperinstruments such as Fireflies⁹ and Simple Things¹⁰. Basically all these instruments are hand-held computers that contain sound manipulating devices, which employ varying types of pressure controllers which trigger the sound. The instruments gain their power when networked with other instruments but can also be used independently. For more technical details on The Beatbugs and Fireflies refer to Weinberg 2002b; Weinberg et al 2002; Weinberg, Lackner & Jay 2000.

When using the Beatbugs collectively, users usually form into a circle and literally 'pass' music samples to each other. In this respect the communication is side-by-side, face-to-face and synchronous. Each musical sample received is tweaked and edited and then passed on to another player. What is interesting about this approach to collaborative music making is the merging of individual and collective output. Similar to an orchestra, each Beatbug player plays their own instrument but simultaneously and in real-time is contributing to an ongoing, evolving composition. As the 'beats' get passed around the circle, players have time to reflect and consider what do to next, and one receiving a 'beat' has the possibility of modifying it or adding a new sound. In relation to the current discussion the Beatbug Network provides an example of how new networks are supporting real-time co-construction and repurposing of each players personal musical input through sensor-based, hand-held computers.

4.2.2 F@ust Music On-line

Completing the work of Weinberg et al, Jordà and colleagues (Jordà and Barbosa 2001) designed the 'F@ust Music On-line' (FMOL) as part of the Catalan theatre group company La Fura dels Baus show F@ust 3.0 (1997). The aim of their IMN was to develop a net-based virtual synthesiser and graphic interface which allowed users (professional, amateurs and newcomers) to compose electronic acoustic music and synthesise it in real-time over the internet. The best of the finished pieces were then selected to become part of the soundtrack for La Fura dels Baus show and later were made into a CD.

To support online synchronous communication, Jordà and Barbosa's design permitted users to listen to already existing pieces and either modify them or create their own new pieces. In enabling users to modify existing pieces an inbuilt user profile and preference system was created. The user profiling system allowed users to input their preferences (eg preferred musical genre, favourite instruments, musical training and level of expertise). The FMOL system then provided users with suggestions such as potential partners for collaboration, or the most adequate musical pieces for participation in collective composition. After working on a suggested piece, the author evaluated the quality of the proposal. This information was stored in the system and taken into account in its next proposal. In this respect the system was constantly being tuned and attuned towards the preferences of the users by taking into account their feedback responses. Initially FMOL versions 1 and 2 discarded the implementation of real-time interaction between different users, mainly because of synchronisation and technical restrictions, but this feature was implemented within the final versions, which allowed several players to share a common environment and improvise together (Jordà and Barbosa 2001).

What is of particular interest about Jordà and colleagues' interface is their use of a preference system, which in some ways provided a base for remote users to begin collaborating. Their system supported remote users, who had never met before and therefore had no previous

⁹ www.media.mit.edu/hyperins/projects/fireflies.html

¹⁰ www.media.mit.edu/hyperins/projects/simplethings.html

knowledge of each others' backgrounds, with the possibility to achieve common ground and successfully build on each others' work. As a tool it scaffolded online communication between musicians and provided an initial platform through which common ground for musical communication and appropriation was facilitated. For future research it would be interesting to examine whether the project would have been as successful without such a preference system, and what other mechanism would need to be implemented in order to support the work.

5. CONCLUDING THOUGHTS AND FUTURE DIRECTIONS

The aim of this chapter was to explore how digital technologies are reinventing how we create, distribute and share music. The concept of the 'thief' was used as a guiding metaphor, as the 'thief' is considered as some who takes from one pot to feed another and in doing so creates new opportunities.

Sampling culture and file sharing have permeated nearly every aspect of music production and consumption, leading to the increasing recognition that we have always been 'thieves' and continue to be so as we appropriate, use and repurpose music through new digital medias. The evidence for appropriation and how we reuse existing material to create new musical artefacts was highlighted in extracts from interviews with professional musicians and research carried out by the author on young people's creative collaborative processes when using computers and keyboards. In particular the work carried out on young people's collaborative creative interactions when making music on keyboards and computers (Dillon 2003, 2004), and the work on IMNs (Jordà and Barbosa 2001; Weinberg 2002a; Weinberg et al 2002) indicated how existing and new digital technologies designed for music composition are providing users with avenues into the professional practices of composition and sampling culture. The research with young people working side-by-side and around computers highlighted how their personal musical memories and knowledge of pre-existing musical works was appropriated and reused within the compositional practices. Similarly Jordà and Barbosa's F@ust Music On-line preference systems provided means through which remote, online users could build a similar kind of common ground by sharing their personal music preferences online and through this be matched with an appropriate collaborator. From this base they could then either build their own composition of reuse or modify an existing user's piece. On the other hand, Weinberg and colleagues' Beatbug Network provided a wireless network through which users could work side-by-side and face-to-face over a certain distance but in the same physical space, using hand-held devices. In this network participants co-developed their composition and in real-time built on each others' samples, reworking them as they were passed between players within the Beatbug network.

Overall these examples showed how currently existing and emerging digital technologies are providing new means through which we can access, download, share, compose and co-construct music on-the-fly. The increasing pace of technological advancement has meant that the global music industry is struggling to keep up, causing knee-jerk and in some cases oppressive reactions. In this respect the Creative Commons is a measured, welcome response, providing an alternative which meets both producers' and consumers' demands. The reality is that we are increasingly becoming a more networked, pervasive musical world. Recognising the social, creative and political power of such networks is important as they not only provide a medium through which we can express ourselves but also challenge us not to simply rip-off dominant or existing approaches to music but actively develop new practices and opportunities. Future work in the creative, software and academic sectors needs to pay attention to these challenges and to the global debates on music copyright and piracy. As this area develops, it will be interesting to see how countries who have by-passed landline telephone networks start to use broadband and mobile networks to create and share music, and the influence this will have of our understanding of music on a global, local and personal level.

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