COMPUTER SUPPORTED COOPERATIVE WORK

Consuming Music Together:

Social and Collaborative Aspects of Music Consumption Technologies

Edited by

Kenton O'Hara

and

Barry Brown

Springer

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PART 1

INTRODUCTION

Chapter 1

CONSUMING MUSIC TOGETHER: INTRODUCTION AND OVERVIEW

Kenton O'Hara and Barry Brown

1. Introduction

Listening to, buying and interacting around music is an immensely important part of everyday life and a key part of the cultural material through which social action is constructed and organised (e.g. DeNora, 1986, 2000; Hargreaves and North, 1997, 1999; Cohen, 1993; Crozier, 1997). Music can make us feel happy or sad, relaxed or energetic, it can highlight special occasions or evoke valuable memories. Music is a rich part of our environment - providing cues for structuring activity and creating appropriate atmospheres and ambience. Music also plays a role in our social lives – talking about, displaying, swapping and sharing music are all ways through which we express who we are and interact with others (e.g. Brown et al, 2001; Willis; 1978; Frith, 1978).

The way we consume music is not simply about listening but involves the ways it becomes integrated into our personal and social lives. This is very much determined by the technologies through which we experience it: how music is distributed, rendered, purchased, organised, shared, chosen, listened to, interacted with and repurposed. This relationship between technology and the ways people consume music in their everyday lives can be illustrated by looking at some key technical shifts over the years and how they created new and interesting social phenomena around music consumption. A notable example here is home taping technology. At the time of its introduction, this technology was seen as a threat to the music industry in terms of replacing actual music purchases. Social Research has shown, however, that the effect of home taping on consumption was much more complex providing a means by which friends could swap and share music. Such behaviour was socially rich, providing a vehicle for conversation, identity management and tokens of affection and gift giving. A second notable example,

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also based on tape technology was the hugely influential Sony Walkman. Through this process of miniaturisation of music delivery, the Walkman allowed music to be consumed in new places such as the car and urban environments. As a consequence music consumption could now accompany, a whole host of new activities under new social circumstances (e.g. Bull, 2000; du Gay and Hall, 1997).

Yet technical shifts over recent years have disrupted existing music practices and created new social phenomena around music and its consumption. Parallels with the above examples can be seen in more recent technological advances, namely peer-to-peer online file sharing applications (e.g. Napster, Gnutella) and the hugely successful iPod. While in some respects, these new digital alternatives afford some common social and behavioural phenomena with their historical counterparts, there are also significant new behaviours and social consequences of their new digital capabilities. For example, with peer-to peer applications such as Napster, the sheer scale of the Network over which music is shared can have a tendency to remove some of the social aspects of the music sharing seen with swapping tapes among friends. Likewise, a simple increase in storage capacity afforded by the iPod over the Walkman allows entire music collections to be carried around with a person. Not only does this change listening behaviour and circumstances, it also affords the social value of the portable device as a projection of a person's musial identity.

The aim of the current book is to explore the impact of technology on the way people consume music within the context of their everyday lives. In particular, the concern of the book is to emphasise the social and collaborative behaviours and values that occur around music consumption. It seeks to understand the role of technology within these practices: how technology shapes these practices and in turn how these practices shape new technology. While, there has been much pioneering work in the social sciences around the social circumstances and values under which music is consumed (e.g. DeNora, 2000; Hargreaves and North, 1999), these have, with a few notable exceptions (e.g. Bull, 2000), not been so concerned with the techological components of these practices. Likewise, many discussions of new technological possibilities for music consumption have not attempted to couch their descriptions with reference to the intricate details of social practice outlined by the social sciences. The current ungrounded debate in the music industry around music piracy and copyright theft stem from the lack of careful attention to social practices in relation to new music technology. There is a narrow concern for music consumers as passive audiences for distributed music rather than thinking of consumers as active *users* of music.

With this in mind, the current book brings together the work of key researchers from both the social, and computing sciences, documenting in detail how music technologies are currently used and the complex practices which have arisen around music listening. The book goes beyond reporting on current social practices of music consumption to explore what *new* technologies can be built, and the potential new social and collaborative possibilties these may bring. Accordingly, this book combines studying current practice, with the design of technologies for new practices. It containts both lessons from the present, and the technologies that will likely be important in the future. By combining the careful study of social situations with the design of new technologies in this way, the book bridges two different research approaches which have much to gain from each other. Bringing technology design to social research can focus research by the need to test findings in the form of specific technologies. In turn, bringing social research to technology design can prove to be a powerful motivator for new design concepts, as well as grounding technology in real life practices and needs. As the chapters in this book show, the combination of social science work with technology design can break important ground in both designing technology and understanding the social world.

2. The Book

We begin the book with a chapter by Tia DeNora. DeNora's work is an important starting point for the book in that it introduces some of the key ways in which music "gets into" our daily lives and experiences. Music, DeNora argues, is a key resource in the formation of a social reality; a resource from which social, cognitive and emotional structures are created through people's everyday activities as social beings. Understanding the ways music plays a role in the formation of our everyday social experiences is key to exploring technologically mediated musical experiences. In this respect, DeNora's chapter lays some of the important foundations of social understanding around music that pervade many of the discussions of new technologies elsewhere in the book. Drawing on three actual examples of music experiences in everyday life (listening to a song on the radio; an aerobics class; and an in-store shopping experience), she sets out to demonstrate the key *theme* of the chapter, namely that music, via its emotional effects, is a condition of action in real time. It is part of a conglomorate of features (e.g. actors, time, space, acts of engagment, social conditions and the material spatial environment) that produce social events. Drawing on a musical metaphor, different ways in which the social effects of music are manifest are presented as *variations* on the main *theme*. One such variation is that music, as part of the aesthetic of social spaces, suggests or encourages appropriate actions or roles we might play in these spaces. It is part of the way people make sense of a place. Another variation is the way music triggers memory and that remembering is key to the process of musical occasioning. That is, music is not simply paired with memories but, rather, music is seen as a fundamental *part* of the thing being remembered as well as a fundamental part of means 'through' which the remembering is done. Music is used to structure situationl ambience and emotion; to get people in a particular mood and to convey social meaning to other social beings. Further, music is considered as a technology of the self. The extent to which people comfortably or uncomfortably inhabit a musically configured space, and the actions through which this is conveyed, highlight characteristics of the self and others. Music, then, becomes a resource for the identity work that people do on a daily basis. New music technologies, and the new modes of distribution and use they bring, shift the ways in which some of these social and emotional activities and experiences can be realised. This inevitably raises many new questions and it is these which we are beginning to explore through the social-technical investigations presented here in this collection.

2.1 Sharing Music

The next section of the book tackles the issue of music sharing, a particularly salient topic in recent years with the rise of on-line file sharing applications, such as Gnutella, Kazzaa and Napster. The chapter by Brown and Sellen opens the section with a critical look at the rhetoric surrounding the industry debate about on-line file sharing and its impact on the music industry. Much of the rhetoric, in particular that from representatives of the music industry, has been infused with negative value judgements in relation to music sharing behaviour. Use of terms such as "*piracy*" and "*copyright theft*" leave in no doubt the moral message the industry is trying to communicate. The moral values found in this rhetoric, though, seem at odds with those found in the everyday copying behaviour of ordinary people. Brown and Sellen argue that this industry rhetoric stifles sensible consideration of the issues around copying issues. Brown and Sellen take a step back to understand how music sharing behaviour fits into the broader context of music consumption behaviour, such as listening, buying, owning and collecting. Exploring the pragmatics of music sharing, the authors explore how conventional music sharing is something which is embedded in social practices. For example, Brown and Sellen discuss how music is played in social spaces where friends come together. The music that accompanies these social gatherings is, as DeNora would argue, a resource for social "occasioning" in the way it is chosen, listened to and discussed. Music become a vehicle through which tastes and values are are understood, discussed and evaluated. Music tastes are a resource for understanding and portraying the identity of friends within these networks.

It is not unsurprising, then, that the majority of music sharing takes place in exisiting social networks. As discussed in the following chapter, sharing among existing social networks is an important reason for the success of iTunes. It also helps understand the importance of collecting music because of the way it comes to represent something of the self and the group. With this, an important feature of these collections is how they come to be displayed to others; this act of display being bound up with the impression management work that gets done among friends. Likewise, the actual exchange of music between friends becomes rich with social meaning, ritual and reciprocty (cf. Taylor and Harper, 2002). It embodies key aspects of the relationship between the giver and the receiver and demonstrates, for example, the giver's knowledge of music and awareness of the receiver's taste and circumstances (indeed much of this social element of music sharing is lost in the relatively anonymous large scale online music sharing applications). What Brown and Sellen argue is that ownership and sharing of legitimate and copied material takes place within the context of particular social values and meanings. It is only through this level of understanding that we can engage in a sensible debate about on-line file sharing practices, music piracy and different ways that music can be distributed and purchased legitimately.

The second chapter builds on similar arguments but with a different technology, namely iTunes and, in particular, the ability of iTunes to share music on local networks. With iTunes, Voida et al. argue that the 'person' (which Brown and Sellen claim is lost in the large scale peer-to-peer file sharing applications) is returned to the centre of the music sharing experience. Unlike previous file sharing technologies, the sharing of music files in iTunes does not involve them being copied across machines. Rather they are streamed from one computer to another on a particular subnetwork. This unique position of iTunes within the spectrum of music sharing possibilities enables new social effects to be created. It is these which Voida and her colleagues unpack in their study of the everyday practices of music sharing in the workplace using iTunes. By displaying individuals' music collections and making them visible to others, iTunes becomes a resource for impression management and other social acts such as those outlined in DeNora's work. People not only use it to make judgements about other users but are acutely aware that they too are being judged by others.

This chapter highlights people's behavioural changes that occur in the knowledge that they can be viewed and judged. For example, people were seen to rip more CDs to their iTunes to create "representative" collections. A critical aspect of this impression management comes from the fact that iTunes only shares music across a subnetwork. What this means is that the members on this subnetwork are likely to meet in real life, and to share membership of real world social and organisational entities. In constrast to other online communities where identities can be entirely fabricated, the subnetworks have social meaning reflected in the real world. In this regard, Voida notes, for example, how the presence of a departmental manager on the subnetwork, creates an impetus for refining identities as portrayed through playlists and online names. The chapter goes on to argue that this relationship between the online and offline networks is important enough that problems are caused when the mapping between them is not perfect – for example, when a departmental member finds they are on a different subnetwork from their colleagues.

The streaming of music rather than copying also lends itself to particular frustrations, for example when a colleague's machine is switched off. This also makes the ritual hand over of music a slightly different proposition in iTunes than it is with the more tangible exchange associated with, for example, compilation tapes. Voida nevertheless points to some additional behaviours to which social and emotional significance is attached and which approximates to some of the gift giving type behaviour associated with music sharing, e.g bringing in CDs and ripping them to iTunes especially because someone "special" on the network wants to listen them.

2.2 Choosing Music

In the next section, the book examines issues concerning choosing music. Given some of the social consequences that music brings about and the social meaning it can convey, the control over music weilds significant social and economic power to those who possess it. Different technologies allocate this control across parties in different ways in particular social settings. This distribution of control over music in public spaces is explored in Chapter 5 by O'Hara and colleagues. They look at key stakeholders in a public café/bar setting and their different reasons for wanting to control the musical aesthetic of that space. For the owners of that space and those who work there, music is used to differentiate different periods of the day and fit comfortably with the kinds of social activity appropriate for these periods. Likewise, through the choice of music and its properties (e.g. volume) they are able to maintain a certain amount of social control over the group of people who go there (e.g., playing a cheesy tune at the end of the evening being used to encourage people to leave). However, by keeping all the control over music with the owners of the space, the patrons of the café bar are left unempowered. They are passive consumers of the music that is played for them.

O'Hara et al. attempt to explore the importance of music choice for both parties in these public settings by altering the distribution of choice and noting the social effects. They do this by inroducing Jukola, a digital jukebox that allows the patrons of the bar to collectively nominate and vote on what music should get played from the bar's music collection using handheld computers on the tabletops. Introducing such technology inevitably created a certain amount of tension among the owners and workers of the space since it removed some of their ability to maintain social control and manage identity through music choice. However by empowering the patrons of the space, it created new possibilities for social action through music choice. Choice of music was something which became discussed and negotiated and this became the basis for doing identity work, shared reminiscing, communication of power relations and 'doing friendship' through playful games around the choice. What is highlighted by the chapter is the importance of thinking about music choice in *process* terms rarther than simply *outcome* terms. The introduction of the technology does more than just improve the musical outcome to reflect more closely the tastes of the patrons. Rather, it changes the whole *process* of choice in the sense that the end consumers become actively involved in the choice. It is through the conversation and negotiation leading up to the choice that much of the valuable social meaning of music is embodied.

In Chapter 6, Crossen and Budzik present their Flytrap recommendation system. Digital technologies for purchasing and listening to music have provided an important source of data that can be used for socially grounded music choice and recommendations. Data mining techniques employed across groups of people can help derive patterns in listening and purchasing behaviour and relationships between songs and music genres that simply would not be available through reflection and introspection. The aim of the Flytrap system is to use such patterns to select music in public settings that reflect the shared preferences of groups of people in these settings.

Like the pioneering Music FX system (McCarthy and Anagnost, 1998) from which it's inspiration is derived, Flytrap uses active badges to identify who is in a particular public space and on the basis of their respective listening profiles, calculates the preferred tracks to be played. However, the Flytrap system has some key differences from Music FX both in intent and design. In particular, the aim of Flytrap system is not just to create a more enjoyable musical outcome that matches the tastes of the group. Rather, it aims to provide a musical common ground" that can be used to promote social interaction among its participants. This aim has particular implications for the construction of the algorithm used to calculate the appropriate music. It is also the reason why they explored different ways for people to visualise how a choice was derived from the preferences of people present in the space. This makes more explicit to the users of the system, the links between music and actual people – again highlighting the social importance of music and identity. This contrasts with other systems such as Music FX which, in some senses, were designed to make these things disappear. The Flytrap system also derives its information from the actual listening habits of people. The system has an agent attached to the media players of individuals' computers. This is important for a number of reasons. First is that there is no burden on the users to create their musical profiles. Rather it is something that is derived automatically in the background. Second, it allows for a much richer set of information to be derived that relates to the context of listening habits and which can be used in a more sophisticated group preference calculation. This "automation" of choice raises some important questions and the need for a balanced approach to the design of these systems. For example, as with the chapter on iTunes and later chapter on tunA, there are concerns with how the public and private are managed. Making things visible has both pros and cons according to particular circumstances. Flytrap, in making individual preferences visible to others is no exception to this concern. Likewise, there is debate raised about the extent to which automation can fully be achieved given the complexity of social and contextual factors that influence music choice. So while the Flytrap system has the potential to extract a richer and richer set of circumstantial factors that could facilitate automation, the authors also highlight that there comes a point where some mediated human intervention should be given.

2.3 Mobile Music

Given the cultural significance of portable music technologies over the years, notably the Walkman and most recently the iPod, the next section of the book is devoted to mobile music. The section starts with a piece by Michael Bull, who in Chapter 7 explores the culture of mobile music listenting through perhaps the most significant music technology of recent years, namely the Apple iPod. While these mobile music devices are generally characterised and understood as personal stereos, Bull argues that the behaviours surrounding them are deeply social. These devices allowing music listening practices to be immersed in a whole host of new social spaces and situations, altering the way people relate to their surroundings (the aesthetic dimenison of relational experience) and to other people within those surroundings (the moral dimension of relational experience). These mobile listening devices then, through the strategies used to control music in public places, become a means by which our sense of the social becomes, mediated, managed and understood. To illustrate this, Bull presents a Taxonomy of control strategies seen in the use of personal stereos and explores the social consequences thereof. For example, headphones are used as an implicit "do not disturb" sign. Likewise, listening to personal stereos in public affords a certain amount of "civil disattention" (Goffman, 1971) by allowing what Bull calls a non-reciprocal gazing– an important concern, in particular for women who wish to avoid the unwanted gazes of others.

While Bull acknowledges the social context of personal stereo use as not being something peculiar to the new crop of "MP3" players, he highlights that their new functionalities provide new means by which music can be controlled in public spaces. He discusses how features such as flexible playlist creation or shuffle play, as well as the large storage capacity, dramatically alter the consumption of music and auditory aestheticisation of experience in public spaces. In addition, because of its huge storeage capacity, the iPod becomes an embodiment of people's musical identity which they can then carry around with them. They become something that can be browsed by others with whom one is interacting, again with important social consequences. Indeed, this even allows them to be used as the basis for "iPod clubs" in which people use their own particular iPods to provide the entertainment for a particular social occasion. This leads on to the other key feature of Bull's chapter, namley the *collective* listening behaviours that occur with the iPod. Bull highlights how particular features of the iPod make it more likely than it's Walkman predecessors, to be used as a collective listening device in shared spaces such as the home or the car. Accompanying these collective possibilites are a range of new social issues such as power and control that were not so apparent in consumption behaviour surrounding tradtitional personal stereo use. For example, who controls the iPod when there are passengers in the car or when more than one person is listening to it in the home. These become important considerations for how these devices should be conceived and how they might come to be designed in the future.

The collective use of portable music devices is picked up in Chapter 8. In this chapter, Bassoli and her Media Lab colleagues present the tunA system, a mobile peer-to-peer application for proximity based music sharing. The work builds on the notion of music consumption as a social experience, drawing on, for example, observations of shared Walkman use (as described in the work of Michael Bull) and the social motivations underlying the success of certain on-line music sharing applications. While Bull's work highlights the sometimes subtle and implicit aspects of "*personal stereo*" use, Bassoli's tunA system seeks to more explicitly support the social and collective in a reconceptualised *Walkman* design. Essentially the device is an MP3 player with wireless networking capabilitites. When other tunA devices come into range it is possile to share the music profiles on these other devices. Playlists on the other devices in range can be viewed, music from one deivce can be streamed to another for synchronous listening, and tracks on other devices can be bookmarked as a reminder. On top of this, the devices also have the ability to message between each other such that people can have text based conversations. In this respect, the music becomes a *conversation key* (Sachs, 1992) for people, providing them with a socially important resouce for initiating communication with coproximate others. Such technical capabilities raise all sorts of intriguing social possibilites and concerns. These devices, much more than personal stereos, become a resource for identity understanding as well as identity presentation. The music carried around with you can no longer be understood simply in terms of what people want to listen to. Its visibiltiy to others means that it becomes something to be carefully managed in terms of what gets presented to particular people under particular circumstances. As with the discussion of iTunes presented earlier, this visibility has potentially both positive and negative social consequences that need to be carefully managed. For example, what might be regarded as a positive projection of identity in one set of circumstance, may in another set of circumstances be an invasion of privacy and security concern. The chapter goes on to explore issues such as these through a small scale user trial of the system.

Ostergren and Juhlin in Chapter 9 discuss music listening in the car. The work described in the chapter draws again on key observations in the work of Michael Bull (2001). First, that music listening is a key part of the aesthetic experience of driving and something which "binds together the disparate threads of much urban movement" and which makes interesting the otherwise mundane places that people travel through. The second, is that while driving is often in many ways a solitary activity, in traffic, much of this is an *accompanied* solitude. In traffic, drivers are aware of the presence of other drivers around them, taking an interest in what they look like and what they are doing. These brief social encounters with other drivers in traffic are a place where judgements about each other are exchanged on very limited information, such as what they look like, the car they are driving, etc. For Ostergren and Juhlin, the car driver is a modern day *flaneur*.

With these observations in mind, they set out to create a more social experience around the music that people listen to in their cars. They present their SoundPryer concept, a collaborative car stereo which, like the tunA concept described in the previous chapter, moves away from the notion of music listening as a solitary experience within the bubble that is the car. Sound Pryer allows both local play as in a traditional car stereo but also remote play in which the device picks up local broadcasts from other Sound Pryer users. The system is deployed on a PDA and uses MANET technology to provide a cost free broadband exchange using the inbuilt wireless transmitters the PDAs contain. The range of this wireless technology is limited. This, though, is regarded by the authors as an advantage as it emphasises the importance of physical proximity in the shared musical experience as opposed to something that is removed from space and the possibiltiy of seeing people with whom you are sharing music. This shared musical experience comes either from *listening in* to the music of passing Sound Pryer users or by being *listened to* by passing Sound Pryer users. Both of these types of experience immerse people within a social interaction along the lines of the brief traffic encounters described in the work of Michael Bull (2001). Importantly in Sound Pryer, the interface presents some representation of the car that provides some means of identifying the music played with a particular car. This allows people to use the system for *identity work* seen in other systems presented in the book. In the fieldwork they present of the system in use, people were seen to look round for the source car from which the remote music was being broadcast. Likewise, as modern day flaneurs they would also smile at passing drivers if they felt that driver was listening into their music. Doing identification work through shared music consumption is thus considered to be an experience enjoyed from both sides – from the listener and the one being listened to.

2.4 Music and Dance

In this next section we take a look at music and dance. As well as the collective nature of dance in relation to music, the section explores the associated fan cultures and communities that surround music consumption through dance. It does this from the perspective of some very different technologies. In, Chapter 10, Jacob Smith, takes a look at music video games and their fan culture, focussing most explicitly on the dance simulation games, Dance Dance Revolution (DDR) and ParaParaParadise. With DDR consoles in arcades, players choose a song to dance to. The machine then plays the song along with a series of dance moves in the form of arrows on the screen which direct the player to touch the corresponding dance pads with their feet. This activity must be done in time with the music. As the player interacts with the music through the dance, the machine responds to the performance with cheers and boos and associated terms of encouragement or derision. In this sense, the game creates a heightened sense of interaction with the music. An important feature of this interaction with the music through dance is that the body becomes a spectacle. Being played in arcades, these are public settings where the body spectacle typically attracts an audience. That the performance is public changes the way music is consumed in much the same way that kareoke changed music consumption through the publicity of its performance (Drew, 2001). For Smith, this public performance in arcades becomes an important part of the development of the fan culture around DDR, a fundamental social part of music consumption practices. Local DDR clubs get together to compete against each other in tournaments. Particular kudos is given to performers in these tournaments who learn the moves in reverse specifically so that they can turn around to "dance for the crowd" rather than the machine.

Alongside the fan culture that is built up through these localised in situ activities, Smith also examines the role of the Internet in the creation of a more global fan culture around DDR. Fans, for example, are able to discuss the peculiar brand of Japanese Hip Hop that is unique to DDR, the uniqueness of which is an important part of the whole DDR experience, fan identity and sense of community [1]. Fans are also able to discuss their favourite songs online, swap the songs and search for DDR rarities. The web sites also feature videos of tournaments that allow people to follow the fortunes of their particular teams and star performers. In this resepct, the chapter argues that the Web has mainstreamed fandom, making it much more readily available to people. The chapter goes on to explore some interesting gender issues associated with fan cultures that arise through the types of dance encouraged by the charateristics of particular interaction devices. With DDR, the dance pads encourage a very physical and athletic style of dance that has created a sometimes macho community and culture – in particular, as seen in the competitive nature of DDR tournaments. This is contrasted with the much more restrained Para Para dance of ParaParaParadise in which the player interacts with the game via infrared sensors responding to choreographed hand movements. As a consequence, the nature of the dance is much less competitive resulting in a more open and less competitive online community. What Smith demonstrates in this chapter, then, is how such music games provide new ways for bodies to interact with pre-recorded music and how this can become a significant and powerful factor for the formation of community and performance of identity.

The discussion of music, dance and community continues in Chapter 11

[1] With more recent home versions of the game, the song selection also consists of some more mainstream songs as well as the more bespoke DDR Hip Hop. In this respect, the game creates new ways in which to consume and interact with more mainstream music.

by Karneza Moore. In this chapter, Moore offers a socio-technical persepctive on "clubbers", dance music consumption and contemporary "clubbing" culture. The focus of this socio-technical analysis is not on the technlogies that one might typically associate with dance music/club culture (e.g. DJ Decks). Rather, she explores a seemingly much more mundane technology and the role it plays in the organisation of dance music consumption practices, namely the mobile phone. Of particular interest here is that in contrast to many of the other technologies presented in this book, the mobile phone has, at first glance, a somewhat indirect relationship to music consumption practice. However, this importantly broadens the way we think about technologies in relation to collaborative music consumption. In Moore's analysis of club culture, then, the phone is positioned as a technology that is inextricably bound up in the social and collaborative experiences of dance music consumption; a technology that is both a creator and enabler of dance community activities. The aim is to move our understanding beyond the simple notion that clubbing is just a "group of people coming together to listen to music at a set time and place." The organisational practices of dance music consumption are something which extend to contexts and settings pre and post club and into "real life". It is only by examining these practices across these broader settings that we can come to understand the social and emotional siginificance of mobile phones for dance clubbers. Such an understanding, Moore argues, can play an important role in the design of new mobile applications and services in the domain of dance music consumption.

Bearing in mind the above discussion, Moore presents key examples of mobile phone use within clubbing culture. First is the role of the mobile phone in the procurement of illegal substances prior to going into a club. The consumption of illegal substances goes hand-in-hand with the consumption of dance music. As illegal substances, though, there is inevitably risk associated with these procurement practices. Key here is the mobile phone and its relationhip to the perception and management of risks associated with this procurement of illegal drugs. Second, is the use of the mobile phones in the organisation of clubing nights out. While this may not appear something unique to dance music culture there are specific practices of this organisation that are. For example, the rounding up of "randoms" as well as "real life" friends is an important feature of the open culture of organising clubbers nights out. The mobile phone also brings a certain fluidity and mutability to the arrangements which paradoxically is both a source of feelings of freedom as well as anxiety that arrangements will fall through (especially in combination with illegal substance use). Within the club itself, the mobile phone provides the means to maintain group bonds. Text messages are used to bring disparate party members together when a good tune comes on as well as to manage the wellbeing of friends through particular phases of substance use. Through these findings, then, Moore presents a more grounded notion of clubbing culture and commuity as mediated though mundane technologies that actually relate to the real world practices and values of "clubbers".

Staying with the dance music and the nightclub, the next chapter considers a somewhat different technology. In Chapter 12, Cliff presents an automatic DJ system called *hpDJ* in which collections of dance music are sequenced and seamlessly mixed by a computer. The mix that is output from the system is presented as a single continuous audio file that can be played in a nightclub of people or through a media device such as an iPod. Our concerns here are with the use of the system within a nightclub setting.

Sequencing is of course a very social concern in that the ordering of music is used to transport a group of people through various emotional and physical states. There is also an important social relationship between the DJ and audience, with the DJ using “white of the eyes” feedback from the audience to fine tune what is played and when. While Cliff respects these social concerns, he argues that there are key features of the task that are mechanistic and which therefore make it ripe for automation. He also argues that that there are alternative ways to derive feedback from the audience using sensor technologies from which social and behavioural judgements can be made. The social nature of dance can be “summarised” through patterns of sensor technology output. With this in mind he presents extensions to the core hpDJ system, that use a variety of sensor technologies to determine ongoing crowd response to an automated sequence of music. This feedback is used to determine ongoing sequencing. Some of these technologies passively sense features of the environment or audience; others depend on an explicit technology mediated response from the audience such as a button-press vote. In this respect, the crowd determines the sequencing collaboratively as well as potentially composes completely new remixes collaboratively. Cliff raises many interesting issues about copyright, authorship and ownership that come about due to the new and explicit relationships between the audience and the ongoing musical composition. It is these issues that we turn to in the final section of the book.

2.5 Consumption as Production

The final section on Consumption as Production opens with a chapter by Atau Tanaka. In Chapter 13, Tanaka describes how new technological infrastructures for creating, rendering and distributing music, change the way that music can be consumed and appreciated. Accordingly the relationship between producer and consumer must shift. A key part of Tanaka’s work centres around the notion of *idiomatic* writing. That is, people write music that specifically suits the particular charactersitics of the instrument on which it is to be performed, or the acoustical properties of where it is going to be performed (e.g. a Cathedral). Tanaka’s claim is that while idiomatic writing practices have been employed in relation to instruments and spaces, they have not really been applied to particular properties of the new technologies for rendering and distribution of music. Take for example, network music performances in which music is performed not just for a local audience but also to be consumed by an audience of people over the Internet. Transmission delays and losses in quality are typical characteristics of music via this medium that traditionally have proved a frustration to many musicians. The argument of the chapter, however, is that such characteristics are an inherent property of the medium which need to be embraced in more idiomatic composition.

The basic tenet of idiomatic writing becomes of particular interest here when Tanaka introduces technological possibilties for end user participation. In the *MP3q* system, for example, the listeners mix multiple music streams using an abstract graphical text interface, as well as contribute their own sounds. The musical piece starts off as an empty shell but is evolved by the participation of the listeners who add their own contributions as the base material for the piece. The point here is that the original author has to give up a certain level of control over the piece. The composition for them lies in the creation of the "open system" which listeners can contribute to. The production process changes by virtue of the interactive possibilities for the end consumer.

Tanaka's broader aim then is to find the "musical voice" idiomatic to the democratic network and create architectures for collective musical processes that blur the boundaries between production and consumption. With this in mind he presents his Malleable Mobile Music System in which people collectively listen to a familiar piece of music via their respective portable music players. The music is remixed on the fly according to the movements and gestures of the listeners as they move around an urban environment. The music is sensitve to the social dynamic of the listeners. In this resepct, music pieces are no longer seen simply as deterministic products to be downloaded and consumed. Rather, they are better viewed as structures of possibility, to be completed only at render time with the active participation of the listeners.

The relationship between content producers and consumers is further explored in the final chapter by Dillon. Once again the rhetoric of the music industry surrounding copyright laws is called into question, this time within the context of contemporary sampling culture in music making. Within this culture, music is not simply consumed as an end product but rather is appropriated and repurposed in the creation of new music. The everyday practices of music consumption within this sampling cluture do not fit neatly within the music industry's model of copyright and piracy. This has led to the formation of the Creative Commons Movement (CCM) which recognises the link between music distribution and creation through the repurposing of distributed content. This link is manifest in the CCM's more flexible licensing arrangements associated with distributed materials that allow them to be apppropiated within the sampling culture. As with Brown and Sellen's efforts to inform music industry rhetoric, Dillon argues that an exploration of everyday music repurposing practices is necessary to inform the debate. Towards this goal, she presents some research looking at the everyday collaborative music creation practices of school children. As with O'Hara's distinction between *process* and *outcome* described in Chapter 5, Dillon argues that creativity cannot be understood by simply looking at the outcome product. Rather, to understand what is really happening, it is necessary to look at the *process* of music creativity. The process Dillon presents is a collaborative one. This collaboration is a social process; a negotiation that provides an opportunity for many of the social values of music to be manifest. Through one's orientation to particular samples, their associated cultural references, and how one makes these visible in their repurposing, much social meaning can be expressed.

Dillon continues the explorations of collaborative music creation and content repurposing with a discussion of Interconnected Music Networks. These allow distributed groups of people to collectively repurpose material in the creation of new music. Much of the work in this area has been criticised for its tendencies towards high art rather than appealing to a broader audience. Dillon however, highlights some exceptions, namely the Beatbug Network and F@ust Music Online. Again it is the social aspects of these processes that the chapter draws out. With the F@ust system for example, users input their preferences for musical content to be repurposed. These preferences become a common ground scaffolding on which strangers are brought together online to collaborate creatively in producing new music through the reporposing of mutually understood published content.

Through her examples, then, Dillon shows how the new technological possibilities for accessing, downloading, sharing, composing and co-constructing music on-the-fly mean we need to rethink our approach to the consumption of published music. The music industry, she claims, should recognise the social, creative and political power of computer networks in the ways people can and will be able to consume music in the future. Rather than becoming entrenched in existing approaches to consumption, the industry should understand and embrace the new practices and opportunities that technologies are bringing in a way that suits both consumers and producers and the evolving relationship between them.

The collection of chapters presented here is not intended to provide a comprehensive account of social and collaborative music consumption practices as mediated through particular technologies. Rather, the attempt is to consolidate some important examples of research effort and the diverse perspectives they represent. Without this consolidation, it remains difficult to assimilate these diverse perspectives and, as such, many important issues get overlooked by the respective social and technical camps. By drawing the perspectives together, we hope to raise questions and highlight issues that help us think more critically about the social shaping of music consumption technologies and the technological shaping of social practices surrounding music consumption.

References

Brown, B., Geelhoed, E. and Sellen, A., 2001, Music sharing as a computer supported collaborative application. In *Proceedings of ECSCW 2001,* Bonn, Germany, 179-198.

Bull, M., 2000, *Sounding Out the City: Personal Stereos and the Management of Everyday Life.* Oxford. Berg.

Bull, M., 2001, Soundscapes of the Car: A Critical Ethnography of Automobile Habitation. In Miller, D. (Ed) *Car Cultures*, Oxford: Berg.

Cohen, S., 1993, Ethnography and Popular Music Studies. In *Popular Music* **12**(2), 123-138.

Crozier, W.R., 1997, Music and Social Influence. In Hargreaves, D.J. and North, A.C. (Eds) The *Social Psychology of Music.* Oxford: Oxford University Press.

De Nora, T., 1986, How is extra-musical meaning possible: music as a place and space for work. *Sociological theory*, **4**, 84-94.

De Nora, T., 2000, *Music in Everyday Life.* Cambridge: Cambridge University Press.

Drew, Rob, 2001, *Karaoke Nights: An Ethnographic Rhapsody*. Walnut Creek: Altamira.

du Gay P. and Hall S., 1997, *Doing cultural studies, the story of the Sony Walkman*, London: Sage.

Frith, S., 1978, *The Sociology of Rock*. London: Constable.

Goffman, E., 1971, *Relations in Public: Microstudies of Public Order*. London: Penguin.

Hargreaves, D.J. and North, A.C., 1997, *The Social Psychology of Music*. Oxford: Oxford University Press.

Hargreaves, D.J. & North, A.C., 1999, The functions of music in everyday life: redefining the social in music psychology. *Psychology of Music*, **27**, 71-83.

McCarthy, J.F., and. Anagnost. T.D., 1998, MUSICFX: An Arbiter of Group Preferences for Computer Supported Collaborative Workouts. In *Proceedings of CSCW '98*, Seattle, USA, 363-372.

Sacks, H., 1992, *Lectures in Conversation*. Oxford: Blackwell.

Taylor, A. and Harper, R., 2002, Age-old practices in the New World: A study of gift giving between teenage mobile phone users. In *Proceedings of CHI '02 Conference on Human Factors in Computing Systems*, 439-446.

Willis, P., 1978, *Profane Culture*. London: Routledge.

Chapter 2

MUSIC AND EMOTION IN REAL TIME

Tia DeNora

1. Introduction

There has been a venerable history, perhaps especially in popular music studies, of 'reading' music for its social content and, by implication, for the ways that it 'constructs' emotions and the body. This work, which is often defined as part of the 'new musicology' (begun circa 1980s so no longer 'new') may be understood to have provided the basis for more recent focus on music's actual and dynamic involvement in the formation of subjectivity and emotion within specific social settings and in real time and on the processes through which music's producers and recipients draw music into the vortex of their on-going subject formation.

In short, music does much more than *depict* emotions. It is a condition of affective experience. In this respect, music works in real time, as it is heard and overheard, produced, remembered, and imagined. Music is part of the basis of our social experience; it is a resource in actual formation of social reality. How then does music 'get into' daily life and daily experience, and how is it a resource through which social, mental and emotional structures are produced and reproduced as part of our natural normal work as social beings?

To introduce these ideas, I will present three examples, drawn from earlier research. In all three cases musical experience may be understood as *eventful* experience (DeNora 2003: 49), that is, as taking place in real time and space, and as involving change and outcome over time.

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 19–33.

Example One:

> *"It [car radio, switched on as the speaker started the car] was playing the Double Concerto and I just had to stop, and some friends were coming behind, you know, and I was just in floods of tears, and they said, 'why don't you turn it off'? and I said, 'I can't' and that, it was ages before I could listen to that, or anything like it without thinking of him." (DeNora 2003:62)*

These are the words of a woman who, at the time of an interview we did together in late 1997, was in her early fifties. The respondent, 'Lucy', is describing how, one evening, after her usual mid-week choral practice, she got in her car to drive home along Devon's beautiful country back roads and happened upon music that triggered strong memories of her father, literally stopping her progress.

Example Two:

In 1998 Sophie Belcher and I conducted research on music's role as a prosthetic technology of the body. We focused on an exercise setting in which music's role was central – aerobics classes.

Within a 'typical' aerobics session, the songs employed blocked out phases or chunks of time that were in turn associated with type, speed and intensity of exercise movement. The songs also demarcated the grammatical structure of the exercise session, from warm-up, to high energy 'core', to (cooler) 'post-core' to 'cool-down' (in which toning exercises are performed). Each of these structural components was associated with particular tasks (types of movement), problems to be overcome (e.g., lack of coordination, acquiring motivation, sustaining energy and strength) and values (as when participants speak of a 'good' session or 'good' music).

We learned early on in our research that an aerobics session is much more than a physical activity. By this I mean that the physical passage from one phase of the session to the next involved more than mere physical movement. It also involved things like emotion, motivation, pleasure, expectation and, more subtly, different calibrations of consciousness. In other words, aerobics is a psycho-cultural event, one that involves a passage from one to another state of consciousness over time, from one to another level of emotion. These passages, moreover, are linked to the styles and physical demands associated with the phases of aerobic sessions. To 'succeed' at aerobics, in other words, involved a conglomerate of emotional, physical and cognitive 'work'. This work was, we found, musically assisted. Put simply, music was a medium through which body and consciousness were shaped and modified during an aerobics session.

For example, different types of musical materials were employed to realign class members over time so as to enable different forms of embodiment at different times in the session. It is important to note that she 'uses' music in a dynamic manner, pairing it with further devices and practices that frame it for consumption/reception and that underwrite the uses that the music may afford. For example, a good instructor may alter her speech tone and style to consolidate these affordances. The instructor who ran the class 'barks' her instructions during the core phase, rather like a drill sergeant might bark ‘orders’, in synchrony with the music’s seemingly relentless pulse, effectively encouraging class members not to ‘think’ but rather to ‘move’. As the music enters the post-core phase, by contrast, the instructor modulates her voice back to a more conversational, matter-of-fact mode (pitch, style, phrasing, rhythm and volume), making use of a slightly legato form of speech that contrasts with the staccato utterances during the core and highlights the sentimental-feeling orientation of the ballad numbers. This is and example of a tacit strategy for taking class members, as it were, ‘out of’ the music and recalling them to the ‘head’ world of ordinary conversation and interpretation, a style she employs even more markedly in the final ‘toning’ section . It highlights a point that should be read as a subtext to all that follows, one that has been at the centre of my own music sociological project since my days as a graduate student (DeNora 1986) – music, in itself ‘makes nothing happen’ to paraphrase Auden; it is music in specific contexts, as framed and consumed, that holds power ‘over’ its recipients.

Example Three:

As part of the research on music’s ambient role in public spaces, we conducted in-store ‘shadowing’ experiments. These involved a volunteer shopper and a researcher, both equipped with tape recorders and microphones. The volunteer was told simply to engage in High Street browsing activity, to enter/exit shops as she liked and to ‘think out loud’ into the lapel microphone as she moved through each space, commenting on anything that came to mind – store ambience, music, goods, etc. The researcher followed the shopper at a distance, commenting in turn on the shoppers movements and activities, for example her handling of goods, the length of time she spent with goods, etc. There was to be no contact or communication between volunteer and researcher until the shopper deemed herself ‘finished’ with all browsing (usually after she had visited all or most of the shops on the street). The aim was to consider music’s role in retail outlets in context of the retail atmosphere and its connection to the consumer experience – in real time.

Figure One is a transcript of a few moments during a ‘shadowing’ session. On this occasion, I and the volunteer shopper, ‘Annette’, were spending the morning in a small British city, wandering in and out of various shops on its High Street. Because both tapes were recorded in the same space, at the same time, with music playing in the background, it was possible to align the utterances of each speaker over time and, of course, in relation to the music.[2] This transcript shows a 46 second period of in-store time.

[2] This was a meticulous process. It could have been simplified had we been able to use digital technology. In follow-up work we intend to explore these issues but with several volunteers and several researchers simultaneously.

[3] George Michael, Listen Without Prejudice, 1990 epic467295-2.

Song Time in Seconds [notes on music][3]	Shopper (Annette, age 24)	Research Shadow (Tia)
1.15 [end solo phrase]	It's quite relaxing	…perhaps not.
1.17		
1.19	These are nice	
1.21		
1.23	Too much lolly though	
1.25		
1.27		
1.29 ['…year of…']	Too long	
1.31 ['…*these* songs]		
1.33		
1.35 ['…about you']		
1.37	**Oh that's a YUMMY**	**Certainly, *I* would like**
1.39	**jumper!**	**to come back here**
1.41		**later!**
1.43		
1.45		
1.47 [**wrongs**- break]	Mmm. Sixty five pounds.	
1.49		
1.51	A black one as well.	
1.53		
1.55		
1.57	Mmm. It's definitely George	
1.59	Michael.	
1.59		

Figure 2-1. Transcript of in-store shopping experience showing the relationship between music being played and the consumer's experience

In this example we were in a somewhat 'up-market' store and a new song, George Michael's 'Waiting (Reprise)' began to play, roughly 15 seconds after we entered the shop.

The reader will notice that the purpose of this shadowing exercise was not fulfilled (i.e., I, the researcher, was meant to be reporting in detail on what the volunteer shopper did). There is, in other words, a lot of blank space where the researcher should have been offering observations. Initially, we deemed this experiment a failure – it didn't show anything of significance!

And yet, looked at from a different angle, this 'silence' was itself significant. It helped to highlight how, in store, even the supposedly neutral researcher was drawn in to the aesthetic environment. Consider, for example, the passage beginning at 1.37.

As illustrated in bold on the transcript, this was a synchronous moment of enthusiasm, marked in bold. Both the volunteer shopper and the researcher (me) expressed emphatic pleasure in relation to some aspect of the shop, Annette commenting on a 'yummy jumper' and Tia on how she would 'like to come back here'.

In short, here are two individuals, moving through an acoustic and material space independently of each other, and occupying different positions within that space (though one is meant to be watching and reporting on the other). Apparently independently, both exhibited a type of emotional response synchronously.

Linked to this moment but more broadly in store to the ambient environment of which music was but part, the *paralinguistic* features of our talk (i.e., its sound parameters and stylistic stance) changed – the volume increased (in the way it typically would [in Britain, perhaps even more in the USA and I am American] when a 'high' point is being identified), both of us also engaged in additional more melodic variation (pitch variation) and employed higher pitched notes – again typical within the generic British speech community, though obviously varying by region, ethnicity and many other factors. Indeed, when I began to listen to the tape of my own voice (during transcription), I was surprised not only by the level of enthusiasm I expressed at this moment, but also at how, while this music was playing, and in this particular shop, my speech style changed remarkably – and I have described this in print elsewhere (DeNora 2003:113). In store, my character had been transformed unbeknownst to myself! Actor Network Theorists, such as Michele Callon, would describe this as *interessment* – the interposition of two subjective trajectories and the drawing in to or on to one (Callon 1986). I became, I think it is fair to say, a different person, and certainly different in a stylistic (paralinguistic) sense to the person I had been only moments before. Music can, as I believe this example helps to highlight, enter in to the ways we perform self in real time and in real space. What then was the music 'doing' at this point and how might that sonic structure have helped to structure the micro-temporal ambience at and just before 1.37 of the transcript?

At this point, the song is developing, becoming more agitated, moving toward a musical climax that occurs some seconds later, and doing so in such a conventional manner that 'anyone' familiar with pop music would 'know', albeit perhaps not consciously, that we were nearing a musical high-point, one on which, melodically, Michael's voice actually can be heard to break. Simultaneously, the lyrics make arguably their most direct appeal to the listener, the 'you' of the song. (At the time, in-store, I had never heard the song before and was unfamiliar with Michael's work; Annette spoke on tape of how she thought she 'knew' the music.)

Because I was personally involved in this incident I can report on my own experience here, the memory of which, I should note, was present before listening to the tape. (For example, Annette's enthusiasm over the 'yummy jumper' was in relation to a bright orange jumper; she then moves on to notice a black one in the same style; I 'knew' I felt a little 'up' at that moment in store and remembered the slight rush of feeling. I did not remember/was not aware of my paralinguistic style.) Listening to the soundtrack of that experience however I remembered more clearly the sensations of that moment, the feeling behind my utterance ('Certainly *I* would like to come back here later').

2. Theme and Variations

These examples illustrate the theme I will to speak to in the second half of this chapter – music's role as a real time mediator of emotion and action. In each of these examples it is possible to see music as one component in a conglomerate that includes: (a) actor(s), (b) time, (c) space, (d) act(s) of engagement (with music and with other things), (e) social conditions and (f) material-spatial environment.

All of these features coalesce in and interact to produce social events, as events in so-called 'real time' (is there anything but real time, this moment now, when we think, speak or otherwise act and when we re-present moments past or profile moments future?).

How music works, in real time as a medium through which both emotion and action are configured, provides, in my view, a topic through which to think about the non-cognitive, aesthetic and material bases of action, experience, interaction and the reproduction of action over time and space as socio-cultural and psych-cultural institutions. Here, then, is a theme and some variations.

2.1 Theme: music, via its emotional effects, is a condition of action in real time

It can interrupt action, it can make some things (such as Lucy's driving) difficult, dangerous or impossible to do, either for reasons that have to do with a clash of symbolism (e.g., would it be 'right' or 'respectful' for Lucy to have simply 'gone on her way' at this profound moment of remembrance?) or because the actor as an embodied and feeling being has simply 'lost' the physical capacity to 'go on'.

This is a point that good aerobic exercise instructors know all-too-well – using 'core' music for too long during a session can cause an injury since class members may be so 'into' the music that they are no longer conscious of bodily fatigue or pain (indeed this is precisely what music is encouraged to do in some pain management contexts).

Brand managers and ambient designers in the retail sector are well aware of music's ability to divert actors from pre-planned or on-going courses of action and on to organisationally preferred trajectories, as when some diners in the UK may be inclined to purchase more expensive wine with dinner when classical music is playing in the background.

Many scholars have written of how music is used to seduce customers, to keep them in-store and to otherwise set-the-scene. They know that action, including the most important action in-store – the purchase – and the also-vital behaviour of lingering and handling the merchandise can be musically conditioned. To repeat what I think is probably now my mantra, this is not to suggest that music 'causes' behaviour through any direct or unmediated process, but rather that, in conjunction with many other factors, music may provide a ground upon which mood, emotion and conduct is configured in real time. Music is a condition and a resource for (emotional) experience and action.

2.2 Variation One: music possesses scenic properties; it may imply ambience, mood and local aesthetic/affective style within a setting and these ambient properties are linked to modes of embodiment

Music may be used or perceived to connote occasion and action style, and this includes the admixture of embodied and emotional style as well as social personae or types of roles we might play. In this sense, it can be understood as, the words of the late Pierre Bourdieu (1985: 724) one of the 'active properties' with which social spaces are constructed and 'practically perceived' (ibid:726). This theme is illustrated clearly in the above examples of the retail space and the aerobics class where actors can be seen to latch on to music's properties, incorporating them into the on-going embodied, emotional and stylistic performance. The research on music and purchase decisions also illustrates this theme – consumers are likely to 'fit' their purchase decisions to the subconsciously perceived scenic properties of a space.

In a sense, then, actors can be seen as cognitive and pre-cognitive sense-makers, putting together self and role and calibrating emotion and mood in real time. This sense making project includes finding working answers to implicit questions (and a preparedness to account for self in relation to these questions) such as "who am I/are we? What is happening here and what can be done here? What is appropriate? How do I feel and how do I fit in? What are the embodied features of this situation?

To develop this theme through the example of aerobics classes, music does much more than provide the coordinating 'pulse' for exercise. Different styles of music over the course of the session place different types of embodied agency on offer to participants, the gentle and somewhat ballerina-like *habitus* of the opening lyrical warm-up numbers, the 'heated' mindlessness of the strenuous core, the recall to consciousness in the 'cool-down' ballads. If one is 'fit enough' to participate in these classes, one can appropriate or inhabit the musically configured space with ease, indeed with pleasure – the music thus minimises difference and imbues actors with embodied capacity. If, alternately, one is not fit for the exercise class, the music, via the actions that are implicitly and/or explicitly 'fit' to it will mark one's difference, indeed, one's dis-ability. In this sense, music may provide media for the aesthetic and embodied production of social exclusion, including the distribution of opportunities for feeling and embodied expression. Music is a material through which the relational figures of 'fitness' and 'disability', 'competence' and 'incompetence', 'taste' and 'vulgarity' are constituted.

2.3 Variation Two: Remembering is often key to the process of musical occasioning

For example, actors may 'fall into' a mode of feeling-being that they recognise as having 'done before', either by themselves or as seen done by others (including media examples), as when we are aware of the generic signals that, say, smoochy music gives off and the types of conduct it 'reminds' us of and thus may afford, or as, in Lucy's case, the Brahms triggered a rich seam of highly personal memory, bringing to mind very many things about her very dear father and their shared listening experience, after dinner, sitting by the hearth. (Indeed, it is worth noting here that this signal musical experience on the road happened at roughly the same time of evening as the music listening she shared with her father when a young woman.)

Moreover, music may also provide the terms or models within which to imagine a particular feature of reality, for example, might Lucy, who elsewhere describes how she finds, 'the me' in music, have especially loved this concerto where the larger and lower voiced instrument (the masculine, paternal voice?) is paired in dialogue with the smaller, higher voice (daughter)? I only wish I had pursued this question at the time of the research. It might have helped to show how memories are not simply paired with music, but how what is remembered was both made 'of' music at time A, and remembered 'through' music at time B (DeNora, 2000: 67). To speak of this issue is to recognise music as an ingredient for the forging of experience in time and space, a process that is characterised by an interlacing of experience (feeling, action) and the musical materials that come to 'stand in' as referents for that experience, that provide experience with metaphoric and temporal parameters.

2.4 Variation Three: because music is associated with social conventions, music may 'remind' actors of conventionally appropriate modes of action, ones that 'go with' the music

When this happens, it is appropriate to speak of music as providing cues or quasi-scripts for action characterised by varying degrees of formality (e.g., from improvisation to ritual). To the extent that this occurs, the study of music in real time connects the so-called 'micro' realm of individual experience with the 'macro' realm of cultural/musical structures.

'The biggest unanswered question in the sociology of culture', Swidler has suggested (2001a:206),[4] 'is whether and how some cultural elements control, anchor, or organize others.' According to Swidler, an anchoring practice is one that 'creates a situation of action' (Swidler 2001b:83). It is a tacit framework from which

[4] There is a cultural theoretical move on-going within current American sociology to speak of 'repertoires' of action (Swidler 2001; ASA Culture Section Newsletter, Winter 2004: http://www.ibiblio.org/culture/newsletter/). This perspective develops Swidler's influential notion of culture-as-toolkit and shifts cultural analysis from 'values' to 'practices' and to how people 'use' culture.

other practices may be seen to flow. Swidler describes these anchoring practices as, ‘silent,’ constituting, ‘the unspoken realities upon which more directly symbolic or linguistically mediated activities are based’ (ibid: 85).[5]

Thinking of music as ‘silent’ is fruitful for socio-musical research (as well as nicely ironic and reminiscent of John Cage’s 4’33’’!). In particular, the idea of music’s ‘silence’ elaborates music’s role as a medium for creating what Swidler terms a, ‘situation of action’. Within such situations actors mobilise and manipulate various cultural ‘tools’ or ‘resources’ for action, a process that they do with varying degrees of ease and skill.

I found actors doing this as a matter of routine so as to structure situational ambience and themselves as emotional agents within those ambient environments (e.g., as something they ‘needed’ to do to get up or get through a phase of action/interaction [music to get motivated for an evening meeting] or to produce an atmosphere conducive to a type of action, for example, music for erotic and intimate encounters.[6] There, respondents described using ‘sacred type’ music for intimacy so as to signal the serious and transcendent quality of their interaction with their partner, ‘soft’ music to create a feeling of relaxation, and so on. In all of these cases, the music could be understood (by those participants) as a medium through which action and action potential and capacity (agency) may be formulated.

In all of these cases music’s technologies of distribution are active, enabling or constraining the task at hand. For example, when Columbia first introduced the long-playing album, it prototyped use with a sketch of a man and woman in what might perhaps best be described as a bourdoir, emphasising the advantages of uninterrupted music (in my research on music’s uses in daily life, older respondents described the difference an LP could make for ‘getting into the mood’ – namely, less disruption for record changing. The ability to stack of LPs enhanced this further). Conversely, the longer playing unit of music affected the parameters for ‘choosing’ and changing the on-going flow/cessation of music. One gained longer envelope of sound while relinquishing the ability to interact with the sound environment in shorter time intervals. One could no longer, as a dj, constantly tinker with the musical direction of the situation. On the other hand, one’s mind (and body!) were

[5] As described by Biernacki in The Fabrication of Labour, his study of labour relations in the 19th century England and Germany [U. California Press, 1995:3]), ‘silent’ (tacit) practices arise through actors’ engagement with materials. It is through the study of this engagement that we can see how practical interaction with and use of objects and material practices underwrite action and conception. In Biernacki’s study, ‘the hallowed form of unobtrusive practices’ (1995:36) underwrote the schemas through which labor was conceptualized and discussed. In other words, it was through the routine employment of objects and through material practices of manipulating and producing objects, that socio-economic discourses and economic and managerial policies were forged.

[6] For a richly detailed study of the cultural materials of intimacy, see M. D. Wilson-Kovacs, Women, Pleasure and Everyday Life: An Ethnographic Investigation into the Cultures of Sexual Intimacy, Thesis Submitted for the Degree of Doctor of Philosophy, University of Exeter, September 2004. contact: m.d.wilson-kovacs@ex.ac.uk

freed from having to deal with music on a frequently recurring basis. With digital recording, the possibilities for seamless musical ambience are again enhanced. For example, a young respondent in the music in everyday life study described how she and her boyfriend crafted the sonic backdrop to their time together in his university hall of residence. He had, she said, 'a fifteen million CD changer. I'm like, "I didn't know they existed!" ' (DeNora 2000:112).

Arlie Hochschild's well-known concept, 'emotional work', complements Swidler's notion of culture as providing repertoires for action. By the term 'work' Hochschild means, 'bodily co-operation with an image, a thought, a memory – a co-operation of which the individual is aware' (Hochschild 1979:551, quoted in Williams 1996:129). Hochschild initially used the term, emotional work in context of occupational sociology, to describe the type of non-contractual and gender-segregated 'work' that was increasingly part of the modern, service-based workplace (Hochschild 1983).

I find Hochschild's concept useful however for thinking about the role that music plays and can be made to play in the emotional work we do outside the workplace in our daily lives and, in contrast to Hochschild's emphasis on how we are 'aware' of how we may be co-operating with an image, etc, I would emphasise that we are often at best only quasi-aware of how we engage in this 'work'. So much of our 'intelligence' as social performers is tacit, felt, intuited or otherwise not always 'known' at the level of consciousness, as discursive, cognitive 'information'.

Swidler and Hochschild have provided us with some of, in my view, most useful images of action-as-cultural-practice, one that resonates richly with Bourdieu's lifework. If there are 'weaknesses' in the theoretical perspectives of Swidler and Hochschild, and Bourdieu himself, it is that neither has considered action in real time, and neither have considered the warm, hot, cold, cool, 'tears, laughter, warmth and trembling'[7] of *actual* social being. This *lacuna* eludes embodiment in social action, including feeling, and it misses an equally critical matter, one moreover that raises the profile of sociomusical studies: investigating music-and-action in real time provides an excellent opportunity for examining the role and importance of feeling-in-action and its link to social structure. Such an examination, however, requires a far more powerful lens than most sociologists (apart from those who study socio-linguistic matters) are willing to employ.[8] As analysts of conversation have shown, a great deal may happen in a split second and it is within these eye-blinks that trajectories of action may be set, affirmed and altered. Music shows us how Time is of the essence. This leads to the next variation.

[7] '[A]lmost everything that is important for social life unfolds within this minute web of times, spaces, gestures and relations', says Melucci (1996:1), much of which involves and invokes the 'earthly consistency' of emotions, 'fed as they are by moods and sounds, by odours and vibrations. Fear and joy, tenderness and sorrow are not merely ideas but tears and laughter, warmth and trembling' (ibid, p. 72). I am very grateful to the late professor Melucci for early help with my earliest research on music and emotion, Milan 1996.

[8] I hasten to say that music therapists, particularly those working in the area of Creative Music Therapy, have understood this point for decades.

2.5 *Variation Four: the interaction between musical response and emotional effect is often-split second*

One of the most effective devices for getting aerobics class members into the right mind-body state for moving from warm-up to core was a brief syncopated (cha-cha type) rhythmic figure. Tiny as it was, this small figure could actually be seen to energise class members – it placed on offer an ‘up-lifting’ and ‘catchy’ movement style that was pleasurable to mimic with one’s feet, precisely what was required as and if the session were to move from warm-up phase to core phase. The fact that this so-called ‘Latin’ rhythm was set in context of a piece entitled, ‘Yodelling in the Canyon of Love’ (wherein clearly audible passages of yodelling were juxtaposed with cha-cha rhythm in a kind of joyful melange of ‘cheesy’ styles!) created a joyful-playful frivolity making the prospect of moving into the hardest phase of the session bodily and emotionally appealing. The cha-cha rhythm, like the Brahms for Lucy, provided a ‘switch’ for emotional being, in Lucy’s case, back to a mode of reflection and remembering, associated with grief, in the case of the aerobics class, associated with a passage of playfulness and heightened energy. In both cases we can see an almost instantaneous recalibration of emotional – embodied state brought on by music. In both these cases, moreover, this recalibration involved the reconfiguration of actor and agency, the former becoming again a grieving daughter, the latter becoming an energised body, temporarily separated from self-identity, responsibility, fatigue and conscious awareness.

This instantaneous dimension of music’s relation to the often unconscious recalibration of affective action and affective actors as types of beings highlights music’s momentary ability to generate emotion (characterised by sudden onset or flare and subsiding fairly quickly – as when we experience flashes of anger or joy) versus mood (less intense but longer lasting – as a background condition of action – as when we speak of feeling aggrieved, melancholy or relaxed).[9]

At different times in aerobic sessions, the instructor we spend most time observing would stop the music, sometimes shouting emphatically, ‘bad music!’ So too, in independent and quasi-independent shops where clerks retained control over music programming, we observed musical interruptions, where staff would decide that the music ‘wasn’t working’ (sometimes not working for them, sometimes with the idea that the music wasn’t working for the customer, the time of day or the general mood. In both these examples, the technologies of music distribution enable, with the flick of a switch, an often dramatic shift in ambience, just as lighting may be dimmed or enhanced or altered. In global retail chains, where the music is a permanent fixture and where staff have no input, music was, by contrast, hard-wired

[9] See DeNora 2003:106-7 and Parkinson et al, Changing Moods: The Psychology of Mood and Mood Regulation. (London: Longman, 1996).

into the system as a non-negotiable condition of the scene.[10] Because, increasingly, music is part of a global soundtrack in public places, actors may also use music playing technologies (personal stereos, mp3 players) to reclaim spaces and overlay those spaces with soundtracks of their own choosing, sometimes thereby reframing the spatial experience (Bull 2000).

2.6 *Variation Five: Musically induced emotion may in turn be linked to actors' attempts to identify their feelings with features of the external social world and thereby become pivots for shifts, consolidations or intensifications of action trajectories*

When I and Annette were in Enigma, both of us experienced a surge of emotion in store, both at the same musical moment. I cannot speak for Annette here, but I recall my own experience well – moving deeper into the store, in pursuit of Annette, noting the acoustical properties of the music and suddenly feeling of well-being, noticing the atmosphere and furnishings, the order and artistry of the store. At this stage I was conscious of the music, noting in a verse about how, to paraphrase the lyrics, there was a year of the singer's life in his songs, most of which were 'about you' [i.e., I was being 'personally addressed'] and the way in which these words were paired with a burgeoning musical climax. Speaking for myself at this stage, I know I was – somewhat involuntarily, since I would profess not to 'like' this type of music [data in itself!] – 'responding' in a musically induced manner. Unfortunately, I have no data on Annette's experience of this moment and indeed, I had forgotten the moment until I transcribed the tape of my own voice. (I remembered only that I 'liked' the shop.)

In both my case and Annette's a kind of, for want of a better word, connection to or liking of the atmosphere. For both of us, this was quickly linked to an object – a 'yummy jumper' for Annette (with the potential of purchase looming) and, for me, a self-commitment to return sometime to the same shop, when off-duty. Music, at least for me, set me up emotionally in a socially standard way – I 'felt' something which I then substantiated by linking it to an object – the shop, and the pleasure I found in it.

Surges of emotion, when they are 'silently' achieved, as with music, are often accompanied by actors' immediate attempt to locate a reason for their feeling, to supply a predicate for it ('I feel suddenly happy because…') and this is what I think

[10] Of course, extremely 'low tech' music distribution – such as someone strumming their guitar as part of the on-going sonic backdrop of a social event – can be changed instantly with as much ease as is permitted by the musician's repertoire of music and musical skill, so too the whistler in a public place. Programming flexibility did not arise with new digital technologies and is always relative, not to mention locally defined.

I was doing at this moment in-store, at roughly 12.30 pm in January 1998. Emotion is undoubtedly a relational, temporal phenomenon; indeed, there can be no emotion without variation. How we 'feel' has everything to do with how we felt before and how we imagine we will feel later or again. And this is why music, as a medium that presents itself in and over time, and that constitutes quality and quantity of time (as George Michael's 'Waiting' performed musical waiting – even in its tempo, roughly one beat per second) is so powerful in relation to the emotions. Much has been written about the connections between music-over-time and emotion. But to point to music's temporality is to offer a necessary but not sufficient account of how music and emotion are linked. What is it that music does, in the time that it takes?

2.7 Variation Six: music, understood generically as the shape and texture of sound over time is a sensuous medium

Music partakes of body culture in extra-musical realms and so describes or can be seen to delineate such things as closeness, tension, styles of touch (think of musical critical and pedagogical discourse here, such as 'attack and release' [sic] or staccato and legato). The George Michael song playing in Enigma, for example, was both slow-paced and highly textured, acoustical music – one could hear clearly the traces of the body in the music, the 'grain' of voice, as Barthes has described it (the muscularity of the music) and the sound of fingers slipping along the guitar fingerboard. In this way, music can be understood to present two forms of bodily experience – the actual experience of the musician, in terms of what it takes to produce sound and the perceived/imagined bodily phenomena that accompany that production (sweat, heart rate, strength, physical restraint, breath, energy) and, related but not necessarily identical to this, the perception/imagination of the body-in-the-music – as heard or heard and seen when there is a 'sight of sound' (Leppert 1993).

When we 'like', 'hate' or otherwise respond to musical material, we are responding to, among other things, what that music will afford in terms of thinking about or experiencing our and others bodies, and indeed in this respect, the study of the body-in-the-music illuminates the mostly tacit subject of touch, sociologically and social psychologically conceived. Just as in aerobics classes it is possible to learn how to feel and move (pain, absence of pain, motivation, ability to jump or move in quasi-choreographed, stylised ways), so too, in intimate situations it is both possible to touch in musical ways (slow, soft, fluid, etc) and to feel in musically mediated ways, as when one's erotic sensations may be kinaesthetically produced (see DeNora 1997). These are issues well-developed in music therapeutic research devoted both to pain management (Maranto 1991) and to the transcendence of bodily suffering (Aldridge 2003; Pa) and the relearning and relational repositioning of the body in relation to musical grounds and referents for its location (DeNora forthcoming).

3. Recapitulation

The examples and themes described above help, I hope, to highlight why the study of music and emotion needs to be considered as part of a cultural sociology of the actual, related to conditions of musical experience and music's impact upon action and, in turn, why the study of musically instigated emotion leads on to sociological concerns with the structures of agency and action.

In short, music is a means through which individuals are drawn into the social world and socialised as types of feeling beings – agents. To restate the theme: *music, via its emotional effects, is a condition of action in real time.* We have seen how music does this work in the following ways: (a) as a scenic property of action where its ambient properties may be linked to modes of embodiment (for example, in public spaces and in aerobic classes where actors switch modes of being – comportment and embodied emotional style, mostly without conscious awareness). (b) through the ways that music may trigger memory and through how actors draw upon memories of stock situations and aesthetic styles and, related to this, (c) music may be consciously or quasi-consciously 'read' as providing cues to actors about a situation's on-going meanings and potential meanings and trajectories, (d) music's dynamic power as a condition of action may involve split-second processes, musical and responsive and (e) actors may, when stirred by music attempt to locate an object for their feelings in the setting or elsewhere in the external social world. In all of this, music's technological mode of presentation is far from neutral; by contrast it affords, in its own right, music's possibilities, its potential uses and thus its powers. How actors realise these powers and incorporate new music-technological practices into their own daily lives is of especial importance to the 'new' music sociology and indeed, thinking about music as a 'technology of the self' is also to think about music as material and technological practice.

A focus on music as material practice raises important questions about music's modes of distribution, for the opportunities for affective experience that music provides may be differentially distributed across populations. This distribution may take social forms (for example, there may be some soundtracks and their imputed aesthetics and ambience that some types of people find difficult to inhabit in terms of psychological comfort or because others do not view their location as credible within them). It may also take a technological form, when technologies of music distribution make certain things more difficult to do (while simultaneously making other things easier) or when they asymmetrically allocate control over music to some and not to others (e.g., according to gender, age or technical expertise). These are, inevitably, questions that call for ethnographic, applied and action-based investigations and the future of socio-musical-technical research – in so far as it examines how actors appropriate music-as-technology is an area that promises much for our understanding of the musical bases of being and for how structures of difference and power may be underwritten through music's invisible powers from moment-to-moment in daily life.

References

Aldridge, David. 2003, Music therapy and spirituality; A transcendental understanding of suffering [online]. *Music Therapy Today*. Retrieved February 20, from: http://musictherapyworld.net

Bourdieu, Pierre. 1985, 'The Social Space and the Genesis of Groups'. *Theory and Society* **14**(6), pp. 723-744.

Bull, Michael. 2000, *Sounding out the City*. Oxford: Berg.

Callon, Michele. 1986, 'Some elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St Beine Bay'. pp. 196-233 in J. Law (ed.), *Power, Action and Belief: A New Sociology of Knowledge. (Sociological Review Monograph)*. London: Routledge.

Cook, Nicholas and Nicola Dibbin. 2001, Musicological Approaches to Emotion. pp. 45-71 in P Juslin and J. Sloboda (Eds.), *Music and Emotion: Theory and Research*. Oxford: Oxford University Press.

DeNora, Tia. 1986, 'How is extra-musical meaning possible? Music as a place and space for "work".' *Sociological Theory* **4**, pp. 84-94.

DeNora, Tia. 1997, 'Music and Erotic Agency – Sonic Resources and Social-Sexual Action'. *Body&Society* **3**(2) (1997): 44-65.

DeNora, Tia. 2000, *Music in Everyday Life*. Cambridge: Cambridge University Press.

DeNora, Tia. 2003, *After Adorno: Rethinking Music Sociology*. Cambridge: Cambridge University Press.

DeNora, Tia. Forthcoming. 'The pebble in the pond: musicing, therapy, community (Book Essay). *Nordic Journal of Music Therapy*.

Hochschild, Arlie. 1983, *The Managed Heart. Berkeley,* Los Angeles and London: University of California Press.

Melucci, Alberto. 1996, *The Playing Self*. Cambridge: Cambridge University Press.

Mercédès Pavlicevic & Gary Ansdell (Eds.) (2004). *Community Music Therapy*. London: Jessica Kingsley Publishers.

Swidler, Ann. 2001, Talk *of Love: How Culture Matters*. Chicago: University of Chicago Press.

Williams, Simon. 1996, 'The emotional body'. *Body&Society*, **2**(3), pp. 125-139.

Discography

George Michael. 1990 'Waiting (Reprise)'. *Listen without Prejudice*. Epic (Sony) EPC 467295-2.

PART 2

SHARING MUSIC

Chapter 3

SHARING AND LISTENING TO MUSIC

Barry Brown and Abigail Sellen

1. Introduction

One of the most controversial computer applications of recent times has been the "Napster" file sharing system. Napster made front-page news worldwide in 2000, with the legal drama around the service causing much comment and attention (Hellmore, 2000, Richtel, 2000). Napster allowed users to copy MP3 music files across the internet from other Napster users. Although Napster was finally shut down by the US courts, it was quickly replaced by a range of related music sharing services – such as Gnutella, Kazzaa and Soulseeker. These applications have also recently gained *legal* competition – in the form of the iTunes music store and a resurrected Napster (similar only in name) offering legal music downloads.

Despite the attention given to internet sharing, physical music sharing is an activity that has been commonplace for many years – sharing of music between individuals through copied tapes and CDs. In this paper, we investigate both sharing with conventional media and compare it to online music sharing. We situate music copying in general music listening practices, looking at how individuals not only share music but also how that sharing is affected by their listening practices.

The data collected for this chapter come from in-depth interviews with thirty six users of both conventional music media and adopters of computerised music technology – in particular music compression such as the MP3 file format. This data lets us unpack some of the contrasts between using physical tangible media (such as tapes or CDs) and computerised music files. Although these interviews were conducted before some recent technological developments (such as the mass market popularity of the iPod (Bull, 2005)) they allow us to study some of the relatively slow changing practices which take place around music, the work involved in listening and sharing to music. In particular, our data gives us a chance to move

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 37–56.

away from seeing music consumers as an audience, to thinking of them as music *users*. That is to say, rather than seeing music consumers as a mass audience to be differentiated according to music taste, we ask what issues and problems, in detail, do individual music users have with their use and sharing of music in their lives.

The original focus of our interviews was music sharing, and in particular the social activities that take place around sharing physical music media. However, our data led us to explore music consumption more broadly – sharing is only one part of music practice, and is impacted by a range of other aspects. The tangibility of physical media, for example, encourages the collection of physical media over digital music files. The interviews allowed us to inverstigate how music is important not only for listening to, but also as something that forms a collection, and in turn how that collection can be part of forming an identity. In the implications section, we draw out the relevance of these findings with a number of new concepts which explore how advantages of physical media can be integrated into the design of new music media technologies.

2. Studies of music

The literature on music falls mainly into two large and well-researched fields: musicology and cultural studies. Musicology considers music itself as its object of study, for example, investigating classical, popular and non-western musical styles (Bennett 2000; Scott 2000). In musicology, music has been investigated as an object of study, somewhat removed from any particular way in which it is produced or consumed. Within cultural studies there has been more of a focus on the attitudes and uses to which music is put in different cultural groups (Longhurst 1995; Gay, Hall et al. 1997). For example, in Willis' book "common culture" (Willis 1990), he discusses how young people, in using different music products, creatively rearrange and reinvent those products, vesting them with their own meanings in the process. Willis describes how simple audio equipment like record players, microphones and tape-to-tape copying machines were appropriated by teenagers to provide entertainment at parties, and also as leisure activities in themselves. This "hidden creativity" in consuming music can also be seen in research on amateur musicians (Cohen 1991).

However work in cultural studies seldom gives sufficient attention to the mundane details of the use of music media from a consumer's perspective. That is, such research is not concerned with questions such as: Where do people listen to music? With whom? What activities take place in conjunction with music listening? How is music acquired? Why do people choose one form of music media over another? How do they share music with others? So while great attention has been played to the culture around music, the actual mundane acts of listening to music has been mostly ignored.

Alternatively, work that has looked specifically at music sharing has generally focused on recent economic and legal debates, such that over recent decline in the sales of pre-recorded music (Rob, 2004). Yet music sharing is hardly a new development – one of the first recorded instances of music piracy was the copying of Allegri's Miserere by Mozart in 1769 (Galan, 2000). Copying music and the associated problems of piracy have remained ever since. Chesterman and Lipman (Chestermann and Lipman, 1988) describe three types of pirated music. Counterfeits are copies of music sold for profit in shops or markets and often passed off as original copies, bootlegs are unauthorised release of artists work, such as recordings from live performances, and home-taping is the copying of music by individuals for use in their car or to be given to friends. It is home-taping which we will have most interest in here, since it is the category of piracy which is most relevant when discussing internet music sharing technologies.

Controversy raged around "home taping" since the event of the compact cassette tape in the sixties. While the record industry has claimed at various times that home taping is "killing music", tape manufacturers have claimed that home taping increases sales, as individuals come to hear music they would not normally purchase (ibid, 141). For example, the British music industry's representative body conducted a study that claimed that 55% of the population used tapes to copy music, whereas the tape manufacturers claimed 22%. For the music industry, however, the key question was what proportion of copied music would otherwise have been bought. Their own surveys suggested 51% of copied music would have been otherwise been bought, whereas the tape industry argued that copying actually increased sales as individuals copied music to "try before they buy".

Value judgements about music sharing are inherent in the terminology that one uses to talk about the activity – does one speak of music piracy, or music sharing? Very different values are evoked by both of these terms. One evokes the values of theft and abuse, the other of community and reciprocity. For example, showing careful use of language, the UK anti-piracy organisation calls itself the "federation against copyright theft" (FACT), evoking a direct analogy between theft and piracy. However, as has been discussed in the legal literature on piracy there is no simple analogy between theft and piracy (Couser, 1999). For example, theft as an activity denies someone else the use of an artefact, whereas in music piracy, almost the opposite happens – the use of some media is extended to whomever pirates a copy of it. This is not to downplay the damage that can be done to recording artists if they are not properly compensated for their efforts. This provision – that artists are compensated sufficiently to record new material – is at the heart of American copyright law. It is for this reason that within the U.S. the sharing of music between friends for personal use is legal (Plumleigh, 1990), although even this 'fair use' protentction has been called into question by recent legistlation. In this article we refrain from taking a judgemental stance on copying practices. Instead we seek to understand what is involved in the changing practices involved in copying, and how this fits into the broader practices around music listening.

These issues have been cast into sharp relief with the advent of online music sharing technologies. However, there are still few detailed descriptions of copying practice, of why media is copied, for what purposes, from whom, and as part of what other activities. One exception is Voida *et al*'s chapter in this volume on how the sharing of music has been integrated – legally – into the iTunes application and how practices have sprung up around the relatively limited features that it offers for sharing.

3. Methodology

In collecting data on the practices around music use we took a broad ranging approach, seeking to explore as much as possible the range of practices around music, of which sharing and copying are only one part. One focus was the different *affordances* of music media and technology (e.g. tapes vs. CDs vs. digital music files) and how this influenced activities around that media. The study looked at the whole “lifecycle” of how consumers use music, from how people first find out about it, to how they obtain it, listen to it, share it, organise it and collect it.

We felt that in a study such as this it was as important to study conventional music media use as much as use of the new music technologies. The change in media, as with other recent moves such as that from recrods to CDs, results in a range of changes to the practices involved. Contrasting conventional and new media use thus brings out absences in new practices which are instructive for design. Accordingly, we chose thirty-six music consumers from three different groups: teenaged users of conventional music media (e.g., CDs, vinyl, and tapes), adult users of conventional music media, and a group of new music media users, namely MP3 users (see Table 3-1). The rationale for focusing on music enthusiasts came from an analysis of market data collected in the U.K. by Mintel (Mintel, 1998). Mintel’s survey asked consumers how many music products (singles or albums) they had bought for themselves in the last year. These data show that while only 16% of the population make eleven or more music purchases a year, this relatively small group accounts for 65% of the total number of music purchases made in the market. It seemed to us, then, that understanding this influential part of the population would be a good first step to understanding music use. We therefore screened for participants who fell into this category. We were also interested in understanding teenagers’ behaviour, since teenagers are particularly heavy purchases of music (Mintel, 1998), and are a key market for the music industry. It is worth remarking that when these interviews were carried out new music media users were still in the minority, as iPods and the like were yet to gain their widespread acceptance in the UK. The selection criteria we used for the three different groups are summarised in Table 3-1.

Table 3-1. Different user groups according to music consumption habits.

Group	No	Criteria	Av. Age	% Male
Teenage conventional	12	> 11 music purchases a year and age <20. No use of MP3 files.	16	42%
Adult conventional	12	> 11 music purchases a year and >=age 20. No use of MP3 files.	30	42%
MP3 early adopters	12	> 11 music purchases a year. Listen to MP3 files > 5 times a week.	27	71%
Total	36		24	56%

As the aim of our original data collection was to uncover the details of music behaviour across a broad spectrum, we used semi-structured interviews to ensure that the important issues we wanted to discuss were covered. The questions we asked were designed to probe a range of activities from first awareness of music through to collecting and archiving behaviour. As much as possible we also tried to unpack specific examples of participants' activities around music. So, for example, we asked participants to describe the last three times they had copied or purchased music. Here the focus was not just on their interaction with the music but also on the context within which the activities took place (such as where they were, who they were with, and what other activities they were engaged in). We also asked a more extensive set of questions for the MP3 group.

4. Results

We discuss the findings from our interviews in two different sections. Firstly, we dicuss how conventional music media came to be used, in particular music sharing with conventional media but also the ways in which music is collected and arranged by music enthusiasts. We then move on to discuss the use of digitial files, focusing on some of the issues which result from the lack of tangibility of digital files. These findings are drawn together in the implications section where we discuss design concepts developed directly from these results.

4.1 Conventional Music Media

4.1.1 Choosing and selecting music to play

For out users of conventional music technology, their choice of music was determined to a large extent by what technology was available in the places they listened to music. In different parts of the home, in the car, or out walking, one has access to different sound systems and different collections of music media. In the car, for example, nearly all our participants had a tape player with a built-in radio. This limited their music listening to either the radio, or pre-recorded tapes. In the house, the standard set-up was to have a main sound system in the living room, with satellite systems of limited capability in other parts of the house. This meant that some rooms, such as the kitchen or bathroom, became exclusively radio or tape playing rooms.

These differences in technology across spaces meant that participants often faced the problem of managing the distribution of music media from one room to the next. Music would be carried around the house and be left in different distributed piles. One participant had even taken all his CDs out of the boxes and put them into a portable wallet so he could more easily carry his collection from room to room.

Listening to music while outside the house generated further frustration for our participants. Portable CD players were seen as cumbersome, and portable minidisk players, while smaller, still suffered from a limited selection of music and added the further complication of another format. Listening to music in the car also had its own complications in terms of the dangers of theft, the high cost of car-based CD systems, and the problems of limited music selection. In part this shows something of the opportunity which the iPod fills – playing music from your collection wherever you are.

Inside the house, in terms of actually choosing from a collection of CDs, some enthusiasts felt strongly about the pleasure of looking through the spines and selecting CDs to play. Others preferred to avoid this, and often left CDs in the player for days on end. Generally people had their collection stored a short distance from their main hi-fi, with a smaller pile close by. This small pile contained either new CDs, or ones they had recently played. While this simple form of pile management helped to restrict the search space of music when changing the CD, in practice participants complained that it also presented an effort barrier to listening to music from the main collection:

> *"A lot of time when I come back from work what I listen to is what is in there before. I just whack the stereo on and push okay."*

> *"But I do like the whole thing of choosing the CD spines … like a baby! Pulling out the red things and the blue things. I like choosing something and looking at the graphics on the case."*

> *"I am massively lazy, so I suffer from a recency effect."*

Another issue which arose was whether to listen to pre-recorded music or broadcast radio. Again, this was a choice somewhat dictated by the available technology, however it was clear that for some participants the radio served as a back-up source of music when they ran out of pre-recorded music since they would often be in situations where they only had access to a limited number of tapes (such as the car) or CDs (such as the kitchen):

> *"I get bored with the tapes I've got. The radio tends to be fresher."*

Some participants were also surprisingly strategic about their radio listening. These enthusiasts knew what programs were on the radio at what times, and would choose depending on the current program without even turning the radio on. Often they took advantage of the temporal structure of radio broadcasts to make their choice. That is, the fact that there is usually news on the hour, or that certain types of music are played at certain times of day:

> *"I listen to Radio One and listen to it at the points where I know they're going to play tracks that aren't on the play list. I listen to the Simon Mayo show just to get the three tracks – and the other day they had the most beautiful little selection."*

The diversity of technology across places presented a number of obstacles to unfettered use and choice of music. This included the need to carry around and organise a physically distributed collection, the need to copy across formats, problems in managing and searching large collections, and limited access to music in different locations.

As Bull's chapter in this volume reports the ability to carry your whole music collection with you is a big motivator for the popularity of the iPod. Yet for most music listeners some, if not most, of their collections will remain in conventional formats alongside their new music media. This managing and juggling will therefore be part of music practice for some time.

4.1.2 Copying music between friends

While market surveys report that 15% of the UK population copy music using conventional, non-Internet means (Mintel, 1998), all of our interviewees (both MP3 using and not) had copied some original recordings with conventional formats:

> *"Oh, [I copy] at least once a week. This week I've probably made about six or seven but at least once a week I'd say."*

> *"It's about 50-50 whether I copy it or buy it. It really depends on how available it is to be copied."*

The mean amount of copied material in our enthusiasts' collections was 28%. This suggests that copying was an important part of our enthusiasts' music consumption behaviour. Perhaps unsurprisingly, the major motivation for copying music was to avoid buying the music. The primary advantage of copying is that one saves money and can experiment with music that one might not have otherwise bought:

> *"That is one of the advantages of (home) taping, quite often you're not sure whether you'll like it enough to get it on CD but by taping you can listen to things and find out about a lot of different types of music and find out what your taste is."*

However, this is not to say that those who copied music, did not buy music. We found no significant correlation (negative or otherwise) between the amount of copied material people owned and the amount they bought. Suggesting that copying did not inhibit his buying, one enthusiast who copied music heavily commented:

> *"Whatever I've been doing I've always spent as much as I can of my money on music without going bankrupt."*

While this could be a feature of our sample (we chose individuals who frequently purchased music), Mintel has also reported that only 2% of their sample of the UK population copy music regularly but did not buy music regularly (ibid).

The major source for material to copy came from friends. Indeed, copying music was an activity very much embedded in existing social networks. For the teenagers we interviewed, a common social activity would be to visit friends' homes and play video games or relax together. In these settings, music would nearly always be played, providing both a way of moderating the mood of the group, as well as a forum for finding out about new music. The older music consumers we spoke to also discussed music being played in groups, as a way of producing amicable social situations when friends or family visited their house. In these setting it is natural to ask for a copy of music from a friend, since it is easily available at the point where the music is listened to.

These settings are important for spreading the all important "word of mouth" about new music. Friends would play to each other new music that they had purchased or discovered. These social music listening environments promoted the exchange of information and taste about new music. Not only did friends get to listen to each other's music collections, but friends filtered music for each other, deciding what they thought others would like to listen to. This involved a form of mutual understanding; friends would get to know each other's taste in music and so design their recommendations, and in turn their opinion of each others recommendations:

> *"I really value (my boyfriend's) opinion as he usually gets it spot on for me."*

> *"I think its because you get to know a person's musical profile, for want of a better word, you can trust certain people's recommendations."*

In this way, our enthusiasts and their friends acted as a form of collaborative filtering mechanism in how they found out about music and passed on recommendations (and copies). Friends also often searched through each other's collections, looking for music that they might borrow or perhaps copy. Thus friends' collections were used as sources of new media to experiment with and explore. Another important social method by which music tastes were shared was through the swapping of compilation tapes (see also (Willis, 1990) on this topic). This sharing of music, although time consuming and cumbersome with most current technology, was particularly valued by our interviewees:

> *"All the cassettes and CDs that I treasure are the ones which are compilations. And it tends to be the way I get into a new music area. I recently have been getting into dance stuff because of John who taped his DJ collection for me and is gradually getting me into harder and harder stuff."*

Overall, these social methods of finding out about music were very important for how our participants found out about music. In asking them to rank 14 different ways they could find out about music, "Someone I know played it to me on their Hi-Fi" was the highest ranked. This notwithstanding, a number of enthusiasts also underlined the frustrations they had with finding out about new music:

> *Int: "Do you ever have troubles finding out about music?"*

> *A: "Yes I do a hell of a lot actually, I always hear it off my mates they always seem to find out about it but I seem to miss it all the time."*

These frustrations highlight the potential for new technologies that help individuals to discover and expand on their music tastes. This is a point we will return to later when we discuss implications.

4.1.3 Identity and collecting

As has been remarked before in the literature (Frith and Goodwin, 1990), music choice is tied up with the formation of identity and membership of different groups. Often youth sub-cultures identify themselves using music as a way of forming and establishing their identity. Examples of this include “mods and rockers” (Cohen, 1972), “skinheads” (Clarke, 1975) and more recently “ravers” (Redhead, et al., 1997). To our interviewees, this connection between identity, sub-culture and music was also apparent, if in a less extreme way. The participants often would have friends who shared a taste in music. This gave them opportunities to socialise together around music, by going to nightclubs or live music together. Particularly for the teenagers we interviewed, a shared taste in music was an important bond for groups of friends. However, the older enthusiasts we spoke to also talked about having groups of friends with whom they frequently discussed new music, often swapping popular recordings and recommendations. Some enthusiasts even went as far as saying that if someone liked the same music they liked, this created an instant bond which would make friendship far more likely:

> *“There’s an instant connection, like if I meet someone who listens to the early Verve stuff then I think there’s something really important going on inside them [...] I think it brings me a lot closer to people if you can share the exhilaration that music can bring you.”*

This is perhaps not surprising: music taste, as with other tastes, can be seen as part of an individual’s identity. Others who have similar tastes may have other aspects of their identity in common. Later in the implications section we will discuss how this connection between identity and music can be exploited to enhance socialising online.

This connection between identity and music also followed through into collecting music. In many ways a music collection acts as a tangible presentation of one’s taste in music. Music collections were something that the enthusiasts took pride in:

> *“Your library expresses who you are. If everyone had access to the same stuff [...] it’s not the same.”*

In particular, a collection of original recordings (as opposed to copies) was very much valued. Over and over again in the different interviews the enthusiasts returned to their perception that originals were better than owning a copy. While this was often described in terms of the superiority of a purchased original – having the sleeve notes, having a CD over a cassette tape, better quality recording – there was also a strong perception that a copy was less legitimate than an original:

> *“It’s nice to have something permanently and properly, a bit of a feeling that (home) taping is quite scab [...] I don’t think it’s a moral thing, it’s a more sort of genuine thing that you actually like it and gone out and bought it. I’m mildly embarrassed about taped things.”*

"If it is a band I really like I'll buy it for collectors use."

"I buy something if I think I'm going to listen to it lots, I mean its easy to buy something like the Beatles White album because it's going to last a long time. Although I listen to it far more on the [copied] tape version than I ever do on the CD – that's kind of the irony of it all."

One possible reason for this could be the connection between collecting and identity. In some ways, a music collection is a physical manifestation of an individual's taste in music. Thus if music taste is part of identity, then so is a music collection. A frequent comment from our participants was that if they found they really valued some music, they would then go out and purchase an original to replace the copy. This suggests that having a collection of originals that reflects your taste in music is an important reason for buying rather than copying. Having a collection of originals of good music indicates good taste in the owner of a collection. As Belk puts it:

"[A] benefit of collecting is in enlarging the collector's sense of self. [...] the choice and assembly of objects to form a collection is ostensibly a self-expressive creative act that tells us something about the collector. [...] The surest way to undermine a collector is to observe that the collectible or collection 'is not you'." (Belk, 1995, p89)

To some of our enthusiasts, having an impressive collection of originals was a way of standing out from others. In this sense displaying the music collection became important, since the collection says things about us that it would be socially unacceptable to express aloud:

"I believe I've got optimal music tastes and I think my record collection reflects that, other people should respect it! (laughs)"

This has some implication for the design of new music technologies, in that digital music fails to properly support this collecting behaviour. This is not to say that there is no cache in collecting digital files. Yet these files fail to support much of the 'collectability' of physical CDs and records, in the way they can occupy space in a collectors home, how they can be displayed to others in the home.

4.2 New Music Media Use

We now move onto music activity over the Internet, as conducted by our MP3 users. Many of the MP3 files which our enthusiasts had on their computers were recordings that they also owned in conventional formats. A CD can be placed into a computer and the music "ripped" onto the computer's hard drive in MP3 format. Yet the different affordances of digital files led to a range of different usage patterns.

4.2.1 Tangibility

A key difference between computerised music files and physical music media is that they do not have a persistent physical presence which can be arranged to create an aesthetically pleasing display. Browsing through these on-line collections is also very different from browsing through physical collections with their accompanying artwork and sleevenotes. In addition, because they are not physically embodied, they are not as linked with social interactions. For example, digital files are not as desirable as gifts. They cannot be purchased from shops in the way that physical CDs and rcords can be. Moreover, digital files also have a number of serious practical problems with durability. File formats change frequently, and playback devices change:

> *"I wouldn't be so keen on that [...] if everything is not physical then you've got worries [...] it will be harder to lend to friends who haven't got the technology to access your collection and also not having sleeve notes and things like that."*

> *"No, there's no point. I like choosing – I like going through my records and then spotting one, if it was digital I'd have to [...] scroll down and it would be words."*

These limitations seem to impact on the collectability of digital files. Our participants saw a collection of digital files as inferior to a collection of tangible physical media. When we asked our participants about collecting digital files rather than physical music objects they were consistently negative, even those who used MP3 files extensively. Digital music files were untrustworthy, of lower quality, and unreliable:

> *"I think I'd always like to have something there – the solid thing. The option of being able to do that [collect the music digitally] would have to be a lot cheaper than having a CD, I don't know whether I'd actually trust it."*

This suggests that physical objects are more suitable for collecting and that current digital files do not support all the subtle activities involved in collecting. Of course, this is not to say that collecting digital music files does not have its own attractions. As mentioned in the introduction, this finding is similar to our findings on the use of paper documents (Sellen and Harper, 1997), and suggests some barriers to digital music superseding physical formats. For these reasons, we would argue that MP3 should not be seen as replacing physical media but rather as a complementary format, at least in the short to medium term.

4.2.2 Music copying online

It is ironic that one of the major drivers of the Internet, a network originally built for the millitary and funded by business, should turn out to be the illegal sharing of media. Some estimates put the amount of internet traffic generated by peer-to-peer downloads as high as 80% (CacheLogic, 2005). Certainly it has been a driver behind the growth in high speed internet connections to users. Yet while peer to peer applications allow the sharing of files between users, they seldom support much in the way of communication around music sharing unlike physical sharing, something which has instead been taken up by a wide range of websites which support interpersonal communication, such as webforums, chatrooms, IM and the like.

Our MP3 enthusiasts exhibited the same kinds of motivations behind copying as the conventional enthusiasts, but took advantage of MP3 files by either downloading from online file sharing system or by exchanging them with friends. In some cases, copying MP3 files followed a similar pattern as conventional copying. In these cases, files would be shared between friends over local networks, such as at work or on a college campus. For example, many of the university students we talked to had personal computers connected to the university network meaning that music could easily be shared between friends' machines:

"You can [download songs] off the network. I discovered Stereolab, and I liked one of their songs and one of my mates said 'oh so and so got it on his computer', so I went and had a look at that and he's got both albums on MP3, so I downloaded them off and listened to them."

However, the main method of music copying which the MP3 users discussed was the use of file sharing networks. These systems obtains music files by searching the machines of users also connected and downloads music files directly from them. Accordingly, unlike conventional music copying, this form of copying goes on generally between individuals who do not know each other and will probably never meet. This difference in technology also means that the number of tracks available far exceeds what could be copied from friends. At the current time, there are over three million tracks available for downloading. While many of these are duplicate files, this does give an idea of the amount of music available.

As might be expected, this change in the amount of music available changes the copying which is done compared to conventional music sharing. The enthusiasts talked about using online file sharing to experiment with new types of music that they would not have necessarily bought. This music was downloaded from strangers, without a social context, yet from a far wider range of music than available from friends. In doing so they complied somewhat eclectic collections of tracks, instead of downloading whole albums:

"I think there was a Quincy Jones song, the theme from "Minder" – don't know what came over me that night – and it would have probably been... Jolene by Dolly Parton. I wouldn't dream of going and buying them."

"I sort of do it in batches, just old classics that I have in my collection and I want to copy or just records I never got round to buying and I don't want to go back and buy an old album because I just wanted the one track off it."

So rather than downloading music to directly replace buying, this downloading was more a way of exploring music that the enthusiasts would not normally have bought. Certainly, for the enthusiasts we interviewed they claimed that using online file sharing had encouraged them to experiment with new music and did not make them any more reluctant to buy CDs. In fact, some said that this had increased their music purchasing (a finding also confirmed by other questionnaire studies of MP3 users (Jupiter, 2000)):

> *"I wouldn't say its cut down on my music purchases at all, in fact to a certain extent it would make me go out and buy it in a way if I hear something by an artist on MP3 if I like it that much I'll go and buy it."*

> *"It's influenced which ones I buy but if I like it 9 times out of 10 I will buy it. I don't think it has replaced buying the physical thing."*

This behaviour may have in part been caused by the time that it takes to download music online (it takes about three hours to download an average album using a conventional modem). However, our enthusiasts with broadband connections showed similar behaviour – the physical media still had a crucial role in their music use.

5. Lessons for the design of new music media

In the above two sections, we have highlighted some of the details of sharing music in both conventional and MP3 form. Music sharing with conventional media is deeply embedded in social activities, connected with both friendship and identity. For these activities, the physical nature of conventional media is highly important in how it affords certain uses, particularly the collection of music. For computer-based media, we have discussed the use of online filesharing services: how it differs from conventional copying, and how it can be used as a tool for browsing and exploring new music.

5.1 Selecting Music

A key set of lessons can be drawn from the differences in practices around new and conventional music media. Some of the changes in practices are due to the limitations in new media, some of which could be countered by better design for digital media. For example, while digital media supports much more flexibility in how it can be played (such as shuffling through a complete collecton), it loses the physical manipulations which CDs and records support so well. As remarked above, many CD listeners keep a small pile of CDs separate from their colleciton as a 'recently playing' collection. Yet few, if any, music players support this functionality. This would be easy to support with a 'shelf' inside the application which allowed users to keep a small collection of albums which they had just purchased or were currently being listened to. A second failing of digital media is the division of music into individual songs. While iTunes and Windows Media Player support organising a music library – to an extent – in terms of artists and albums they offer only limited support for this. A user cannot keep a playlist, for example, with multiple albums grouped together yet kept suffiently separate. This is easy with physical CDs – just put three CDs together. Media player applications could thus support much more the organisation of music in terms of albums, the natural organisational form of physical media.

5.2 Collectability and Display

As we remarked above, digital media files also loose much of the collectability of physical CDs. It is not just that physical CDs are more attractive than ephemeral digital files. Rather, they support uses which are much harder with digital files. One cannot leaf through information about that album in the form of sleve notes. Lending music to friends is harder. The emotional attachment to objects which much of collecting depends upon is lost. Of course, digital files do have some advantages – they are much easier to share, and they can be displayed online in new ways (see again Voida *et al's* paper in this volume). Yet one can foresee a number of ways in which digital files could recover some of these advantages of the physical form.

First, there could be much better support for the presentation of self through one's online collection. One could easily display a pictorial representation of one's music collection online on a website. While hardly as attractive as the physical presentation of a wall of CDs, it would support identity presentation through collections of digital files at a distance. Digital files could also provide much more in the terms of extra information about albums purchased. One could imagine extra content contained along with an album's downloaed files which can be broswed on an iPod while listening to that content. Band photos, articles and the like could then be read while listening to that music.

Lastly, and most radical of all we could forsee an attempt to recombine the physical form with digital media. One concept for this we have developed is the 'music book' – this takes the form of small CD sized books. Each book represents one album, yet, rather than storing the music itself, the book is designed to connect with an online copy of the music. Music books contain a small RF tag that acts as a unique identifier. The book itself contains information and articles on the artist and album, much like an extended version of the sleevenotes that currently come with an album. When the book is waved in front of a suitable player, the RF tag is read and the music connected with the book is downloaded from the Internet and played. In this way, the Music Book can be used just as a conventional record or CD would have been, giving a tangible and substantial representation of the music.

However since the music is stored centrally, what is played can be of near unlimited duration and can be accessed from any device connected to the Internet. This means that any Internet connected player – either portable or home-based – can access the music without having to be physically close to the Music Book. This combines the advantages of the physical and virtual. Music Books can be collected and displayed just as conventional CDs are. This supports the all important sense of ownership and collection which was discussed above. Searching for a piece of music can be done by physically looking through the collection of Music Books, rather than having to choose a album on a computer interface. Music Books can also be lent or borrowed. Music Books therefore combine the advantages of both the physical and the digital music distribution worlds. With this system, users can choose to buy music digitally online. If the music is bought online, the music (or the rights to access the music) can be downloaded to their player. This gives them the ability to instantly listen to the music on their digital player as soon as it is purchased. Soon after this, the corresponding Music Book is sent to them using the conventional post. The music tag on the book links to the digital music content. The individual therefore has instant gratification in that they can listen to the music digitally as soon as they buy it, but they also have the corresponding advantages of the physical artefact. Music can also be sold through existing retail outlets, even though all the actual music is distributed electronically.

5.3 Friendship and Community

A major part of this popularity of online music sharing is the ability to browse through media, sampling different types of music. This suggests entertainment media as a powerful "hook" for Internet communities more generally. The results above show that while conventional music sharing occurs with friends in social environments, with online sharing much of this sociality is stripped away. Certainly, sharing music online with current technology is an activity that is very 'lean' and involves little communication . These findings imply that online music applications could better support communication with friends around their music collections. Further, as discussed above, music taste is also part of an individual's identity. This means that those with similar tastes in music may have other aspects of their identity in common. If we meet someone who shares a particularly eclectic music taste then there is at least the potential of a bond of friendship. At the very least, there is a common conversation topic. This suggests that online music applications could exploit this to support community and the generation of new friendship around music.

Some of the connection between identity and ownership has been discussed in work on collaborative filtering systems, specifically systems which support filtering for individuals with particular expertise, such as "Who Knows" and "Expertise Recommender" (Mcdonald and Ackerman, 2000, Streeter and Lochbaum, 1988). However, looking at the example of music emphasises a connection between identity and collecting behaviour which has been previously neglected. This suggests that for some collections there is a special connection between the owner and the collection – since the collection has been selected in part to represent that person. In this case it is music, however other examples are collections of movies, art, books or academic papers. These collections could prove to be especially valuable for identifying individuals.

A second invention we are investigating looks specifically at the differences in music sharing online and in conventional media, in particular the amount of socialising that takes place around music sharing. As we discussed above, music is an application that is particularly suited to linking with creating friendship or community bonds, since in the physical world it is strongly linked with social activities. A similar observation comes from the collaborative filtering of friends' music tastes for each other. This suggests that the music collections of friends, and those with similar music tastes, would be a useful resource for discovering new music. With conventional music media, the enthusiasts we interviewed would look through friends' music collections to discover new music and experiment with music that they would want to listen to. Therefore there may be value in browsing through other's on-line music collections as a way of exploring music.

These observations led us to develop an application called "the Music Buddy" to help support discovering new music, and making friends through music. In designing the Music Buddy, our aim was to design an application that would combine some of the advantages of physical music sharing with those of Internet music sharing. This system starts by uploading a list of a user's music collection onto a centralised server. This is done by an application running on the user's machine which collects a list of MP3 files using MP3 format ID3 tags which list album, artist and song. This list is then sent to the centralised server which records which users have which songs. The server then supports the browsing of this and others' music collections using a normal Internet browser. To start, the system displays lists of songs by user. By clicking on a song, album or artist, a list of other users who also have that music is then listed. In turn, these related collections can be browsed. Importantly, this design does not enable copying music or infringing copyright. Instead, it only provides the names of individual tracks which are held on the server. The system then offers links to on-line music retailers to listen to legal samples of the music. In this way, users can explore new albums with the convenience of having an immediate link to a retailer if they should wish to purchase new music.

This "music browsing" functionality is an attempt to address some of the frustrations our interviewees expressed with finding out about new music. Different music collections act as a form of collaborative filter, in that one can browse through different music tastes in a structured way. Existing collaborative filtering systems (such as the Firefly and RINGO systems) work by a user specifying a set number of items which they like (Shardanand and Maes, 1995). With the Music Buddy, however, a user's music taste is automatically uploaded in the form of a list of the MP3 files they already have on their machine. This provides a more reliable and less troublesome way of getting at different users' tastes in music. Once a user's music taste is in the system, the system can then use techniques for matching the user with other users to suggest music that they might like.

While the current version of the music buddy works on a stored collection, aspects of its design could easily be integrated into online music purchasing websites, since these websites contain a record of all the music purchased by particular users. In part, this extends the functionality in the iTunes music store for sharing 'iMixes' – playlists which users can form and offer to others as selections of songs. Taking this further to support both music stored locally, and more extensive discussion forums could prove to be a valuable social 'hub' in the way that Amazon reviews have brought business to that website.

5.4 Purchasing Music Online

In closing our discussion some observations can be drawn concerning the recent popularity of legally purchasing online music. While the advent of the iTunes music store happened after we had conducted the interviews for this chapter the comments of our interviees are suggestive of why iTunes may have succeeded where others failed, as well as for the future development of these services.

A number of our interviewes complained about the lack of honesty associated with copied music – as one of our interviewees memorably commented, copied music 'is a bit scab'. The association for many is that copied music is in bad faith, that it neither helps the artist nor is it completely commensurate with being a 'good person'. This is not to say that this stopped our interviewees from having copied music – everyone we interviewed had *some* copied music, rather that these feelings could motivate the purchase of online music, despite its disadvantages when compared to physically purchased music. Buying music online, then, can be seen as a sign of honesty – but also of being properly 'into' the music. A collection of purchased online music is superior to a collection of copied music, even if those files have less technical capabilities due to digital rights management.

This suggests a disadvantage with subscription services such as Napster which offer an 'all you can download' model of music access, but only so long as a subscription is paid (a rental music model). These services do not present a clear model of 'owning' music, removing much of the motivation of buying music in the first place. Why 'rent' music through a subscription service when one can download it from the Internet (albet illegally). Yet 'purchasing' music is part of rightfully owning some music and building allegance to a band. Purchasing online supports these feelings in ways that renting does not.

It should be added that there are also a range of prosaic reasons why purchasing music online is increasing in popularity. Legal challenges by the music industry, where they have 'sued their customers', have obviously put some users off downloading music online from peer-to-peer services. The usability of most current peer-to-peer applications is below that of Napster – not only in their interface and reliability but also in the number of fake downloads which are not what they are described as, spyware integrated into the applications or a general association between peer-to-peer downloading and computer viruses. These factors, combined with iTunes' exellent ease of use, encourage online purchases for many users.

Yet for some music enthusiasts the ability to find whatever music they want online, for free although illegally, will mean that they will seldom purchase music so long as peer-to-peer services exist. It could be that as with home taping this group will remain a minority which can be safely ignored by the music industry, as the majority of music consumers find it safer and more comforting to buy their music, either online or from stores.

6. Conclusion

In this paper we discussed a study of music sharing in both physical and Internet forms, drawing implications for design. Using empirical data collected with interviews with 36 music enthusiasts we explored consumers' music sharing practice. While the group that we studied in this paper – music enthusiasts – is relatively small, it is worth emphasising again that this type of consumer makes the majority of music purchases.

This discussion took two parts. First, the paper discussed conventional music practices. This was a practice very much tied up with existing social processes, such as socialising with friends. In particular, friends were important for finding out about new music through recommendations and searching through friends' collections. In this way, friends act as a form of collaborative filtering for new music. Moving on to the use of online sharing services we commented on the differences between copying music physically and over the Internet.

As a final comment it is worth pointing out that iPods and digital music files are not the end point of the development of music technology. Just as formats are superceeded by more convient newer formats, so it is likely that these devices and formats will be superceeeded by newer technology. One possibility is the use of wireless networks to stream whatever music one desires from a central point. Alternatively, portable storage may become sufficent to store all the music ever recorded with ease. While these are beyond current technology they would in turn herald changes as with the move from physical to new music media. Music usage will thus continue to be a co-existance between the new and the old, rather than simply the replacement of old technology with the new technology.

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References

Adar, E. and B. A. Huberman, 2000, "Free Riding on Gnutella", *First Monday*, vol. **5**, No. 10, URL: http://www.firstmonday.dk/ issues/issue5_10/adar/index.html

Bakos, Y., E. Brynjolfsson and D. Lichtman, 1999, "Shared information goods", *Journal of Law and Economics*, vol. **XLII**, no. April, pp. 117-155.

Belk, R. 1995: *"Collecting in a consumer society",* Routledge.

Bentley, R., T. Horstmann and J. Trevor, 1997, "The world wide web as enabling technology for ECSCW: The case of BSCW", *Computer-Supported Cooperative Work*, vol. **7**, no. 21

Bowers, J. and S. O. Hellstrom, 2000, "Simple interfaces to complex sound in improvised music", in *Proceedings of CHI' 2000 extended abstracts*. The Hague, The Netherlands: ACM Press.

Bradner, E., W. A. Kellogg and T. Erickson, 1999, "The adoption and use of babble: A field study of chat in the workplace", in *Proceedings of ECSCW '99*. Copenhagen, Denmark: Kluwer Academic Press.

Brown, B., E. Geelhoed and A. J. Sellen, 2001, "The use of conventional and new music media: Implications for future technologies", *Proceedings of Interact 2001*. Tokyo, Japan.

Cachelogic, 2005, *"The true picture of peer-to-peer filesharing"*, presentation available online at: http://www.cachelogic.com/research/index.php

Chestermann, J. and A. Lipman, 1989, *"The electronic pirates: Diy crimes of the century"*, London, Routledge.

Clarke, J., 1975, "The skinheads and the magical recovery of community", in S. Hall and T. Jefferson (Eds.) *Resistance through rituals: Youth subcultures in post-war Britain*. London: Hutchinson.

Cohen, S., 1972, *"Folk devils and moral panics: The creation of mods and rockers",* London, MacGibbon and Kee Ltd.

Couser, J., 1999, "Software piracy and the Doris Day syndrome: Some legal, ethical and social implications of contemporary conceptions of property", *International journal of law and information technology*, vol. **7**, pp. 1-30.

Frith, S. and A. Goodwin, 1990, "From subcultural to cultural studies", in S. Frith and A. Goodwin (Eds.) *On record*: Pantheon Books.

Galan, R., 2000, *"Wolfgang Amadeus Mozart". Composers' Network*. Available on the internet: http://www.composers.net/ database/m/MozartWA.html

Gopal, R. D. and G. L. Sanders, 2000, "Global software piracy: You can't get blood out of a turnip", *Communications of the ACM*, vol. **43**, no. 9, pp. 82-89.

Hellmore, E., 2000, *"Music industry is caught napping",* The Guardian. London. March 16. Available on the internet: http://www.guardianunlimited.co.uk/ Archive/Article/0,4273,3974240,00.html

Hughes, J., J. O'Brien, T. Rodden, M. Roucefield and S. Viller, 2000, "Patterns of home life: Informing design for domestic environments", *Personal Technologies*, vol. **4**, pp. 25-38.

Jupiter, 2000, *"Jupiter finds napster users are 45 percent more likely to increase music spending"*. New York, Jupiter communications. July 20, 2000. Available on the internet: http://www.jup.com/company/pressrelease.jsp?doc=pr000721

Oram, A., 2000, *"Peer to peer: Harnessing disruptive potential",* O'Reilly & Associates.

Kollock, P. and M. Smith, 1996, "Managing the virtual commons: Cooperation and conflict in computer communities", in S. Herring (Ed.) CMC: *Linguistic, social and cross-cultural perspectives*. Amsterdam: John Benjamins.

Konrad, R., 2000, *"Napster among fastest-growing net technologies",* CNET News. October 5, 2000. Available on the internet: http://news.cnet.com/news/0-1005-200-2938703.html

McCarthy, J. F. and T. D. Anagnost, 1998, "Music FX: An arbiter of group preferences for computer supported collaborative workouts", in *Proceedings of CSCW '98*. Seattle, WA: ACM Press.

McCay, B., J. Acheson, 2000, *"Question of the Commons: The Culture and Ecology of Communal Resources",* University of Arizona Press.

Mcdonald, D. and M. S. Ackerman, 2000, "Expertise recommender: A flexible recommendation system", in *Proceedings of ECSCW '2000*. Philadelphia, PA.: ACM Press.

Mintel, 1998, *"Mintel report: Records, tapes, cds"*. London, Mintel. February 1998.

Nardi, B. and S. Whittaker, 2000, "Interaction and outeraction: Instant messaging in action", in *Proceedings of ECSCW '2000*. Philadelphia, PA: ACM Press.

O'Brien, J. and T. Rodden, 1997, "Interactive systems in domestic environments", in *Proceedings of the ACM conference on designing interactive systems – DIS'97*: ACM Press.

Pauws, S. and D. Bouwhuis, 2000, "Programming and enjoying music with your eyes closed", in *Proceedings of CHI 2000*. Amsterdam, Netherlands: ACM Press.

Plumleigh, M., 1990, “Digital audio tape: New fuel stokes the smoldering home taping fire”, *UCLA Law review*, vol. **34,** pp. 733-776.

Preece, J., 2000, *“Online communities: Designing usability, supporting sociability”,* New York, Wiley.

Redhead, S., D. Wynne and J. O’Connor, 1997, *“The club cultures reader: Readings in popular cultural studies”,* Oxford, Blackwell.

Richtel, M., 2000, *“Napster and record industry clash over sales and copyrights”,* The New York Times. New York. July 4, 2000, Tuesday.

Rob, R. and J. Wadfogel, 2004, “Piracy on the high c: music downloading sales displacement and social welfare in a sample of college students” *NBER working paper series (10874)*.

Sellen, A. and R. Harper, 1997, “Paper as an analytic resource for the design of new technologies”, in *Proceedings of CHI ‘97.* Atlanta, GA: ACM Press.

Shardanand, U. and P. Maes, 1995, “Social information filtering: Algorithms for automating word of mouth”, in *Proceedings of CHI ‘95.* ACM Press.

Shirky, C., 2000, *“In Praise of Freeloaders”,* OpenPTP.com article, 1 December 2001, http://www.openp2p.com/pub/a/p2p/2000/12/01/shirky_freeloading.html

Streeter, L. A. and K. E. Lochbaum, 1988, “Who knows: A system based on automatic representation of semantic structure”, in *Proceedings of RIAO '88 conference on user oriented content-based text and image handling.* Cambridge, MA.

Turner, R. M., 1993, “The Tragedy of the Commons and Distributed AI Systems”, in *Proceedings of the 12th International Workshop on Distributed Artificial Intelligence*, Hidden Valley, PA.

Ungar, L. and D. Foster, 1988, “Clustering methods for collaborative filtering”, in Proceedings *of the workshop on recommendation systems*. Menlo Park, CA.: AAAI Press.

Willis, P., 1990, *“Common culture: Symbolic work at play in the everyday cultures of the young”*, Open University Press.

Chapter 4

SOCIAL PRACTICES AROUND ITUNES*

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1. Introduction

Music sharing technologies appear to exist tenuously between the possibilities supported by technical innovation (e.g., peer-to-peer discovery protocols) and the constraints of political, legal, and ethical considerations. These political, legal, and ethical considerations – digital rights management laws, in particular – have catalyzed much of the recent changes in music sharing technologies and have led to an almost exclusive research focus on those issues (e.g., Bowrey & Rimmer, 2002; Kasaras, 2002; Lam & Tan, 2001).

There is, however, a gap in the research that is available to inform current music sharing technologies – a lack of understanding about users' actual practices surrounding music sharing (a notable exception to this is Brown, Sellen & Geelhoed's comparison of music sharing offline with online music sharing via Napster (2001)).

Apple Computer's iTunes[11] digital music jukebox software has been one of the few music sharing technologies that has successfully walked this apparent fine line between taking advantage of certain technical innovations and conforming to the constraints of political, legal, and ethical considerations. A study of iTunes music sharing practices enables the research community to better understand the moving target of music sharing technologies and practices and the implications of the positioning of music sharing technologies between technical innovation and political, legal, and ethical considerations.

[11] http://www.apple.com/itunes

* This work is based on an earlier work: Listening in: Practices surrounding iTunes music sharing, in *Proceedings of the SIGCHI conference on human factors in computing systems,* © ACM, 2005.
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K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 57–83.

In this chapter, we report findings from an interview-based study of the day-to-day practices surrounding iTunes music sharing among employees of one corporation. We describe a variety of iTunes music sharing practices and examine their relationship to the technologies of iTunes – the interface and discovery protocol. Prior to this study, what was known about iTunes music sharing came from media reports that largely focused on use in the college setting (Kahney, 2003). These reports placed their emphasis on a single social effect of iTunes usage, a type of musical voyeurism, termed "playlistism," that had been hyped in college newspapers (Aubrey, 2003).

The ability to see and subsequently judge others' playlists arose when Apple released a version of iTunes that supported the sharing of music collections on the same subnetwork via the Rendezvous (also known as OpenTalk or ZeroConf[12]) discovery protocol. Suddenly, individuals could listen to and examine not just their own music collection but those of anyone on the same subnetwork.

This change, from iTunes as a single-user jukebox application to a tool for music sharing, clearly brings with it the potential for social effects that have not yet been studied. What are the everyday practices involved in iTunes music sharing? Are iTunes users really casting musical judgments upon other iTunes users? In what ways does the design of iTunes impact how the impressions of others are being constructed? What additional kinds of work are created to ensure that the impressions others are constructing are desirable ones? What are the implications of a technology whose social structures are predicated on solely technical network structures? How does the discovery protocol and dynamic nature of the system impact user experience? How do users make sense of the comings and goings of users and their music libraries? These were some of the questions we set out to answer in our study.

In the remainder of this chapter, we provide a brief orientation to the iTunes application and an overview of technology and music sharing, including a discussion of related work and a design space for music sharing technologies. We then present the results of our study. These results cover a range of topics including the adoption of iTunes; the impression management involved in iTunes music sharing and the impressions that are created; how users make sense of the dynamic system; experiences of rediscovery; implications of the overlaid technical, musical, and corporate topologies; and how iTunes is appropriated in different contexts to create different soundscapes. We interleave design implications throughout these results. Finally, we relate our results to broader themes of the music sharing design space, of iTunes as an online community, and of the positioning of music sharing technologies between technical innovation and political, legal, and ethical considerations.

[12] http://www.zeroconf.org

2. iTunes

iTunes is a "digital jukebox" for organizing, sharing, and listening to music on both the Macintosh and PC platforms (Figure 4-1). Each music file can be tagged with a name, artist, album, genre, and rating. These tags can then be used to sort libraries or portions thereof. In addition, genre, artist and album tags can be used as filters on a library, filtering out all but the "film score" genre, for example. A user can also search within music libraries.

Figure 4-1. iTunes

Any sort, search, or filter operation will result in a transient music playlist. Users have two options for creating persistent playlists within their library. First, they can simply drag selected songs into a playlist. Second, they can create a "smart" playlist by defining a set of rules over the library, such as "include only unplayed music." iTunes generates several default playlists, including "My Top Rated" and "Top 25 Most Played."

Using Rendezvous, iTunes users can share their music in two ways – either by sharing their entire library or by specifying which playlists to share. Rendezvous, a zero-configuration networking protocol, supports publishing (the act of sharing) and discovery (the act of finding) across a subnetwork. A subnetwork (colloquially known as a subnet) is a small division of a computer network, created a priori by an administrator, that reduces the volume of network traffic by allowing machines on the same subnet to bypass routers and communicate directly with each other. Users see others' shared music automatically; they do not have to take any explicit network connection actions.

In contrast to previous online music sharing technologies, iTunes music sharing does not support copying music over the Internet. In iTunes, music files reside only on their host machine and, when shared, are streamed to another user's computer. One side effect of this mechanism for sharing is that when a music sharing host shuts down iTunes, her music is no longer available to anyone who might be listening.

Other features of iTunes that are not directly relevant to this study include the ability to rip and burn CDs to and from one's own library, access to Internet radio stations, and an online iTunes music store.

3. Music Sharing & Technology

The history of the relationship between music sharing and technology goes back to at least 1963 when Philips introduced the cassette tape (Lubar, 1993). Music sharing was carried out via mixtapes (or party tapes, as they were originally known) (Reid, Calloway, Dukes, Byrne, Parry & Waller, 2003). The use of mixtapes thrived in certain musical subcultures, such as the hip hop subculture, in which many of the best records were "not legally available" (Frith, 1986). In these subcultures, mixtapes helped individuals develop a collective sense of identity based on shared musical interests (Ebare, 2004; Hebdige, 1990).

In both musically-oriented subcultures and among other individuals, mixtapes provided a means of establishing and maintaining social bonds with other people. For example, dating has long been facilitated by the ever-popular romantic mixtape – a carefully crafted collection of songs given to a person as a sign of an existing or desired relationship. While the underlying technology may have changed to CD-Rs, the social practice of gift-giving that surrounds mixtapes and the intent of that exchange to forge a closer bond through shared music has remained the same.

In contrast, the first wave of peer-to-peer file sharing technologies (e.g., Napster (Brown et al., 2001), Gnutella (Adar & Huberman, 2000), and KaZaA (Good & Krekelberg, 2003)) brought with them very different music sharing practices. Collectively, these systems provided access to huge quantities of music. Because of the massive volume of content available, users were bound to find almost anything they looked for. Theoretically then, these systems made it possible for individuals with divergent musical interests to share files with each other. In practice, however, one could only find a song through an explicit search. It was impossible to browse through another user's library without first conducting a search for the name of a specific song in that library. Searches, then, were more likely to lead a user to music libraries with shared or overlapping musical interests than they were to lead a user to a library with completely divergent musical taste.

These large-scale, peer-to-peer applications also tended to anonymize music sharing interactions (Brown et al., 2001), making "the human" in the system secondary to the explicit search for a specific music file. Even after locating a desired file, the music sharer was often relegated to being the signifier of a desirable or undesirable bandwidth for serving songs over the Internet. In addition, while some of these peer-to-peer systems had built-in chat functionality, we know of no accounts of this functionality being used. Some systems (e.g., Napster) separated chat from song download in its interface, making it difficult to talk while getting music and further decreasing the potential for sociality.

In this first wave of peer-to-peer file sharing, then, not only were the interactions anonymous, they also acted as filters, filtering out those users with no overlap in shared musical interest or knowledge. Perhaps, in part, as a consequence of this lack of strong social connection, some researchers interested in peer-to-peer file sharing focused more on what were perceived to be crises in collective action (Adar & Huberman, 2000). Other researchers responded, instead, to broad concerns about economic and legal consequences of peer-to-peer music sharing (Bowrey & Rimmer, 2002; Kasaras, 2002; Lam & Tan, 2001).

The difference between the strong social bonds among individuals sharing music via mixtapes and the relatively anonymous experience of online music retrieval mirrors the findings of Brown et al. (2001). Indeed, they argue that much of the sociality has been stripped away in massive-scale online music sharing and, as a result, propose that technologies be designed to support the sociability that exists in face-to-face music sharing. As a new type of technical artifact, we were interested in seeing whether the specific features of iTunes supported sociability better than the massive-scale online music sharing systems.

iTunes populates novel territory in the music sharing design space (Figure 4-2). First, by making people, not music, the first class objects in the system, iTunes does not favor shared musical interests over divergent ones; this potential to support music sharing among individuals with divergent musical interests sets iTunes apart. Second, since discovery is restricted to a subnet, it occasions music sharing among people who may be quite intimate all the way to people who may never have met. Yet, music sharing interactions over iTunes will never be as anonymous as the massive-scale, peer-to-peer systems because the scale is smaller, the human aspect of the system is foregrounded, and perhaps most importantly, because each group of users has IP addresses on the same subnet, each group will share something in common, be it working for the same company, living in the same dormitory, or frequenting the same coffee house.

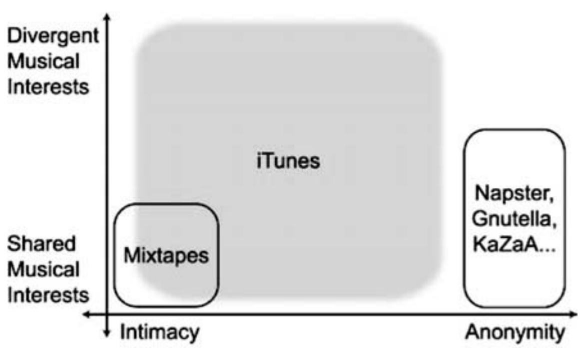

Figure 4-2. Design space of music sharing technologies

4. Method

We conducted 13 semi-structured interviews of iTunes users. The interviews lasted approximately 45 minutes each and were held in the participants' offices. To the extent possible, the interviews focused on specific examples of social aspects of iTunes use. For example, we asked participants to tell us about the last time they discovered a new music library in iTunes. The 13 participants were all employees of a mid-sized (~175 employees) corporation. Ten of the participants were researchers in various technical disciplines; three of the participants were administrative support staff.

The network topology of this company consisted of four wired subnets. Three of the subnets were defined by the physical layout of the building – floor 1, floor 2, and floor 3. The fourth subnet was used by the members of a department within that corporation. Theoretically, then, our participants belonged to four different groups of iTunes users; participants were able to view and share the music only of those members of their subnet group. In reality, we interviewed between two and eight members of each of three subnet groups, ranging in size from 3 to 12 known members. One last participant did not share his music library; if he had tried, he would have belonged to the third floor subnet group which had no other members (Table 4-1).

Table 4-1. Participants' subnet distribution

Subnet	Number of participants	Number of sharing iTunes users
Floor 1	2 (P1-P2)	3
Floor 2	2 (P3-P4)	7
Floor 3	1 (P5)	0
Dept. A	8 (P6-P13)	12

5. Results & Design Implications

5.1 Adoption, Critical Mass & Privacy

Twelve of the thirteen participants in this study shared their music via iTunes. Those who used iTunes as a personal music library prior to the version release that enabled sharing upgraded their versions of iTunes and started sharing immediately.

The rest enabled sharing as soon as they started using iTunes; sharing, as it was seen, was part of the "ethos" of the application:

> *"...the fact that you can then see immediately that other people are sharing their music then sort of implicitly makes the whole ethos be that you ought to share."(P12)* [13]

Only one participant did not share his music via iTunes. Sharing, he felt, was something that students, not co-workers, would do. Although he was incorrect at the organizational level, it was interesting to note that his machine was connected to the only subnet in which no one else shared their music, so his intuition was correct for the co-workers nearest him.

5.1.1 Design Implications: Jumpstarting Network Effects

The visible foregrounding of others' shared music libraries in the interface seemed to encourage people to share their own music collections. The challenge, then, would seem to be to get the first person to share their music. In our data, we noted at least one pair of users who initiated iTunes sharing on their subnet by making a commitment to share their music with each other. The number of individuals sharing on their subnet grew from that initial two. For iTunes, unlike many collaborative applications, the critical mass required to fuel adoption may be as small as one or two users willing to share their music.

Another sharing design decision also played an important role in iTunes adoption. By default, one's own music sharing is turned off; users must explicitly turn it on. One participant (P9) reported that if his music had been automatically shared, he would have strongly resented it and turned it off. Giving users control over whether they share their music from the start respected users' privacy concerns in sharing.

5.2 Impression Management & Access Control

By turning iTunes' music sharing on, people made their music libraries available to others on their subnet. This act also brought with it varying amounts of additional work – the work of determining what identity to portray through one's own music library, something sociologist Erving Goffman termed "impression management" (Goffman, 1959, 1967) .

The most intentional account of impression management came from a participant who already had a small iTunes library when the version of iTunes with sharing functionality was released:

[13] All identifying information, including names of participants and their music libraries, department names, and, where necessary, artists and genres of music have been changed to preserve anonymity.

"I just went through it and said, "Eh, I wonder what kind of image this is, you know, giving me," right? I just went through it to see if there was not like stuff that would be like, I don't know, annoying; that I would not like people to know that I had." (P11)

For this participant, music sharing led to the additional work of ripping more CDs to create a more "balanced" portrayal of himself:

"When the sharing happened…I had not ripped everything from my CD collection…It was fairly heavily skewed toward the classical and soundtrack part of my collection…the order in which I'd popped the CDs in. And I remember thinking about this and was like, "Gee, that's not very cool.…" So when we started sharing, I started re-ripping things, adding stuff to my collection…I added more to kind of rebalance it and cover a wider breadth of genres that I had in my collection." (P11)

Another participant had not given the contents of his music library the same degree of scrutiny. With respect to constructing an identity, the contents of his library were complicated by the fact that he occasionally purchased music online for his wife. These songs were by artists that he did not listen to or like, and he was disturbed by the impression that these songs could give others:

"I mean if people are looking at my playlist to get a picture of the kind of music I like and don't like, you know. Or to get a little insight into what I'm about, it'd be kind of inaccurate 'cuz there's, you know, there's Justin Timberlake and there's another couple of artists on here that...Michael McDonald, you know. Some of this stuff I would not, you know, want to be like kind of associated with it.…I guess part of it is it wouldn't be bad if, you know, people thought I was kind of hip and current with my music instead of like an old fuddy duddy with music. I mean I sort of like to experiment a little bit with stuff. I mean I'm not like totally wild but I like to experiment with, you know, some newer stuff. So I guess it would be okay if people thought that I had good taste. It wouldn't be so good if they said, "God! He likes Justin Timberlake? That sucks!"(P1)

Expertise played an interesting and differentiating role in the ways that our participants crafted their identities. Some of the participants felt their libraries should foreground the kind of music in which they had expertise – creating a definitive repository of Jimmy Buffett music, for example. Another participant used his own national identity to give his library…

"…a particular focus on all of the German bands actually that I have, because…if I have something to offer on the network, I'd like to be able to give, you know, albums and artists that other people don't have." (P11)

However, expertise not only caused users to augment and foreground music in a library, it also caused users to hide and not share music in their library. These participants described their expertise as being in an area they felt that, at best, others would not "relate to" and, at worst, would be a "horrible experience":

"I have a lot of Hindi music that is stuff that I listen and I don't expect other people to relate to. So that is not there." (P4)

> *I don't want to bother sharing all of my stupid band clips 'cuz that would probably be a pretty horrible experience." (P12)*

Sometimes it was not sufficient for users to craft a static identity. As more and more co-workers joined the iTunes community, sometimes the identities were actively managed. Most notable were the changes that one participant attributed to the arrival of some managers to the community:

> *"Some people have expressed some concerns especially when the managers started sharing, started browsing other people's collections, about being exposed to other people and like the contents of their playlists, like how much they like Abba or whatever…I'm trying to remember if [employee] changed her name when [manager] showed up." (P12)*

The name change referred to by P12 is supported by the ability within iTunes to label one's collection. By default, when a user turns sharing on, the name given is "[OS user name]'s music," but this name can be changed. Making the name of a music library more appropriate for a manager to see was one factor in naming a music library. Other names referred to the hobbies or interests of the library's owner while others commented on the contents of the library.

5.2.1 Design Implications: Supporting Users' Ability to Manage the Presentation of Self

Participants utilized several of iTunes' mechanisms for managing identity. First, people changed the name of their music library in response to the audience of potential music listeners. Second, iTunes allowed users either to share their entire library or to specify which playlists to share. People who wanted to remove certain types of music used playlists as a means of controlling what was shared.

Based on our findings, particularly regarding the role of expertise, we believe other types of sharing control (including share by genre, country of origin, album and artist) would have been well received. Further, as libraries get large, managing the sharing becomes complicated, so offering users the choice to make new music part of the shared collection at the time it enters the system may also help.

Several of our participants reported problems with their workplace iTunes music libraries resulting from additionally using iTunes at home. One participant (P1) had music in his library that he had downloaded at work only to take home for his wife. Another participant (P2) had to construct a completely separate music library for work because his music library at home contained so much of his son's music. The overloading of multiple identities in a single library raises other design questions and suggests that providing some mechanism for sharing based on "which user you are" would be of value.

More generally, the length to which people managed their shared music highlights the relationship between identity and access control. Today, many access control solutions are designed by security engineers with secure systems in mind. But this study suggests that access control is more complex than simply restricting who can see what. Access control is a tool through which users manage others' impressions of them. It is a technology that has been appropriated to support the careful crafting of identity.

5.3 Creating Musical Impressions of Co-workers

For the potential listening audience, these carefully crafted views into others' music libraries constituted "little windows into what they are about" (P1). In some cases, participants would browse through the list of genres represented in others' libraries to come to the conclusion that someone is "eclectic" or "easy because he has only one genre" (P11). One participant (P1) drew his impressions not so much from the musical content of others' libraries as from characteristics of the custom playlists that some users generated from their content.

However, the ability to determine whose collection was whose was made more difficult by some of the features people used to manage their identity. For example, the ability to customize the name of a music library confused potential listeners:

> *"People can give names to their collections that are not necessarily obvious. So the first few times that SmallieBiggs here appeared on my list, I was really curious who the heck is SmallieBiggs?...So the first time SmallieBiggs appeared on my collection, I spent, I don't know, maybe fifteen to twenty minutes navigating the collection, and thinking who at [this company] in [this department] could possibly be listening to this particular music collection. So that was, you know, enjoyable detective work." (P11)*

Although P11 enjoyed guessing whose collection it was, others found the ambiguity more frustrating. In addition to being confused by the name, users were also puzzled by the intent behind obscuring the owner's name:

> *"I wish I could find out who these people are. That's one thing that would be cool. I mean its kind of a small group. There's only like five or six things shared here. But like I have no idea who SmallieBiggs is. And I don't know maybe it's because they don't want me to know or because they think it's more fun to have like an interesting name or what." (P10)*

Many people could make educated guesses about some of the anonymous collections by examining the music itself. Some people figured out whose collection was whose by asking colleagues. Most participants felt certain they knew who owned most of the music libraries. Often, if there were libraries that a user had not mapped to an individual, it was a library that user rarely, if ever, listened to; not knowing whose library it was, in this case, did not seem to concern our participants.

Beyond providing simultaneous customizability and ambiguity in naming music libraries, the iTunes interface was perceived as more directly affecting the impressions that were created. For example, when a person clicked on another person's library, the interface displayed each file (usually this equated to one track of a CD) in the entire library in ascending alphabetical order by artist name:

> *"[That] people's impressions of what your collection is are probably very heavily influenced by the things that happened to be the first thing in sort order is sort of a weird thing...If Pete[14] was here...one of the first things that comes up for him...so I think 10,000 Maniacs is in there and then the second thing I think is he listens to this Jewish humour rap group called 2 Live Jews...If you didn't scroll down that would be like your whole impression of [him]." (P12)*

Another source for judging other's musical libraries came from an individual's own tastes and expertise. By browsing through their music libraries, one participant was hoping to learn something surprising about his co-workers. In the end, he found he didn't know enough about the types of music to which others listened to know if he even should have been surprised: "I don't really know the first thing about music; it's either classical or not" (P7). This same lack of distinguishability was articulated by another participant, also a classical-only listener. "Their collections are pretty much the same as each other's, so you don't need more than one of them" (P13).

These two classical-only participants were better able to distinguish the distinctions and articulate their impressions of each others' music:

> *"He's got quite an eclectic taste and for me, like, I can try out, especially from more difficult, you know, more modern...music." (P13)*

To contrast, the user that is being referred to in the quote above as being "eclectic" is the same user that another participant had decided was "easy because he has only one genre"." (P11)

Despite the close examination of others' libraries, participants seldom felt that these musical impressions significantly changed their view of a co-worker. Rather, they felt it mostly "serves to reinforce impressions I've already got" (P12). Occasionally, however, a participant admitted that knowledge of others' musical tastes impacted his opinion of them: "[P6] I have learned is a big fan of whatever current pop is which I suppose to some degree lowers my estimation of him but not by too much" (P12).

The more significant and longer-lasting impact of these musical impressions seems to be the binary judgment that frequently gets made:

> *"So when there is someone new, I spend a fair amount of time listening to what they have and then...binary process, either I just decide well there is nothing in there for me or I really like it and will come back to it." (P11)*

In other words, the first examination of another person's library seems to have a strong influence on whether the visitor will ever return to that library.

[14] Pseudonym for an iTunes user who was not a participant in this study.

5.3.1 Design Implications: Scaffolding Impression Creation

iTunes' interface plays a critical role in terms of allowing an audience to examine and judge a collection, thereby creating an impression of a co-worker. The name customization feature presents a design trade-off between allowing collection owners to enhance or hide their identities at the cost of ambiguity and of potentially frustrating listeners.

The design decision to present another user's library as an ascending alphabetical list requires users to do the work of scrolling down through potentially enormous collections to see the entire contents[15]. These same users, however, are likely to make a binary decision about the value of the library based on what they do see, whether they scroll through the entire collection or not. Alternate visualizations designed to help novices and experts (of each library and the genres of its musical contents) navigate their way through the contents would seem valuable.

Finally, while people make significant judgment calls up front about whether they will ever revisit a library, almost all the participants continued to add new music to their own libraries. iTunes did not provide any mechanism to signal that new music had been added to an individual's collection. In our data, we noted several cases of participants working outside of iTunes (in person or via email) to alert others to the presence of new music in their collections.

We think that in addition to encouraging people to reexamine libraries that they previously had no interest in, foregrounding new music would also attract people who liked some of the music in another person's library and wanted to see whether they would also like the new additions.

5.4 Making Sense of a Dynamic System

Although the potential dynamism created by a person adding new songs to their library largely went unnoticed, other types of dynamic events were more visible. In particular, the arrival of new collections on the network and the coming and going of people's libraries were very visible.

We were surprised by the excitement generated by the arrival of a new person and their music collection on the network. More than one participant described the presence of a new collection as an *event*:

> *"...all of a sudden thirty gigs more music appeared on the network. That was a notable event." (P12)*

> *"Someone's collection shows up for the first time...you wonder, you know, what their musical taste is and you want to find out, you go through it, you want to know whether there's going to be some cool music that you can listen to that you don't currently*

[15] Although iTunes provides another view that allows people to filter or browse by genre, artist, and album, it requires activation by pressing a browse icon, a feature which few participants had discovered.

have in your own collection or through the other people that you already know….That's a good event if somebody shows up." (P6)

It was the arrival of these new collections that triggered the first and deepest exploration of the library by many other participants.

The more routine coming and going of music collections was not as notable an event, but people did notice. Indeed, some participants were highly attuned to this dynamic system, noting when music libraries disappeared and responding accordingly. Two of our participants had adjacent offices. During one interview, the first participant noticed that the second participant's music library had disappeared: "Oh, [P2] just rebooted his machine. His music went away. [Shouting through the wall at P2, next door]. [P2] what happened? Did your machine crash?" (P1).

For some participants, the dynamic nature of the iTunes virtual world mapped conveniently on to the dynamic nature of the physical world; iTunes became an explicit mechanism for awareness:

"The interesting thing is that so this list is dynamic, so by definition if I see those people it means that they are online and here, which is kind of interesting because for some people it actually sort of doubles the functionality of IM. There are some people here that I don't have on my IM list that I have in the iTunes so I don't have [P6] on IM but if I want to talk to him today I know he's here so that's kind of nice." (P11)

For other participants, the mapping was more complex. Another participant had figured out that some music libraries were shared from laptops and some music libraries were shared from desktops. As such, if a desktop user's library were still available, it was possible that user was not actually present but had, instead, left his iTunes application running:

"[P9] and Pete have the stuff loaded onto their desktops and so their things are always here at work….Everything else disappears….Everybody else has it on their laptop, as do I." (P12)

The coming and going of some members of the iTunes subnet groups also foregrounded asymmetry in the awareness information provided. Assuming one had mapped an iTunes library to its owner, as most of our participants had, one knew whose music one was listening to. The music provider, on the other hand, was not aware of who was listening to her music. When a music provider shut down iTunes, her music was no longer available to anyone who might be listening. For the listener, the music stopped abruptly and without warning. The provider was informed that someone was connected to her library, but it was unclear (a) whether someone had merely downloaded information about the contents of the library or was actively listening to the music and (b) who that user was.

One of our participants recounted a conversation with another participant about what it felt like to disconnect someone's music: "She was saying how she felt bad disconnecting because she figured someone was listening" (P12). Because the listeners likely knew who turned off the music on them, they knew who to hunt down: "I know that every so often when I turn this off or reboot my machine, he comes by and says, 'Hey, what's happened?'" (P3). In contrast, the music provider did not know who they might have inconvenienced:

> *"I notice that when I power down at night, there's frequently somebody, you know. It gives you that message that says, "Are you sure you want to turn off iTunes, somebody is listening to your music?" That's interesting; I wish I knew who it was…" (P13)*

One participant felt strongly that music within the subnet groups should be more consistently accessible to members of that subnet group, particularly if someone had just logged off of iTunes for the evening. He knew that their music was still on their machine and that their machine was still connected to the network and the music should, therefore, be available. This participant had considered using a utility like getTunes[16] to exploit iTunes music streaming and to copy the music he wanted access to in the off hours.

Another sense of the loss of music on a larger scale occurred on two separate occasions when two iTunes users left the company. In one case, a participant noted disappointment; he had been in the middle of a process of discovering enjoyable new music from one ex-employee's library. In the other case, a backup CD that included the ex-employee's music files was discovered as his old office was cleaned. That music was illegally added into the music library of a participant, giving the second ex-employee something of a ghost presence on iTunes.

5.4.1 Design Implications: Designing for Comings and Goings

One difficulty with the dynamism inherent in iTunes was the asymmetry associated with closing a connection. Users disconnecting did not know whose music they might be shutting off. The discomfort that people felt after having cut someone off without the ability to warn them or to apologize suggests that listening to music might be like having a conversation; appropriate closure is needed. Facilitating closure in iTunes could happen in a variety of ways – more explicitly by providing a chat facility (although as with Napster, we are not sure whether this would be used) or more indirectly by automatically increasing the size of the stream buffer to allow the connected user to finish the song.

The dynamism of iTunes also foregrounded the loss of music when individuals logged off of iTunes. Participants reported frustration with the inaccessibility of music that they knew was still on a particular machine and still connected to the network. One might consider making music available regardless of whether a user is logged on or running the iTunes application by implementing music sharing as a system-owned service, similar to the way in which many operating systems implement FTP and Web services. Such a feature could also be useful for civic sharers, those who shared music without ever using the application, themselves (see discussion in the next section).

[16] http://sourceforge.net/projects/gettunes

When a user shuts down her iTunes application or even permanently leaves the company, as was the case with the two ex-employees, there was a "hole" left in the music community. One could explore design techniques for leaving "traces" of those missing playlists. These "traces" could be useful if one wanted to purchase any of the music that was no longer available, supporting users who knew they had liked some of the missing music but could not recall the specific album or artist. The "traces" could also support users who had been in the middle of discovering new music in the missing libraries.

5.5 Experiences of Rediscovery

Rendezvous, the technology underlying iTunes music sharing, is one of a class of technologies referred to as discovery protocols. Every time an iTunes user logged on to share his or her music, whether it was the first or the fifty-first time, the discovery protocol found that music library and shared it – a new act of discovery. Our participants, however, did not experience discovery with the same repetition or at the same level of granularity. The first time a participant saw a new music library, it was an event, an opportunity to discover what new music might be available and what the musical tastes of a colleague might be. Subsequent times the discovery protocol rediscovered a music library, it was a non-event and not experienced as "rediscovery" by participants.

The experiences of rediscovery reported by our participants, although related to the technical discovery of music sharing, did not correlate with technical rediscovery. The theme of rediscovery in our data was a personal, often reminiscent one:

> *"I found a couple just interesting music that…I remembered from you know my teenage years." (P6).*

This participant had the personal experience of rediscovering music while the discovery protocol had found and shared the music library with this participant for only the first time.

Beyond sharing experiences of rediscovering music, our participants shared a preoccupation with rediscovery, particularly in the context of increasingly large music libraries. One participant would drag the scrollbar of his music list to a random point to "find some stuff that I haven't heard in a long time" (P10). To this participant, it had a "serendipitous" aspect to it. Another participant had a "smart" playlist…

> *"…that's called "Not Heard" which is all of the songs in my collection that I have not yet listened to on this machine. And so sometimes I run this and this way I rediscover things that I have forgotten." (P11)*

5.5.1 Design Implications: Supporting Rediscovery

While no participant reported negative experiences related to forgetting about music, there was certainly an acknowledgement if not a concern for the possibility.

If participants were worried about the possibility of forgetting about music in their own libraries, we could certainly hypothesize that as participants become accustomed to other relatively stable music libraries on their subnet, they may also become concerned about the possibility of forgetting about music in those libraries, as well.

Several of iTunes' features provided some support for rediscovery of music in one's own library; rediscovery of music across other users' libraries was less well supported. P11 appropriated smart playlists hoping to be able to rediscover his own music. In iTunes, however, there is no mechanism for creating playlists of any kind over the aggregated library of shared music. One might provide general tools such as smart playlists that function across shared resources; such general tools might then be appropriated for the rediscovery of other's music.

Another feature of iTunes that seemed to support rediscovery of one's own music was the party shuffle feature. Party shuffle served as a kind of automated DJ for one's own music library, selecting a random "mix" of music to play based on the contents of a user's library or a specified playlist. Again, however, there is no similar mechanism for shuffling that works for music in others' libraries; if there were it would be able to be appropriated to support rediscovery of music in those other libraries.

5.6 Technical, Musical and Corporate Network Topologies

Throughout this study we found overlapping networks: technical subnetworks, networks of individuals with shared musical interests, and corporate networks of departmental divisions and employee hierarchies. The interplay among these three types of networks created some interesting sharing patterns.

We found three strong dyadic pairings of "compatible" users who often shared an interest in a type of music that was not widely available on the network. In one pair, both users were interested in jazz music. While they often talked about music with each other, they had resigned themselves to not being able to share music because they were on different subnets.

In the case of another pair, both interested in classical music, the challenge of the subnet was something more tractable to be overcome:

> *"You can only share [with] people in the same subnet and I wasn't in the same subnet as her. That was the reason why I had to have help. Finally someone figured out, oh you're not on the same subnet. So I had to get my subnet changed." (P7)*

Once the subnet "problem" had been resolved, the manner in which these two shared music was asymmetrical:

> *"He doesn't have a real extensive collection here...actually he didn't put stuff in his that he knew I already had so he's just kind of filling in some gaps." (P13)*

In other words, P7, who had never used iTunes to listen to music, brought CDs to work to rip so that P13 could listen to them.

In the case of the third dyad, we also noticed an unspoken asymmetry. This dyad shared interests that were originally unrelated to music. They made a joint decision to share their music libraries with one another in order to broaden their personal musical horizons. And indeed, this was the outcome for one member of the dyad who described listening to the other person's music and learning about the genres that his colleague enjoyed listening to. Although he assumed that his colleague was doing the same, in our interviews we found this not to be the case. The lack of awareness about who is listening one's music allowed two people to believe quite different things about the nature of their music sharing.

Another feature of the relationship between technical and corporate networks also struck us over the course of this study. Although we can not draw any causal conclusions, we thought it was interesting that the most populated iTunes subnet in the corporation was the only subnet organized around department rather than building floor.

Even for those on the most populated subnet, the potential for what resources lay beyond that subnet proved irresistible. Most typically, this took the form of questions and speculation. Several participants reported that they were happy to be patient; they were confident that another member of the department, one commonly known to be a tinkerer, would discover a hack that would allow them to share music across the remainder of the company.

Another reason to want to see beyond the local subnet came from a member of the administrative staff who found himself on a separate subnet from those whose research he was tasked with supporting:

> *"We're always, in public relations, looking, you know, to sort of get to know the researchers better and get to know little windows into what they are about....I don't know these people that well and I want to have conversation pieces." (P1)*

5.6.1 Design Implications: Exploring Boundaries of Music Sharing

Discovery protocols vary in how they set the boundaries of what they can "see." Rendezvous happens to use subnets. The level of technical knowledge in this corporation was significant enough that the subnet boundaries of iTunes' discovery protocol were generally transparent merely through the list of what music libraries could be seen. Yet while the specifics of the technical boundaries may be clear to those with sufficient technical knowledge, we posit that other users would require a more transparent accounting of the technical boundaries of discovery within the iTunes interface.

Alternately, boundaries defined by networks other than technical networks may make more sense for many potential discovery technology users, especially in the case where discovery must be limited. One that we would like to see further explored is the organizational network.

The dyads we noted in the musical topology of this organization wielded a unique sort of power, particularly if they did, on their own, constitute critical mass.

It seems important, then, to support these dyads, particularly when the musical and network topologies do not overlap. One might consider ways of allowing these boundaries to have more flexible edges, perhaps by providing guest licenses for music sharing groups.

5.7 Soundscapes & Contexts of Use

Our participants used iTunes to create soundscapes – the sum of all sounds in an environment and the acoustic manifestation of place (Schafer, 1977). More than just about anything, our participants liked the ease with which iTunes allowed them to positively influence the acoustic environment of their offices, whether it was a matter of being able to listen to their favorite music...

> *"I do like the idea of having my favourite music around all the time…and part of my environment while I'm working. And I actually think that that probably does make me a little bit easier to get along with." (P3)*

…or the ability to drown out loud meetings next door:

> *"Probably the main reason I started listening to it here was there's some people around who are really loud and I was having trouble concentrating with people…in adjacent offices having meetings. I could hear everything they were saying and it was very distracting." (P13)*

In our participants' accounts of iTunes use, there were even more nuanced connections between these intentionally crafted soundscapes and the context of use. While we focused our study on the office environment, our participants revealed the role that iTunes and these intentional soundscapes played in various working contexts – a different soundscape for doing different kinds of work. Often, participants mentioned activities such as writing needing music without words, often classical or jazz:

> *"Because the kind of listening that I do while I work calls for a different kind of music. I probably have most of my jazz albums on iTunes." (P4)*

> *"I actually find music with vocals distracting if I'm trying to either code or write. The voices just like take up too much of that neural space in my head or something and I can't do anything else." (P10)*

Other types of work required the crafting of other soundscapes:

> *"The difference is really just something like I want something more energetic or something calm and there are some things that I know…I guess when I need to think a lot, when I have like a problem I am solving, I don't want…techno music because it sort of distracts and then I can't think. But if I have to do sort of menial tasks, I need to pull in something that I know how to do, so I won't fall asleep you know at the keyboard, I'll put on something more energetic." (P6)*

The variation in work activities created variations in working context. These different contexts called for particular soundscapes supported, in turn, by the iTunes music libraries.

One participant pushed this notion of context even further. He had multiple pieces of technology in his office – desktop computers, laptop computers, and an iPod, each with copies of his iTunes library. He related how these different kinds of technology have different affordances, resulting in their being used in different contexts. Each context of use had a different soundscape and these different soundscapes resulted in different ways of using iTunes:

> *"Usually the standard thing is I have this Classic Jazz playlist [on my desktop] and I just let it play all the time, 24 hours a day. It's set so that the music is shuffled automatically. It just randomly selects something from one of these songs and there's 1016 songs on display down there which continuously play for about 3.3 days. And when it reaches the end of that shuffled list, it just goes back and just plays jazz continuously….I do tend to listen to different things on the different devices. Usually on my iPod, for example, I'm often listening to Motown or various kinds of pop or even rock from the 70s, 80s. And I'm usually using my iPod in some situation where I'm not near a computer, when I'm out for a hike or something. So I think there's more active music for more active pastimes, perhaps. With this guy [a laptop], I don't tend to have a set playlist. I tend to much more frequently select an album and play that album. Perhaps that's because you tend to use a portable in shorter stretches of time. It's less of a static, fixed thing so you're doing things in spans of half an hour, hour at a time…. This is a tablet PC. And it's also got iTunes on it, but since I rarely use it in a mode where I'm playing music. I'm usually using it in a meeting. I'll rarely use the iTunes on it." (P3)*

5.7.1 Design Implications: Sustaining Soundscapes Across Contexts

Our data about soundscapes and contexts of use is not explicitly about music sharing. This may be because iTunes does yet extend the features that support creating soundscapes across network boundaries – much in the same way rediscovery was supported for the one's own music library but not for the music libraries of others. When creating soundscapes in their offices, the most critical characteristic of soundscapes seemed to be their sustainability; our participants looked for a large enough collection of music of a similar style that they could set to play, enabling them to return to the task at hand without having to continually adjust the music:

> *"Sometimes I just go down until I find a list that has enough stuff in it and then I say play." (P6)*

The most common technique for creating large enough collections of music to create particular soundscapes was to create a playlist. Again, however, while playlists could be created from the music in one's own library, they could not be created from the others' music. We believe this feature would be a welcome addition, enabling iTunes users to create even larger soundscape-specific playlists from across the dynamic music collections of iTunes users.

Many of our participants were able to specifically articulate the kinds of music that they used to create particular soundscapes for particular work activities. The cleanliness of the mappings articulated by our participants in interviews lead us to believe that they could do the same with a simple rule-based interface in iTunes. If iTunes were able to monitor the applications that were open or had focus on the user's machine, iTunes could raise the possibility of playing a particular playlist. If P10, for example, changed from using a web browser (surfing the Internet) to his development environment (coding), iTunes might raise the possibility of changing to a playlist of music without words, perhaps one that P10 had previously indicated would be appropriate in such a context.

P3's account of his differing use of iTunes on different machines raises the question of whether iTunes music sharing might be fundamentally different on different devices. Other research is currently exploring the design space of mobile music sharing (Bassoli, Moore & Agamanolis, 2004; Östergren, 2004; Wiberg, 2004). For iTunes as an application, this account challenges an assumption about what the iTunes libraries represent. The iTunes application assumes that it is the master store of all of one person's music. This assumption works well enough when considered in relation to specialty hardware devices such as the iPod[17] or iPod Shuffle[18], which download specified subsets of an iTunes library. This assumption does not work as well when considered in relation to additional personal computers, such as laptops. P10 had to run multiple versions of iTunes; on each version he listened to different music. Here, the assumption that each iTunes application is the master store of all of one person's music in incorrect. As devices proliferate and particularly as a larger number of smaller devices have the potential to run full-fledged versions of iTunes, one might need to consider providing more than one version of the application – one that is meant for the master music library and another that is for secondary music libraries. Or one might provide the ability to specify which version of iTunes is the master version. Either way, features that support the easy transfer of music from the master iTunes music library to secondary iTunes music libraries and that support synchronization of music from secondary music libraries into the master music library would, we believe, be appreciated.

6. Revisiting the Music Sharing Design Space

6.1 Intimacy & Anonymity

The workplace, we felt, was a particularly fruitful context for exploring the design space between intimacy and anonymity in music sharing. In fact, the context of the workplace challenged our implicit assumption that the axis of intimacy and anonymity was a single, straight continuum. Over the course of this study, it became clear that there were many facets to an individual's identity and that interactions and

[17] http://www.apple.com/ipod
[18] http://www.apple.com/ipodshuffle

relationships may have a different degree of intimacy depending on which facet of identity was being foregrounded. There were many individuals in our study who worked closely with each other on a daily basis. Many of their workplace interests overlapped to a very high degree. From this perspective, we would probably be inclined to characterize their relationships as being more intimate than anonymous. But until their adoption of iTunes, most of our participants had no idea what kind of music their co-workers listened to. The adoption of iTunes, then, meant that communities that were relatively intimate in some facets of their identities were able to become intimate in previously anonymous facets of their identity.

This study also foregrounded the importance of context in impression management and the ways in which the grey area between intimacy and anonymity in the design space – the space occupied by iTunes – may be the most critical area with respect to impression management. In anonymous music sharing, the only impressions one has of a music sharer are those of their music library. In intimate music sharing, the particulars of a music library may be a small fraction of all of the outside context or prior experience used to form an impression. As one participant pointed out, however, it is the grey area in between that can be most problematic in impression management:

> *"Music…says something about your identity, you know, in some ways, right; it says something about who you are. I would talk about music with perfect strangers, like someone that I would never see ever again...and someone that I know really well I can do this also because I know they'll be able to sort of interpret my taste with enough background information to know where it is coming from. But there is a sort of in-between state where people can form misguided perceptions and you'll have to interact with them again so this can be a problem but they won't have the context and the background to reframe whatever impression they made of you according to the proper information." (P11)*

It is the grey area represented by iTunes in which these "misguided perceptions" are mostly likely to form, perceptions created from not quite having enough outside context to balance the impressions given off in iTunes.

6.2 Disparateness

Although there was potential solely within iTunes for people to discover new music, it rarely happened. Users looked at others' music libraries and made binary decisions. If the library contained music they did not recognize, they would likely never return. Perhaps we might hypothesize that our participants did not want to discover disparate music, but this was not the case either. Our participants did not want to become musical "fuddy dudd[ies]" (P1); they wanted to use iTunes to be "exposed to new music" (P10).

It turns out that our participants were discovering new music; the motivation and impetus for doing so was, however, happening outside of iTunes. One participant (P6) was invited to screenings of Bollywood movies and discovered that he really liked Bollywood music. So when he stumbled onto something that looked like it might be Bollywood music in iTunes, he started listening. Another participant (P13) was loaned a book about a musical artist. Although she was primarily interested in the political aspects of the biography and had never before listened to his music, when she found his music on iTunes, she decided to try it. If it were not for musically-related social interaction outside of iTunes, these participants would not have discovered new music inside of iTunes. This suggests the need for increased scaffolding for the exploration of new music, particularly within music sharing technologies that afford music sharing among users with disparate musical tastes.

7. iTunes as an Online Community

One of the greatest challenges for technical innovation in music sharing may be in allowing designers to make the leap between treating music sharing technologies as personal music listening utilities and treating music sharing technologies as online communities. Although music sharing has traditionally been a strong indicator of group identity and has reflected shared musical taste (Ebare, 2004; Hebdige, 1990), our study of iTunes music sharing has demonstrated that even groups with disparate musical taste can form strong group identities. The iTunes subnet groups became iTunes communities, highly attuned to the coming and going of others and impacted by the loss of community members.

Throughout our discussion, we have highlighted design implications that speak to iTunes as an online community – for example, allowing community members to establish closure in interactions or providing a lens onto the collective community's (departed) music resources. These design implications have arisen in the context of data about specific iTunes music sharing practices. One might also explore more general techniques for "seeding" an online environment in ways that better support communities. These techniques might include enabling awareness or allowing users to share knowledge and expertise (Kim, 2000; Lee, Danis, Miller & Jung, 2001).

Currently, iTunes provides an awareness of the presence of other users' music libraries that may or may not correlate with the presence of that library's owner. Various other forms of awareness could be used to augment this. In instant messaging clients, awareness of status is often maintained either by an explicit selection of one of several status indicators or through modification of the user name (Grinter & Palen, 2002). In iTunes, one's own user name is not visible in the interface. Several of our participants, in fact, had no idea what their own user name was. Moving a customizable name field to a more visible and accessible place within the interface, as with instant messaging, may enable it to be appropriated by users to provide awareness. In the online community, Babble, awareness is not only provided from an online-offline binary perspective; visualizations of the recency of activity are provided, as well (Erickson, Smith, Kellogg, Laff, Richards & Bradner, 1999). In iTunes, this might mean that the name of a user's library is indicated in bold if that user has just interacted with the iTunes interface and over time, if there are no further interactions, the name of that user's library might fade to grey. Or perhaps, this might mean that the more music one has recently added to one's library, the bolder the typeface of the name of one's music library. Finally, visualizations of awareness in iTunes could be extended to display which song the library's owner is currently listening to, such as has been developed to broadcast one's music listening activities as awareness in instant messaging clients (e.g., the "Now Playing" iChat script[19]).

Access to domain knowledge or expertise has often been touted as a benefit of joining an online community (Kollock, 1997). Our participants wanted to "be exposed to new music" (P10); recommendation systems (Terveen & Hill, 2001) are one technique for augmenting the word-of-mouth recommendations that our participants exchanged outside of iTunes. Currently, iTunes supports sharing domain knowledge by allowing users to rate individual songs, but very few of our participants did so. If rating songs was perceived by users as being too much work, iTunes could, instead, base recommendations on which songs were most frequently played. This could be done on a global level by providing a list of the most frequently played songs overall or on a personal level by recommending the frequently-played selections from one user's library who had sampled frequently-played songs from another user's library. Perhaps in a large enough iTunes community, the value of having a recommendation system would encourage users to rate their own songs and allow other resources for recommendations to be explored.

In general, a richer feature set that allows actions to be taken upon the community's collective music resources will enable other, more nuanced aspects of this online community to be explored. For example, while the technical hurdles may not be insignificant, the conceptually small design modification of allowing users to create playlists that draw from other user's music libraries may enable new roles to emerge and new forms of expertise to be displayed, such as through community DJs (e.g., webjay[20]). In general, the key is to treat a user's music collection not as a stand-alone, isolated entity, but rather as a node in a community network of co-listeners.

8. Unpacking the Social Meaning of iTunes: Theoretical Perspectives for Future Work

"A need is not a need for a particular object as much as it is a "need" for difference (the desire for social meaning)."

- J. Baudrillard (from Selected Writings, 1988)

Baudrillard argues that the meaning of an artifact is constructed through use. With iTunes, the meaning of the technology is not only bound up in its artifact-ness, but in its appropriation in the context of a community. This meaning, Baudrillard asserts, is a social one – most importantly one of identity.

[19] http://www.malcolmadams.com/itunes/scripts/scripts05.php?page=1#nowplayinginichat
[20] http://www.webjay.org

We have undertaken some discussion of the role of identity in iTunes music sharing, with a Goffman-esque framing of how participants presented themselves online (Goffman, 1959, 1967). We have also discussed a complementary perspective: how others created impressions from those presentations of self. Future work might more deeply explore this social meaning of iTunes, perhaps integrating the social meaning of the technology from both points of view. Such an exploration of the meaning of iTunes might also provide a more phenomenological understanding of the technology (Voida, Erickson, Kellogg & Mynatt, 2004).

The appropriation of artifacts as a means of social differentiation is an aspect of social meaning that might, in and of itself, be more fully explored in future studies of iTunes music sharing. Discussed by Baudrillard (1988) and more fully elaborated by Bourdieu (1984) and de Certeau (2002), the theme of differentiation or distinction is one well-suited to the study of a technology that foregrounds music. Bourdieu's study of the aesthetic preferences of different social groups connected anthropological views of culture with notions of high culture. His argument, in essence, was that…

> *"Taste classifies, and it classifies the classifier. Social subjects, classified by their classifications, distinguish themselves by the distinctions they make between the beautiful and the ugly, the distinguished and the vulgar, in which their position in the objective classifications is expressed or betrayed." (1984)*

Our participants were well aware that, through iTunes, they were giving off impressions. Many paid close attention to the types of music that were shared from their library. Expertise in certain genres of music was either foregrounded or completely hidden. Within our study population, we noted participants whose taste in classical music created tight dyads of sharing as well as a participant who wanted to be known as the definitive resource for Jimmy Buffet music. A productive direction for future research would be a more in–depth study of the relationship between iTunes and these extremes of taste, as framed by the theories of Bourdieu and de Certeau.

Finally, one might further explore the meaning of the sharing of music, what may be viewed as goods, through the lens of gift giving (Mauss, 1990). One of our participants noted that there was an "ethos" of sharing in iTunes. Some participants said they shared because they were not embarrassed about their music and they had nothing to lose. Others shared because they wanted to share their musical expertise. One participant said he felt something of a civic duty to share. Another participant shared because he was asked to. One might further explore motivations for music sharing through the theoretical lens of Mauss' theory of gift giving or exchange. Mauss viewed the exchange of gifts as being intentionally strategic and competitive. He outlined three obligations in gift giving that, while there may not be a one to one mapping onto music sharing practices in iTunes, are nevertheless cultural aspects of gift-giving that might generally be explored: the obligation to give gifts, the obligation to receive gifts, and the obligation to reciprocate.

9. Conclusion

From many perspectives, it would seem that these technical innovations pull the opportunities of design forward while political, legal, and ethical considerations push those opportunities back. When we fill gaps in research and add studies of users' actual practices surrounding music sharing to our understanding, however, we find that this antagonistic push-versus-pull perspective does not always hold up. It is through studies of practice that we can come to understand users' underlying motivations. When we come to understand why a user would consider circumventing legal means of music sharing, for example, to download getTunes, we can also come to realize that the underlying motivation for doing so is entirely reasonable and that the desired practice could be supported through entirely legal means, by supporting music sharing as a system-owned service, for example. From a perspective with an additional understanding of practice, technical innovations pull the opportunities of desired practice forward in ways that can be politically, legally, and ethically sound.

In this chapter, we have provided descriptive evidence of the practices surrounding the iTunes music sharing of employees of one corporation. We have explored new areas of the music sharing design space supported for the first time by Apple's iTunes. We have also explored the impact of iTunes' technologies, its interface and discovery protocol, on music sharing practices. These technical innovations have allowed for a greater number of ways to share digital music and have supported new technical boundaries among groups of music sharers.

Music sharing is a quickly moving target for research. It is propelled by technical innovations and political, legal, and ethical considerations. Music sharing technologies are both socially implicated and socially implicating technologies and we hope this descriptive account of the practices surrounding their use will enable designers to move forward in supporting desired and emergent music sharing practices more comfortably within the space of technical innovation and political, legal, and ethical considerations.

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References

Adar, E. & Huberman, B.A., 2000, Free riding on Gnutella. *First Monday,* 5(10). Online: http://www.firstmonday.org/issues/issue5_10/adar/index.html.

Aubrey, S., 2003. Adventures in higher education iPod envy. The Wesleyan Argus. 4 November 2003, Online: http://www.wesleyan.edu/argus/archives/nov042003/dateyear/w1.html.

Bassoli, A., Moore, J. & Agamanolis, S., 2004, tunA: Synchronised music-sharing on handheld devices. In Adjunct Proceedings of the Sixth International Conference on Ubiquitous Computing. Online: http://ubicomp.org/ubicomp2004/adjunct/demos/bassoli.pdf.

Baudrillard, J., 1988, *Selected writings*. Cambridge, UK: Polity Press.

Bourdieu, P., 1984, *Distinction: A social critique of the judgement of taste* (R. Nice, Trans.). Cambridge, Massachusetts: Harvard University Press.

Bowrey, K. & Rimmer, M., 2002, Rip, mix, burn: The politics of peer to peer and copyright law. *First Monday*, 7(8). Online: http://www.firstmonday.org/issues/ issue7_8/bowrey/index.html.

Brown, B., Sellen, A. & Geelhoed, E., 2001, Music sharing as a computer supported collaborative application. In *Proceedings of the European Conference on Computer Supported Cooperative Work*. Dordrecht: Kluwer Academic Publishers, pp. 179–198.

de Certeau, M., 2002, *The practice of everyday life*. (S. Rendall, Trans.) Berkeley, CA: University of California Press.

Ebare, S., 2004, Digital music and subculture: Sharing files, sharing styles. *First Monday,* 9(2). Online: http://www.firstmonday.org/issues/issue9_2/ ebare/ index.html.

Erickson, T., Smith, D.N., Kellogg, W.A., Laff, M., Richards, J.T. & Bradner, E., 1999, Socially translucent systems: Social proxies, persistent conversation, and the design of Babble. In *Proceedings of the ACM Conference on Human Factors in Computing Systems*. New York: ACM Press, pp. 72–79.

Frith, S., 1986, Art versus technology: The strange case of popular music. *Media, Culture, and Society,* 8(3), 263–279.

Goffman, E., 1967, *Interaction ritual: Essays on face-to-face behavior*. New York: Pantheon Books.

Goffman, E., 1959, *The presentation of self in everyday life*. New York: Anchor Books.

Good, N.S. & Krekelberg, A., 2003, Usability and privacy: A study of Kazaa p2p file-sharing. In *Proceedings of the ACM Conference on Human Factors in Computing Systems*. New York: ACM Press, pp. 137–144.

Grinter, R.E. & Palen, L., 2002, Instant messaging in teenage life. In *Proceedings of the ACM Conference on Computer Supported Cooperative Work*. New York: ACM Press, pp. 21–30.

Hebdige, D., 1990, Style as homology and signifying practice. In S. Frith & A. Goodwin (Eds.), *On record: Rock, pop, and the written word*. New York: Pantheon Books, pp. 56–65.

Kahney, L., 2003, iTunes undermines social security. *Wired News*. 12 November 2003. Online: http://www.wired.com/news/mac/0,2125,61177,00.html.

Kasaras, K., 2002, Music in the age of free distribution: MP3 and society. *First Monday,* 7(1). Online: http://www.firstmonday.org/issues/issue7_1/kasras/index.html.

Kim, A.J., 2000, *Community building on the web*. Berkeley, CA: Peachpit Press.

Kollock, P., 1997, The economies of online cooperation: Gifts and public goods in computer communities. In M. Smith & P. Kollock (Eds.), *Communities in cyberspace*. New York: Routledge, pp. 221–239.

Lam, C.K.M. & Tan, B.C.Y., 2001, The internet is changing the music industry. *Communications of the ACM,* 44(8), 62–68.

Lee, A., Danis, C., Miller, T. & Jung, Y., 2001, Fostering social interaction in online spaces. In *Proceedings of the IFIP Conference on Human-Computer Interaction*. Amsterdam: IOS Press, pp. 59–66.

Lubar, S., 1993, *Infoculture: The Smithsonian book of information age inventions*. Boston, MA: Houghton Mifflin.

Mauss, M., 1990, *The gift: The form and reason for exchange in archaic societies* (W.D. Halls, Trans.). New York: W.W. Norton.

Östergren, M., 2004, Sound pryer: Adding value to traffic encounters with streaming audio. In *Proceedings of the Third International Conference on Entertainment Computing*. Berlin: Springer-Verlag, pp. 541–552.

Reid, S., Calloway, S., Dukes, R., Byrne, D., Parry, H. & Waller, C., 2003, Mixtapes: The other music industry. *MTV News*. 10 February 2003. Online: http://www.mtv.com/bands/m/mixtape/news_feature_021003/index.jhtml.

Schafer, R.M., 1977, *The tuning of the world*. New York: Knopf.

Terveen, L. & Hill, W., 2001, Beyond recommender systems: Helping people help each other. In J. Carroll (Ed.), *HCI in the new millenium*. New York: ACM Press, pp. 487–509.

Voida, A., Erickson, T., Kellogg, W.A., & Mynatt, E.D., 2004, The meaning of instant messaging. In *Companion Proceedings of the ACM Conference on Computer-Supported Cooperative Work*. Online: http:// www.cc.gatech.edu/~amyvoida/meaning Of IM-cscw04.pdf.

Wiberg, M., 2004, FolkMusic: A mobile peer-to-peer entertainment system. *In Proceedings of the 37th Hawaii International Conference on System Sciences*. Los Alamitos, CA: IEEE Press.

PART 3

CHOOSING MUSIC

Chapter 5

DISTRIBUTING THE PROCESS OF MUSIC CHOICE IN PUBLIC SPACES

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1. Introduction

Social studies of music have shown how it is a key part of the cultural material through which social action is constructed and organised (e.g. DeNora, 2000, this volume; Cohen, 1993). The physical properties of music play an important role in affect regulation, perhaps inducing relaxation or perhaps increasing energy levels. Such affective states are intimately tied with action both at the individual and social level (e.g. Willis, 1978; DeNora, 2000; this volume). Music, along with other material artefacts is used to create a scene for social episodes, signalling intent for how particular social interactions would be hoped to pan out, or facilitating the interpretation of the episode (DeNora, 1986, 2000). Music too, through the particular association of songs and genres with certain cultures, events, eras, people and fashion, plays a sophisticated role in eliciting congruous social behaviours and even "*appropriate*" conversational style. Such associative properties of music also allow it to be appropriated as an important mechanism for identity control both at the self and collective levels. Through affiliation with the music or through demonstrable behaviours in relation to the musical backdrop, particular facets of an identity can be affirmed or denied to those who are around (e.g. Brown et al., 2001a and b).

The social properties of music and its ability to affect social agency is not just the concern of everyday consumers. As DeNora argues, there is an ever-growing body of literature demonstrating relationships between music played in public settings and consumer related behaviours. This has invariably raised considerable interest among economic and political factions in their bid to encourage or dissuade

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 87–109.

certain behaviours among individuals and social collectives towards particular "organisationally sponsored aims" and the pursuit of profit. DeNora highlights several studies within psychology and market research that demonstrate a relationship between music played in a public setting and behavioural outcomes such as amount of money spent, length of stay in a public setting, which brand chosen, and how much food and drink are consumed. Music in public settings then is becoming a much more important, considered and utilised feature of the social aesthetic of our everyday lives. This is particularly the case as identity maintenance occurs through evermore conspicuous consumption practices.

The upshot of all this is that control over the music in public places is an increasingly important source of power and social value and one which needs to be understood more deeply by the Social Sciences. Important as they are, it is necessary to move beyond some of the simplistic empirical demonstrations of relationships between music and behaviour offered in the psychology and market research literatures. As DeNora says:

> *"The degree of participation in the production of a soundtrack for ongoing (and future) action, the relations of music production, distribution and consumption, is thus a key topic for the study of music's link to social agency. This hitherto-ignored topic is focused on the social distribution of access to and control over the sonic dimension of social settings." (De Nora, 2000: p.20)*

As illustrations of this perspective, DeNora points to different ways in which particular retail organisations structure control over music policy and the implications this has for social behaviour. For some of the larger national and global organisations, much of the music policy is centrally determined such that all the stores play the same music at exactly the same time throughout the day. Tapes are distributed to each store and the technologies in the stores are specifically modified to prevent them playing normal tapes – thereby removing any ability for the local staff to subvert the musical policy. This is a source of frustration and boredom for the staff in the local branches, whose motivation is thus ignored in order to achieve musical homogeneity across the stores. Other retail organisations are set-up to devolve autonomy over the music to staff at a much more local level. While the staff have to operate within certain organisational constraints (e.g. limited budget and restricted genres) they are afforded much more involvement in controlling the musical landscape of the public setting where they work. As well as being more motivating for the staff, the benefit here is that shop staff are "culturally aligned" to the customer base and therefore are better able to select music appropriate to that base.

There are also ways in which the distribution of control over music policy extends outside to bounds of the organisation that occupies a particular public setting. A good example of this would be the humble DJ. A particular venue will choose a particular DJ and through this choice delimit the music that is likely to be played. The DJ is then given autonomy within organisational bounds to control the music according to how he/she sees fit. A part of this may be responding to particular requests for certain songs that come from the audience. In this respect, access to music control is distributed across various levels of the organisation as well as across its customer base.

Understanding this distribution of access control lies not just in organisational structures, relationships, rules and policies. Rather a key concern for us lies in the technological embodiment of such control distribution. While not a central concern of DeNora's work, there are clearly areas where the control distribution she describes is a function of the technology involved – sometimes by design and sometimes simply as an unintentional by-product. One example here is the tape player used in certain retail outlets that plays tapes "in reverse" requiring special recording equipment to create tapes that work. Only the higher level of the organisation has access to such equipment which therefore embodies the control structure of the music. A second example is how the DJ's physical music collection maintains the DJ's status as portal to the music played. While customers can interact with the DJ and make special requests, they don't have the physical ability to go through the records and put them on the decks. Consequently their ability to control the music is mediated by the DJ's control over the physical music source. A further example to consider is the traditional jukebox. Through its placement in a particular location, the jukebox gives an audience an interface to the physical musical collection affording them a certain level of control of the musical ambience of that public setting. This technological embodiment takes away a certain amount of fine level control from the owners of that space.

The point here is not simply that technology distributes control across different parties to achieve a particular musical outcome. Rather, there is something much more significant in the way particular technologies structure the "process" of control and control negotiation. Making a request to a DJ to play a particular song is not simply about having some part in the musical outcome. Rather, it is an important social engagement in itself through which many of the values of music outlined earlier may be experienced. The request is an expression of identity that may be accepted or rejected. It can also provide the excuse to talk further with the DJ about musical tastes and possibilities, again a rich source of social bonding and identity maintenance. Similarly, with a jukebox, there is a strong social element to the process of choosing a song that is embodied in the technology. The choice is in many ways a public performance. Consequently, for example, many people can feel stressed by the possibility of the choice not being favoured (a reflection on their identity) by the group at large. Alternatively they may receive considerable Kudos if their choices are deemed acceptable by the group.

With the emergence of each new digital music technology new opportunities arise for distributing access to control of music by different groups in public settings. Some recent innovations in this area include Music FX (McCarthy and Anagnost, 1998 in which active badge sensors are used to detect who is present in a gym and combines profiles of their musical preferences to determine a suitable music choice. Another system, HPDJ, (Cliff, 2000; this volume) uses sensors to determine physical and physiological responses of a crowd to the music and uses this feedback to automatically sequence and mix the music in nightclubs. Other research systems exploit peer-to-peer capabilties of mobile MP3 devices to allow access to the music stored on all individual MP3 players within a particlar public space (e.g. Bassoli et al., 2005).

One of the potential limitations of some of these systems is the emphasis their designs give over to the determination of musical *outcome*. While this aspect is important, such designs, through their tendency to automate rather than mediate choice, perhaps underplay the importance of the very *process* of choice. It is through the process and the entailed acts of engagement that the social importance and meaning of music becomes manifest in everyday life (Willis, 1978; Cohen, 1993). In this respect we would like to argue for technological designs that offer possibilities for such engagement in the choice process; technologies which seek to mediate the choice rather than simply automate it.

In reponse to the above argument, then, we present in this chapter a technology called Jukola. Jukola is an interactive MP3 jukebox that allows active and collective participation in the choices about music in a public place. In contrast to many of the emerging generation of MP3 jukeboxes (e.g. eCast NetStar), which offer much the same functionality as traditional jukeboxes, Jukola allows people, using a combination of public displays and wireless handheld technologies, to nominate songs and vote for them to get played in the public setting. Music choice through nomination and voting in this way is designed to allow greater engagement with the music and the social values this produces. As well as presenting opportunities for users of the public space to engage in different ways with the music choice, the system aims to offer new behavioural opportunities for the owners of the public space to manage their music.

We begin first with a description of the system. Later on in the chapter we present a field study of the system in use in a real world setting, a local café bar in Bristol, UK. The chapter will discuss the social and behavioural implications of particular design features of the system and the way it seeeks to distribute music choice across patrons and staff in the bar.

2. The Jukola System

Jukola is made up of several different components which all afford different levels of control over the music choice. The first component is the main unit which stores music as MP3 files in a database. MP3 files are transferred to the device via the CD ROM using either audio CDs or data CDs containing MP3 fies. Standard CD ripping software is used to convert audio CDs into MP3s. This mechanism is triggered automatically when an audio CD is inserted. The device is also connected to the Internet. So when ripping a new CD, information and images related to the CD are retrieved from freedb.org and amazon.com, (e.g. artist, album name, track listing, release dates, and collaborative filtering information such as “people who like this song also like these artists”).

The owners of the public space are responsible for building up the pool of music that is stored on the device and in this way maintain some level of control over the kind of music that can be played in the bar. The pool of music in the database is also organised into collections and it is through the management of these collections that the owners and bar staff maintain an additional level of control over the musical ambience of the pubic space. The creation and management of music collections is done using a standard music management software package, JuK, with some minor modifcations (figure 5-1). Only one collection can be activated at any one time. Only songs from the active collection will be available to choose from by the clientele in the bar. This allows more fine grained control by staff and owners over what music can be chosen at different times of the day or on different days of the week – according to the particular ambience they are trying to create for those periods. Simply pressing on a different collection will cause it to become the currently active collection.

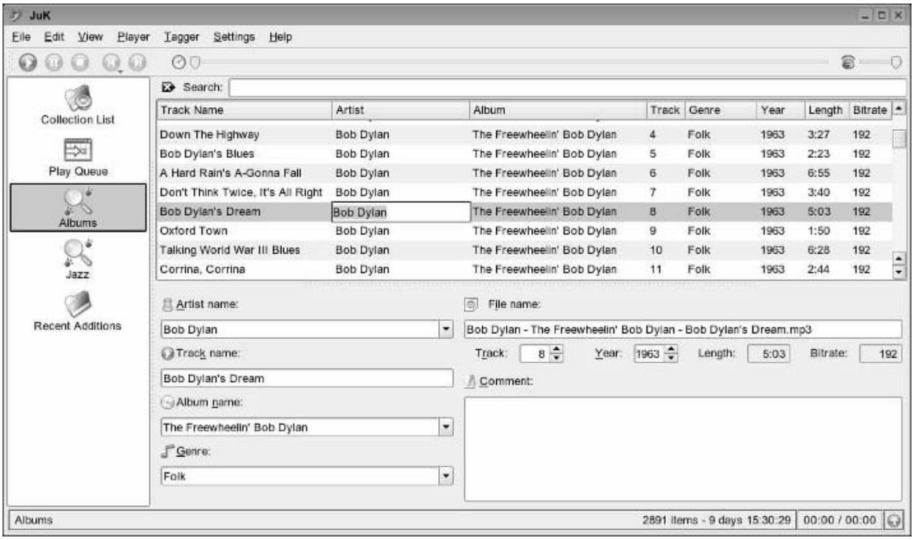

Figure 5-1. The JuK 1.1 MP3 collection management interface.

Some of the important modifications to the software include a "skip song" button. This allows bar staff to override the currently playing track if it is deemed to be inapropriate. The software was also modified to allow bar staff to listen to a second audio channel in parallel to the one playing in the bar. This allowed them to listen to and review any song in the database independently of what was currently being played in the bar. This made it possible to do collection management tasks in a back room without having to disrupt the ongong music in the bar.

The main Jukola unit serves various different clients over a wireless network. The first of these clients is a 15-inch touch screen display that is situated in the public part of the bar (see figure 5-2). The interface on the public display (see figure 5-3) essentially allows clientele to browse through the currently activated music collection. Songs from this collection can be nominated by clientele simply by touching the particular song. A nominated song is highlighted in green and remains this way so that other people coming up to the display can see what others have chosen. Unlike a traditional Jukebox, the nominated song is not guaranteed to be played. Rather, it is subject to subsequent voting by other people in the public space. The interface also presents information about the song that is currently playing (top left of figure 5-3) as well a short history of the recent vote winners (bottom left of figure 5-3).

Figure 5-2. Touch screen public display.

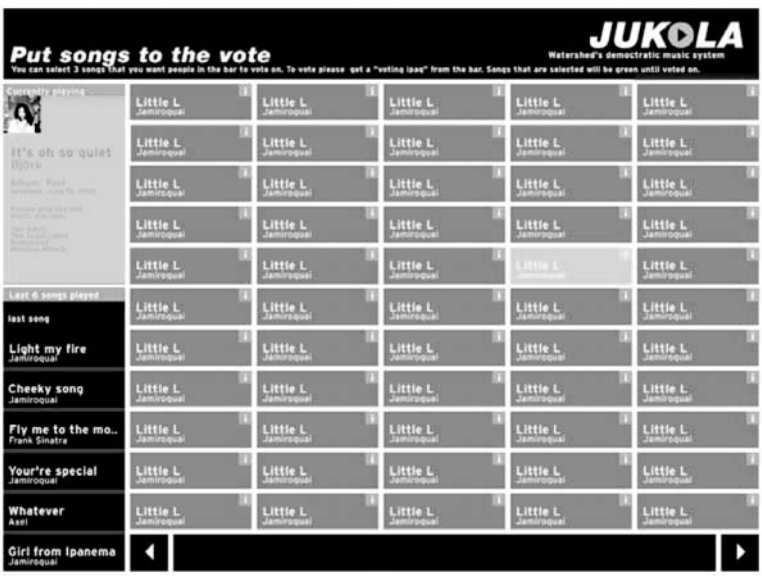

Figure 5-3. The interface for the public display.

The main unit also serves numerous handheld clients (HP iPAQs). These handheld units are placed in their cradles on tables throughout the public space (see figure 5-4) and are for use by the clientele to vote for which of the nominated tracks should be played next.

Figure 5-4. The handheld client used to vote for the next song.

For each voting round, the interface on the handheld client presents four candidate songs for the next song to be played (see figure 5-5a). These candidate songs are drawn from the list of songs nominated on the public display as well as at random from the selected collection (the ratio of random to nominated songs is dependent on number of songs currently nominated). While the current song is playing, anyone in the bar with access to one of the handhelds can register their vote simply by touching on one of the four candidate songs on the iPAQ touchscreen. Each iPAQ allows one vote per voting round - a voting round being the duration of the song currently playing and represented by a timeline at the top of the display. A vote can be changed at any point during the voting round simply by pressing on an alternative choice. The percentages of votes for each song are presented in real time throughout the duration of the voting round so that people can monitor ongoing voting performance. The song with the most votes at the end of a voting round then gets played.

The handheld clients also display information about the currently playing song (see figure 5-5). Further information about each song can be found by pressing on their respective "i-buttons" (at the top right of each candidate song). This includes information such as the album from which the song is drawn, release dates and information about related artists. Clientele can use this information to make more informed voting choices or simply find out more about songs they are listening to which they particularly like.

Figure 5-5. Screen shot for the handheld voting interface.

The Jukola device also has its own web site that extends the reach of the system beyond the physical boundaries of the space where the jukola unit is located (see figure 5-6). This web page provides a number of different functions. Firstly the web page presents a playlist history of the songs played by Jukola on any particular day. The top level shows the playslist for the current day including what is playing at that exact time. But people can also click on any day in the past to review what songs were played on that day. The aims of this functionality are both propsective and retrospective. That is, people can visit the web site to find out what the musical identity of the place is to see if it might be the kind of place they would want to visit in the future. For those who have already visited the bar in the past, the web page allows them to reminisce about the music played on a particular evening when they visited the bar. This draws on findings in the sociological literature about how music is used by people as reference point to particular occasions and events of special importance to them and to friends who may have been there with them. This kind of behaviour can be seen in the common use of the phrase “This is our song”.

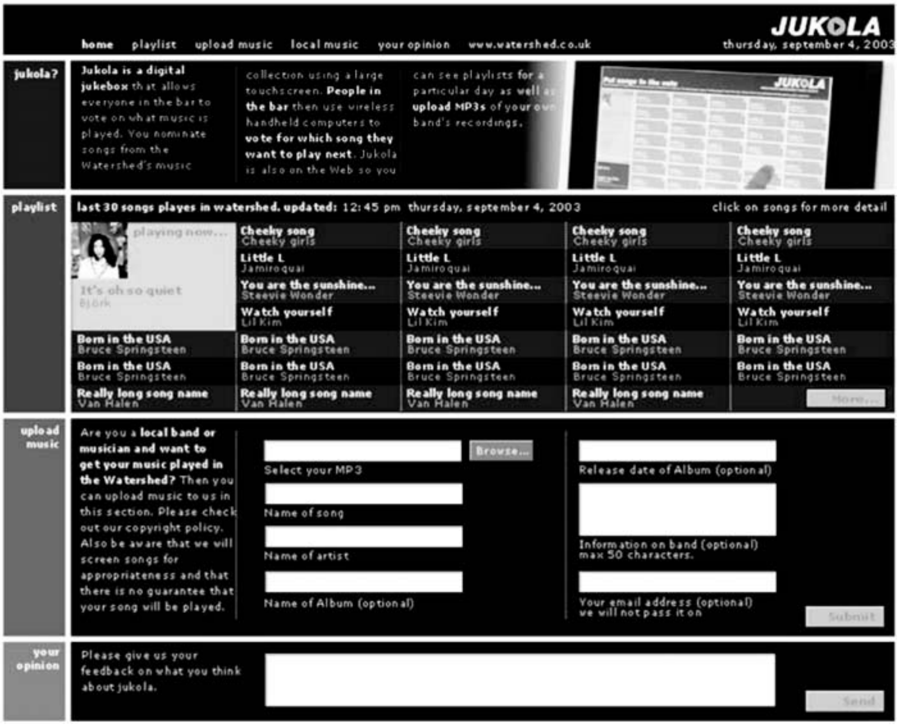

Figure 5-6. The web page interface.

An additional purpose of the playlist is to act as a point of entry to on-line services that relate to the music played in the bar. The example of this that we implemented was a link from the song through to an on-line vendor. In our case we chose to link to amazon.com and the particular CD from which the track was drawn. A more relevant choice now would proabably be to link to one of the on-line digital music vendors such as i-Tunes. The point here, though, is to explore the interesting potential of the playlist as access point to on-line music related services. What is of further interest is how this potential could be exploited by wireless mobile devices to allow in the moment access to these related services while in the actual bar itself listening to the music.

The second key purpose of the web site is to provide the capability for people to upload their own MP3s to the database. In this respect the broader community of people who may frequent the public space can contribute to the general pool of music in the Jukola database. Such uploading behaviour would have to take place within the confines of copyright laws. For the purposes of the field trial, copyright restrictions and ambiguities led us to restrict this feature to unsigned bands that wanted exposure for their material. However, there is no reason why, with the appropriate royalty payment mechanisms in place, such a feature couldn't be extended.

The upload facility was a potential point of control conflict between the owners of the space and potential users of the space. That is, people could potentially upload music that the owners would regard as out of keeping with the overall musical identity of the place, or out of keeping with particlar periods of time during the day. With this in mind, the system was set up to incorporate some form of vetting procedure in which uploaded files had to be explicitly accepted by staff members before they were admitted to the databse and before being assigned to a particular colleciton.

3. A Study of Jukola in a Public Space

To explore how Jukola would be used and to undertsand its imapct within in a public setting we carried out a field trial of the system in the café bar of the Watershed – an arts cinema and digital media centre in Bristol.

Before installation, we conducted ethnographic observations and interviews at the Watershed. The aim here was to build a picture of the Watershed both from the perspective of the clientele and behind the scenes. Observations and interviews were carried out at different points during the day to get a sense of who was using the bar at particular times, for what purposes, the activities they were performing there, how busy the bar was and the general musical ambience. In-depth interviews were carried out with staff members to help further our understanding of clientele behaviour as well as to ascertain knowledge about the "behind the scenes" roles of different staff members. A particular focus of these interviews was the role of music in the bar and how and why, in the context of behaviours front of house and behind the scenes, the music came to be managed in particular ways.

3.1 The Watershed Café Bar

The Watershed offers various amenities including an arts cinema, photographic dark rooms, conference and training facilities and various exhibition rooms. People find themselves in the Watershed for a variety of different purposes. The café bar (see figure 5-7) is there to serve these people using the amenities but is also well established as a venue in its own right with people visiting there who are not explicitly using the other amenities available.

Because of its status as a media centre, the Watershed has acquired somewhat of a reputation for attracting an "artsy", "intellectual" clientele. In actuality, it attracts a much wider diversity of people, including students, business people, elderly people, families, individuals, and groups. There are fairly consistent patterns of how busy the bar is at particular periods during the day. At the beginning of the day, the café/bar starts the day empty, with only a handful of people there. This gradually builds up over the morning reaching a peak over the lunchtime period when it becomes very busy as local shoppers and workers come in for something to eat. Post lunch the numbers drop off quickly until about mid afternoon when the numbers once again start to pick up steadily towards the evening. Particular peaks in activity occur both before and after cinema showings of which there is an early evening and later evening viewing. On Friday and Saturday nights, in particular, the venue can be very busy where the bar is used even more as a venue in its own right.

Figure 5-7. The Watershed Café Bar.

People in the café/bar undertake a myriad of different activities beyond simply eating or drinking there. People read newspapers and books, write in notebooks, talk over documents, chat with frineds, hold mobile phone conversations, work on their laptops, surf the Internet, relax, or simply just soak up the atmosphere while waiting for friends. People mainly visit and sit round the tables in small groups though there are a significant proportion of solo visitors (or people waiting for friends to arrive), in particular during the quieter periods of the day where the atmosphere is much more conducive to relaxed solo activities such as reading.

Physically, the Watershed is split into different components: a larger main bar area off which there is an entrance hallway and corridor-type room. The main area in the centre is the largest room that holds the actual food and drinks bar. Small tables are located along the main wall, throughout the room and on the raised platform. The tables, while small, can easily be pushed together to accommodate larger groups. There are standing areas immediately in front of the bar and between some of the tables. Various other supportive surfaces and shelves are available around which people can stand and rest drinks. There is also an interactive table surface from which people can surf the Internet and check email. The walls in the bar are adorned with classic images from cinematic history as well as posters for upcoming films to be screened there. Scattered around the various surfaces are leaflets and postcards advertising upcoming exhibitions, films, conferences and courses. Further tables exist in the entrance and corridor rooms.

3.2 Music Control in the Watershed Pre-Jukola

Music is played in the Watershed café/bar almost constantly. Before Jukola was installed, a standard tape deck and amplifier were used to play the music. Members of the bar staff were allowed to choose a tape to play, though some individuals were particularly involved and the duty bar manager could veto anything they felt inappropriate. The staff was adept at using a combination of volume and genre to achieve the right atmosphere and level of social control. A collection of tapes has been built up over the years being either whole albums or compilations that have been specially constructed by some of the bar staff with a particular interest in music. This collection continues to evolve as staff bring in new albums and compilations that they have receorded. To facilitate the choice of appropriate music, the tapes are organised according to three colour-coded categories loosely designating when they are supposed to be played – "Green" for the daytime, "Yellow" for weekday evening, and "Red" for Friday and Saturday nights. "Green" music is subdued and relaxed background mood music and more "middle of the road". "Yellow" music is slightly more upbeat and "Red" is livelier still. Editorial control over categorisation now resides with one bar manager who takes considerable pride in this task.

In order to understand the impact of Jukola, there are a number of important issues to highlight in relation to the control of music by the staff. Firstly, much of the music is brought in by well motivated staff. They are given a certain level of responsibility for chosing the music because they are seen as representative of the clientele who frequent the bar. The choosing of albums and the construction of compilations are done with a great deal of pride and passion. What is important to note here is that much of the creation of this collection takes place away from the bar in the homes of the bar staff on their own machines. That is, the system of music in the bar has to function within this broader ecology of music systems in order to evolve the way it has. This process also takes time that is volunteered by the bar staff rather than being something that is officially sponsored in time and financial terms by the Watershed as an organisation. It is this volunteering of time and resources by particular individuals that represents a considerable personal investment in the music by particular staff.

The motivation of the staff with respect to the music has an important organisational consequence. The creation of compilations or recording music to be brought into the bar can take a considerable amount of personal time and effort. Yet this activity is not given any official orgnisational time to perform. When staff are at work, there is no time for such activities to take place. Rather it typically happens in the homes of particular staff members on their home machines and in their own free time. In this respect, there are issues of technical compatibility between within this broader ecology of music systems that is impacting on the nature of the music collection within the bar. This process also takes time that is volunteered by the bar staff. As such the ongoing musical ambience of the bar is dependent on the goodwill and time of these motivated individuals. The point here is not to argue this is an exploitative relationship by the organisation. On the contrary, the devolution of responsibility is something that is highly valued by these staff members. For them it provides a resource for their personal identity management since they can express something about themselves through their choice of music. They regard themselves as *arbiters of good taste* and very much enjoy talking about new music with colleagues and punters alike.

> *"We do play a lot of very interesting music, not very well known music, a lot of underground stuff, that customers really get off on and come up to the bar and say look what the hell is this it's brilliant, where can I get this, who's it by. Not introducing them to new styles of music necessarily, but just stuff that they would love if they'd heard, you know no one's ever played it to them before, but it's right up their alley and they can't believe they'd never heard it."*

In addition, they also valued being able to have some contol over the auditory aesthetics of the space in which they worked.

> *"We all bring our own tapes in and as long as they are acceptable we are allowed to play them. That's one of my favourite things about the job, having input into the music myself... I bring in my own tapes and they are exactly - they are really wicked journeys of music. I get a lot of pleasure from listening to them in the [bar]...I do put a lot of tapes on here, more than most people. It is the control; it is because I can decide what I want to listen to. Not as much here as it would be at home when I am really listening to it. Most people here don't care as much as I do. They won't run to the tape player as soon as the tape finishes."*

What we are highlighting here is the importance of understanding the how, why and where of this tape recording/compilation creation process and how particular tapes come to be chosen by certain staff members. That this process is a resource for identity management for the staff and that it is distributed both spatially and temporally will be important for us later in thinking about the acceptance and ongoing management of Jukola within a setting such as the Watershed.

A further issue to consider is that for certain key members of the bar staff the choice of music is something that they consider themselves responsible for. Indeed, it is a defining part of their job role. The bar manager in particular was required to be protective over the musical ambience of the place and make sure it was appropriate for the kinds of clientele and activities associated with particular parts of the day and week:

> *"At the end of the day any given day of the month there are people here who have come to see a film, there are people here for a conference, and there are people here for a managers meeting. If there is something on that is really, really, you know, off the wall, a bit unusual, I am going to hear about it it's me that the complaints come back to... it's not just a venue for music! If we were a venue that was specifically set up to play music for people then brilliant...we are a bar within a media centre and we have to think of all the customers, that's why for instance in the day we keep the music very middle of the road."*

The implication of this, then, is that introducing a technology which shifts music control away from key staff to clientele, could potentially be viewed as a threat to significant parts of their job role. This again is something to bear in mind in later discussions of the fieldwork findings post-installation.

3.3 Staff Control of the Music with Jukola

Once the system was installed, one of the issues was the creation of content. Building up a collection of music was something that was going to take much longer than the time available for the trial. So while the bar manager did get involved in putting together some new content, this was not as extensive as he would have liked simply because he did not have sufficient time available. For a week-long field trial the benefits of this behaviour did not justify the effort. Consequently much of the initial collection creation and organisation fell to the trial team but overseen, where possible, by the bar manager. This aspect of the process was considerably frustrating for the bar manager. While he recognised the practical necessity, it hindered his creative control and his abiltiy to express his and the Watershed's identity through the music. In particular, he had difficulty accepting the assignment of particular tracks to the relevant playlist categories – *"Who put Colplay in the evening collection?"* – the *important* subtleties of these categorisartions being missed by the trial team.

During the interviews with staff members though, some evidence did emerge to suggest that their involvement with the collection management would increase over time. Indeed the facilities for creative collection management is something that would be valued by staff if they had more time and could reap the longer term benefits of this invested time.

> *"If I had all the time in the world I would go to town. I mean I love music-it's a big passion and a hobby of mine. I would create all sorts. I'd have collections that were randomly selecting from a huge pool of tunes that were all appropriate to a certain time of day. You would have ones where you create special playlists, where you go right, it's really buzzing in here now, let's have that special party play list that you only play when it's really buzzing in here - play entire albums...have a Thursday line-cleaning play list just for Simon that's just full of hippy music that keeps him really calm when he's cleaning the lines."*

The issues here are not simply ones of amounts of time but also when and where this time can be taken. Exploiting their spare time during work breaks was difficult at first because the system did not support simultaneous audio streams for playback in the bar and playback for monitoring purposes. The staff needed to be able to listen to a song or at least a short snippet of it in or order to be able to assign it to a category, or to create a new collection. So while the system was playing voted for tracks in the bar tracks, the system did not allow other songs to be listened to in the back room for the purposes of collection management. Previously, this distribution of tasks had been supported effectively without explicit thought through the use of separate tape players and use of different cassette tapes. Collapsing these functions together in a single system had brought with it this new problem. With the emergence of this problem it was necessary to introduce the facility for two audio streams to be played in parallel, one for the music being played front of house and one for the music being monitored and organised in the back room. This feature was particularly important for songs that had been uploaded by the clientele which had to be vetted by staff before being made available for voting.

The distribution of collection management activities across multiple staff members was also hindered to a certain extent by the position of the system within the broader ecology of music recording devices. Previously, with the tape-based system this was supported by the fact that other staff members could create their own compilation tapes on their home machines or easily make copies of purchased albums for playing on the system. At the time of the study, MP3 creation software and CD writers were not sufficiently widespread in the homes of the staff working at the Watershed. In this respect, a by-product of the new system was to partially exclude these staff members from involvement in the collection creation process. This, of course, is something that is shifting relatively quickly. In the long term, with the greater ubiquity of powerful home PCs and MP3 creation software, this is unlikely to be a problem.

While these staff members could have brought in CDs for ripping to the system, this does not quite afford the same opportunities for expressions of identity that is closely bound with bespoke compilations and the timing of playing a particular CD. CDs which people have brought in are not played immediately on the Jukola system. Rather, tracks which have been ripped from a CD simply become part of a larger pool of music some of which *might* be played later. Consequently some of the binding of person to particular tracks can become lost. In this respect much of the key motivation underlying the staff bringing in or creating music was reduced. In particular, this applied to the creation of compilations. Much of the value of these lies in their status as a collection and more specifically their sequential order. The value of having such a functionality is seen in the following statement by one of the junior staff music afficionados.

> *"On a Tuesday afternoon I would sit back in the back office and create a little play list for this coming Friday night and handpick maybe 20 MP3s and put them in a really good order so you get a nice build up."*

Removing this level of control over sequencing of tracks, removed some of the opportunities for identity expression through the music. Introducing such a facility could be of benefit on future versions of the system and would facilitate some of the distributed collection creation and management process.

Further complications with the effective distribution of this control across staff members was found in how access to control was dynamically managed by the bar manager. The bar manager, being ultimately responsible for the musical ambience needed to maintain a certain level of control over the music. Relinquishing control to other staff members was not simply a binary all-or-nothing decision. Rather, he applied judgement as to when and for whom it was appropriate to increase or decrease leniency with repsect to who "put music on". With the tape based system, this application of "judgement-based" control was facilitated by being embodied in the technology iteself. The tapes were time-based, bite sized tokens of control over the music. Giving permission to other staff members to put on a tape was granting them control over the music for the duration of the tape after which it automatically reverts back to the bar manager. Control access, in this respect, was very "explicit" with the tape machine and something that was therefore easily socially mediated. A concern with the Jukola system for the bar manager was how to manage the level of control given over to other staff members. While he was happy to devolve some of the reponsibiltiy for music control he didn't want the staff to have unrestricted access to the device. Consequently a password was introduced. But this turned out to be rather a blunt solution; a binary all-or-nothing level of control. To give out the password to the other staff would effectively be giving them full control whenever they wanted. This made the contingent management of control much more difficult to do in a socially mediated way. This consequently ended up restricting the opportunities for distributed contribution to the collection creation process.

The system did offer some different opportunities for distributing control to staff members. For example, the public display in the bar was used by staff members to nominate tracks as they went about the rest of their duties. This not only allowed them to get music played for themselves, but also served some of the pedagogical motivations bound up in music choice. That is, songs were nominated by bar staff to steer the choice in an altruistic sense to inform people about music. They nominated less mainstream songs, styles and artists that they thought people would like but not vote for because they had not heard of them.

> *"If there were no nominations on there and it was just on random play, then I would think I know some really nice tunes on there that people would love that won't get selected because people won't know what they are. So I would go on there and maybe just stick a few on. That was more just to get certain stuff played that wasn't getting played because people hadn't heard of it."*

Interestingly, these opportunities became more prevalent outside working hours. With the clientele gone, and the handhelds switched off, the staff would appropriate the public display for their own use, nominating songs that they wanted played while they tidied up. In many ways this opened up the system in a way that they could expresss their identities within the staff circle through musical choices.

Ultimately, it is by virtue of giving up a certain level of control to the clientele, that the system inevitably created a certain amount of tension with some staff members. One key frustration for the staff was that certain songs would get repeated throughout the day. Part of this is a tendency for most people to vote for the familiar. But another factor has to do with the different durations of presence in the bar for staff and clientele:

> *"One of the worst things is you get tunes playing over and over again. As a customer that is not a problem, because you are not here all day, but as a member of staff you are here all day and you don't want to hear 'Let's get it on' by Marvin Gaye once every 45 minutes whether it's a good tune or not. That is one of my biggest criticisms of it. You could certainly reduce that problem."*

For clientele, their presence there for a short durations on a single day means they do not suffer the frustrations of repeated plays. But bar staff who are working for long shifts on a particular day and for several days in succession, this issue was particulalrly problematic. But the issue here is not simply about the frustration of hearing the same song but also that certain staff members felt a certain pedagogical drive with respect to music and a certain responsibility for what was playing. The loss of control to the clientele was not something that was simply given up in a sustained manner. Indeed at times, the experience of control loss among certain staff members (in particular the bar manager) was so acute that behaviours were enacted that shifted the balance of power back in favour of the staff and their own particular motivations for control outlined above. One example of this was seen when the bar manager actually switched off the public display in the bar. The idea here was to prevent clientele from nominating for a period allowing a more *random* set of songs from his music collection to be played. Another time, the handheld devices were taken in earlier than normal, again to remove some of the clientele control and introduce more randomness into the music being played. On a small number of other occasions the same staff member found ways to buy back control by repeatedly clicking the emergency song-skip function until he found a song he thought was appropriate:

> *"I would just let it play through, but if I had a spare minute then I would go and click next until a song came on that I would want to hear and then I would go oh yeah, that's a brilliant tune, let's have that, turn the volume up."*

What is clear from this is the tensions between the different stakeholders in terms of music control. What is not clear though is the extent these tensions are an inherent part of the system. That is, whether they would continue to play out over a longer period than the initial trial, or whether a more stable position would emerge as staff buy back control through inventive workarounds and greater investment in collection management.

3.4 Clientele Control of the Music with Jukola

For the clientele, the installation of Jukola introduced a sense of control over the music. While this control was not complete for any particular idividual, what was important for people was being "*involved*" in the choice.

> *"If it is just down to people behind the bar you can just walk in and think oh my god. At least you have - even if they have decided what goes on at the server, you have a little bit of sway to get it round to what you want to listen to."*

> *"You are never going to keep everybody happy. But at least if people feel they have some control they are less likely to complain about it."*

What is important here though is understanding the nature of this involvment and the real locus of value for the people using the system. The value lies not in the ability to influence the music outcome per se but rather what is made possible in social interaction terms by virtue of being involved in the choice process. As with the staff, musical preferences and tastes play an significant role in how people can project aspects of of their personal identity as well as providing a understanding the identity of collocated others. Nominating and voting with Jukola became a vehicle through which such identity management could occur. For example, a typical scenario was for a particular group of people sat at a table to only have one handheld device shared among them. What was voted for in any particular voting round was then something that had to be discussed among the group. The handheld displays became a common point of focus for the group in the course of these dicussionss. People were observed pointing to the handheld displays as they talked and would lean into the device to focus their visual attention and help orient the attention of others to what they were looking at. They would make small adjustments to the position of the display in order to draw others into the discussions (cf. Luff and Heath, 1998). People talked about which of the song options they recognised or didn't recognise, which one the group should vote for, which one they thought would win. The technology became the resource through which the dynamics of the conversations were managed and controlled by the group. These discussions also took place around the public display in the bar, where small groups would gather to discuss which songs to nominate or simply comment on the highlighted nominations of others. The majority though, occurred around the handheld devices since their location at the tabletops supported the disucssions without disrupting the physical cohesion of the group around the table. Maintaining this physical cohesion is an important design consideration for integrating the technology into the bar environment.

Such identity conversations were not just about music genre associations in which certain choices would be praised or denigrated but also occurred at a more general level. When we interviewed one group, they affectionately joked among themselves as to how old they must be getting as they didn't recognise any of the song options that seemed to be coming up at a particular point in the evening:

> *"I thought it was a reflection of the time of evening we got to that we were getting to tracks we didn't know at all – whereas earlier in the evening there was stuff the old people knew well." – [laughs at their mock oldness]*

We see here, then, how through engagment with the choice of music, opportunities are provided for people to express something about themselves and others around them.

Such identity expressions occurred also at a level of the tightly coupled group of people sat around a particular table. For example, song options were sometimes discussed in reference to shared memories in which particular song options were associated with some shared time or event in the group's past. The discussion of which to vote for, then, became an opportunity for reaffirming group bonds and friendships:

> *"If we had those [songs] it would be like oh yeah do you remember this tune – we were out 2 years ago in Southampton and we heard this track – it was wicked man - and then voting for it to come on sort of thing."*

As well as identity and group affirmation conversations within the tighly coupled groups at tables, Jukola provided interesting information to users about the identity of other people at other tables and around the bar in general.

> *"It's kind of a fun game to see what everyone else is voting for... It's just interesting to see what everyone in here likes. I was quite surprised Coldplay got played."*

This identity information occured at various levels of granularity. For example, people expressed an interest in understanding what the "Watershed" as a whole would vote for. The fact that people had explicitly voted for particular songs was informative about the type of people who frequented the Watershed bar. Indeed, as can be seen in the quote above, there was an expression of surprise about the kind of music chosen by the Watershed clientele since this was at odds with their perception of the type of people they thought would frequent the bar. A significant feature in these identity assessments made by people concerned how they combined the online-networked information about voting progress with the other off-line attributes (e.g. clothing styles, age) which could be perceived about people by virtue of being collocated in the bar. In this respect, it was not just the networked nature of the technology that played an important role but also the way in which it was *situated* within the physical environment.

At a different level of granularity, more explicit associations were possible because the handheld displays on the table acted as *public displays* (see O'Hara et al, 2004). People walking past a table could glance at what those on that table had voted for because of the salience of the selected track. Identity judgements about people sat at a particular table were thus made according to what they had voted for.

> *"In the same way as wearing band tee-shirts or labels or something, what your table says is saying something about who you vote for on the jukebox which generally people like don't they – to advertise that about themselves...and then there would be all jokes – you'd nip over to someone else's table to vote for the Britney songs – you wouldn't want that on your own."*

At an even finer level of granularity, people were able to infer certain identity characterstics of particular individuals through the synchronised association of physical behaviours they could see with the online voting feedback. That is, on viewing a particular individual making a pressing motion on the touchscreen on one of the handheld devices, they could infer what that individual voted for by seeing the simultaneous change in the voting feedback on their own device.

> *"And also at the beginning when there weren't that many people around you could tell who on different tables would vote for what because you would see them press the button and then you would see that your screen had changed and you'd think ah you know what they are like."*

The social nature of the choice process also manifest itself in the form of playfulness. Much of the voting behaviour was not simply about the ability to choose the best songs. Rather the capabilities of the technology came to be appropriated for game like playful behaviour.

> *"It's like musical bingo, a competition to see which tune wins – yay."*

Rather than considering such behaviours as merely second order, we would argue that they actually part of the underlying social process involved in simply "*doing friendship*" . They gave the device a sense of fun for a wide range of ages providing what one father with his family called a "*common ground for the Big Kids and Little Kids*". That the device came to be used in these ways can be taken as some indication of it success as a "socialising" technology.

If a person voted for the eventual winner they seemed to feel a sense of pride about the fact that they were able to select the winner. They also expressed a mild disappointment about the times when they kept "losing". There was a sense that the voting was something that they should be good at rather than simply a means of expressing their choice. This was the sense of playful competition and relates back to the issue of how music can define group belonging and non-belonging. This could be seen in people's expressed sense of pride when someone commented positively on their music nominations and choices.

The prospect of winning and losing created an ongoing sense of anticipation throughout the voting cycle. Much like backing a particular horse while watching a horse race creates a sense of tension and fun, so too did the ongoing voting feedback. Some people would monitor the votes because of this fun sense of anticipation. This became more notable as more handheld computers were distributed throughout the bar, the greater number of voters creating much more frequent changes in the real time voting feedback. There was evidence that people were strategic in the way they voted, for example, picking their second favourite if their favourite looked unlikely to win.

> *"You sit down, you think well that is ok I can vote on the songs and they you notice that you have got all sorts of fun stuff like see how other people are voting so you can tactically vote. I love the way that it does the count down thing so it knows how long the MP3 is so it counts down to when you can vote on the next thing."*

Prediction games were played by people in which they tried to guess who would be the eventual winner. Again this draws on some of the identity issues discussed earlier whereby people are trying to guess musical preferences of others in the bar on the basis of what they look like or some stereotypical notion of a "Watershed" consumer.

> *"We were predicting weren't we – saying well that one will win probably because that one we've heard of...We just kept on saying right well we think that seeing that it's a Massive Attack song it might get voted but no wait a second its from the new album so they wont have heard it."*

Subtle expressions of social relationships were also made through the behaviours with the device. For example, upon returning from nominating some songs on the public display, one woman commented how she just wanted to see whether her partner would be able to guess which tunes she had nominated when they came up in the candidates list. While such a game is in many ways trivial, guessing succesfully or usuccessfully has all sorts of interesting social concequences of much greater significance. Likewise people used the collaborative nature of voting to play with unwritten rules of etiquette that would accompany such a task. For example, some people played friendly sabotage games where they would deliberately vote against the songs nominated by a group member. In normal circumstances one expects some form or solidarity here and so to deviate from these expectations can be used for playful purposes – playing games with friends by playing with the status of social bonds.

> *"I nominated my eight favourite tracks and then they conspired against me and voted for the other stuff."*

Similarly, etiquette in relation to sharing control over the group voting resource was something that was toyed with for the purposes of being playful with friends. One group described a notion of *Stealth Voting:*

> *"And once we've voted for something we need to keep an eye out for stealth votes – for when the time is coming to an end and people doing last minute votes…people on this table actually will sneak it away from somebody at the last minute to change the vote."*

It is through the ways in which the technology distributes control across many people that people were able to make subtle expressions of knowledge about the unwritten "rules" of social interaction. In turn, it is through these expressions, playful and otherwise that people provide cues about the nature and status of their relationship with others in the group.

A further feature of clientele control of the musical ambience was the facility for uploading MP3s to the device over the Internet. In this respect, clientele away from the physical setting of the Watershed bar were able to exert some influence over the choice of music in the bar. This capability again had some important social consequecnes in terms of identity expression. A number of local bands for example, sumitted their MP3s to the device hoping to obtain some visibility for their work in a public setting. Band members who had submitted songs over the Internet would also come in to the bar explicitly for the purposes of seeing their song on the public display and also to vote for it. For them it is a kind of mini fame in which their work is legitimised by virtue of having their "name in lights". On the opposite side of this value though, came disappointment for those whose uploaded songs did not appear. Because the uploaded songs had to first go through a vetting process the lack of appearance of the song was taken as a sign that it was not good enough.

Along similar lines a number of people commented how the uploading feature could become an integral part of the night out.

> *"If I was going to come up with some mates there would be a point in uploading something because you think we'll vote for that for the sheer fun of it. I wouldn't do it on my own but in conjunction with other people I probably would do it [upload some music] actually. In fact it could become – its funny, when you think about it, it could become a build up to a night out in a funny kind of way. So you are getting ready to go out and you think ah lets upload some stuff and we'll vote for that when we get in there."*

Again, the process of selecting the music for the evening was something that would be inherently social and something tied in to the subsequent experience of being in the physical space of the bar.

4. Discussion

Installing Jukola into the Watershed Bar introduced a range of new dynamics into the control and decision making processes. From the staff perspective, while they were interested in some of the new opportunities for controlling music through the system, their experience overall was actually of a reduction in music control and the identity management impliciations (both personal and organisational) thereof. Some of this is inherent in the opening up of control to include the clientele. But a large part concerned the changes in organisational practices that were made necessary by the system's characterisitcs and the broader ecosystem of content creation and management within which the system was immersed. These proved a barrier to staff involvement in the creation of content during their spare time in the bar and at home. By not accounting for some of these factors, the opportunities for content management, while functionally enhanced, were in practice removed. New practices would probably have emerged in time to take advantage but these are dependent on considerable organisational investment in the technology.

From the clientele point of view the greater level of control afforded by the system was actually of enormous value to people interacting in this type of social setting. What was important here was not so much the control of the musical outcome itself. Rather it was the act of participation itself. In particular it is what they were able to achieve socially through this particpation in the decision making that was of significance. What the system did by distributing choice across multiple people was encourage debate, conversation and negotiation around music. In many ways the system engendered the music options to be what Sacks might call an *inexhaustible topic* (Sacks, 1992). That is, the discussion of music choice became a vehicle through which all sorts of social values, identities and power relations were able to be expressed and perceived and played with. It is these social topics underlying the discussions around the music choice per se that was of value and significance to the people within such social settings.

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References

Bassoli, A., Moore, J. and Agamanolis, S., 2005, tunA: Socializing music sharing on the move. In O'Hara, K. and Brown, B. (Eds) *Consuming Music Together: social and collaborative aspects of music consumption technologies*. Springer.

Brown, B., Geelhoed, E. and Sellen, A., 2001a, The Use of Conventional and New Music Media: Implications for Future Technologies. In: Hirose, M. (Ed) *Proceedings of Interact 2001, Tokyo, Japan*. IOS Press, 67-75.

Brown, B., Geelhoed, E. and Sellen, A., 2001b, Music sharing as a computer supported collaborative application. In *Proceedings of ECSCW 2001, Bonn, Germany.* Kluwer Academic Publishers, 179-198.

Cliff, D., 2000, *Hang the DJ: Automatic sequencing and seamless mixing of dance-music tracks*. HPL Technical Report, Bristol.

Cliff, D., 2000, Music From The Masses: An automated dance-music DJ that mixes, remixes, and composes on the basis of crowd feedback. In O'Hara, K. and Brown, B. (Eds) *Consuming Music Together: social and collaborative aspects of music consumption technologies*. Springer.

Cohen, S., 1993, Ethnography and Popular Music Studies. In *Popular Music* **12**(2), 123-138.

DeNora, T., 1986, How is extra-musical meaning possible. Music as a place and space for work. *Sociological Theory* **4**, 84-94.

De Nora, T., 2000, *Music in Everyday Life*. Cambridge: Cambridge University Press.

De Nora, T., 2000 Music and Emotion in Real Time. In O'Hara, K. and Brown, B. (Eds) *Consuming Music Together: social and collaborative aspects of music consumption technologies*. Springer.

Frith, S., 1978, *The Sociology of Rock*. London: Constable.

Hargreaves, D.J. & North, A.C., 1999, The functions of music in everyday life: redefining the social in music psychology. *Psychology of Music*, **27**, 71-83.

Luff, P. and Heath, C., 1998, Mobility in Collaboration. In *Proceedings of CSCW '98: Conference on Computer-Supported Cooperative Work.* ACM Press, 305-314.

O'Hara, K., Perry, M., Churchill, E. and Russell, D., 2004, *Public, Community and Situated Displays: Social and Interactional Aspects of Shared Display Technologies*. Dordrecht: Kluwer Academic Publishers.

McCarthy, J. F., and. Anagnost. T. D., 1998, MUSICFX: An Arbiter of Group Preferences for Computer Supported Collaborative Workouts. In *Proceedings of the ACM 1998Conference on Computer Supported Cooperative Work (CSCW '98), Seattle*, pp. 363-372.

Sacks, H., 1992, *Lectures in Conversation*. Oxford: Blackwell.

Willis, P., 1978, *Profane Culture*. London: Routledge.

Chapter 6

PROMOTING SOCIAL INTERACTION IN PUBLIC SPACES: THE FLYTRAP ACTIVE ENVIRONMENT

Andrew Crossen and Jay Budzik

1. Introduction

Flytrap is an active environment that knows its users' musical tastes and can automatically construct a soundtrack that tries to please everyone in the room (Crossen et al, 2002). The system works by paying attention to the music that people listen to on their computers. Users of the system have radio frequency ID badges that let the system know when they are nearby. Using the preference information it has gathered from watching its users, and knowledge of how genres of music interrelate, how artists have influenced each other, and what kinds of transitions between songs people tend to make, the "virtual DJ" finds a compromise and chooses a song. The system tries to satisfy the tastes of people in the room, but it also makes a play list that fits its own notion of what should come next. Once it has chosen a song, music is automatically broadcast and played.

Music lives at the boundary of private and public life, and a discussion about music preference can provide a great deal of insight about the people involved in the discussion. Explanations for music preference are often personal—inaccessible to those who do not share a certain social context, set of interests, or intimate knowledge of the listener. As such, social interaction involving music preference provides a context in which the boundary between public and private can be explored. Listening to music in a public setting can provide the basis for social interaction about typically private matters. Expectations about the listener are drawn from the music to which they are listening. Yet because of the boundaries implicit in music as a representation of self—that not everyone knows the back-story of a certain artist or genre, nor have they trained themselves to decipher lyrics

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obscured by style—music allows the listener to maintain a boundary around aspects of their private life that can be inferred from their musical taste, in a way that invites a pre-defined class of others in, and actively keeps others out.

Technologies that can make personal preferences visible in a public setting provide opportunities for studying these boundaries and the effects of manipulating them. We focus here on a technology that intends to spur social interaction in a public setting by making personal preferences visible to those present in the space. Of interest to us are technologies that can facilitate informal social interaction by highlighting common ground. The technology we discuss represents a new kind of social environment that actively facilitates participation in social exchange by manipulating representations of self. Musical tracks that match people's preferences replace the generic, "lowest common denominator" music typically played in public environments. In exchange, users delegate control over sharing their preferences to our technology. Having technology mediate this sharing allows us to explore the issues that arise around privacy and trust. We built the Flytrap system so we could explore these ideas.

2. Motivation

People's choice of music can be deeply personal, as seen in Tia DeNora's ethnographic studies of music listeners. Listening to music often triggers memories of events and experiences that have emotional significance. Explanations for music preference often involve very intimate, private matters. One interview subject noted that she often privately listened to Schubert's Impromptus because they "reminded her of her father" and listening relaxed her before work (DeNora, 2000)

Yet the very personal experience of listening to music originated in a completely public setting. Before modern listening technologies, music was performed at small social gatherings in homes and public places, as well as in larger venues that are more like today's concerts. Even with the widespread use of portable, private listening devices today, the act of listening to music often occurs openly in public. It is this dichotomy between the private and personal nature of the reasons for listening to certain music—and the public settings in which the act of listening to music occurs—that makes music preference particularly compelling.

Listening to music in public is often an invitation to the public to enter the private space of the listener. Readers will be reminded of times they heard music come from someone's office, stopped in to ask what it was, and heard a very personal story about why the listener liked the music they were playing so much. Readers will also be reminded of times when an explanation for the music choice was avoided, perhaps because the reason was just too personal.

This ability for the listener to invite people in, but still negotiate the boundary between public and private by choosing what, if anything, to share about their personal reasons for choosing certain music, is one of the properties of music preference that make it particularly well suited for this study. People ultimately control whether the reasons for liking certain music is shared, even if they choose to publicly expose what music they like.

Music often also has properties that allow the listener to select a portion of the public to invite in, and a portion to keep out. These built-in boundaries are present from opera (which typically filters in the wealthy and educated and filters out the rest) to punk rock or hip-hop (which do the opposite). Readers might remember hearing music coming from an office, and deciding not to stop in, because there was no interest in what was being played. At the same time, commonalities in music preference (especially if that preference isn't shared by many people, generally) often pre-qualify people for certain kinds of social exchanges.

Erving Goffman suggests that focused interaction in an encounter becomes possible when commonality is perceived among the participants (Goffman, 1961). The most interesting commonalities are those experiences and preferences that aren't shared by many others. This rare common ground provides the Flytrap active environment the opportunity to promote social interaction among its users.

2.1 Public Space as a Locus for Social Interaction

Many public spaces exist mainly to support specific kinds of interactions. Convention halls, classrooms, and train stations are all designed to support specific uses. The constraints of the activities performed in these spaces govern the social interactions taking place therein, which are often focused around a task. Music does not typically play a part in the rules of social interaction in these spaces, and could be construed as a distraction in some cases (e.g., if it was playing during a lecture).

Other spaces are designed for public use but do not typically facilitate or result in social interaction. Elevators, waiting rooms and subway cars are sometimes even designed to make social interaction entirely optional, if not difficult (it is difficult to talk with someone who is reading a magazine in a waiting room). People are barely socially present in these spaces.

Still other spaces—company lunch rooms, pubs, parks, and green space—are designed to provide a venue for the public to interact socially on a more informal basis. Music in these spaces establishes the mood and social constraints of an informal environment (DeNora, 2000), and helps people to mold a socially appropriate dramaturgical "front" to fit the space (Goffman, 1959). Some of these spaces position music as a focal point, while others use it as a backdrop to other activities. Coffee houses may play soft music as part of establishing an intimate atmosphere, while rock clubs play loud music that make quiet interaction difficult.

These types of spaces—where people are socially present in an informal manner—best suit a Flytrap installation. These spaces balance informality, social accessibility, and generality of use for our augmented environments. Flytrap's synthesis of personal preferences for use in public can help to support and ultimately change the character of these public spaces, using music as a backdrop to or basis for social interaction.[21]

[21] The properties and character of public space outlined above can be used to tailor the kind of music played. This idea is further explored in Section 6.

2.2 Can We do Better than Elevator Music?

While it is feasible to suggest that most people visiting a blues club like blues, in many settings it is impossible to infer music preference from the location alone. Acquiring and synthesizing knowledge of the tastes of people present in these types of general-purpose public spaces is a difficult task. Often the perceived difficulty outweighs the perceived benefit and "elevator" music is played, or music is omitted altogether. Ideally, the musical tastes of each individual present and knowledge of the activities they intend to perform could be used to come up with better mix of music to play.

According to Joseph Lanza (Lanza, 2004), during the early 1980s, patrons of Pittsburgh's airport complained of feeling uneasy waiting for their flights as Brian Eno's ambient composition "Music for Airports" played over the public address system. This was a particularly poor choice of background music given that people made specific complaints against it, instead of ignoring it altogether. We see an opportunity to fill generic public spaces with something more interesting than "elevator" music. We want to present visitors in the space not just with something they like, but with a selection of their music that could promote sharing and social interaction by weaving a musical thread amongst those in the room.

Our goal with Flytrap is to leverage rare common ground in music preference to provide a basis for social interaction. Flytrap invites people to share the intimate reasons for their choice of music with each other as they feel comfortable. Public spaces can thereby be transformed into environments that facilitate new kinds of social interaction.

3. Related Work

Already, environments are designed to support and encourage certain types of behaviors. Yet the environments of today are often static, unless someone is actively orchestrating the experience of those within them. The environments of the future—the rooms, offices, churches, shopping malls, and parks of the world—will know about the people inside of them, and will be able to craft an experience for those people that not only reflects their preferences, but actively supports everything they do, including encouraging social interaction and discourse, when appropriate.

One active environment is in use today at a company health club. The MusicFX system (McCarthy and Anagnost, 1998) is a group music preference arbitration system installed in a company fitness center. Users of the gym sign up for MusicFX by detailing their music preferences in a survey. Users rate about 100 genre-constrained radio channels on a five-point scale, used later by a voting mechanism to choose the radio channel to play based on the preferences of those present in the gym at a given time. As their music preferences change, users of MusicFX update their survey profile.

At first glance, the goals and functionality of MusicFX and Flytrap seem similar. Both systems strive to replace "lowest common denominator" music in a public space by democratizing the music selection process. Both systems model user music preferences to make recommendations in a group context. Yet the systems differ in their intent: while MusicFX aims to make the environment less offensive and more enjoyable, Flytrap aims to make it socially engaging. The difference in choice of deployment environment reflects this difference in intent.

Flytrap can foster social interaction by exposing specific overlapping preferences that are not generally shared. In order to do so, Flytrap's information about user preferences must be highly granular (the system must know about specific artists and songs). Because of the volume of preference information required, we focused on implicit sources of music preference that can be gathered automatically, without requiring explicit user input.

This difference in focus and approach resulted in significantly different design choices, reflected below.

4. The Flytrap System

A number of distributed components comprise the functionality of the Flytrap system as a whole. Each user has a Flytrap agent tied to their personal media player, responsible for gathering information about their music preferences, and voting on songs being considered for play in a group setting. A central server houses a database of song information populated by each personal agent, and a file repository containing each of the musical tracks. Public areas where the system is to operate are outfitted with a voting agent, user identification subsystem and music player.

4.1 Gathering Music Preferences

Deriving a user's musical tastes from observation provides a more accurate characterization of the user's tastes than a survey, which requires somewhat difficult introspection and exhaustive enumeration. Likewise, observation allows the system to gather preferences in context, which provides fertile ground for research on more context-sensitive methods.

Because of the personal and spontaneous nature of music selection, it is necessary to capture people's listening habits in an unobtrusive way, participating directly in the act as a silent observer. Many users generally listen to music on one of a handful of media players on their personal computers. We developed interfaces to several popular Windows-based media. These give us access to the music a user is currently interested in. While preferences are not gathered from portable personal music devices, the model extends to such devices if they support the installation and use of third-party software.

On each Flytrap user's personal machine, their instrumented media player gathers information about what tracks the user is listening to, and records this in Flytrap's database. Users interact with their media player just as they always do, with no additional work on their part to make music known to the Flytrap system. The tracks themselves are uploaded to the server by the agent if they don't exist in the central repository. In this manner, the user's preferences are learned through the act of listening to the music as they would normally.

4.2 Approach to Music Representation and Recommendation

There are generally two approaches to building recommender systems: statistical approaches, which mine usage or preference data in order to provide recommendations (e.g., collaborative filtering (Resnick et al, 1994) or market-basket analysis (Fu et al., 2000)); and content-based approaches, which use knowledge of items and similarity among them to provide recommendations (e.g., FindMe systems (Burke et al, 1996; Burke, 1999). The primary advantage of statistical approaches is they require no representation of items and no theory of similarity among them. Their disadvantage is that they require large volumes of rating data before they begin to make recommendations that make sense to users. Likewise, they require an item to be rated in order for it to be recommended. Content- or knowledge-based approaches are the opposite: they require knowledge of items and a theory of similarity, yet they require no rating information in order to make recommendations.

We chose to implement the following content-based recommendation algorithm given:

1. We wanted our system to introduce users to music they hadn't heard before
2. The number of artists available would be large and initially unrated
3. A large knowledge-base about music and genres was immediately available
4. We needed to compute similarity in order to maintain play list coherence (see below)

The system did not immediately meet the requirements of typical statistical methods, and therefore lent itself naturally to the application of content-based recommendation frameworks.

As a basis for recommendation, Flytrap needs to know information about each musical track it has been exposed to via the personal agents. Flytrap uses multiple methods of obtaining information about a piece of music. One technique involves looking at the metadata in MP3 files (called ID3 tags) to determine a track's artist and genre information. Since the genres reported in ID3 tags are notoriously inconsistent, we use a web wrapper (Crossen et al, 2004) built around the AllMusic Guide[22], a popular music information site, as a backup to retrieve the genre of the track given the artist. This covers cases in which the genre is available but the artist isn't. In cases in which no information is available about the track, it is not included in the track database. This is a minor failing that, in practice, does not occur very often.

[22] Available at http://www.allmusic.com/

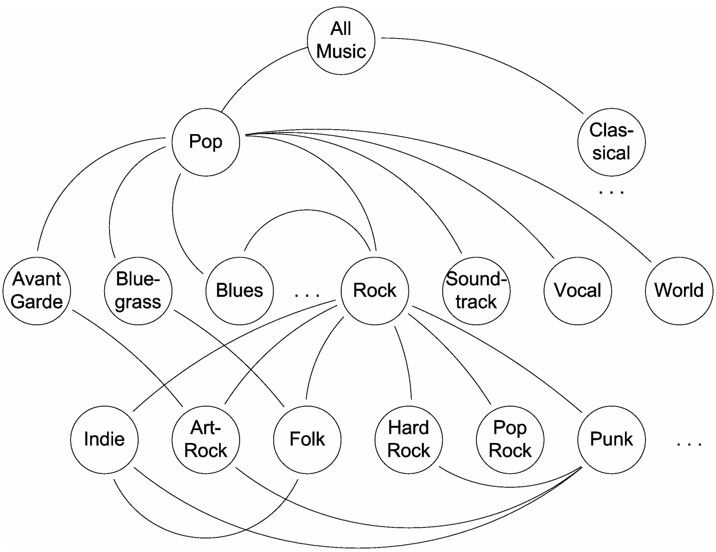

Figure 6-1. Partial Music Genre Network. This highly connected network of genres is derived from a crawl of Allmusic.com, an online music guide. This semantic network forms the basis of our content-based recommendation algorithm.

However, statistical recommendation algorithms could be leveraged to cover instances when tracks are not properly tagged, or artists are simply not known to the system. Ideally, recommendations would not be based on loose concepts like genre that shift over time. Artists can change genres, and tracks can vary wildly in genre and tone, even on the same album. A representation that captured track-level information that reflects this reality would improve the quality of the play lists our system constructs. This could be accomplished by analyzing the acoustical properties of the tracks themselves, and is the subject of future work. Notwithstanding the above shortcomings, our system produces results that are generally good enough for its users.

A song's genre acts as a key into a semantic network of inter-related genres, which are used to determine similarity among artists. A similarity network of genres derived from the AllMusic Guide is used to determine similarity between genres (see Figure 6-1). Artists can belong to multiple genres. Links between genres are assigned weights based on the number of artists they have in common. This similarity information is used in a variety of ways to compute a group play list, as described below.

4.3 Determining Who is in a Public Space

As users move from their personal spaces into the Flytrap-equipped public space, the system needs to know who is present in the location. We used a system of radio frequency ID badges (see TIRIS; Want et al, 1992) that transmit a unique identifier to a base station. Each badge's unique identification number is tied to a user's Flytrap music profile. As users walk into the public area, their unique ID is picked up by the base station, informing the system that a user is now present in the space.

4.4 Deciding What Tracks to Play

After personal preferences are gathered and the system notices a user has entered a Flytrap-equipped public space, the system begins the recommendation process. Flytrap decides the next track to add to a play list using a voting mechanism whereby the agents representing each user present in the room give a numerical vote to each track in the system's database each time a new track event is signaled. The criteria for voting are based on artist, genre and style information, as follows:

- A user's Flytrap agent will give a song a high vote if it's an artist they've listened to previously, and a higher vote to those they've listened to frequently.
- Songs users present have never listened to before receive positive votes from the user's agent if the genre is the same or similar by some degree to music they'd previously listened to.

Similarity among artists (and thereby songs) is computed by spreading activation (see Quillian, 1968)) along the links in the genre network. For each user, the activation level for a given genre is the ratio of the number of tracks they've listened to over a certain time in that genre to the number of tracks they've ever listened to in that same time frame. Thus, if N is the number of times a user has played any track during a given time period (counting a track twice, for example, if it was played twice in that period), and $N(G)$ is the number of times the user has played a track in genre G. Then the activation level of genre G, $A(G)$, is given by:

$$A(G) = N(G) / N \tag{1}$$

The activation level of an adjacent genre G' is the ratio of the activation level of G and the number of links out of G. So if $|\mathrm{adj}(G)|$ is the number of nodes connected to G, $A(G')$ is given by:

$$A(G') = A(G) / |\mathrm{adj}(G)| \tag{2}$$

The value of a user's vote for a given artist is given by the sum of the activation levels of the genres to which that artist belongs multiplied by the percentage of users that would have voted for that song. The more frequently a song is preferred across all users in the database, the less likely it will be played. This ensures the system exposes the rare common ground that exists among the users participating in the experience it crafts.

Once the voting has completed the sum of each agent's votes (normalized by the number of users) form a probability distribution across the entire database of songs. Songs that get more votes have a higher probability of being played. Songs that get few votes can still be played, but it's less likely. We chose a stochastic algorithm so the system could be somewhat serendipitous, causing users to become aware of new kinds of music.

In addition to the personal user agents, the system also has a disc jockey (DJ) agent, which has the power to override and manipulate the outcome the voting process based on its own 'good taste'. The rules followed by the DJ agent are much like those a human DJ would use in deciding what to play next:

- Never play two tracks by the same artist in a row.
- Maintain loose genre coherence across tracks.

Unless it's "Two-fer Tuesday" on a radio station, a human DJ will not typically play the same artist twice in a row. The Flytrap DJ agent assigns very low probabilities to songs by artists whose songs were played the last 10 times. The result is a less repetitious play list, and also one that frequently drifts into new areas, because this rule significantly reduces the number of choices in a given genre available for play.

In order to produce play sequences with as few jolting transitions as possible (e.g., playing hard rock after classical), the DJ agent uses its similarity network of genres to assign new probabilities to each track, based on the candidate track's genre and the genre of the track it just played. The probability associated with each candidate track is multiplied by its genre similarity to the previous track, as captured by the semantic network of genres described above. As a result, the DJ will favor new tracks from the same (or similar) genres as the track that was just played. The result is a new probability distribution over the entire database of tracks, which the DJ uses to choose the next song.

4.5 Playing the Music

Once all votes are cast and a song is selected, the winning track is streamed across the network for play on the machine located in the public space. Music that the system votes on is housed in a central, network-addressable repository to facilitate streaming to the playback machine.

In sum, the system understands the music its users like and broadcasts that music in the spaces it controls.

5. Experiences and Iterations

We installed Flytrap in one of our public areas used for demonstrations, informal student lunches, and studying. This space perfectly suited a Flytrap installation. Its physical design and utility promote informal activity, and its inhabitants are often people that do not know each other intimately. Graduate students and professors regularly use the area for various purposes.

We gave ID badges to around a dozen people and outfitted their personal music players with the Flytrap preference gathering agent. Over 3000 musical tracks were listened to by users during that period (and therefore made available to Flytrap). For several months, we kept the system running so people could give us feedback. Through a series of informal interviews and observations, we derived the following improvements and iterations, which we implemented and deployed.

5.1 Promoting New Music

One behavior observed as a result of the initial voting mechanism was that users were not being exposed to enough new music. Preferred artists would consistently receive higher votes and the system would oscillate between the same few artists. We added a rule to the DJ agent that selects music users in the space hadn't heard yet, using the same spreading activation recommendation model responsible for selecting songs (except that it punishes songs users heard recently). This provides necessary noise in the system to ensure the play list doesn't get "stuck" in a poorly-connected sub-graph of the genre and artist network.

5.2 The Vote Visualiser

After about a week of users interacting with the system, they began to ask us why particular songs were chosen. Flytrap maintained an internal model of its song selection rationale, but offered no visual representation of the process. From this feedback we built a vote visualization component (see Figure 6-2).

The vote visualiser graphically depicts the voting process in real time. Each user is assigned a color when their badge is first picked up by the system. Candidate track titles have a text color based on an interpolation between the user's color and the strength of their vote on the track. Brighter track graphics represent stronger votes. As votes are tallied, the track names meander around the screen. Those with higher weights gravitate toward the center, and then the DJ's vote is calculated and the final track selection is made and highlighted (the song's final position lies on a circle with radius proportional to the probability of that song being played). This gives the user not only a sense of how the voting process is going and a visual cue as to the winning track, but also shows the outliers–those tracks that lost but were also strong candidates, as well as some of those that were not.

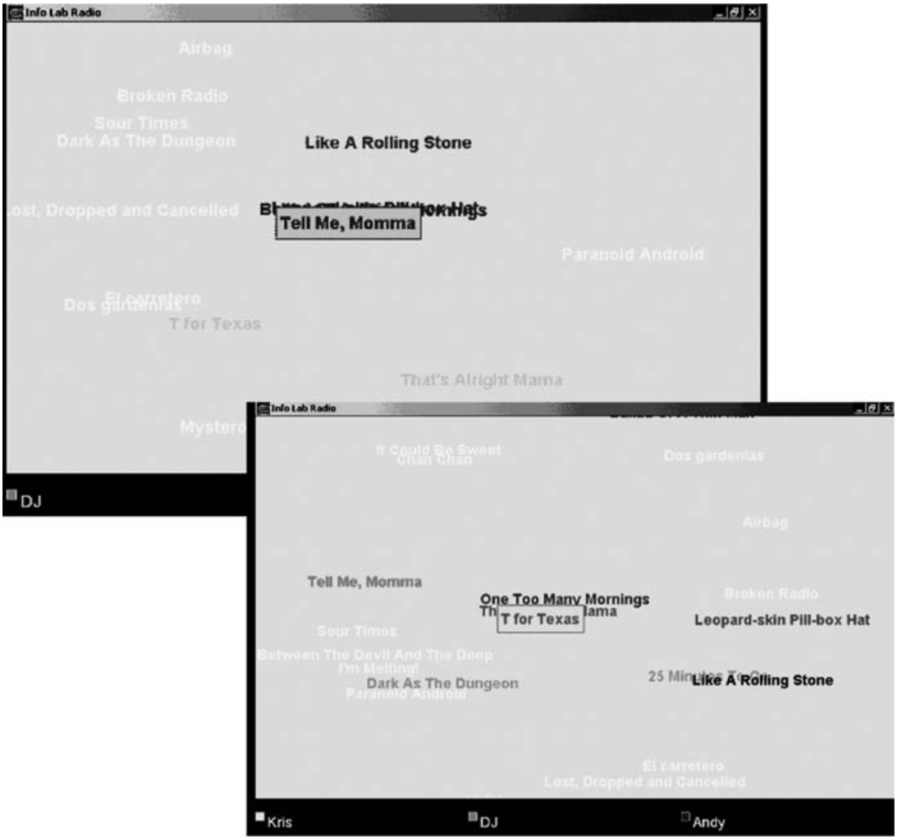

Figure 6-2. The first version of the Flytrap vote visualiser, working with two users. The first user is a Bob Dylan fan, and Flytrap plays the Dylan cut "Tell Me, Momma" (top-left). The second user, a Johnny Cash fan, enters, and Flytrap plays a track from a Cash & Dylan album, "T for Texas" (bottom-right). Songs near the center are more likely to be played.

Users reacted positively. For those in our Flytrap-enabled space, this visual reinforcement of how their private musical preferences overlap, promoted interesting conversation.

While the system was having its intended effect, users sometimes voiced concerns over whether putting their preferences up on the screen in front of everyone was an invasion of their privacy. Although we intended to get some push-back around privacy issues, we didn't expect users from the same group to feel uncomfortable openly sharing their preferences with each other. The visualization also wasn't scalable: with more than two or three people in the room, colors got muddied, and there was too much text on the screen to read it.

A second iteration on the vote visualiser can be seen in Figure 6-3. This version makes the association between users and music less visible, balancing privacy concerns with the goal of providing enough common ground to spur interaction. It also promotes additional insight into the voting process (which was the original user request). This iteration shows users the intermediate recommendation sets built by the system during the system's process of deciding what to play next, and by explaining its choice in limited English. The revised interface also scales much better to dozens of users and organizes information in a way that is easier to consume.

Figure 6-3. Redesigned interface for the Flytrap system. This version presents the system's current and future behavior without disclosing the preferences of individual users. Instead, users can share these preferences with each other only if they so choose.

The "Top Picks of People Present" lists artists ranked highest by the agents representing those present, without disclosing their identities. Instead, the ranking and number of people who influenced that choice are presented. Since the system has no representation for the content of a given track, track names were not displayed, because they didn't convey any useful information. This change was intended to directly address the privacy concerns voiced by users.

The "Next Up" list is the virtual DJ's working set of recommendations. As described above, this list contains any direct overlap in users' artist preferences, as can be seen in the selection of Wilco and Shins. Music preferred by one user directly but not another may be added if the degree of genre similarity is high enough (Cash). New music not directly preferred by users (i.e., not in the list of top picks) is also added by the DJ based on the degree of genre overlap between the candidate artist and artists in user profiles. In the example above, The Pogues and Billy Bragg are added because of the high degree of preference for the music's genre expressed by users present in the space (in the example above, Wilco, Crosby, Stills, Nash and Young, and Johnny Cash influence the choice of The Pogues and Billy Bragg).

"Now Playing" represents the current selection being played. Full artist, song and album information are displayed. In addition, the system explains why it chose the song it's playing, which includes a combination of user preferences (genre preference or artist preference) and similarity to the last song played.

At a glance a user can see what the system is doing and why. Displaying a selection of the preferences of users present allow those people to start conversations about any of the artists mentioned. Not displaying which users influenced what choices allows users to choose whether they share that information.

6. Future Work

During the time Flytrap was running, users suggested new features they would have liked included in the system. In addition, we noticed opportunities for improvement ourselves based on an analysis of the system's behavior. The following future work reflects this.

6.1 Reflections on Flytrap's Preference Model

The preference model employed by Flytrap represents choices of individuals for themselves and uses those choices in contexts in which others are present. The implicit assumption is that the relationships among the participants in the experience crafted by Flytrap are irrelevant. This assumption is reasonable, given the music ultimately selected by the system is influenced by all of the participants equally. However, it could benefit the system to understand the context of its presentation more deeply (e.g., that there is a meeting in the room and people are waiting for it to begin, vs. lunchtime). Choices made in private are not always the same as those made in public (Hebdidge, 1979).

6.1.1 The Use of Space and Social Context of Inhabitants

DeNora suggests that "music is active in defining situations because, like all devices or technologies, it is often linked, through convention, to social scenarios, often according to the social uses for which it was initially produced ..."(DeNora, 2000). Environments are often used for activities other than their central purpose. The classroom that by day supports student learning in a traditional structured manner is also cleaned at night, by a completely different set of people.

Flytrap should be sensitive to the use of a space. One way to establish such context is to use properties of the music itself to determine the appropriateness of a recommendation. Muzak[23] engineers listening experiences based on the stimulus level of different pieces of music. The stimulus level is based on, among other factors, tempo and instrumentation. AllMusic[24] maintains a wealth of descriptive

[23] Available at http://www.muzak.com/
[24] Available at http://www.allmusic.com/

data about artists, including the style and mood of their music.

Additional tags including the tempo, instrumentation, and lyrical content could be used to functionally describe social contexts in which the music should be played. Music with no lyrics, a slow to moderate tempo and low volume might be appropriate play during a meeting in a conference room. That same room during lunchtime might be better served with an up-tempo number at a higher volume. In addition, Flytrap could integrate with calendar systems to become more aware of how certain spaces are planned to be used, and when.

Moreover, the social contexts in which groups of people are engaged can differ dramatically moment to moment. An informal hallway chat can turn instantly formal when the boss walks up. Users should be able to more directly influence the sets of their music played in certain places. Flytrap's representation of its users should be expanded by better understanding the relationships among them. This could be done, for example, by using the employee LDAP directory or social networks like Friendster[25].

6.2 Richer Music Representation

Flytrap's representation of music ends at a genre-level. It has no representation of a track (or individual song) other than what artist performed it, and therefore what genre it belongs to. More granular information about the music it is playing could dramatically improve the character of the play lists it constructs.

6.2.1 Music Content Analysis

Research into analysis of the content of musical waveforms will lead to a richer model of recommendation based on the sound of the song. DJs regularly "beat match" music in clubs to provide smooth transitions between songs of different speeds. Songs can be slowed down or sped up without altering the pitch of the music through algorithms (see Sethares et al, 2005) designed to pinpoint and adjust the rhythmic content of music. Untapped aspects of recommendation for Flytrap involve looking at appropriate times for playing fast or slow music, and assessing a personal music collection for trends in rhythmic structure to provide more on-point recommendations in the future.

Moreover, technologies that allow the programmatic detection of melody in a rich, complex waveform can be leveraged to derive an even richer content model.

6.2.2 Environmental Annotations

Some modern media players give users a view into their music collection that is based on the time of day in which they tend to play various tacks. This is a stepping stone into richer environmental contexts associated with a music collection. We

[25] Available at http://www.friendster.com/

mocked up a component of Flytrap that records the time of day, weather, and season for each piece of music played. Over time, user profiles can be built to describe patterns in their listening habits. These patterns can be taken into account when Flytrap makes recommendations in a group setting.

A simple example is a user who tends to listen to Christmas music around the holidays and no other time of year. While this music is in their collection, it should not be included in the set of possible recommendations in July. Another example is a user who tends to listen to Billie Holiday on dark rainy mornings. In a group setting where the weather is dark and rainy and vocal jazz is a centroid of recommendation in the current social context, it should be weighted higher. These kinds of patterns are indicative of some users' listening habits and could be used by Flytrap to make better recommendations.

6.3 Personal Annotations

Music is often internally catalogued by how it came into one's life. Nick Hornby's book *High Fidelity* involves a protagonist who organizes his music collection by the ex-girlfriend that introduced it to him. This organizational mnemonic reminded that character about the time when the music was fresh to him, and invoked subsequent recall of other life events at that time.

Music comes into peoples' lives for many reasons and from many sources. It may be from browsing the shelves at a music store, hearing an opening act at a concert, or hearing it emanate from a car window. Because we can only capture the behavior of a user in context of them using their personal media player—thus capturing the moment when music enters a personal store—it is feasible to outfit the Flytrap user agent with functionality that lets users add personal annotations to their music.

Radio stations often have a call-in request line that lets listeners select and dedicate songs. The radio station DJ empowers the listener by giving them an opportunity to establish and publicly broadcast an intimate personal connection to the music. The Flytrap user agent could be instrumented to let a user associate media with each artist or song. These media could then be uploaded to the central repository and associated with the artist or song and user in Flytrap's database. When the song is next selected for play by Flytrap in a public space, the associated media could be presented.

These additional representations add a more personal dimension to music played by Flytrap in a group setting. To other listeners, these personal associations signify that the music about to be played is especially representative of that individual in the manner the associated media portrays. The window into that user's private preferences is opened a little further, giving others additional context for making personal connections to that person. Aside from just being fun, this is an interesting means of attaching and recalling very personal musical artifacts in a way that can be used by Flytrap to promote social awareness of these connections.

6.4 User Vote Control

The Jukola system (O'Hara et al, 2004; O'Hara et al, this volume) offers patrons control of music at a local bar with a remote control that lets users override automatic selection. Flytrap is currently an autonomous system that leaves the final song choice up to the Virtual DJ for subsequent broadcasting. Users of our system expressed an interest in being able to influence the choices once they'd been made. We imagine a Flytrap ID badge outfitted with "thumbs up" and "thumbs down" buttons. As a new song is selected and played by Flytrap, users can express their like or dislike of the choice by pressing one of the respective buttons. The user's preference is transmitted to Flytrap and used in future voting decisions concerning that user.

The feedback mechanism is ambiguous in giving the user only two controls with which to express an opinion. By providing negative feedback, did the user mean they disliked the artist or was it just the particular song? Could it have been the genre of music? A set of rules that drive learning user feedback preferences over time fine tunes this process:

- If a user provides negative feedback for a song, a new recommendation is generated immediately and an association is made between that track and the user who expressed their dislike.
- If that user gives negative feedback again for a different song by the same artist, that artist will no longer be played when that user is present in the space.
- If a song by the same artist is played and the user is present but provides no feedback, the assumption is that they disliked the particular song. That song will never be played when the user is present.
- If a user provides positive feedback for a song, that song is weighted stronger in the future.
- If a user provides positive feedback for another song by the same artist, that artist is weighted stronger in general for that user.

This type of interaction lets users feel more in the loop about their influence on the music being played. Behind the scenes, a profile of the idiosyncrasies of a user's music preferences is built for future research into more context sensitive methods of recommendation. However, our intent is to have the system's selections delight its users initially, lessening the importance of this feedback mechanism.

7. Conclusion

Flytrap was built with the purpose of exploring how personal preferences could be gathered and manipulated to craft a group experience in a public setting. Flytrap is a work in progress, yet it provides an example of a new kind of system: one that deliberately manipulates boundaries to achieve social effects. Though the system has not been widely tested, our informal evaluation showed such environments can be built, and that they can achieve those ends. Along with more extensive deployment and evaluation, we envision our next steps leading us closer to a general model of leveraging personal preference in a group setting.

We see Flytrap as a mediator of music and associated social interactions in all environments and group contexts. Imagine the use of Flytrap spreading to waiting rooms and building lobbies. Opportunities for exploiting common ground through music are possible in each of these spaces. Willis promotes the notion that music's powers are best seen in action (Willis, 1978). Flytrap manages music intelligently in a space populated by people with disparate tastes. Discovering music that exploits commonalities amongst the occupants of a space establishes a basis for social interaction. Interactions occur at the ground level of social action, exposing personal preferences in a manner conducive to sharing.

DeNora (2000) suggests in *Music in Everyday Life* that "music can be used … as a resource for making sense of situations, as something of which people may become aware when they are trying to determine or tune an ongoing situation." By providing music that brings together the personal preferences of everyone in a space, rare common ground can be highlighted to produce an active, social environment.

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References

Burke, R., Hammond, K. & Cooper, E., 1996, Knowledge-based navigation of complex information spaces. In *Proceedings of the 13th National Conference on Artificial Intelligence*, pages 462-468, AAAI.

Burke, Robin, 1999, The Wasabi Personal Shopper: a case-based recommender system. In *Proceedings of the sixteenth national conference on Artificial Intelligence and the eleventh Innovative Applications of Artificial Intelligence conference*, pages 844-849, AAAI.

Crossen, A., Budzik, J., and Hammond, K. J., 2004, Between Now and the Semantic Web. In *Proceedings of the ICAPS 2004 Workshop on Automated Planning and Scheduling.*

Crossen, A., Budzik, J., and Hammond, K. J., 2002, Flytrap: Intelligent Group Music Recommendation. In *Proceedings of Intelligent User Interfaces 2002.* ACM Press.

DeNora, T., 2000, *Music in Everyday Life*. Cambridge: Cambridge University Press.

Fu, X., Budzik, J., and Hammond, K. J., 2000, Mining Navigation History for Recommendation. In *Proceedings of Intelligent User Interfaces 2000*. ACM Press.

Goffman, Erving, 1961, *Encounters. Two studies in the sociology of interaction*. Bobbs-Merrill: Indianapolis.

Goffman, Erving, 1959, *The Presentation of Self in Everyday Life*. Doubleday: Garden City, New York.

Hebdige, Dick, 1979, *Subculture: The Meaning of Style*. Methuen: New York.

Lanza, Joseph, 2004, *Elevator Music*. University of Michigan Press.

McCarthy, J. F., and. Anagnost. T. D., 1998, MUSICFX: An Arbiter of Group Preferences for Computer Supported Collaborative Workouts. In *Proceedings of the ACM 1998 Conference on Computer Supported Cooperative Work* (CSCW '98), Seattle, pp. 363-372.

O'Hara, K., Lipson, M., Jansen, M., Unger, A., Jeffries, H., and Macer, P., 2004, Jukola: democratic music choice in a public space. In *Proceedings of the 2004 conference on Designing Interactive Systems* (DIS 2004), ACM Press.

Quillian, M., 1968, Semantic Memory. In *Semantic Information Processing*, M. Minsky (ed.), MIT Press,

Resnick, P., Iacovou, N., Suchak, M., Bergstrom, P., Riedl, J., 1994, GroupLens: An Open Architecture for Collaborative Filtering of Netnews, In *Proceedings of ACM Conference on Computer Supported Cooperative Work*.

Sethares, W. A., Morris, R. D., and Sethares, J. C., 2005, Beat tracking of audio signals using low level audio features, IEEE Trans. On Speech and Audio Processing. Vol. 13, No. 2, March 2005.

TIRIS. Texas Instruments Radio Frequency Identification (RFID). See http://www.ti.com/tiris/ (Accessed October, 2004).

Want, R., Hopper, A., Falcao, V., and Gibbons, J., 1992, The Active Badge Location System. In *ACM Transactions on Information Systems*, 10(1): 91-102, January 1992.

Willis, Paul E, 1978, *Profane Culture*. London: Routledge.

PART 4

MOBILE MUSIC

Chapter 7

INVESTIGATING THE CULTURE OF MOBILE LISTENING: FROM WALKMAN TO IPOD

Michael Bull

1. Introduction

"I am a huge music fan. When I was a girl, I dreamed of having my own Wurlitzer jukebox to play my music, so I could have all my favourite songs available at a moment's notice. I own over 1000 CDs, and would never be able to listen to that volume of music if it weren't for the iPod. While it took weeks to rip every CD I have to my iMac, the time was well spent. The ability to take a large chunk of my music collection with me wherever I go is amazing. I now listen to music any time I can: walking to and from work, at work, on vacation, on a train or aeroplane, even at home when I don't want to disturb my partner. I have any song I want to listen to at my fingertips at any particular moment. That amazes me. It truly is my own personal jukebox, and puts the soundtrack to my life in my pocket and at my fingertips." (Anna)

"It has dramatically changed the way I listen to music. I use my iPod every day, generally for 4-6 hours a day. I listen to it at work, at home, in my car, on the subway, etc. While I frequently carried a personal CD player before, the iPod has become a necessity. When I leave the house, I now check my pockets for four things: My wallet, my keys, my mobile phone, and my iPod. I never go out without all four on my person." (Mark)

"I can't overestimate the importance of having all my music available all the time. It gives me an unprecedented level of emotional control over my life." (Terry)

The ability to carry your auditory identity in the palm of your hand as you move from one place to another is a relatively recent event in the history of mobile sound technologies. For many users the Apple iPod is the most recent of 'magical'

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technologies that celebrate miniaturisation and mobility coupled to the power of capacity. The present analysis based upon original research, focuses upon one specific MP3 device, the Apple iPod, which presently dominates the MP3 market.[26] However, the development of MP3 technology should not be understood in isolation from other mobile technologies, as Mark comments above, he never leaves home without his mobile phone either, in many respects, the use of the mobile phone mirrors that of the Apple iPod - all of the users contacts in the palm of their hand.[27]

It is also important to contextualise current iPod usage with previous generations of mobile music reception. Mobile sound technologies and their use do not exist in a cultural vacuum - prior to the Apple iPod came the personal stereo. Prior to that, the transistor radio and the portable record player and of course there exists a history of mobile listening in automobiles through radios and then cassette players (Bull 2004). Mobile listening habits and desires also should not be separated from forms of domestic listening in the home that often provide the cultural pre-disposition to the desire for continual listening to either music or the voice whilst on the move (Bull 2000).

The history of mobile listening is also the history of a ratcheting up of consumer desire and expectation - consumers habitually expect these technologies to do more and more for them. In the process these technologies have transformed the way in which many users listen to, process and classify their music during their day. As mobile technologies developed so consumers were able to choose from an increased array of players - from the simple tape machines of the early personal stereos; the portable CD player to more recently the mini-disc player. These new formats incrementally increased the users flexibility and choice over their music choice. Freedom of choice, for the contemporary music listener, appears to be qualitatively changed with the development of MP3 technology and the development of products such as the Apple iPod whereby users can not only store thousands of tracks but also continually select how they listen to music. Users are able to construct an array of

[26] The following empirical material derives from an ongoing qualitative research project on the use of iPods internationally. The 1004 respondents are mainly from the UK, USA, Switzerland and Denmark. The research was conducted by Internet questionnaire consisting of thirty-five questions concerning use. Selected individuals were then subsequently asked to elaborate on the answers. In addition to this a smaller pilot study of UK users was undertaken using face to face interviewing. The Internet responses were gained from author requests placed on BBC Online News, The Guardian Online, Wired News and MacWorld. The Apple iPod was chosen for the object of research given its dominant role in MP3 use with around 70% of the market.

[27] Whilst the mobile phone and the Apple iPod are joined in their mobile communicative functions, they are of course vastly different technologies. Many iPod users stated that they actually disliked using mobile phones regularly. One reason for this is the continuous nature of iPod use through which the user constructs an auditory cocoon around them which in itself is often experienced as empowering as contrasted to the discontinuous nature of mobile phone use whereby the user is always potentially at the beck and call of others.

playlists permitting them to stream their music in any desired configuration or alternatively they give themselves up to the random 'shuffle' of the machine itself.

Whilst forms of mobile listening have often been seen as a solitary exercise it is important to recognise that forms of solitary use are deeply social. The way in which users occupy social space is relational. They look, they listen, and they think and interact through their privatised and technologically mediated soundworlds. Relational experience has three dimensions; the cognitive - how the user manages their moods and thoughts to music; the aesthetic - how they construct their relationship to the outside world, and the moral - how users relate to other people. We notice the moral dimension when we feel affronted by a personal stereo or iPod user who fails to take out their earplugs at a supermarket check out counter for example or by the inconsiderate use of a mobile phone in public space. New mobile technologies continually confront and inform us with how we construct our sense of the social through them and consequently how we negotiate shared space socially.

Whilst Apple iPod use mirrors the privatising tendencies of the personal stereo, it also encompasses a host of new ways to consume music that might be thought of as both more 'mobile' and as offering greater possibilities for collective music reception. For example, Apple iPods can integrate the user into new forms of social behaviour through its use via automobile radios, by plugging it into home stereo units to be played as a domestic jukebox or by plugging it into the users computer at work. More recently iPod clubs have sprung up in New York, London and Melbourne whereby iPod users provide the music for the evenings entertainment.

2. The Culture of Personal Stereo Use

Explanations concerning possible meanings attached the use of devices such as personal stereos often use variants of urban theory as reference points. From this perspective urban dwellers might be thought of as responding to an overload of sensual stimulation and physical proximity resulting in strategies of 'retreat' (Simmel 1997). Alternatively urban streets might be considered as semiotically bereft of interest (Sennett 1990, 1994, Auge 1995). Another and related concept is of the alienating city, the city full of strangers and potential danger as reflected in the work of Bauman and others (Bauman 1991 and 1993). These images of urban life are primarily negative and appear to explain the desire of many to transcend their everyday urban experience through the creation of a privatised auditory bubble in which they can control or neutralise these negative experiences of the city. In contrast to this largely negative image of urban experience some theorists take a more positive view of the city invariably taking the work of Walter Benjamin as their starting point. From this perspective personal stereo users are thought of as latter day flaneurs in which the city becomes an aesthetic site. In a similar vein situationalists like Debord developed the notion of the aestheticisation of experience in which the city becomes punctuated with the 'spectacular'. In parallel to this the work of de-Certeau provided a focal point for post-modern images of the urban subject revelling in the freedom of the city streets in a fragmented and de-territoralised manner. All of these perspectives on urban life were primarily informed by a visual epistemology of experience rather than an auditory one. This is significant as visualist approaches to behaviour tend to be 'externalist' whereas a sound based analysis tries to grasp the subject's 'interiority' resulting in a differing explanation of the relational qualities attached to the activities attached to personal stereo use (Bull 2000).

An auditory based explanation of mobile listening focuses upon forms of self-prioritisation that enable users to interact or not interact with others and the spaces passed through at will. A central metaphor for use is one of 'control' or the management of experience through a creative dependency on the technology of the personal stereo and the music contained within it. Personal stereo users often created forms of accompanied solitude constructed through a manufactured industrialised auditory. In doing so users transform or control their mood, thoughts and forms of interaction with others and their environment, be it the street, the tube or the shop. The strategies of control are summarised below:

- One urban strategy aims block out any external sound - to control one's aural environment very much in line with Simmel understands of the urban. From this perspective personal stereo users were responding to the chaos and uncontrollable nature of much urban life. By creating their own auditory bubble they could gain their own sense of space. Users were better able to cope with the close proximity of unknown others. By listening to their chosen sounds they thus created a sense of their own space and a sense of order for themselves as they moved through the street or as they sat in a crowded tube or bus. In this sense personal stereo use acted as a form of boundary demarcator enabling users to operationalise a range of strategies to negotiate crowded urban space.
- In contrast to this many personal stereo users listened to music in isolated streets bereft of people or noise. For many users the desire and ability to move through space and time accompanied by their very own 'soundtrack' was of paramount importance. In doing so they felt connected to culture with musical accompaniment becoming habitual to their daily life on the move. Personalised and privatised music gave users a feeling of 'specialness' whilst on the move.
- Alternatively, and in line with writers such as Debord, users were able to 'aestheticise' their urban experience through personal stereo use, often describing the city in filmic terms. Their journey would become an audio-visual spectacle in which they perceived themselves to be the creator of the script. These forms of aestheticisation were not in the image of Benjamin's flaneurs though - an image in which the subject imagined themselves as the 'other' but rather a remaking of the urban to fit in with the users thoughts and desires - a mimetic aesthetic impulse.
- Given the mundane nature of much everyday movement through urban space it is hardly surprising that many personal stereo users reported not noticing the spaces of the city they habitually moved through. Cities were for them not particularly visual, in the sense that they did not habitually or actively look at the environment passes through. Rather they preferred to be immersed in their own auditory world - often using the music as an auratic mnemonic in which the music listened to conjured up feelings and sensations from their own narrative.

In effect personal stereo users were placing themselves elsewhere, transforming their mundane daily experience into one of personal significance and meaning.

- Equally, some users felt a sense of isolation whilst on their own and used the personal stereo to allay these feelings. Users tended never to feel alone whilst listening to their own chosen music - rather as many consumers switch on the radio or television as soon as they arrive at home in order to create the feelings of a home inhabited.
- Users often reported using music to control their own ‘internal chaos’. Music was used as a means of ordering their own thoughts and feelings. Users claimed that they were often unable to control unwanted thoughts and feelings whilst alone. Personalised music permitted the user to channel their thoughts and desires successfully. Users would describe ‘clearing a space’ for themselves through the use of the personal stereo by creating a ‘cognitive space’ for themselves in which they could successfully inhabit. Personal stereo use thus minimised the contingency of the users moods, thoughts and emotions.
- Personal stereos were also used to control interaction with others. The headphones dangling from the ears represented a ‘do not disturb’ sign making it harder for others to initiate contact with the user. Indeed, it is unusual for personal stereo users to initiate interpersonal contact whilst listening to music. The use of a personal stereo in public also permitted users to engage in forms of interpersonal strategies that I have called ‘non-reciprocal’ gazing. Users might be stared at by others but do not have to return the gaze - listening in this sense signifies ‘otherwise engaged’. Women users, especially, reported feeling much more secure in urban environments (in the day at least) precisely by not having to return the unwanted gaze of others. Users could also control interaction when it did take place by keeping one earplug in, so that they could continue listening to music whilst interacting. In effect users often pretended to listen to the ‘other’.
- Use was also reported as a method of regaining control over the users time. Commuting time, for example, was often described as becoming a time of relative pleasure as the user listened to their chosen soundtrack to the day. Meaningless time thus became transformed into the users own time.
- Music also has an energising function for many users as they walk or cycle through the city or as they use their privatised sounds to jog or work out in the gym. The body works in rhythm to the music and by extension to the outside world.

The ‘typology’ above represents the spectrum of strategies that any personal stereo user might engage in. On any journey users might switch from one mode to another. Unifying these diverse practices was the desire to listen to their own chosen music when and where they wanted - preferably on their own terms. Users described being transported into their own auditory world, transcending the often-mundane reality in which they were placed. The transcendent quality of music was invariably successful for users as they moved through urban culture.

Users invariably were very happy with this relatively simple piece of technology that enabled them so successfully transform their daily experience. Yet as mobile technology developed so users were able to choose from an increased format of players - from the simple tape machines of the early personal stereos to the portable CD player to the minidisc player. These new formats enabled users to take more music with them whilst on the move. With the arrival of MP3 technology we see a qualitative transformation in the capacity of users to transport and listen to their chosen sountrack to daily life. The relational qualities and strategies attached to personal stereo use are mirrored in many of the uses of devices such as the Apple iPod.

3. From the Personal Stereo to the Apple iPod

The swift transformation of mobile listening over the last four years has been dramatic. On a recent visit to Dixons, a large high street electrical distributor, I found a large basket on the floor containing the stores remaining CD Walkmans, all on sale at a cut down price of £9.99. Today's consumers want the listening possibilities and choices that MP3 technology gives them.

Whilst personal stereo players permitted users to choose their own soundworld, they did so in a very restricted way. An important element of listening for users was the ability to synchronise music to their mood or surroundings. Users often found themselves in situations where the music didn't 'work' for them - leading to the music reluctantly being switched off, for many users 'incorrect' music was invariably worse than no music at all. Traditional mobile music technologies were often unable to manage the complexities and vicissitudes of the subject's moods or environment. So whilst personal stereo use enabled users to reclaim the rhythm of their day whilst they moved from one place to the next, it also posed problems of music selection and transportation.

MP3 technology has also produced a radical and swift change in consumers' expectations concerning what they can do with mobile sound technologies. The nature of mobile soundscapes has been subject to rapid change with users now able to modulate their experience to music - to fine tune the relationship between mood, volition, music and the environment in ways that previous generations of mobile sound technologies was unable to do. John, a twenty six-year-old graphic designer from Manchester takes us through a mini history of the functionality of mobile music devices:

> *"Before the iPod came a Sony MD Walkman, before that a Rio 600 MP3 player, and before that was a long string of portable CD and cassette players. I think when I was very young I owned a portable radio…Memory size was the deciding factor. I had previously been using a Sony MiniDisc Walkman for a little over a year. I liked that I could keep 5 hours of music on a disc (much better than the 2.5 hours I could fit on my Rio MP3 player), but I got sick of switching discs every so often. Plus, it was cumbersome to switch between tracks. The MD player had a terrible interface for entering song title information (no ID3 tag compatibility), so I gave up on doing it myself after about 2 discs. I gave up on the MiniDisc and bought an iPod. I no longer had to change discs every time I wanted to hear a particular song or album, and*

> *I could carry around 80 hours of music in something roughly the size of my MD walkman, without having to carry any discs. It was a revelation." (John)*

Johns description of the technological developments that have produced the Apple iPod represent a combination of technological functionalism - 'what the technologies enable him to do' - married to a sense of wonder at the listening possibilities that the iPod. Users invariably point to the 'freedom' of being unencumbered that the Apple iPod provides them with. The artefact no larger than a mobile phone - yet containing the whole of a user's musical history:

> *"Prior to my iPod, I used to carry around 5-6 mini-discs (or 2-3 CDs before that) so I had to 'plan' what I might want to listen to in advance. If I didn't have time, or couldn't be bothered to change the spare MDs or CDs before going out, my choices were then limited, often to the most recent acquisitions which would then get over-played. Since having my iPod, I have some 280 albums at my fingertips, and often find myself listening to something I haven't heard in a long time." (Roger)*

Users continually refer to the wide range of choice that the new technology provides them with and appear to be increasingly attentive to the relationship between their mood and the music listened to. Technologies like the Apple iPod permit them to synchronise their music to volition, purpose and mood - to fine tune the body to the rhythm of their chosen music. As such, the solitary uses of the iPod are inherently social in that they permit a transformation and control of the user's everyday experience. The Apple iPod does this more successfully than more traditional mobile devices as the user synchronises the world to their own private soundworld - the world walks in step to the iPod user.

4. Planning not to Plan: Playlists and Life on the "Shuffle"

The technological limitations of technologies such as the personal stereo meant that users had to invariably plan their listening modes - the effectiveness of personal stereo use to successfully deliver what the user wanted was normally based on the choice of appropriate music by the user. Hence, successful personal stereo use was often based on planning - assessing what they would most likely want to listen to for the coming day. For some users this was not a problem as they might listen to the same music for long periods of time, changing their tape infrequently. Others confronted with the breadth of their music collection, and unable to plan or find the suitable tapes or CDs would merely pick some tapes in hope rather than knowledge. The common denominator of use was that music listened to had to suit the moods of the user throughout their periods of use. Personal stereos tended to be used as in between technologies taking the user from their front door to their destination seamlessly.

Apple iPod use permits a re-assessment of the role of mobile sound technologies in the management of users' time and casts fresh light on the cultural ambivalence associated with the liberation from schedules and planning at the heart of the rhetoric of many users - indeed not to plan involves much planning for many iPod users!

> *"Before when I had a Discman I had to plan ahead and think of the several CD's I'd want to listen to on a given day. Now there's none of that…Whether I plan or not depends on my mood - if I'm irritable, bored and fed up then I might choose an album rather than shuffle through all my library - since I only want to hear stuff I want to hear. Otherwise I might choose my 25 most played, or recently played playlists - these can get a bit samey though - so after a while I have to renew them by going through a burst of listening to new stuff." (Emily)*

> *"The iPod also makes me think about ordering songs - although I've always been a mix-tape maker, but because it's so EASY on the iPod, it's much easier to get a mix right. I also use smart playlists to make sure I listen to songs I haven't listened to before - I share music with a friend, and when he gives me some tracks, I have a New Stuff playlist set up to make sure that I can find them easily." (Virginia)*

The Apple iPods permit users to create endless permutations of the contents of their machines. Whilst listening might be solitary users often share music files with other users. Playlists can be endlessly changed and songs evaluated, scored and listed. Typically users will have a selection of playlists that suit a variety of moods, times of day, weather conditions, times of the year or musical genre. iPod users are invariably planners, spending hours creating playlists for themselves. The ability to continually adjust music with such sophistication and precision is relatively new, if indeed the desire to do is not:

> *"I listen to about 100 songs a day at work, and they come from three playlists - one I call "Dusty Tunes" which is anything on my iPod that is not soundtrack or holiday music that I have not listened to in a month. This is how I start the day and will play through until it's empty. Then I switch to general rotation, which is the same pool, but with no last listened to time constraint. When I listen to dusty tunes, if something comes on that bugs me (a dull track on an album I have for another track or tracks), I will look at the rating I've given it, and if it's a three I'll move it to a two (ones are awful). If it's already a two, I'll just advance through it, but I don't do either much. When I listen to general rotation, I am much more prone to advancing through 1-4 tracks until something comes on that suits the moment. Driving to and from work, I listen randomly to my 4 and 5 rated songs, and will also advance through them until I find one I am really pleased to hear." (Ran)*

Freedom from planning for many comes with much planning! Consumers appear to engage in a form of 'mediated spontaneity' in which they micro-manage their experience precisely through the use of the iPod.

Alternatively, many users switch to the 'shuffle' mode of the iPod at various times. The 'shuffle' function plays any music contained in the users iPod at random. In doing so, users give themselves over to their music collection and the technology of the iPod. Heather a 33 year old projects manager in New Jersey typifies this customisation of travelling sounds:

> *"It's everything I would want to listen to - I'm a girl - I change my mind all the time and my iPod can keep up with that. I normally listen on shuffle, there are times where*

I will put on one song, and then half way through it I will change my mind and switch it to another song because my mood changed or the song wasn't capturing my mood correctly." (Heather)

Most users use a combination of playlists and the shuffle mode on their iPods. The use of the random mode permits a rediscovery of much of their music collection. Many iPod users have simply download their whole CD collection onto their computer which may well contain thousands of songs they haven't listened to for some years. The 'shuffle' mode permits them to rediscover much music that previous habitual modes of listening had often discounted. They can then choose whether to delete certain songs that they no longer like or to re-invest time listening to them afresh:

"I can make playlists for any kind of mood, or just let it play randomly, so that I can rediscover music in my collection that I haven't listened to in a while...I love to just turn the settings to random and then let it jump around my music collection. In this way, I can rediscover old favourites, and I get some wonderful juxtapositions that I would have never made on my own." (Janice)

"I tend to listen to the iPod on random a great deal of the time. This is particularly apt when I'm in no such mood to choose a specific album or artist. With a large music collection, it is very easy to forget some of the gems that are in there, and random tends to bring some of those out again. This often means I'll listen to a song, then it'll inspire me to go and listen to a specific artist, or genre…Today, I just had it in my four and five star playlist on random." (Thomas)

Listening to music on the 'shuffle' mode also permits a juxtapositioning of music to place that users would not have normally considered, thus making the listening exercise one of discovery and surprise. Whilst this appears to contradict the claim made earlier concerning the functional fit between user, place and mood, some users nevertheless claim that the music is either 'suitable' or that the unexpected juxtapositioning of disparate music to their environment in itself is stimulating. There is always a get out clause that the user can simply operationalise by merely fast-forwarding the music until something suits.

"I like to put my music on random….I don't like a set playlist in order. There's something about the spontaneity of a random song coming on that I really enjoy… I don't like it all planned and I like to be surprised as to what song will come on next. Sometimes it gets weird with the song selection, almost like the damn thing was reading your mood and playing a succession of songs that perpetuate a mood. It makes me wonder if the random function on the machine is just an unbiased algorithm or if my iPod is somehow cosmically connected to me." (Jason)

The iPod as the embodiment of the users musical identity, sometimes and unsurprisingly takes on the aspect of an intimate friend who knows just what the user would want to listen to at any particular time.

The continual re-adjustment of music collection and organisation to mood and circumstance is embodied in the design of the iPod and used by many users:

"A lot of times I choose a group of random songs in the elevator on the way downstairs (just whatever comes to mind), then, when I get to the subway, while I'm waiting for it I queue up a more extensive, personalized On-the-Go playlist. Basically the first time it's just to have something on, and then I make a real playlist for the 30- or so minute subway ride in which I have nothing else to do but listen (so it has to be something I like!)" (Daniel)

"I also love the on-the-go-playlist and make playlists when travelling. I no longer consider a tape/CD track list as a static object and rarely play track in the order in which they are listed by an artist." (Julian)

iPod use thus permits the user unparalleled control over the shape of their music collection and the mode of listening with their music collection becoming a more fluid entity subject to the users micro management of it to suit their mood or desire of any particular moment.

5. Automobile Sounds of the iPod

Apple iPods, unlike personal stereos, can be plugged into automobile radios and used as a source of music. The automobile has been a favoured site of music reception for many drivers since the installation of radios in automobiles in the nineteen forties. Since then automobiles have become increasingly sophisticated listen spaces with the introduction of cassette decks, CD players and now the Apple iPod. Many journeys are solitary ones yet even a solitary journey can produce a powerful sense of connection for many drivers as they listen to their favoured music through their iPods. Gerard is a thirty seven-year-old Swiss systems analyst living and working in America. His use strongly brings out the personal and nostalgic elements attached to music consumption.

"My drive to work is about 60 minutes. The first time I use my iPod on a weekday is when I drive to work. I have an 'iPod cradle' permanently installed in my car, so I 'pop' in the iPod, turn on the car stereo and 'blast off'…Sometimes I am in a certain mood (home sick to Switzerland, melancholy - thinking about my childhood or certain events in my life etc.) in which case I choose a specific playlist that has all the songs that relate to this specific situation. But in general, I have the device on 'Shuffle' in my 'Never been played' playlist…Driving in the countryside of Indiana does not quite take as much concentration as driving through the rush hour traffic in London. I usually set my car on 'cruise control' and just keep an eye on the traffic in front of me. The songs transform me to all kind of places in my life….And that is what I love about the 'shuffle' feature. Whenever a 'childhood' song comes on, I 'feel' like I am back in my parent's house. Then a track from an Australian band might bring me back to the 2 years I have spent in Sydney. I sometimes don't even remember that I have passed certain 'points' on my drive from or to work. This thing is a wonderful 'time machine' and is better than any diary." (Gerard)

Interestingly for Gerard, in these situations he is not really alone in his automobile but rather transported to where his music takes him. Whilst the nostalgic element of music is well documented, the use of the iPod differs from previous use precisely through the control and attendant access to his musical narrative that the iPod affords him. Gerard is able to control his memory through the use of playlists or to have memories evoked unexpectedly as the 'shuffle' device throws up songs from his musical past. The iPod more than any other technology permits the driver full auditory control over their thoughts and memories:

> *"Prior to the iPod, listening to music in my car or at home involved either being trapped listening to what the radio station wanted me to hear, or changing out the tape or CD every ~45 minutes. The latter not only takes time, but also involves deciding exactly what I want to listen to next. That's annoying at home, and potentially dangerous in a car." (Jane)*

> *"I used to hate the radio and was even looking into getting XM radio in the car so I would be able to hear MUSIC opposed to hearing POPULAR CRAP…now I have my own little personal radio station that knows what I like and don't, and can also tell me my hairdressers phone number and let me know if I have plans this coming Friday…. My iPod IS my music in the car." (Stephanie)*

American users, whose dominant use is in the automobile (apart from the centres of cities such as New York, Chicago and Los Angeles) often see iPod use as a form of control against the commodification of music on commercial radio stations with their attendant habit of cutting off the beginning or ending of most songs. Some users will construct what amounts to their own radio channel for their journey with a mixture of songs and recorded radio programmes listened to it their own time, thus enabling them to free themselves from daily radio schedules.

> *"I love the iPod in the car, since it frees me from the bland corporate tripe that is American radio. I am no longer annoyed by ads and bad songs - now it's just me and my private radio station. My wife really enjoys the iPod in the car, as it has music we love on it, music for our kids, making it a very flexible companion." (Michael)*

> *"I listen to more music in the car now. I very rarely used to listen to music while driving, as it used to give me headaches. I listen to Radio4 a lot less now. It also means I have a huge range of music available in the car, and not just the 6 CDs or tapes in there… there is always something for the wife, the kids, as well as me!" (Jack)*

> *"I use to have 6 CD's in my car and that was it. Now I can listen to soundtracks one day and 80's music the next. My music can reflect my mood! The kids can choose between read-along stories and their favourite music too." (Fiona)*

Both Jack and Fiona in the quotes above point to the collective use of the iPod in the automobile through the creation of family playlists suited either to all of the family or particularly to the children in the family. Whilst this can produce problems of choice depending on the musical taste of members of the family, many users pointed to the possibility of creating playlists that all the family might find acceptable - in this way musical choice produces a further sense of shared experience for the occupants of the automobile. However the following example also points to the possible use of multiple iPod listening in the same automobile:

> *"The choice of music in the car was usually the radio or the kids CDs. Now I can listen to my music when driving using the pod when alone. I have used the pod with the car full of the family but not for too long as they want their music. Now that some of them have their own pods well that is great, as we all three can listen to our own choices. Two of the girls try to synchronise their pods to play the same song at the same time so they can sing along together!" (Jim)*

Jim, a father of three in the UK points to the potential multiple use of the iPod. It is becoming increasingly common for all members of the family to possess an iPod. In this example, Jim points to the problematic nature of joint listening in the automobile due to differing musical tastes. The result is that he plays his iPod through the car radio whilst his children listen to theirs independently or playfully in 'harmony' resulting in multiple sound-worlds in the same space.[28]

6. Apple iPods at Work

Many iPod users have taken to listening to music at work. The ability to engage in music listening at work is partially a reflection on the type of work of the iPod user but is also related to the new capacities of the iPod itself.

John is thirty-five years old and works in web development for a major international bank in New York; he lives in Manhatten with his wife and daughter. John has a long history of listening to music but describes the iPod as having permitted him to rediscover much of his music. He has downloaded all of his CDs onto his computer and then on to his iPod. John, like many users, travels to and from work listening to his iPod whilst also using it in his office at the bank.

> *"I now listen to music while I work…at work. I suppose this would be possible with a tape or CD player. But there are a lot of hours in the day, so the hassle of changing media and carrying it around in the first place means that this just isn't practical. With the iPod, it is…When I arrive at my desk inside my building. The iPod goes immediately onto my desk. Although I don't listen to it right away at work, I know I will at some point during the day (when I need its magical protection against interruptions.)" (John)*

So whilst John had been able to use music at work previously, it had never come in a suitable form to make it attractive to him - what he desires is ease of use, seamless listening and his own music on tap. The iPod on the desk also signifies a 'do not disturb' message to other workers. This is similar to iPod use in the street where the earpieces signify much the same to others. The iPod works as a kind of territorial preserve; as a form of boundary marker for others. The earphones also signify the users status in the organisation - he can listen when he wants; this is not

[28] I give a fuller account of the use of music in automobiles and especially singing in the car in Bull 2004.

tied to any notion of leisure but rather to efficiency:

> *"By listening to music at work, I'm now using music (or rather the fact and act of listening to it) to a) block out distractions, b) send out a signal to co-workers that I am actually busy and so their interruption had better be work related, rather than just casual chat and c) prevent myself from distracting myself (sic) - I find my attention easily wanders to surfing the web or doing 'other stuff' unless I have music on. It's as though listening to music focuses me in on the task at hand." (John)*

Music use, in this example, represents a 'rationalisation' of work practice, John can only be disturbed if it is a query about work, thus music reception enables him to function better in terms of his perceived tasks by helping him to focus upon his work rather than have his mind wandering off as he puts it. So, rather than music being a distraction at work, it becomes a more efficient enabler in this example. iPod users normally have to stream appropriate work music; either music that matches the type of task they are engaged in. Music that fits the bill differs from one user to the next. What unites most users is their desire for the mediated sound of music to accompany them through their working day - iPod technology appears to have produced the correct seamless environment working to music, unlike CD players that need continual attention or the radio over which the user has no control of content.

Work tasks often vie with the users fleeting moods, personal thoughts, tiredness or lack of concentration; iPod use appears to permit the user to manage these changing cognitive states. John listens to his music through headphones at work rather than plugging in his iPod to his computer thus producing his own aural cocoon within his office, a space inhabited only by him. The office itself acts as a boundary marker. Yet his use of the iPod in his office demonstrates his authority to transform his workspace into a privatised space of audition. The tell tale white headphones signify to others 'do-not disturb' unless absolutely essential. Office space is transformed into a hermetically sealed space for his own work and thoughts. He works whilst listening to a variety of rock music, classical, opera, choral and 60s motown chosen at random by his iPod.

Within this private bubble John pragmatically recognises the necessity for interaction at work so does not get too carried away in his auditory bubble:

> *"I'm realistic about what it means to actually live in the real world, especially at work. What I mean is: I understand that there are going to be interruptions and so there's no point in getting visibly upset. If an interruption has been particularly pointless then I'm as likely to be frustrated by it if I was listening to my iPod as if I was just sitting at my desk with no music on…When interrupted: I always switch it off (using the remote) and take an earphone out. I just think it's rude not to; in these circumstances, you've got about 10 seconds interaction with the person. You can't leave them wondering for the first 8 seconds whether or not you're listening to them. It's a question of respect really."(John)*

iPod use requires a re-assessing of workplace sociability and courtesy so as not to alienate other members of staff. The obligation to interact with work colleagues is far stronger than the fragmenting rules of recognition that exist in the street or in the supermarket check out. Not all staff in John's workplace has the authority to use technologies such as the iPod, a further indication of John's status, and to the nature of his work within the company, unlike the working conditions of Bill who works as a technician in an American university. Bill shares office space with others but works primarily on his own tasks:

> *"By and large, it allows me to concentrate more, to remain completely inside of my thoughts as I work. I wouldn't classify it so much as "getting rid of unwanted sounds" as the work environment is relatively quiet." (Bill)*

Bill's work environment is composed of workers listening to music on their iPods:

> *"The team of people that I work with has seven members. Six have iPods and the seventh wants one. They all use the iPod at work…I only interact with others at work to discuss design issues, and obviously those meetings aren't something I bring my iPod to." (Bill)*

Office space thus becomes a series of multiple individualised soundscapes whereby workers concentrate on their work through their chosen soundtrack. Office space might also be a contested aural landscape. Amy, a 32-year-old development manager from Philadelphia, who shares office space with others, regulates her listening according to her mood and to the tasks lying ahead:

> *"If I'm off to work I tend to listen to something upbeat but not too overpowering, such as someone within my singer/songwriter category. Once I get to work, I usually choose something I've heard a million times so I don't mind if I'm interrupted. If I have a particularly difficult task ahead of me, I tend to choose something with a driving beat, like Soundgarden, the Matrix Soundtrack, or Rob Zombie. If I'm the last one to leave, I put on something I can sing along with, take off the headphones, and attach the iPod to my speakers." (Amy)*

Work is modulated through her choice of music. Working in a busy office brings certain restrictions for Amy, as evidenced by her singing along to her music whilst listening through speakers rather than headphones when nobody else is in the office. Equally, the contingent nature of interaction in the office is understood, as is the nature of her tasks that determine whether she listens to music or not:

> *"When I arrive at work, I take it off for a bit until I've spoken to my staff about the day ahead, or worked out any personnel issues…[at work] I listen to it as much as I can without letting it interfere with the course of my work. On rare days I prefer silence, or don't want the feel of headphones/earbuds, so on those days I leave it off. Also, if my day is filled with meetings and/or phone calls, I'll leave it off, as it doesn't make much sense to me to keep turning it off and on." (Amy)*

Continual interruption makes iPod use dysfunctional with users preferring not to listen at all. Dysfunctional because users prefer to settle into a mood through uninterrupted listening. This limits the use of privatising technologies like the iPod to certain types of task and particular workspaces. In general though Amy experiences the office as a free and continuous space of listening:

> *"One of my favourite moments was when I was listening to a really great song that put me in a perfect mood, and I wanted to get some more water to drink. I started taking off my headphones when it hit me: I can take the iPod to the water cooler and not miss a note! It was such a great revelation." (Amy)*

The space of the workplace is thus transformed through the users ability to re-invent it as a privatised space over which she appears, rather illusionary, to have total control. There is however, very little evidence of iPod users constructing aesthetic narratives of the workplace, as they might do in the street - where many users describe the street in filmic terms. This may well be a function of their knowledge of the people around them whom they interact with on a daily basis - they are not the anonymous people inhabiting the street. Or indeed may well be a function of the rational purpose of music listening at work - to enhance the working environment.

After work, Amy maintains her mood through her use of the iPod. The rhythm of her day matches the music that she listens to and her step as she moves through her day:

> *"If I'm walking home, I'll put on something to either de-stress me, or something to cheer me up if it was a rough day. If I'm in the mood to take a walk around the city, I put on faster music to get my blood moving. When I'm wearing it and walking down the street, I find that I match the pace and cadence of my steps to match the music. I also find myself setting distance markers and timing my arrival to the marker to the music; for example, I'll say to myself "I'll reach that corner by the end of this song." (Amy)*

iPod use not only regulates the day for users; it creates an alternative linear sense of progression to the day. From the enervating music in the morning to the wind down music after work, daily experience becomes increasingly mediated and modulated by their own chosen sounds. The world becomes mimetically 'in-tune' with the users desires and movements.

The office can also be a contested space of multiple recorded sound. Marianne a 38 year old web engineer from Berne, Switzerland shares an office with one other worker who plays commercial radio all day in the office. Marianne responds by wearing her iPod for most of the day in the office:

> *"During working hours I will wear my iPod as soon as I need to concentrate to something and I don't want to listen to my office mate's boring radio station! This radio station plays the same songs all day long and that's really boring. I have more choice within my iPod." (Marianne)*

She varies the volume in relation to the amount of noise being made in the office:

> *"If my co-worker is on the phone and talks loudly, I'll increase the iPod's volume so that I won't have to hear what he's talking about (especially if it's personal). But most of the times I'll just have the music on a normal volume." (Marianne)*

iPod use for Marianne is private both in terms of protecting the co-worker from being overheard in conversation and in creating a cocoon of sound within which she works. It is also re-active in relation to an unwanted existing soundworld. Use thus empowers the user in relation to other workers - it is a post-fordist use of sound within a Fordist sound space in which one worker is being fed a diet of commercial radio, the other her randomised, yet personal playlist on the iPod. The space thus becomes two simultaneous privatised environments - one existing in radio sounds, the other in iPod sounds. Music enables Marianne to manage her workspace and also makes her feel better about herself and the world around her:

> *"I have sometimes the feeling that music lets me see the world around me in a "happier" or "brighter" light. I have the feeling that I'm happier when I listen to music. But I don't always "need" that to be happier. It's just that music lifts the spirits when one is a little down." (Marianne)*

Whilst the use of iPods in office space is primarily a solitary exercise in listening, at times it is used as the music system for the whole office, connected to the speakers of the users computer:

> *"It has become the office sound system. I have a set of computer speakers hooked into it, put it on random and everyone listens to it…In the office it can be anything that takes my fancy, I think during the day at work the most played stuff is probably the 80's music, but that is more to do with the age of the people in the office." (Frank)*

This demonstrates how technologies like the iPod can be used for general office use - but a use in which the workers choose which music they will potentially listen to. Yet negotiation, in this instance is also dependent upon the authority and disposition of the iPod user. In this example, there is no evidence of file sharing or collective creation of playlists. The iPod then is a dependent technology, dependent upon both the organisational practices of the workplace - and the desires of the individual worker in relation to their work colleagues.

7. Apple iPods in the Home

The dynamics of home listening are also potentially changed with the use of technologies like the Apple iPod. There is much written on the transformation of the home from a space in which all consumed the same media in the same space to one in which the home becomes a multiple consumption space with an array of televisions, radios and music systems distributed around domestic space. (Flichy 1995, Livingstone 2002) iPods can be plugged into home stereo systems working as home jukebox systems:

> *"I 'port' it to my home stereo system and use it to play on the radios throughout the house via the FM transmitter. When I walk from room to room, the same music is playing. It's a great low cost way to have a great stereo system." (Jeff)*

The home thus becomes colonised with each room receiving the same sounds. Collectively this may, or may not, always be desirable, in which case the iPod can be added to the armoury of domestic yet privatised listening nodules:

> *"I've gotten to the point that music portability is paramount to my day. I'll take my iPod into a relaxing bath. If my partner is watching TV, I'll wear it while making dinner. I'll use it to go to sleep. It's also more polite to wear my iPod while doing yard work instead of blasting my home stereo." (Ben)*

> *"At home I only use it with the FM transmitter over my stereo. I have used it for small and large gatherings (parties) as well as when I am home alone." (Alison)*

The iPod can be used to further secure both the users private space but also that of other members of the family. It would be incorrect to associate private use in private space necessarily as a form of ant-social behaviour; rather it can be construed as a way in which users respect the space of other members of the family. Yet equally collective use of domestic technologies throw open the issue of who controls domestic space that is not apparent in privatised listening modes. There is also an added dimension in homes with multiple iPods where family members file share and teach the skills necessary to download music.

Public spaces can also produce forms of collective recognition for iPod users who often see themselves in some sort of 'imaginary community':

> *"I also like the sense of belonging. They still enjoy rather a lot of cachet in London, and there's a sense of shared currency - you go out and meet someone in a bar who has an iPod -you can go through their playlists and build a musical profile of that person." (Joanna)*

Whether this sense of belonging will endure the increasing popularity of the iPod has yet to be seen. Yet what is clear is that the iPod provides for a new spectrum of listening habits, both public and private.

8. A Cultural Coda

The Apple iPod appears to be the cultural equivalent of the Citroen DS written so elegantly about by Raymond Barthes in the nineteen fifties:

> *"I think that cars today are almost the exact equivalent of the great Gothic cathedrals: I mean the supreme creation of an era, conceived with passion by unknown artists, and consumed in image if not in usage by a whole population which appropriates them as a purely magical object." (Barthes 1972 p. 15)*

From Gothic cathedral to Citroen DS to Apple iPod appears to represent a Western narrative of movement and privatisation. The Gothic cathedral, immobile, massive and austere, an edifice magnifying the glory of god whilst reducing the size of the individual to a mere speck on the horizon. Gothic cathedrals were the largest of man-made buildings in Europe at the time, just as the pealing of the cathedral bells were the loudest routine man-made noise that the population regularly heard.

Barthes, in his analysis of the Citroen DS, had already reduced the size and scale of the cultural icon from the size of a gothic cathedral to that of a five seater automobile - and of course, one could inhabit the Citroen in a way that you could not inhabit the cathedral - the DS was something not merely to be looked at or desired, it was something to be owned and travelled in - an icon to movement and mobility. Barthes interpretation of the Citroen DS is of a domesticated icon - this icon is however largely, although not exclusively a visually orientated one - whilst Barthes brief description of Gothic cathedrals is certainly visually based. Yet a parallel cultural history can be discerned and developed from Barthes sharp insights concerning the development of a Western aesthetic. Gothic cathedrals were not merely to be looked at or to be prayed in in silence - they were also cathedrals of sound in which the edifying sounds of music reverberated through those massive spaces. The populace invariably went into these spaces not merely to pray but to listen to the grandeur of religion as evoked by the music resounding through the great arches of the cathedral - music itself was representative of the grandeur of vision of the day.

Yet just as Barthes had reduced the size cultural icon of the 1950s from that of a Gothic cathedral to that of a five seater automobile, so at the beginning of the 21st century, the cathedral of sound now exists in the head and mind of the iPod user - the spaces of culture have been redrawn into a largely, but not exclusively private, and mobile, auditory worship. The Apple iPod appears to be the 21st century's first cultural icon and as such a potent metaphor for much urban life.

References

Auge, M., 1995, *Non-places: Introduction to an Anthropology of Supermodernity*. London. Verso.

Barthes, R., 1972, *Mythologies*. London.

Bauman, Z., 1991, *Modernity and Ambivalence*. Cambridge. Polity Press.

Bauman, Z., 1993, Postmodern Ethics. Oxford. Blackwell.

Benjamin, W., 1973, *Illuminations*. London. Penguin.

Brodsky, W., 2002, The Effects of Music Tempo on Simulated driving Performance and Vehicular Control in *Transportational Research Part F*, (pp. 219-241) Pergamon Press.

Bull, M., 2000, *Sounding Out the City. Personal stereos and the Management of Everyday Life*. Oxford. Berg.

Bull, M., 2004, Automobility and the Power of Sound in *Theory Culture and Society*. **21**(4-5) pp. 243-261.

Debord, G., 1977, Society *of the Spectacle*. Detroit. Black and Red.

De Certeau, M., 1988, *The Practice of Everyday Life*. Berkeley. California University Press.

Flichy, Patrice., 1995, *Dynamics of Modern Communication. The Shaping and Impact of New*

Communication Technologies. London. Sage.

Lefebvre, H., 1991, *The Production of Space*. Oxford. Blackwell.

Livingstone, S., 2002, *Young People and the Media*. London. Routledge.

Putnam, R., 2000, *Bowling Alone. The Collapse and Revival of American Community*. New York. Simon and Schuster.

Sennett, R., 1990, *The Conscience of the Eye*. London. Faber.

Sennett, R., 1994, *Flesh and Stone. The Body and the City in Western Civilisation*. New York. Norton.

Simmel, G., 1997, *Simmel on Culture*. London. Sage.

Chapter 8

TUNA: SOCIALISING MUSIC SHARING ON THE MOVE

Arianna Bassoli, Julian Moore and Stefan Agamanolis

"The enjoyment of music is essentially a social experience" (Crozier 1997: 67)

1. Introduction

The Sony Walkman was one of the first mobile personal technologies introduced in the market (du Gay et al., 1997). Its success, together with the following development and high penetration of mobile phones, has stressed the importance that ubiquitous technologies play in our everyday life. There are, at this stage, many new opportunities to explore for the design of future mobile devices, especially if we consider the fast improvements in terms of broadband wireless technologies and powerful handheld computers. The main interest of the researchers involved in the project presented below is, in general, to design technologies and applications able to create, support and maintain social interactions among people who happen to be in physical proximity, while performing various everyday activities within an urban environment. Cities are becoming in fact more and more alienating places where people mostly ignore whoever is nearby in their everyday routine (Putnam, 2000). Our aim is to design new personal technologies that could support the creation of a 'neighbourhood feeling' and the improvement of the social capital on a local scale. While many definitions have been assigned to the concept of 'social capital', it could be here summarized as the sum of relationships, norms and institutions that shape the quality and quantity of a society's social interactions (World Bank, 1999).

This research has started from the analysis of common habits in terms of mobile devices usage, and has investigated potential incentives that would make people use these devices to connect to other people nearby, even strangers. Many studies have tried to explain why the personal music player has become so popular, and to research habits of consumption related to this technology (du Gay et al., 1997; Bull, 2000). From these investigations it emerges that music can constitute a tool to

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control mood, to relax and to be disconnected from the surrounding environment. It is not the intention of the authors to imply that this isolating experience has to be changed, but to explore if it can be integrated with a more social one, depending on personal motivations and intentions. Indeed Bull has recently stressed how people already enjoy sharing the music of their portable music players with others nearby, and the same happens with mobile phones (Weilenmann and Larsson, 2002). "Personal stereos can be shared by peers on the way to school, on the bus, in the school common room, or in the corridors whilst waiting for lessons to begin" (Bull 2000: 110). The success of online peer-to-peer music sharing shows how there is space for new technologies that enrich the enjoyment of music and support the creation of social connections as well, even among strangers (Brown et al., 2001) The portable music player of the future could be used both to listen to music in a solitary way and to share this moment with other people.

Communication about music is a key feature of how we consume music; with this in mind, emerging networked technologies are offering new opportunities for people to share ideas about the music they are consuming, even on the move. Moreover, music is a social practice, especially when we consider young people and how it constitutes for them a form of identity expression and a social bonding factor (Frith, 1981). Research in the field stresses how "the most common sociological explanation of the importance of music for youth is in terms of peer-group culture" (*ibidem*: 215), and how "music provides the security of identification with other like-minded peers" (Larson, 1995: 548). Finally, a synchronized music consumption among people in physical proximity, as it happens in clubs or during parties, can create a strong emotional connection, more than what an asynchronous download of music over distance could provide, such as in the case of online peer-to-peer applications (e.g. Gnutella).

Sharing music may however not be enough for people to socialize with each other, and this is why the 'walkman of the future' could become also a communication tool, providing instant messaging features for instance. The exchange of messages could add to the experience of listening to the same music, and could reinforce the bonding already created, by providing a direct communication channel between users. In this way an overlap between the 'virtual' and the 'real' world emerges, and new behaviours of interaction could arise from that. The portable music player, which has kept its function and role in the society for the past twenty-five years, could now radically change and become a hybrid device that allows people to isolate themselves but also to connect more with others nearby. In this chapter we present tunA, a new mobile music player, that supports social experiences around music through local sharing and communication.

tunA is an application that runs on Wi-Fi-enabled and Pocket PC PDAs; it works as a standard mp3 player, but it also displays a list of other people in range, providing some information about them (i.e. icon, nickname, song currently playing). tunA then allows browsing the playlist of other users and to connect to them if the song they are listening to seems appealing. An instant messaging feature is also provided, in order for the users to be able to exchange messages about music or any other topic. Finally tunA gives the possibility to bookmark the songs other users are playing, to keep a record of interesting new artists being discovered while moving around.

In terms of content, music has been selected as the main interest around which new social links can be established and existing ones maintained. In terms of technical solutions adopted for the development of tunA, short-range wireless technologies and peer-to-peer connections have been chosen, because, if combined, they can support the creation of dynamic and flexible local networks. PDAs have been chosen as a platform because of development constraints that other existing mobile devices present, because new models have Wi-Fi built-in and finally because they are small but powerful computers for which it has not been found a successful market strategy to reach mass penetration. While PDAs have shown to present both positive and negative aspect, they have generally contributed to identify potential design choices for a future development in terms of hardware. Wi-Fi is probably the optimal existing wireless standard to create proximity-based peer-to-peer interactions, but tests that have been conducted so far on tunA show that the Wi-Fi range is too short to create stable and durable networks with a minimum density of users. It is likely that future improvements of wireless technologies may overcome this problem.

2. tunA: The Technology

This section introduces some of the technical characteristics of the application (see figure 8-1). The current software build is deployed on 802.11b enabled HP iPaq 4150's. Concerning privacy issues, it is important to specify that in the current version of the software the user does not have the ability to be 'invisible' in the network. This means that once the application is started, the user is directly connected to the network, and is accessible to any other user.

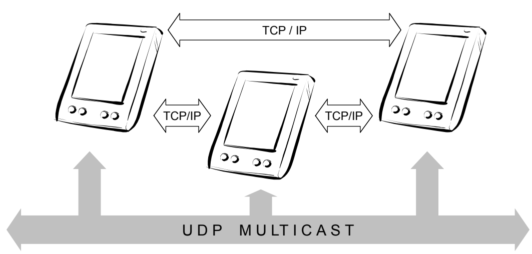


Figure 8-1. tunA peers interacting with each other

Obtaining music - Music is stored locally on the device as a series of MP3 encoded files. Audio can be downloaded to the devices by copying compatible files directly to a storage card using an external card reader, or any other normal means of transferring data to the Pocket PC such as ActiveSync, a network share, or any Internet connection.

Peer discovery - tunA uses a ‘beaconing’ approach to detect other devices within range. The discovery subsystem periodically transmits custom UDP multicast packets announcing its presence and some basic peer-related information to all nearby devices, and maintains a list of those peers from whom it has detected similar packets within a specified time frame. The envisaged scenarios for this application (waiting in a queue, sitting on a bus etc.) require a range of approximately 100-200m. Maximum values however are heavily dependent on the 802.11 adaptor/antenna used, and could be extended further with Multi-Hop techniques.

Network protocols - For the audio, the streaming service reads frames of MP3 encoded data from a locally stored file, and transmits them via specially formatted UDP multicast packets, which also include certain timing/synchronisation information. When a ‘tuned in’ peer receives these, they are added to a buffer from which the decoding service periodically requests data. For the instant messaging, a TCP/IP connection is formed when the discovery service detects that two peers are within range. A simple chat protocol is then used to exchange playlist information, instant messages, and other binary information.

Synchronization - We believe an important aspect of the tunA application is the synchronization of the music experience; to be able to listen to the same song at the same time could create a strong feeling of connection between two users, as it implies the inclusion, at a particular time and in a particular context, of the user connected into the experience of the user who acts as ‘music source’. Synchronizing the sound experience over WiFi also represented a challenge from a technical point of view. The synchronisation method used in tunA employed is essentially a three-part process, applied for the full duration of the ‘shared audio experience’, the data for which is included in the header of the packets of MP3 frames being multicast as the audio stream. First, a common reference logical clock or ‘heartbeat’ is established, by using any of a number of. Next, the track position of the remote source is computed, using information about the last frame that the decoder requested, and the time it requested it. Finally, if the local buffer is determined to be out of sync by more than a pre-determined amount, frames are removed or blanks inserted to bring the local and remote players in line. The human ear will assume two audio signals are ‘coherent’ (i.e. from the same source) if they arrive within 30ms of each other. On the Pocket PC platform, this level of synchronisation is difficult to maintain over time due to variances in manufacture (audio crystals), clock skew, OEM dependent timing information, unreliable network protocols, and the lack of a real-time operating system. Despite these obstacles the tunA algorithms are reasonably successful, and should see further improvements were they implemented on a dedicated device.

The interface - tunA has a skinable graphic interface; by supplying a set of BMP/GIF images, and an ASCII text file describing their location, content and attributes, a user can modify the appearance of these graphical widgets. Various options have been considered for presenting the necessary information on the screen, while keeping the interface simple and easy to use. The final decision for the default skin of tunA was to have a full screen interface with four tabs. The first tab displays the list of users in range (fig. 8-2a), each through a small icon, a nickname, and the name of the song they're playing (if there is any). By clicking on the icon people can access information about the user selected and the list of songs in their playlist. On this screen three icons are provided: one to 'tune in' and listen to the user's music, one to bookmark the song he/she is listening to, and one to send messages to this user. These last options reveal two other tabs, one dedicated to the list of favourites and one to the instant messaging (IM) functionality.

(a) (b)

Figure 8-2. tunA default interface, (a) people in range and (b) instant messaging. Left: out of four tabs, the first one presents the list of users who are currently in Wi-Fi range. In the latest version of the interface not only the icon of the users in range is shown on the first tab, but also their nicknames and title of the song currently being listened to. The chat interface (right) has the input button on the side (as some new mobile phone have), and is meant to show the dialogue between two users in a similar ways as it appears in the Mac iChat application, in which both the icon and the text are shown every time one of the user sends a message.

Existing IM tools, like MSN Messenger, could have been used and linked to the application as external functions. Instead, a dedicated interface was designed for this purpose, in order to facilitate the integration of it with the other internal functions. As in Europe SMS is massively used and many young people are confident with the mobile phone input system for writing messages, the IM interface has touch based buttons similar to a mobile phone. Buttons are positioned on the vertical opposite sides of the screen, in order to allow for typing by using both hands at the same time (fig. 8-2b); moreover T9 for the word recognition is in the process to be implemented.

Once a working prototype was implemented, it was important to test the application with potential future users. There are many technical and methodological challenges in designing and conducting a user study for a mobile peer-to-peer application such as tunA. This section presents the methodology used and the findings of the user study we conducted for tunA.

The aspect of 'spontaneous mobility' is in general very hard to capture by artificial tests; laboratory experiments, while they can be adequate for Internet or desktop-based applications, present numerous limits in terms of validity when it comes to wireless mobile applications. By comparing various approaches, Kjeldskov and Graham (2003) demonstrated how there is "a lack of focus on real use contexts in relation to engineering and evaluating mobile systems as well as limited construction and use of theory. While field studies are being done, natural setting research is not prevalent. One reason for this may be that applied research and laboratory experiments are simply easier to conduct and manage than field studies, case studies and action research."

For the tunA user study, a field study was conducted, using an original methodology that included qualitative and quantitative methods. The goals of this user study were both theoretical and practical. From a theoretical point of view, the experiment meant to add a contribution to the emerging field of user studies for mobile peer-to-peer applications, to confirm the validity of the concept behind tunA within a specific context of interaction, and finally to provide insights about other possible contexts of usage. The key question addressed was whether or not synchronized music sharing, mobility and physical proximity can create a 'social experience' and support new social connections among people who are nearby. From a practical point of view, it was relevant to test the usability of the tunA software, of its default interface, and of the hardware where it has been implemented. The methods used in this user study included participant observation, a survey, pre-trial semi-structured interviews, a talk-aloud interface evaluation, a one-day field study and semi-structured post-trial interviews.

During the design process a number of scenarios of usage had been identified, taking into account common occasions where people use mobile music players and casually happen to be in physical proximity. These scenarios included activities such as commuting, especially situations where people are waiting for public transport or travelling on them (bus/underground/train), queuing in venues or shops and gathering in parks or beaches. Specific communities were also considered as addressee for the application, especially teenagers and students, for example in situations when they would gather in places around a city or perform various activities at college and school.

In more general terms, a tunA target group of users would include everyone who enjoys listening to music through portable music devices and lives in a populated environment. At the same time this categorization is limiting if we want to address a future mass penetration of tunA, because of the specific development of the software that relies on a set of technologies that is not widely-enough used nowadays: Wi-Fi-enabled PDAs. The ideal target group to be researched at present should then include everyone who already uses portable music players and owns a Wi-Fi-enabled PDA at the same time. This condition is nevertheless very difficult to achieve and has the risk of excluding potential users who do not fall into any of these categories.

A combination of literature review and personal data collection lead to the choice of a university as a reasonable setting for a tunA field trial, and allowed the researchers to make some assumptions about students being a potential target group for the application. Youth has constituted so far the preferred subject of investigation and analysis for studies on music consumption and on the usage of personal stereos, and apparently "adolescence is the period when the amount of time devoted to listening to music is at its peak" (Crozier, 1997:72). Moreover, communities of young people, teenagers and college students in Dublin have been a big inspiration for the design of tunA, especially because of the results of a social study previously conducted locally (Bassoli et al., 2001). Our assumptions included issues such as the fact that students, as other young people, are a big audience in general for the music distributed on the market; moreover, music is for them a way to represents their identity and a frequent topic of discussion. Students may also often make use of portable music devices and could finally be curious about others nearby and willing to meet new people.

The choice of the college where the field trial took place was determined mainly by the technical constraints of the software to test, and by the 'social' characteristics of the college itself. tunA is a proximity-based application, where users can 'see' each other and interact only within Wi-Fi range, which is approximately fifty meters. As a qualitative study focuses on a small number of users, it is necessary to find conditions to make interactions happen. This fact becomes even more challenging where the attempt is to leave the users as free as possible to decide how to integrate the use of the technology with their everyday routine at the campus.

Various characteristics of NCAD (National College of Art and Design - Dublin) made it appealing for the tunA user study. The small size of the campus can facilitate the creation of spontaneous interactions among participants, allowing the technology to be fully exploited without modifying too much spontaneous social dynamics. The concentration of the campus social life in only two physical places (one indoor and one outdoor) makes it easier to track the activities of the students without interfering with their spontaneous activities. Finally, we assumed that the presence of people involved in art and design could bring new insights about possible improvements of the system maybe better than other users could do.

2.1 Observation at NCAD

In order to make sure that the NCAD, was the optimal environment for conducting the user study, a researcher spent significant time in the college. Participant observation mainly involved paying attention to the social activities happening every day and talking with people from the Student Union. The Student Union office not only coordinates the NCAD social life external to the campus's regular activities, but it also represents a physical hub where people would gather and spend some of their spare time. Meeting the people involved in the Student Union was a good starting point to know more about the campus and to coordinate the future field trial for tunA; they in fact have played the role of mediators between the researchers and the students involved in the user study.

The NCAD campus is mainly comprised of two parallel buildings, one for art and one for design, separated by a courtyard where students gather whenever the weather allows it (which is not very often in Ireland). A third building is mainly dedicated to administration offices, the library, and, most importantly for the study, social activities; this is where students eat, take coffees, and spend in general their breaks from university duties. The social life of the campus is very 'centralized', and the university activities take place mostly in 'open spaces', very large rooms where students work on their projects; the subjects taught at the college rely in fact more on the development of practical projects rather than theoretical and classroom-based learning activity. This aspect seems to facilitate more interactions happening among the students, and allows them to listen to music even while working and studying.

2.2 Survey and Pre-trial Interviews

In order to better understand if students could constitute a potential target group for tunA, a survey was conducted, by distributing a questionnaire divided into three sections:

Music - These questions addressed the level at which students were involved with music, how often they used portable music devices, and other related issues.

Technology - This section was meant to investigate what types of technologies the students used and owned in general, and how often they worked with computers.

Social issues - Here it was measured the willingness of students to meet new people who happen to be nearby, their feelings toward their existing social networks, and their level of satisfaction about how human connections are established and maintained in a urban environment.

A total of 76 completed questionnaires were collected. Through the answers given, our assumptions were shown in general to be valid. The next step consisted of selecting a small number of users to participate in the field trial; usually a number between 5 and 15 is suggested for qualitative analysis. Because our resources were limited and because the students didn't own their own PDAs, a group of six participants was finally chosen. The students, selected among the ones who had expressed interest in the application through the Student Union or during the survey, were four males and two females, between 20 and 23 years old, of which four were studying Art and two studying Design. In order to observe different types of interactions the group was heterogeneous in terms of people knowing each other. Some of them were in fact very good friends while some had only seen each other before but never talked.

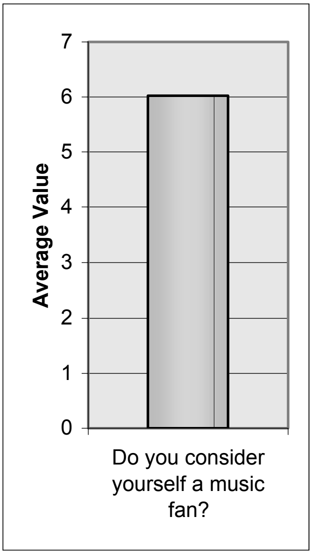
Semi-structured interviews were then conducted with the six participants, in order to understand more in depth their perspective on some of the issues touched by the survey. Participants agreed for the disclosure of their names. The questions depended on their individual answers in the questionnaire; aspects of mobile music consumption, social network satisfaction, and use of new technologies were analysed through these interviews, which were recorded and later transcribed.

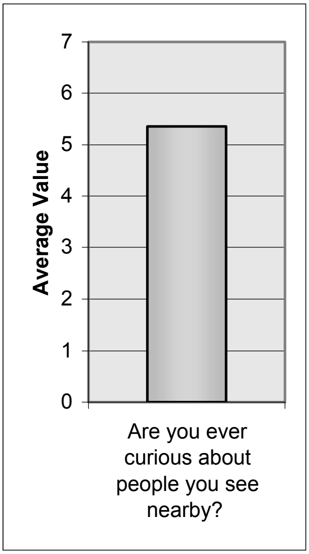
Students demonstrated in general a high level of interest and enthusiasm toward music (54% responded 7 on a scale from 1 to 7). They use portable stereos to a substantial degree (78% own one, 31% responded that they use it ‘always’) and listen to the radio often (25% said ‘always’).

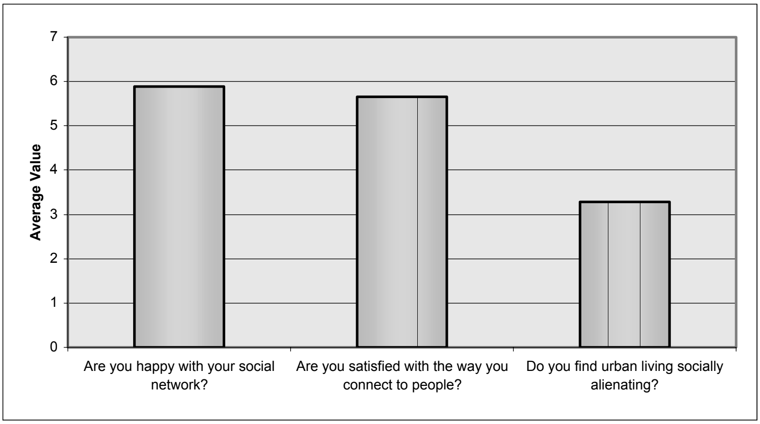
> *“I just use it anytime (portable music player), pretty much everyday if I’m travelling on a bus. Its because I love music, plus I just hate sitting around doing nothing, and also because I love to get into my own little world as well, chilling out with my tunes.” (Dara)*

This is in support of the assumption that students may be a potential target group for tunA. They constitute an important market for the music production and distribution, and have already adopted a ‘mobile’ practice of music fruition. Robust empirical investigations, such the one conducted by Bull about the Walkman, confirm how this finding can be generalized to include a vast number of young people living in western urban cities. Moreover, part of the students said to have felt frustrated because not always able to share their interest in music with others; this aspect occurs in other studies as the one conducted by Brown et al. on music sharing, and encourages research on applications like tunA.

As we expected, there are aspects of the target group of students that makes it difficult to be reached in terms of future penetration of the technologies. Participants of the study said they do not invest much in technologies (43% responded 1 on a scale from 1 to 7) and none of them owned a PDA. Even though, as mentioned, students are comfortable with the practice of music consumption on the move, the fact that there are barriers against the adoption of the technology necessary to run a system as tunA constitutes an important factor for the evaluation of the application potentialities within this target group.







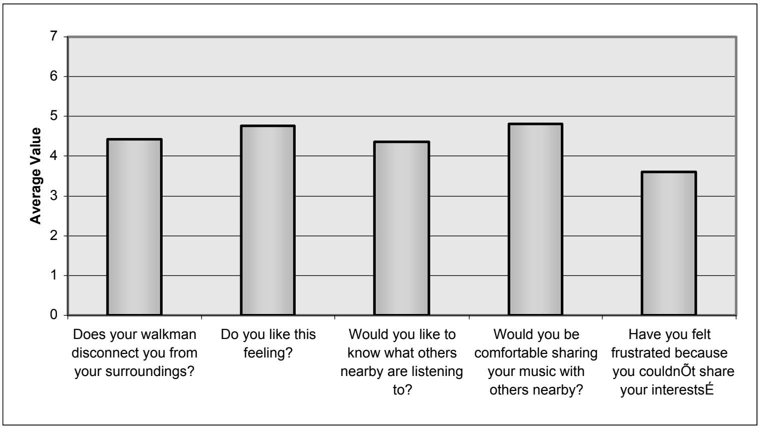


Figure 8-3. Results from the survey at NCAD showing why students could constitute a potential target group for tunA

2.3 Interface Evaluation and Field Trial

The six students participated also in an interface test, where a talk-aloud protocol was applied, in a laboratory setting. Usability engineering guidelines (Nielsen 1994) suggest that five users are generally enough to discover the main problems with a system. The students were asked to perform specific tasks with tunA, and to verbalize their thoughts, feelings and opinions. For the debrief session of the test they were then asked to fill in a satisfaction questionnaire. Tasks varied from playing the songs stored in the device, connecting to another user to listen to their songs, bookmark other users' songs and send messages. The results of this test were later compared to the use of the software and to the comments that users had about the interface after the field trial. This comparison allowed us to better determine what was the actual level of understanding of the graphic interface we had designed as default one, and to plan future improvements.

From the talk aloud experiment it seemed that users had initial difficulties in using some of the features of the software. Nevertheless during the field trial students demonstrated to be comfortable since the beginning in using the application:

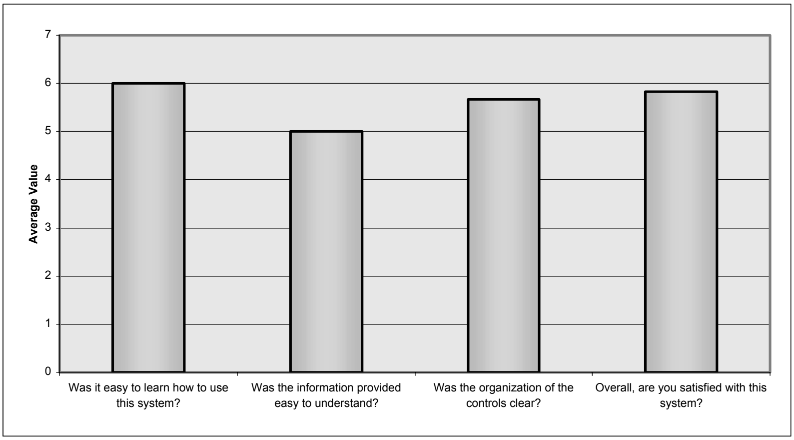


Figure 8-4. Some results from the debrief session of the interface test

> *"I thought the interface was cool, I mean at first there were one or two of the icons that automatically you wouldn't get exactly what they are from the start, but there are so few of them that you get to know them pretty quickly, it was well laid out and it was very simple, you couldn't go around really and if you did, you would fix it in a second, it wasn't over complicated" (Dara)*

In general participants were happy to use a touch-screen graphical interface, even though few of them said they would prefer physical buttons. This aspect became evident during the field trial, as the subjects were very cautious about using the PDAs and afraid of breaking them.

> *"I really liked the interface with the touch screen, I think its just a fact that if I had a PDA I'd feel that I had to use it for more than just the tunA thing, so I would much prefer to pay half the price and get a normal portable player". (Alan)*

Users' approach toward PDAs was not very enthusiastic; they didn't seem to understand a use that they could make out of them except for something similar to tunA. They would rather prefer to have a device only dedicated to tunA, instead of having to carry a small delicate computer like an iPaq.

The interface evaluation allowed the participants, none of whom had used a PDA before, to be prepared for the trial. Concerning the planning of the field study, it was decided to let the students perform their everyday usual activities in the campus, while trying to integrate them with the use of tunA. As all of them said during pre-trial interviews that they spend a lot of time using their portable music player while at the campus, this seemed a realistic option. Nevertheless, in order for the software to perform its features people needed to be in Wi-Fi range, and the small number of participants made this condition very difficult to achieve within a 'normal' everyday campus life. As the study took place during a single day from about 11 o'clock in the morning to 6 o'clock in the afternoon, the students were only asked to be around the 'social area' of the campus at lunchtime for about an hour and half, trying to use tunA as much as they could both for listening to their own music and for connecting to others.

The six subjects were provided with a PDA each and a recharger, and with the instruction about how to run the application and fix possible problems. Each user had an icon, a nickname and a list of their favourite MP3s in the device. They were asked to recharge the PDA at some stage during the day, as battery duration is still not optimal to run an application like tunA for more than about three hours. Apart from this small set of specific conditions the students were let free to behave as spontaneously as they could.

During the day of the trial, one researcher stayed at the campus, observing the interactions and usage of the application and capturing with video some moments of the trial. The researcher acted for one part of the test in a detached way toward the activities that were going on among the participants, and for another part she tried to have a 'participatory' behaviour, interacting with the users and taking an active role in the test. This approach was important to make sure the researcher did not interfere with the spontaneous social dynamics but also that she could experience first-hand the usage of the device within that natural context, with the aim of better understanding the experience of the other participants.

Unfortunately some technical problems encountered during the test left the six participants with only four fully working PDAs, but the cooperation among them in terms of sharing the devices when needed was remarkable. Two other important 'external' variables that affected the test were the good weather outside and the Irish smoking ban. People would already gather outside every time the weather allowed them. As the test took place in May on a sunny day, participants preferred to have their lunch and social interactions outside rather than in the inside social area. This was also due to the recent smoking ban that involved all of Ireland not more than a couple of months before. The fact that students cannot anymore smoke inside is drastically changing the way their interactions take place in the physical space, and the way they make use of the social spaces assigned to them.

During the test students were using the application for a certain amount of time while working on their projects in the studio, but apparently they were not able to spot each other online and they were using tunA like a normal MP3 player, with headphones. Social interactions took place mainly in the afternoon, when two groups of three students each formed in a common space outside the main campus building, at two different times of the day. This meant that only interactions among three people at the same time took place, but also that two different types of group usage could be observed. Each group of users consisted of two men who were already good friends and a woman who they both did not know before. Again, this was ideal for research purposes, as we could observe tunA being used among friends and to interact with strangers. In both groups users were always close to each other, at an average of about five meters, either standing or sitting, while eating their lunch or smoking. Other friends of them were nearby, and they all seemed very interested in the application and curious about it. Because of the proximity aspect, students decided to use their PDAs more like stereos rather than with headphones, in order to let other people listen to their music. In this way users (and the researcher) could check that the application was working, and at the same time they could let other people enjoy the music as well. Something we did not consider before was the opportunity to take advantage of the built-in speaker provided by the device. The traditional privatized music consumption of the Walkman was here partly conversed into public.

Some small technical problems related to the application occurred at various times, but the participants were able to learn very fast how to fix them and to restart the application when needed; fortunately, this factor didn't seem to influence the success of the test much. The students decided themselves when to end the test and to go back to their studies and activities, but this happened after a few hours of constant interaction with the application and with the other users.

After the field trial semi-structured interviews with conducted again with the students, in order to gather their comments and thoughts about the use of the software and the PDA, about the social interactions mediated through it, and about the whole experience in general.

2.4 Privacy and Curiosity

The socializing aspect of tunA much relies upon the willingness of users to share their digital resources, and eventually to communicate with other users in range. While this could be desirable in terms of supporting the enlargement of social networks and providing informal sources of information and entertainment for people, a 'digital open-ness' of users toward their surroundings also rises various concerns in terms of privacy and identity management. As previously mentioned, the use of tunA implies that the people are willing to share with others both their music and some personal information about themselves. Decisions about the level of personal information disclosed are entirely up to users, and information about their location is not provided by the software; as it is now the tunA software allows a certain level of both open-ness and privacy management.

During our field study, users were very comfortable with sharing their music even with people they did not know before, and they had no problems in broadcasting their 'real' identity through the application. This fact was mainly due to the security that the college environment provided for participants, together with the awareness that even strangers were students like them. Behaviors encountered during this study cannot therefore be generalized for other occasions, when strangers share the same physical space for a certain amount of time, as on public transports for example. In the survey students said to be quite comfortable in general about sharing their music with other people nearby (33% responded 7 on a scale from 1 to 7); this could mean that letting other people listen to their music does not seem to be perceived as a privacy violation from students' perspective. On the other side, one concern that they seemed to have was to be able to keep their privacy and anonymity in terms of personal profiling and messaging. This was mainly due to the fear of sharing personal information with some badly intentioned person in physical proximity.

"Well I think I'm a bit paranoid about stuff like that. It would depend also on the context, like here in college I wouldn't have problems to put my information, but outside I would probably try to be more anonymous." (Christian)

"I think less (information to people nearby), cause if like you run across a psychopath in the Internet, they cannot do anything, unless you're stupid and you give out your address, while if somebody is right beside you, it could be more dangerous I suppose. On the other end [...] if you're near a person at least you can see them, so you can decide what level of information you want to give them, like on the internet paedophiles can say that they're young etc, because u cant see them, but if they're physically near someone, they can't lie, so you can look at them and check them before giving them information." (Dara)

Some of the students agreed that they would eventually give more information about themselves after having exchanged some messages with a stranger nearby. This could mean that if the sharing of resources between strangers leads to a deeper level of interpersonal communication, also a certain degree of mutual trust can be built on that.

The level of personal information that each student is willing to provide for other people nearby, through the creation of a digital profile, can be low if we consider users' concerns about security, but it could also be high if we look at other factors acting as 'pay-offs' for this disclosure. One of this can be the satisfaction of a curiosity. From the pre-trial interviews and the survey, students appear to be curious about meeting new people nearby (31% responded 7 on a scale from 1 to 7).

"I think a lot of the times it's like if you are sitting on the bus and you see the same person everyday but you never talk to them. I do get curious about them, where they're going, etc., and the fact that they probably live very near you, it would be amusing if they were listening to music and you could see what they're listening to know what else they're like rather then talk to them if you're to afraid of it. I suppose I'm in general a very curious person." (Lisa)

"I was on the bus one time, and I saw this guy, and he looked like a big though guy, and he had like shaved hair, and his headphones were kind of loud, and it turns out he was listening to Westlife, and I thought: oh this is kind of weird for a tough guy." (Christian)

In general curiosity can arise in some context from the physical proximity of strangers; almost a century ago Simmel was commenting on the important role that the 'eye' plays in urban everyday situations (Frisby and Featherstone 1997). The act of commuting on public transports for instance has generated a new interaction-space, where people have time to and are in the condition of observing each other. Some aspects of the curiosity students referred to imply a connection between the way people express their identity though cloths and attitude and the type of music that they are listening to. The importance of the relationship between music and identity expression has been demonstrated by a consistent body of literature (Frith, 1983; Hargreaves and North, 1997; Willis, 1978). In the case of a person observing a stranger listening to the Walkman this relationship is implicit, but still seems relevant to foster a sense of curiosity in the observer. This curiosity consists in a wish to discover a, subjectively perceived, coherency or discrepancy between the physical and attitudinal identity of a person and the type of music that he or she is listening to. In their study O'Hara et al. (2004; this volume) have shown how networked music applications that imply a physical proximity of users can foster a similar type of curiosity; in this case online music preferences accessible to others nearby can generate the curiosity to discover the appearance of the users who expressed them. The degree to which this curiosity can be satisfied by a system like tunA depends on the willingness of people to disclose either their location or some clear link between the music they are listening to and their physical appearance (e.g. their picture). Going back to what has been mentioned before, this open-ness can affect issues of privacy and security, which need to be considered for future design improvements (i.e. the decision of using GPS to locate users). Otherwise an explicit request from users becomes essential to discover a link between appearance and music tastes of others.

Curiosity can also refer to an interest in finding people with similar music tastes, in order maybe to create new meaningful social connections. This level of curiosity could be satisfied by simply sharing information about playlists, and by having a communication channel to start a 'virtual conversation'. These are features already included in the tunA design, even though for the instant messaging it would be preferable for users to have a 'status' option, that is the possibility to choose whether to receive messages or not. This would let users decide when they want to use tunA for socializing or when they prefer to maintain the traditional 'disconnecting' feature of the Walkman.

> *"Well I presume you could have some control over it, like to set the status on busy when you're not available to talk to people." (Paula)*

2.5 The Importance of Music

In the context of tunA, music sharing can be seen as a first step toward the creation of social links, but it could also just provide alternative sources of mobile entertainment for users. The success of the Walkman and of various online peer-to-peer applications can lead to the assumption that there is a potential for mobile peer-to-peer music technologies, allowing users to have access to a higher amount of music in various everyday contexts. It is hard to predict at this stage patterns of behaviours concerning music sharing, and the processes of decision making that lead to the choice of listening to specific songs available on the network.

During the field trial, these choices were conditioned by the close proximity of users, the level of acquaintance between the users and the awareness of the music being played. As previously mentioned in fact users were interacting through the application and talking at the same time, some of the students were good friends while others were strangers, and finally music was played loud through the built-in speakers of the PDAs. It was interesting to observe that in each of the two groups formed during the day, there was one student more open and outgoing than the others, who would somehow lead the interactions and facilitate the communication among the three of them. The first group of students (Lisa, Alan and Christian) was a lot more talkative than the second one (Dara, James and Paula), but in the latter it seemed more democratic the choice of whom to tune into. This 'democratic' behaviour was probably also induced by the active participation of the researcher in the process of music sharing; students might have felt some pressure in terms of 'fair behaviour'. The music collectively played in the first group instead was mainly decided by the two guys, quite always either listening to their songs or tuning into each other, and only letting the girl to tune into them. In this case the presence of other students and friends might have put some pressure on participants in terms of 'showing off' who could lead the choice of the next song being collectively played. A similar 'competitive' attitude toward music choices has also emerged in the study O'Hara et al. conducted about Jukola, a digital jukebox that allows a democratic choice of songs (O'Hara et al., 2004; O'Hara et al, this volume). In the context of strangers sharing music with tuna another level of competitiveness could arise, where users try to have as many people as possible connected to them. This could, for instance, make users select the songs the will be listening to according to what they think could be appealing for people nearby.

The slightly competitive behaviour was nevertheless not obvious for the students, as after the field trial they justified their behaviour only in terms of being very self-confident about their 'music identity'.

> *"It's just a music difference more than anything else, like id just listen to anything but not Justin Timberlake and she was just listening to that. Any time I managed to tune into Lisa's thing she was listening to it, so eventually I just said I don't want to listen to that song, and I didn't tune in, but I suppose that's what the whole thing is for, you find out what people you want to tune in into and what people you don't want to tune in into." (Alan)*

> *"They all kind of new each other and they are good friend, but like, they're grand. It seemed that my music didn't go into theirs somehow, I got their music but they didn't get mine." (Lisa)*

This partly demonstrate the fact that the option of tuning into somebody else's music can be very appealing for students, but also that most of the people who are into music are very selective of what they are listening to. This fact supports the idea that an application as tunA gains value through a mass penetration, meaning that each person can access a big variety of songs and users to connect to. The short range of current version of PDA-enabled Wi-Fi also confirms the need for many people to have the technology and use it, in order for it to become successful.

> *"It was cool sharing it with James, 'cause we like "mostly" the same music, and then listening to Alan's music…Alan's music it was terrible! There was like one good song…and it wasn't even that good." (Dara)*

> *"There almost need to be more people, like there has to be almost everybody so that you can tune in and things like that. If everybody just had one a lot of the times it would be more easy to search through the menu, cause in the test you would have one or two people to choose and that was it, with more people it would be more interesting." (Alan)*

> *"I suppose I wouldn't tune into somebody that doesn't have anything I like. I think if you're in an environment, if there's enough people around its more a fun thing to play with, but it's kind of interesting cause it's kind of doing what's crap about radio at the moment [.], you may hear more stuff with tunA, or hear some stuff you would never hear on the radio, and that's kind of the fun part of it." (Christian)*

The fact that the students used the application mostly without earphones could have different explanations. According to the participants it just seemed the most 'natural' thing to do. This behaviour, although very interesting and unexpected, failed to show a more realistic usage scenario for tunA, where people would actually wear the headphones on an everyday basis.

> *"Well definitely I would use it with headphones, unless I was around and I met a friend of mine on the street and I wanted to hear a song with him, I suppose it's useful for that. But the sound was quite good in that little thing, it was loud enough. But I definitely would use it with the headphones." (Christian)*

> *"I think because you feel that you have to interact with people, it feels strange to keep your headphones on. If you're walking in the street you definitely want to keep you headphones on." (Paula)*

In an everyday context of usage, with people using headphones, it would be useful to add to the tunA application a feature indicating how many people are connected to each user in range; this would probably influence the choice of whom to connect to.

2.6 Social Interactions and the Power of Messaging

In terms of the socializing potential of tunA, from the field trial it emerged that the aspects of 'mutual curiosity' and music sharing encouraged students to start a conversation with strangers. In the context of the trial, another subject able to help, as a 'bonding factor', was the status of the application, that is if it was working well or not, and whom else everyone was able to see on the screen at a particular time.

> *"Well its something (music) that people may have in common, depending on anything in their life, they could be the worst enemies, but they still could like the same music, and that just establish a common ground for people to kind of talk and whatever. Yeah I think music is a good form of communication. Anyway it's something that most of the people appreciate." (Christian)*

> *"I think if you had one and you were walking by, and especially in college, 'cause it is a social place, if you [...] would see somebody playing a tune and you could listen to that song, it would be good that way, and I think it would establish a dialogue with people." (Lisa)*

Strangers starting a conversation from a music perspective may seem an unconventional thing, but for the students of our study it constituted a quite natural behaviour. Finding common interests before starting to communicate for the first time could be an incentive to 'upgrade' a new social connection to a more substantial level. The progression of such ad hoc and temporary interactions is hard to predict at this stage, even though students said that after the trial they were always saying hello to each other.

> *"I think people are just social creatures and when people share an experience…they automatically bond doing that…you can't help but…so even with a stranger listening to the same music…like with Paula, I didn't know her at all, but we were hanging out as we knew each other, I'm not sure how many times I asked her name, it didn't really matter, we didn't care, we were just hanging out…and you wouldn't get that otherwise…so it made a massive difference, it flipped the whole social thing completely, it's a much more relaxed/ enjoyable kind of thing, it makes you skip all kind of bullshit of 'hey how are you?'. I thought it worked well with both good friends and strangers…very different but good…" (Dara)*

Because of the familiarity of the college environment and the presence of other students, participants seemed to be very comfortable in talking to each other even if it was the first time. It is impossible to know how different their behaviour would be in public places, when surrounded by total strangers. By allowing a certain level of anonymity, the creation of new face-to-face interactions could possibly arise after a virtual exchange of messages. Studies in fact have shown how sometime it can be easier for strangers to communicate in the cyberspace than in 'real world' situations, especially because of the possibilities of playing with their identity (Turkle, 1997; Surel, 2004).

The idea to include instant messaging in the features provided by tunA came quite late in the design process. The possibility to bring the level of interpersonal communication further than the synchronized music sharing seemed to match with the intent of supporting new social connections. Nevertheless it was hard to predict the high level of interest that the user study participants expressed toward the instant messaging. Because they tried this feature during the interface test, they expected it to work during the day of the trial. Instead, various features were not implemented yet at the time of the study, so it was not possible to test them in use. All the students demonstrated to be very disappointed about not having the opportunities to send messages to each other, even though they were interacting at a close physical proximity, and talking to each other face-to-face.

> *"There was one time or two times maybe that I managed to tune in into someone and I didn't know who they were, and I would have sent a message them just to try that but I just think it would have added another dimension to it." (Alan)*

> *"When you check somebody else track list, it would be really cool. I mean, being able to share the music is great, but as a communication, you can't interact with the person, it would be great just to be able to send a message." (Dara)*

> *"Like I was listening into someone, especially with Alan, I suppose 'cause he's my friend. It could have been like trying to have a bit of a laugh with someone, just make fun or whatever. Like if Alan had a good song, like 'well done' or whatever, or have a laugh about crap tastes in music, like that sort of things. That's what you'd think in*

that kind of environment. Like I think if you are out it would be more: 'hello', this kind of stuff, 'I like that band as well' or bla bla bla." (Christian)

This feedback suggests that ubiquitous media are causing some radical changes to interpersonal communication. The fact that people are starting to get used more and more to communicating on a virtual level is affecting not only how strangers interact but also friends (Jones et al., 2002, Hu, 2004).

2.7 tunA and the Campus Life

One of the main goals of the study was to assess whether or not the use of tunA could be easily integrated with the everyday campus routine of the students. Even though there were very few constraints that participants had to take into consideration during the day, it seemed that their level of commitment to the test was so high that they ended up using the application much more that they would have done in 'normal' conditions. Some of them were also worried about the fragility of the iPaqs.

"I was very conscious that I was testing it, I was probably listening to music a lot more than I would normally do, so maybe because of the test I was a bit carried away." (Alan)

"It was distracting (the trial), but that may have been just the situation."(Paula)

"It would have been nice if it was actually a player, but because the thing seemed so fragile, that I was afraid to only use it, and do the thing I usually do with my Walkman; just that it seemed so expensive, that if is screwed it off I'd be pretty pissed off." (Christian)

Nevertheless in general the students felt enough free to use the tool as they wanted throughout the day; apparently the set of actions they performed was quite close to what would be an everyday routine at the campus. Finally, they demonstrated optimistic about using an application like tunA again in the future, in case it becomes a commercial product.

"I didn't really feel forced, cause I spend time in that place anyway, I'm listening to music all time so it wouldn't put me out of my way to be listening to music any time, unless I have to take it off." (Christian)

"The place we were using it was the place we would sit anyway for an hour or two everyday, and it did integrate in that way, because it's portable. I didn't really find too much pressure socially." (Alan)

"I thought it was a really nice way, a better way to socialise than drinking…a little healthier." (Dara)

3. Conclusions

The tunA user study has highlighted how a particular target group (students) could use the application in a specific 'real world' context (campus). Despite the number of participants of the field trial was small, and various technical problems were encountered during the test, it was possible to observe interesting dynamics of use and mediated social interactions, and to obtain a rich feedback about them.

From a theoretical point of view, the study showed how sharing music constitutes a form of social bonding with strangers and a fun experience with friends. Talking about music and commenting about the choice of songs helps breaking the ice with new people, and seems less banal and intrusive than asking personal or very generic questions. Unpredictably, users demonstrated a high level of enthusiasm toward the possibility of sending messages to each other even if they were in close proximity, and this suggests that mediated communication is increasingly affecting face-to-face interactions. In some occasions, according to participants' comments, it was a way to discover whose music they were listening to when they were connected to others, while other times sending messages seemed a way to establish a private and 'secret' communication channel about a topic, in a context where other people and friends were physically present. Another unexpected behaviour occurred when users instinctively used the PDAs with speakers instead of with earphones when playing songs. This, while it can be not representative of an everyday use of tunA, seemed to suggest that people need to be aware of the fact that they're listening to the same music to feel a social connection. In some occasions it also showed how users wanted to lead the joint music choice, or to be proud with friends of the songs contained in their playlist. Moreover, despite users were comfortable in broadcasting information about themselves inside the campus, they expressed concerns in terms of privacy and anonymity. The physical proximity could be a factor that influences the willingness of people to disclose personal details, but it could in general foster new forms of identity expression in the virtual world. Another aspect that became clear during the trial was the necessity to reach a mass penetration for the application, because users can be very selective about music and expressed in various occasions the desire to have a vast pool of choice of users to connect to.

From a practical point of view, these observations can lead to changes in the way the application is currently implemented. First of all it seems clear the importance of integrating music sharing with instant messaging to make interactions more exciting and interesting. Secondly, the feedback from users supports the idea to develop tunA on a dedicated device, more similar to a traditional personal stereo than to a PDA. As far as new features are concerned, it could be valuable to implement the option to know how many people are currently connected to each user, in order to increase the consciousness of a shared experience, and the option to set the personal 'status' as available for others or not, in order to integrate the 'social' and the 'isolating' experience that the 'walkman of the future' could allow. A recommendation system could also be added, to help users finding their favorite music among the available choices; nevertheless, this could also avoid users to expand their horizons in terms of music exposure. Finally, concerning the wireless connectivity, it would be preferable for tunA to have technology that allows a wider range than Wi-Fi, but that could still support proximity-based interactions. For the moment it has not yet been found a better solution to Wi-Fi.

Further user studies, possible involving other potential target groups or investigating scenarios with strangers interacting (i.e. commuting), as well as further technological developments are necessary to confirm the finding of this present study and to complete the design process for tunA. Nevertheless this still constitutes only a research project, and commercial institutions and industries will eventually have the responsibility to introduce and promote a similar product in the market. tunA represents an attempt to explore how new technologies could radically change the traditional function and role of the portable music player, and make it allow a social experience as well as an 'isolating' one.

> *"The Walkman is primarily a way of escaping from a shared experience or the environment. It produces a privatized sound in the public domain, a weapon of the individual against the communal. The walk-person is buffered against the unexpected - an apparent triumph of individual control over social spontaneity" (Williamson, 1990: 209, quoted in Bull, 2000: 137)*

Will this observation be still applicable in few years from now?

References

Bassoli, A., Quinn, I., Agius, M., Moran, A., Nisi, V. and Dini, P., 2002, Social research for WAND and new media adoption on a local scale, In *Proc. Dyd 2002*, ACM Press

Brown, B., Geelhoed, E., Sellen, A., 2001, Music sharing as a computer supported collaborative application. In *Proceedings of ECSCW 2001*, Bonn, Germany. Kluwer Academic Publishers, 179-198

Bull, M., 2000, Sounding *out the city - personal stereos and the management of everyday life*, Oxford: Berg

Crozier, R., 1997, Music and Social Influence. In Hargreaves, D.J. and North, A.C. (Eds) *The Social Psychology of Music*, Oxford: Oxford University Press

du Gay, P., Hall, S., Janes, L., Mackay, H. and Negus K., 1997, *Doing cultural studies, the story of the Sony Walkman*, SAGE publications

Emerson, R.M., Fretz, R.I. and Shaw, L.L., 1995, *Writing ethnographic fieldnotes*, University of Chicago Press

Frith, S., 1981, *Sound effects. Youth, leisure and the politics of Rock 'n' Roll.* Constable

Frisby, D. and Featherstone M., 1997, *Simmel on Culture*, Sage Publications

Heath, C. and Luff, P., 1995, Ethnography: aligning field studies of work and system design, in A. F. Monk & N. Gilbert (eds.), *Perspectives on HCI: diverse approaches*, 175-198, Academic Press

Hu, Y., 2004, Interpersonal communication in virtual reality: Romantic ICQ, *Communication & Management Research,* **3**(2), 31-66

Hughes, J. A., King, V., Rodden, T., and Andersen, H., 1995, The role of ethnography in interactive system design, *Interactions*, **2**(2), 56-65

Jones, S., 1997, *Virtual Culture: Identity and Communication in Cybersociety'*, Sage Publications

Jones, S., Madden, M., Clarke, L. N., Cornish, S., Gonzales, M, Johnson, C., Lawson, J. N., Smith, S., Bickerton, S. H., Hansen, M., Lengauer, G., Oliveria, L., Prindle, W., and Pyfer, J., 2002,, *The Internet goes to college: How students are living in the future with today's technology*. Pew Internet and American Life Project. Retrieved November 16, 2004 from http://www.pewinternet.org/pdfs/PIP_College_Report.pdf.

Kjeldskov, J. and Graham, C., 2003,, *A Review of Mobile HCI Research Methods*, Proc. of Mobile HCI 2003, Lecture Notes in Computer Science, Springer

Larson, R., 1995, Secrets in the Bedroom: Adolescents' Private Use of Media, *Journal of Youth and Adolescence* **24**(5): 535-550

Milgram, S., 1997, *The individual in a social world: essay and experiments,* Addison-Wesley

Nielsen, J., 1994, *Usability Engineering*, Morgan Kaufmann

Norman, D., 1998, 'The invisible computer', MIT Press

O'Hara, K., Lipson, M., Jansen, M., Unger, A., Jeffries, H. and Macer, P., 2004, Jukola: democratic music choice in a public space. In *Proceedings of DIS '04, Conference on Designing Interactive Systems:* 145-154

Perkins, C., 2000, *Ad Hoc Networking*, Addison Wesley Professional

Putnam, R. D., 2000, *Bowling alone: The Collapse and Revival of American Community*, Simon & Schuster

Rheingold, H., 2003, *Smart Mobs*, Basic Books

Shapiro, D., 1994, The limits of ethnography: Combining social sciences for CSCW, *Proceedings of CSCW '94*, 417-428. ACM

Suler, J., 2004, The Online Disinhibition Effect, *CyberPsychology and Behavior,* **7**, 321-326

Turkle, S., 1997, *Life on the Screen: Identity in the Age of the Internet,* Simon & Schuster

Weilenmann, A., and Larsson, C., 2001, Local Use and Sharing of Mobile Phones, in Brown, B., Green, N. and Harper, R. (eds) '*Wireless World: Social and Interactional Aspects of the Mobile Age'*, 99-115, Godalming and Heidelberg: Springer-Verlag

Willis, P., 1978, *Profane culture*, Routledge and Kegan Paul

World Bank, 1999, Social capital research group, Retrieved October 2004 from: http://www.worldbank.org/poverty/scapital/

Chapter 9

CAR DRIVERS USING SOUND PRYER - JOINT MUSIC LISTENING IN TRAFFIC ENCOUNTERS

Mattias Östergren and Oskar Juhlin

1. Introduction

We here present Sound Pryer, an application that lets drivers jointly listen to music in traffic. Sound Pryer is a 'collaborative' car stereo that allows its users to play their choice of music, but also tap into the stereos in other cars and hear what they are playing at any given moment. This ability to 'pry' into the music being played on other stereos is limited to a certain range, and only nearby stereos can be overheard. Sound Pryer also displays a simple graphic representation of the car currently providing music. Consequently the user at the receiving end may, if the driving situation permits, determine the source of the music being heard.

Driving is a widespread phenomenon and is firmly integrated into many peoples' lives. Our work with Sound Pryer seeks to make it more interesting and fun. Driving is sometimes experienced as tedious and lonely, but it can also sometimes be enjoyed for its own sake. Hence Sound Pryer is both about relieving boredom and augmenting something pleasant. To achieve this, we add a new sensory channel to the driver's perception of surrounding road users and their vehicles. This draws on two activities that drivers already enjoy performing, and by combining the two we hope to bring about a safe yet entertaining alternative. The first is listening to music. This is popular for several reasons; it is easy to combine with driving and the car is a good listening environment. The second is the enjoyment that we believe drivers sometimes derive from looking around and forming impressions of nearby road users and their vehicles.

Here we account for a field trial of the Sound Pryer prototype undertaken to determine if it is successful at being entertaining as such. In order to get realistic feedback from a small group of users we imposed certain constraints. For instance,

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 173–190.

we restricted the driving to a particular route to increase the number of encounters, and we set up individual starting points to keep the users apart and anonymous. We also decided to accompany the participants to learn about their immediate reactions to Sound Pryer. We have learned that when using Sound Pryer, receiving or transmitting music was enjoyed the most when the user could see the “other end.” Also, looking around to locate the source of pried music was entertaining, and compensated the poor audio quality and the fact of only hearing snippets.

The work presented here is a contribution to mobile music sharing. It is currently very popular to share music files between desktop PCs using various peer-to-peer internet applications such as BitTorrent and Kazaa. Meanwhile, a growing number of portable digital devices are capable of storing and playing music files away from the desktop, such as MP3 players, PDAs and car stereos. A number of research projects in the mobile computing domain have begun to investigate the sharing of music files between such devices. Sound Pryer contributes to this in two original ways. First, inasmuch as it focuses on sharing the experience of music rather than sharing files, the awareness of other users is an important issue. Second, it investigates such joint listening experiences under conditions of driving. Most research into mobile music sharing concerns movement on foot.

The paper is structured as follows. In section three we present the Sound Pryer concept, describe a user scenario and provide a brief technical overview of the prototype. In section four we state the motivation behind our work. In section five we introduce the field trial we performed to collect user feedback. In sections six and seven there follows a detailed presentation and analysis of the video and interview materials we collected. Finally, there is a summary of the key findings in section eight.

2. Related Work

Collaborative music listening is already a topic in CSCW and related communities. In 1998 McCarthy and Anagnost presented the MUSICFX system (McCarthy and Anagnost, 1998), which enabled members of a fitness center to influence the music selection while they exercised. This is one of the first examples to draw on a social practice surrounding music listening, namely selecting appropriate music that fits the taste of a group. The system uses a set of stationary computers to collect feedback from the members and select a track. The tracks are grouped into genres and then selected randomly. The probability function is weighted such that the genre that the most members prefer has the highest probability of being selected.

More recently, in 2001, following the growing popularity of peer-to-peer Internet applications, Brown et al. expose and examine music sharing (Brown et al, 2001a; Brown et al, 2001b). Based on their findings from a study of enthusiasts’ general music habits, they derive some implications for design and propose two systems: the “Music Book” and “Music Buddy” (Brown et al, 2001b). The “Music Book” re-introduces tangibility to digitally stored music. Brown et al. envision a “CD sized book” that would connect to an online copy of the music. The music could then be stored, shelved, shared, sorted etc. much like the ubiquitous CD. The "Music Buddy," on the other hand, aims at augmenting the socializing that emerges around music sharing. Brown et al. present a prototype in which a user publishes his or her music selection on the web. Any user may then examine this collection. More interestingly, a user may also determine which other users that have the same items in their collections.

An early investigation of mobile music sharing is Kortuem's et al. mobile peer-to-peer platform: the Proem platform (Kortuem et al, 2001). They account for three scenarios where Proem can support music file sharing. The scenarios highlight various technical issues, such as security and privacy that the platform supports. The scenarios do not investigate design or the experience of using the platform. Mikael Wiberg's FolkMusik prototype (Wiberg, 2004) on the other hand addresses mobility (i.e. walking) and touches on the experience of mobile music sharing. This prototype contains functionality that lets a user select any song on any other user's playlist within range. The FolkMusic prototype represents an interesting development in mobile music sharing, as it uses physical proximity to filter the available music selection.

Through a series of field studies and workshops Åkesson et al. found that a group of commuters were often bored while driving and longed for alternative entertainment (Åkesson and Nilsson, 2002). They proposed ShoutCar, a mobile music player that allows interaction while driving to alleviate this situation. The prototype consists of a text-to-speech playlist browser, a music player and a wheel-shaped input device. The playlist is prepared in advance and is made available through a web interface. The browser is installed in the car and reads aloud the items as the user cycles through the list with the input wheel. In itself ShoutCar does not concern music sharing per se, but is a relevant example of a mobile music application specifically designed for the driver.

3. The Sound Pryer Concept

Sound Pryer can be thought of as a 'collaborative' car stereo. A user can listen to his or her favorite music much like with a regular stereo. However, he or she can also 'pry' into what *other users* in *other cars* currently are playing on *their* stereos. In this way Sound Pryer provides joint listening experiences. The provision is limited to a certain range; i.e. only stereos in close proximity may be overheard. Furthermore, while playing another car's music, the Sound Pryer interface also displays a simple graphic representation of the vehicle from where the music is coming (Figure 2). If the driving situation permits, the icon will help the user determine the source of music.

3.1 User Scenario

Figure 9-1. (Left) Sandra is driving listening to her favorites. (Middle) Lorry appears and its music is heard. (Right) Sandra thinks: "Good music! I've got to get it."

As an example, we envision the following scenario (Figure 9-1). Sandra attaches her PDA to the dashboard and starts the Sound Pryer application for a captivating musical experience. As she hits the road, Sound Pryer starts playing her favorite music. After a while she finds driving a bit lonely and tedious. Suddenly, the icon of a red lorry appears on the screen. She says to herself: "It must be that one up ahead", as the latest Cardigans song fills her loudspeakers. Sound Pryer returns to playing her own music after the lorry has passed and fallen behind. Sandra thinks "Cool guy. Good music. I have to get it at the next stop."

3.2 The Sound Pryer Prototype

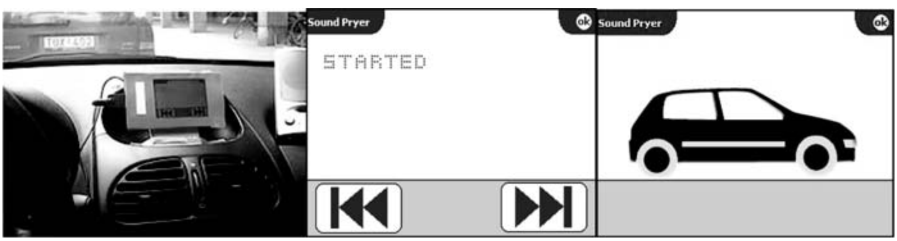


Figure 9-2. The Sound Pryer Prototype. A PDA and loudspeakers on the dashboard (left). The Sound Pryer Interface: Local play (middle) and remote play (right).

The Sound Pryer prototype is an application of wireless mobile ad hoc networking (MANET) for PDAs (Östergren, 2004). MANET technology enables cost-free broadband exchange requiring no other networking infrastructure than the wireless transmitters already in the PDAs. MANET between cars moving in traffic is limited to the range of the transmitters. Generally this is considered a disadvantage, but we exploit it to restrict the joint music experience to when the cars are in close physical proximity, i.e. when they encounter each other in traffic. The user interface is carefully designed to entertain the driver safely (Figure 9-2). It combines two modes of music playback: *local play* and *remote play*. Local play allows the user to listen to his or her favorite music. It cycles through a playlist of MP3 files stored on the PDA. While the music is playing it is also broadcast onto the wireless network. Remote play, on the other hand, allows a user to hear what someone else is listening to at exactly that moment. In this mode Sound Pryer captures and plays the music being broadcast from another PDA within networking range. The interface is also designed to automatically switch from local play to remote play whenever a transmission is detected on the network. It *negotiates switching* to ensure that within a group of PDAs one will remain in local play mode, guaranteeing music provision for the others. The interface also indicates the presence of other users and helps to determine of the source of the music. Whenever remote play is activated the interface displays a stylized figure giving the shape and color of the other user's vehicle.

4. Motivation

The motivation behind this work is simple: we would like to make driving more fun than it already is. Driving is a ubiquitous global phenomenon involving vast numbers of people spending an ever greater number of hours in traffic. Driving could benefit from alternative entertainment, but that is not to say that driving is always a boring experience. Driving is sometimes also enjoyed for its own sake. Making driving more fun would therefore have to include entertaining the bored driver as well as giving the contented driver a heightened experience. The issue we tackle is that of finding the appropriate level of entertainment to do so. Our hypothesis is that we can accomplish this by elaborating on those things to which the driver already must pay attention, such as encounters with other drivers and their vehicles. We want to add a novel flavour to these and tease the driver's curiosity, and in this way enrich the experience of being in traffic.

More precisely, Sound Pryer draws on two ways that drivers already entertain themselves in traffic. First, it is about in-car music listening. Such listening is very popular; e.g. in a recent study of the habits of a group of music enthusiasts, it was found that they listened to music 82 % of the time they spent in cars (Brown et al, 2001a). The reasons for music being popular are that it can easily be combined with driving, and that the car provides a good listening environment in that the selection or volume rarely disturbs others and a driver can unconcernedly sing along etc (Bull, 2004; Öblad, 2000). The second activity is that drivers enjoy looking at the surrounding cars and forming impressions apart from gleaning the information necessary for co-ordination. Drivers primarily look at surrounding cars to determine where they are heading, scan for an opening, maintain proper distance etc. However, we have good support for the idea that looking at surrounding cars also adds something positive to the highway experience.

We have found in our studies of motorbikes that bikers particularly enjoy the visual interaction of traffic encounters (Esbjörnsson et al, 2004). They like taking a quick look at the other bike and its rider as they meet in traffic. In addition they often make an effort to greet each other, and discussions sorting out who was who in such encounters are frequent topics on web chats. We have developed an application for sharing web pages in such encounters (the Hocman prototype). Our field trial showed that motorcyclists particularly appreciated its contribution to the experience of brief traffic encounters (Esbjörnsson et al, 2003). Our ideas here are in line with what Donald Appleyard and Kevin Lynch already argued in 1964, that traffic encounters are central to the experience of driving. Their statement concerned the general road user and not just bikers:

> *"Most impressive of all is the motion of the accompanying traffic, to which he is forced to be attentive, and which even passengers will watch with subconscious concern (Appleyard et al, 1964)."*

These architects never formulated what exactly was impressive about the surrounding traffic, but we would argue that our findings about bikers are generally applicable for all road users. Any driver takes an interest in the other drivers encountered and their vehicles. In addition we believe his or her experience contains the same qualities that appealed to the classic 19th century literary figure known as the 'flâneur.' According to Charles Baudelaire:

> *"He marvels at the eternal beauty and the amazing harmony of life in capital cities…He delights in fine carriages and proud horses, the dazzling smartness of the grooms…the sinuous gait of the women, the beauty of the children, happy to be alive and nicely dressed (Baudelaire, 1859)."*

Obviously, Baudelaire has not based this observation on empirical facts. Still his ideas about flaneuring seem to have relevance today, particularly for modern drivers. For instance we find in Michael Bull's recent investigation of sound and automobility that one interviewee claims:

> *"When I'm sat in a traffic jam or at traffic lights, in town especially, to ease the boredom, I quite enjoy watching what's going on around me. I look in other people's cars, and watch people walking down the street. I like to see what they're doing and where they're going. As I am in my car a lot, I do need something to take away the boredom (Bull, 2004)."*

In conclusion, we suggest that a modern driver-flaneur would not mind sharing music, currently listened to in private, with fellow road users. Further he or she would particularly enjoy prying into the music being played in other cars.

5. Field Trial Method and Procedures

It was necessary to acquire realistic feedback on Sound Pryer, the concept and our assumptions about being in traffic. There are a couple of practical challenges that need to be addressed to obtain useful data: drivers being *anonymous*, and their *briefly* meeting each other in traffic. Sound Pryer is intended for encounters between unacquainted drivers. Most joint listening situations will be brief and can occur potentially anywhere along the vast road network. A study where we merely handed out a few devices would not be successful, as the likelihood that a small number of unconstrained drivers would encounter each other often enough is very low. In such a case the opportunities for making observations would be scant, brief and hard to predict. Therefore, we decided to conduct a field trial where the subjects used the prototype for a limited period of time and their movements were restricted to one particular route. With this set-up we could accompany each individual user throughout the test to be able to watch their immediate reactions and activities. We also decided to interview each individual directly following the trial to follow up on their experience of it. The interviews were loosely structured and performed in parallel.

We conducted three separate trials, which engaged thirteen test subjects in all. We provided the users with vehicles equipped with a handheld device and two portable loudspeakers mounted on the dashboard. Each device was prepared with the test subject's favourite music. The drivers were received at individual rendezvous locations along a circular route to remain anonymous during the trial; they only met the other test participants during subsequent traffic encounters, to best represent realistic situations. They travelled four laps, all at the same time, and each lap took about ten minutes at the speed limit of 50 km/h. This created a large number of events where the Sound Pryer concept was experienced.

The participants were recruited either through mailing lists or through friends of our friends. They (two women and eleven men) were between 26 and 57 years old. Eight drivers owned or had access to private cars, which they used for commuting to and from work, but also for occasional longer trips. They all frequently used either the radio or CD player when driving. Finally, all the users were familiar with the MP3 music format and were aware that such files could be acquired through the Internet. Eight participants had experience of downloading music through peer-to-peer file sharing tools.

All the drivers were video recorded during the trial by a researcher sitting in the front right seat (Figure 9-3). All in all we collected and analysed about six hours of recorded data. The video material was collected in order to conduct an analysis of the test subjects' visible behaviour and increase our understanding of their experiences. We wanted to find visual evidence, such as smiles, laughter, or comments, of the experience of joint listening in traffic. By recording facial expressions from close-up we risked influencing the data, but the drivers could not be too preoccupied with the camera since they had to drive.

Figure 9-3. Still captures from the video material.[29]

Video recorders are increasingly used to collect data during HCI evaluations

[29] The drivers have agreed to the publication of their pictures.

(Hindmarsh et al, 2002). However, there is, as of yet, no common standard for transcribing video recordings similar to the coding schemes used in conversation analysis (Heath and Hindmarsh, 2002). Consequently, we have developed a coding scheme that accounts for the details of the drivers' activities of relevance for this study.

All the video recordings from the thirteen participating drivers have been transcribed and coded. The transcriptions were first divided into 179 distinct Sound Pryer *events*. Such event began when the interface started to negotiate which device is to stay in local play and which is to commence remote play. The event ended when local play resumed, which could happen for two reasons. First it could be due to negotiation i.e. one party was assigned to remain in local play. The other is when the parties would travel out of wireless range.

The coding scheme we developed encoded five variables along a timeline. The first variable captures the duration, quality and source of the music coming out of Sound Pryer. The quality was categorized according to five qualities: silence, noise, choppy, acceptable and good. The drivers received remote music with a quality coded as acceptable or good during 37 of the events. Second we noted their facial expression if other than appearing neutral. Third we transcribed the conversations during an event. Fourth, the users' focus of attention was described in terms of apparent gaze and body movements. Fifth and finally, we also annotated the road context i.e. the particular location or surrounding traffic whenever we could discern it.

The video analysis and the field trial were intended to generate as much feedback on the experience of Sound Pryer as possible. Thus, the primary concern is not to discern general and quantitative trends. Therefore we have included as many aspects of the user experience as we could find, rather than focusing on the statistically most frequent events. Because of this the coded material gave insights into many design issues despite the somewhat limited scope of the field trial.

6. Video Analysis

The purpose of the video analysis is to study how the drivers behave during Sound Pryer events and interpret their experience of them. We have found four main categories of how the drivers observably relate to their experience of Sound Pryer, i.e. how they direct their attention and express themselves. The first category covers events where drivers display the visible behaviour of intensely *looking around*. The second category denotes the observable behaviour of showing interest in *remote music*, but not looking around. The third category combines both of these observables i.e. *looking around and paying attention to music*. Finally, we will discuss situations were Sound Pryer events were *disregarded* and no reactions were observable on the part of the driver. We include the transcript for the first example, but subsequently exclude them for brevity.

6.1 Looking around

Here we discuss the category of Sound Pryer events where the drivers were intensely looking around. In the following we will discuss an event which occurred while Eric was driving on a straight section of the road (Table 9-1).

Table 9-1. Transcript of Eric looking for a source of music

Time	Sound Pryer	Facial Expression	Attention	Comments	Road Context
	Local play		Looks ahead		Going straight
23:04				Green car!	
23:05	Silence, 4 sec	Smiling	Looks at screen		Two cars pass in opposite lane
23:08	Good remote play, 3 sec Silence, 2 sec		Hits turn signal	We're entering here? Right? Res.: You said before even.	
23:14	Local play		Looks at intersection	Res.: mmm right … we should enter there…	
23:15					Turns

Here Eric is gazing forwards and suddenly he says "green car!" Local play is then interrupted by four seconds of silence (23:05) which was caused by the negotiation. As two cars pass in the opposite direction he smiles and then takes a quick look at the screen. Remote play starts, continues for three seconds and then ceases as the parties leave wireless range.

We interpret his smile as a consequence of him spotting the car shown on the screen in the oncoming traffic. It is clear that his comment "green car" is about identification, and his smile comes before the music has begun to play. It seems that he recognizes the car and that he looks at the screen to confirm this. Looking around and identifying the car seems to be an enjoyable experience given his smile.

Interestingly, the same kind of emotional attitude was displayed in situations where drivers believed that someone was listening to their music. For brevity, we have excluded detailed transcripts. Ruth is waiting for a green light and her vehicle is standing still. Sound Pryer starts to negotiate at the same time as she adjusts her seat. Local play comes back on after a few seconds of remote play. She looks out the window trying to identify the source of the music she just heard. However she says to the researcher that she is not sure of where it was coming from. She starts smiling and then laughing. She tells the researcher she realized that the other driver is probably listening to her music.

Here, her emotional reaction is about realizing that she is playing music for someone else. Although she failed to accurately locate the listener, this example shows that doing identification work is an experience for 'both sides' and that providing music for others also triggers interest in the surrounding drivers. Being 'listened to' is a fun experience when we know someone nearby is doing it.

We found that there were two kinds of emotional attitudes displayed in "looking around" events. In 30 events the subjects' facial expressions displayed positive appreciation, and in 61 events they had a neutral face. Having a neutral face does not necessarily imply the subjects were indifferent, but it is hard to interpret their emotional experience. Still these cases show that the concept was understood and the subjects were engaged.

6.2 Paying Attention to Remote Music

We could also identify events where the drivers' observable behaviour was related to remote *music*, but without their looking around. Mark is waiting for a green light at an intersection. Sound Pryer initiates negotiation and his local play is paused; a second of remote play follows and then another pause. Then Sound Pryer plays nine seconds of remote play (snappy Latin music) and Mark whistles along. The remote play continues and Mark starts talking to the researcher.

In this event Mark's visible behaviour is "whistling along" and he seems to do so while listening to the remote music. It is clear that Mark is not concerned with locating the provider. Still, we interpret the event as a positive experience for Mark.

Thus, Sound Pryer can provide an interesting experience without the subjects seeking to discover the source of music, however such occasions were few in number. There were only six examples where the drivers enjoyed listening to remote music *only* and did not try to identify the source at all. This could, of course, be explained by the fact that it is hard to tell whether a subject is listening to and enjoying music. It could very well be the case they would be doing it without showing it. The rather poor audio quality of Sound Pryer was probably another reason why there were so few such events.

6.3 Looking Around and Paying Attention to Music

The most complex behaviour occurs in events where the driver looks around in conjunction with displaying some emotional attitude vis-à-vis the music.

In the following example, John approaches an intersection with traffic signals and stops his car. His local play jumps to the next song on the playlist. Remote play commences and jazzy music fills his vehicle. He glances at the screen and in the rear-view mirror. He smiles and says, "now we didn't get to listen any more," as his own music is interrupted. He leans forward to get a look in the mirror. He continues to look carefully in the rear-view mirror as he gets a green light and proceeds out of the intersection. He looks out towards the other lanes. After half a minute of remote listening he says: "strange tune" and laughs.

Here we interpret John's comment "strange…" and him laughing as some sort of engagement with the music. Furthermore, we cannot be sure that the provider was identified, but he was looking for it. Hence, he is showing some sort of attitude towards the music and he is curious about its source.

All in all there are fifteen such events. This indicates that Sound Pryer is not only about looking for who is providing music, though that was the dominating category of events. Knowing the source, or at least looking for it, contributes to the experience of listening to someone else's music.

6.4 Disregarding Sound Pryer

In 67 events Sound Pryer was ignored. This was due to two principal reasons. First, we suspect there were occasions where the driver did not engage in looking at Sound Pryer due to poor prototype performance. In some events the negotiations were 'lost' i.e. local play was interrupted with a couple of seconds of silence instead of music from a remote source. This occurred mostly in situations where the cars quickly passed in and out of wireless range, e.g. when meeting someone in the opposite lane. In any case, the silence was probably experienced as a long pause in local play rather than a failure of joint listening with some remote source, and the user did not bother to look at the screen. Second, drivers "time share" their attention and manage their focus to fit the current situation. Naturally driving had top priority and Sound Pryer was ignored when the driver was performing complex manoeuvres such as turning or co-ordinating with traffic. Furthermore, in several cases the drivers did not bother to look at the display when they were talking with the researcher. Thus the drivers here prioritize their focus of attention much like how previous research has described the way drivers handle and talk in mobile phones (Esbjörnsson and Juhlin, 2003). The design of Sound Pryer apparently allows drivers to leave it unattended if other things are prioritized.

7. Analysis of Interviews

The questions in our interview concerned four themes: the capability of the prototype, concept comprehension, the experience of service and traffic safety. Twelve drivers were interviewed directly following the field trial. The interviews were loosely structured and were conducted by five different researchers. A loosely structured interview has the advantage of letting the researcher investigate issues raised by the individual participants. In this case, we wanted to collect as many comments as possible about the system, rather than comparable results from the interviewees. All the researchers had a common set of topics to cover, but they also had the freedom to skip any deemed irrelevant to the test subject's experience. This means that not all the participants answered all the questions, and therefore we show the answer frequency in conjunction with each question.

7.1 Capability of the Sound Pryer Prototype

It was discouraging that out of the twelve drivers interviewed, ten complained about the quality of the audio in remote play sessions. Also, in line with such criticism, a further two users were negative in more vague terms towards the technical performance of the prototype. Thus, the prototype was marred by some deficiencies in sound reproduction. The problem was mainly due to three technical issues. First and foremost, weak computer processing timing together with wireless network transfer problems, such as lost data frames and transfer delay, sometimes inflicted short breaks and noise in the reproduction (i.e. playing) of many remote play sessions.

Further, the negotiation performed by auto mode sometimes introduced short pauses in the audio. Consequently a user sometimes heard music come on and off a few times until it settled into either remote or local play. In total, four users noted that they were concerned about this issue.

Finally, the handheld devices together with the loose speakers used in the setup by no means constituted a hi-fi sound system. A couple of users commented that the audio quality was poor by their standards, even when there was no streaming, i.e. in local play.

In some cases, although Sound Pryer did deliver acceptable quality sound in remote play, the sessions were experienced as too short. All in all, five users commented that they wanted to hear more of the music they received in some traffic encounters.

On the other hand, from the video analysis we know that almost all users had at least one remote play session of acceptable quality that yielded a good enough listening experience of appropriate length. And although only four users explicitly stated, while talking about performance, that they also experienced transfers of good quality, we are confident that the prototype was able to demonstrate the concept well enough for them to give constructive feedback on its design.

7.2 Understanding the Sound Pryer Concept

All the users expressed that they could determine when remote play commenced. Furthermore, five users could also describe that it happened whenever they were in the proximity of another car with Sound Pryer. Finally, four users made reference to the moment the eavesdropping commenced by describing which cars they had encountered:

> *"Red station wagon, yellow station wagon, silver-ish station wagon, small blue car. I think they were the ones I noticed."*

Three users stated that they quickly learned which other cars were involved in the trial and therefore could determine the music source quickly without looking at the display. However, ten users had experienced some situations where this was difficult and where they felt unsure where the music was coming from. For example:

"Yes, absolutely! Several times. The first time I thought it was the car behind me, but it was probably the car in front. Then, since I didn't know whether there were three or more cars in the trial, I was of course uncertain."

When asked whether the display was helpful in understanding the source of the music most users were ambiguous. They noted that it was helpful in most situations. But some users had experienced or thought of situations where it did not help much such as:

"Yes, a little. I mean if I'm in dense traffic then 'red car' is not enough because there are so many around."

Accordingly, three users noted that it was hard to pick out the source when there were several similar cars in the surrounding. Also, two users found it difficult to understand when the car was out of sight, for instance, or when a particular source was far away or otherwise obscured. And finally, two users found it hard to identify the cars because it was dark; colours did not show very well at a distance.

7.3 The Experience of Using Sound Pryer

Nine drivers enjoyed listening to other Sound Pryer players. A typical comment was:

"I liked one tune. I don't know the band, but it was rap. It was groovy when we entered the last turn. It was cool to listen to some rap music. I found that really cool."

Four users also claimed they enjoyed trying to determine the source of the music. For instance:

"It was a little choppy in the beginning, but then when you could hear the music it was fun to listen to somebody else. It was fun to be able to see on the display what the car should look like, because then you could look and see if there was anyone around: yes it has to be that car! Then you could figure it out."

However, because of the prototype's technical deficiencies, three users stated they could not describe their impressions of what the concept is supposed to be:

"It can't be done really. The experience was of it being exciting as soon as you were approaching somebody. Since it didn't work the way it was supposed to, or the way I suspect it should work, it is a little hard."

No user approved of the other participants' music preferences. Still at least two users could make out which tune had been received. For instance:

"I don't really know what it was. It was some 'Depeche Mode' and some obscure synth music. Then there was some more common 'Boney M' and something else. Ordinary music, so to speak."

Remote play interrupted local play whenever there was an external source available, and in line with the comments above, eight users found this principle fun. However, six of them also wished to have a little more control, for instance the possibility to override the automatic selection and only hear songs from the playlist. Remote play also means that sometimes others can hear what you are playing. When asked about how this felt, four users claimed they did not think of this as either fun or intimidating. For example:

> *"Didn't think much about it. On the other hand. Don't know. Nothing that I care about really."*

Another six users expressed that they enjoyed this aspect. For instance, a user describes his feelings when realised he was streaming music to another user:

> *"It was really a spontaneous reaction, I must say. It was not like I was sitting there thinking: I wish my music would come on soon. Rather it was like: 'yes' now we are listening to mine."*

A closely related question we asked the users was whether they were willing to distribute music to surrounding cars as demonstrated by Sound Pryer. All the users who were asked this question, which amounted to eight people, had no problem with this at all. One user explained:

> *"Because music is nothing controversial. You're not sitting there listening to something others won't feel good about."*

Finally, we asked the users whether they found the Sound Pryer concept interesting. Encouragingly, out of the twelve answers we collected nine said it was a fun concept. As one user noted:

> *"Absolutely, I think. If you just get it properly organized why not? It is completely new and I haven't even heard that it was possible to do it before."*

Only three users rejected the idea. Their objections had to do with using the prototype for entertainment. They were looking for something that would make a more practical, functional improvement in their lives.

7.4 Driver Safety

When asked if the Sound Pryer prototype interfered with their driving, seven subjects said it did not. On the other hand, three of them acknowledged some sort of impact on their driving, but considered "interference" to be too strong a word. Similarly, another three users described an impulse to drive a little differently than they normally would do. For instance:

> *"One time I drove to try to get away from it just to see when you lose contact with that car."*

Finally, only three users objected to Sound Pryer and claimed that it interfered with their driving.

8. Summary

Despite a somewhat artificial field trial with a flawed prototype we were able to collect valuable insights and feedback on its design as well as the general concept. In the below, we summarize these key findings from the trial:

- The video analysis and the interviews indicate that the users understood that Sound Pryer is about providing joint music listening in traffic while at the same time making them aware of other users.
- Users seldom enjoyed remote music while ignoring where it was coming from.
- Hearing or providing remote music was enjoyable when it was possible to see who was receiving or broadcasting it.
- Looking around for the provider of music was enjoyable, and seemed to compensate the poor audio quality and only hearing snippets of songs.
- Many users used the shape and colour ‘hints’ when looking for the source vehicle. Hence, providing awareness of users contributes to the experience of mobile music sharing.
- A minority of the users also experienced situations where the graphics were insufficient to determine the source of music. Such situations occurred e.g. when there were many similar cars around and when it was dark.
- Problems determining the source of the music could also be due to Sound Pryer playing remote music from sources that were out of sight. This means that the range of the wireless transmitter did not always reflect the users being visible to each other.
- The prototype needs improvements in order to better implement the Sound Pryer concept. These improvements concern audio technical issues e.g. switching between local and remote sources and transferring music data.
- Poor switching performance, such as when meeting cars in the opposite lane, was particularly detrimental to the experience of using Sound Pryer, as it caused users to disregard it.
- Sound Pryer is not dangerously distracting. The video analysis showed that drivers did at times ignore the prototype to cope with driving, e.g. when turning in a busy intersection. The interviews confirmed that Sound Pryer did not interfere with driving.
- Sound Pryer does not invade privacy. In the interviews no users stated that it was particularly intimidating to reveal the shape and the colour of their car, and a majority of the users were willing to distribute music in this manner.

9. Conclusion

In this paper we have explored a novel approach to mobile music sharing. We propose the concept of joint music listening for drivers near each other.

Furthermore, we have presented the Sound Pryer prototype implementing this concept. An extensive field trial shows that the participants enjoyed the concept and particularly the awareness hints Sound Pryer provides to help locate users in the surrounding traffic. On the other hand we have also uncovered some performance shortcomings which need to be addressed in order to better implement the concept. These shortcomings mainly concern aspects of transferring audio information.

Our work on Sound Pryer draws on two activities that drivers already perform to entertain themselves. The first is listening to music. The second is a flaneur-like behaviour that it is our conviction that drivers enjoy, i.e. forming visual impressions of fellow drivers and their vehicles apart from the minimum required to co-ordinate smooth traffic flow. Despite a flawed prototype, the field trial showed that users often wanted to know the source of the music, and that seeking it was particularly enjoyable. We argue that hearing someone else's music gives an additional reason to look around. Therefore this experience is still very much visually oriented, i.e. the kicks are in *seeing* who is providing music. Similarly, flaneuring, as we have described it above, is also essentially visually oriented. Hence we have good support for our hypothesis that drivers enjoy forming impressions of other drivers and their cars.

This conclusion is somewhat contrary to contemporary social theory on listening to music and driving. Michael Bull recognizes that driving (in traffic) is essentially an *accompanied* enterprise, but puts particular emphasis on *solitude* as something much desired [6]. More precisely, he argues that the car realizes the "… desire of urban citizens to maintain a sense of privacy, to create a mobile bubble, while on the move." Furthermore, driving a car is the "… dominant means of escaping the streets…" He argues accordingly that the places travelled though become uninteresting, and listening to music "… appears to bind the disparate threads of much urban movement together..." We agree that driving is an accompanied solitude, but the emphasis is on 'accompanied' and not so much on 'solitude.' Driving is a social practice, and the fellow drivers with their vehicles constitute an ever-changing scene which gives practically endless inspiration and delight for the modern driver-flaneur. Jointly listening to music adds to his or her experience in a positive way, bursts the "mobile bubble" and makes driving less detached, yet without invading privacy.

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References

Appleyard, D., Lynch, K. and Myer, J. R., 1964, The View from the Road, M.I.T. Press, Cambridge, Massachusetts, USA.

Åkesson, K.P. and Nilsson A., 2002, Designing Leisure Applications for the Mundane Car-Commute, *Personal and Ubiquitous Computing*, Vol. **6**, No. 3, Springer-Verlag, London.

Baudelaire, Charles, The Painter of Modern Life, written 1859, Quoted from Mazlish, Bruce, "The Flâneur: from spectator to representation", in Tester, K. (ed.) *The Flâneur, Routledge*, London, 1994.

Brown, B., Geelhoed, E. and Sellen, A., 2001a, The Use of Conventional and New Music Media: Implications for Future Technologies, *Proc. of INTERACT '01*, Tokyo, Japan.

Brown, B., Geelhoed, E. and Sellen, A., 2001b, Music Sharing as a Computer Supported Collaborative Application, *Proceedings of ECSCW'01*, Bonn, Germany, Kluwer Academic Publishers, pp. 179-178.

Bull, M., 2004. Automobility and the Power of Sound. In *Journal of Theory, Culture and Society*, Volume **21**, Issue 4, SAGE.

Esbjörnsson, M., Juhlin, O. and Östergren, M., 2003, Motorbikers Using Hocman - Field Trials on Mobile Interaction. In *Proceedings of Mobile HCI '03*. Springer Verlag, pp. 32-44.

Esbjörnsson, M., Juhlin, O. and Östergren, M., 2004, Traffic Encounters and Hocman: Associating motorcycle ethnography with design. In *Journal of Personal and Ubiquitous Computing: Special Issue Mobile Human-Computer Interaction*, Volume **8**, Springer Verlag, pp. 92-99.

Esbjörnsson, M. and Juhlin, O., 2003, Combining Mobile Phone Conversations and Driving - Studying a Mundane Activity in its Naturalistic Setting, *Proc. of ITS*, Madrid, Spain.

Heath, C. and Hindmarsh, J., 2002, Analysing interaction: Video, ethnography and situated conduct, in May, T. (ed.) *Qualitative Research in Action*, London, Sage 2002.

Hindmarsh, J., Heath C., vom Lehn, D. and Cleverly, J., 2002, Creating Assemblies: Aboard the Ghost Ship, in *Proceedings of CSCW 2002*, Nov. 16-20, New Orleans, USA.

Kortuem, G., Schneider, J., Preuitt, D., Thompson, T., Fickas, S. and Segall Z., 2001, When Peer-to-Peer comes Face-to-Face: Collaborative Peer-to-Peer Computing in Mobile Ad hoc Networks, Proc. *of International Conference on Peer-to-Peer Computing*, Linköping, Sweden.

McCarthy, J. and Anagnost, T., 1998, MusicFX: An Arbiter of Group Preferences for Computer Supported Collaborative Workouts, *Proceedings of CSCW '98*, Seattle, Washington, USA.

Öblad, C., 2000. *Using music - on the car as a concert hall*. (Att använda musik - om bilen som konsertlokal.) Ph. D. Dissertation, University of Göteborg, Sweden, ISBN 91 85974 59 - 5.

Östergren, Mattias., 2004, Sound Pryer: Adding Value to Traffic Encounters with Streaming Audio, *Proceedings of ICEC 2004*, Eindhoven, The Netherlands, pp. 541-552.

Wiberg, Mikael., 2004, FolkMusic: A Mobile Peer-to-Peer Entertainment System, *Proceedings of HICSS '37*, Honolulu, Hawaii, USA.

PART 5

MUSIC AND DANCE

Chapter 10

DIGITAL DANCE HALL: THE FAN CULTURE OF DANCE SIMULATION ARCADE GAMES

Jacob Smith

1. Introduction

This essay is an examination of music video games and their fan cultures, focusing on *Dance Dance Revolution* (DDR), and *ParaParaParadise* (PPP): Japanese "dance-simulation" arcade games that have developed active and diverse fan followings around the world. The fan communities that surround these games demonstrate some of the ways in which digital technologies are helping to shape how people interact and socialize around music. When seen from the standpoint of digital gaming, what is notable about these games is the way in which they use music and rhythm as a novel form of interaction with images on the screen: dance creates a new relationship between game-play and the player's body. In terms of the study of popular music, music games such as these allow for the investigation of some key issues in pop music and cultural studies: the global flow of musical cultures and identities, the interaction of sound and image in new media, the role of sound and music in the creation of interactive digital environments, and the nature of fan engagement with media texts. As we look to the future of popular music, music video games might offer models for how music and dance can function in a global, digital mediascape.

Because one of my primary subjects is DDR fan culture, my methodology has largely been an analysis of the discourse found on Internet websites. Kirsten Pullen (2000) has described how, while the academic study of the media audience has often turned its focus to fan communities, few studies have "considered the implications of the World Wide Web for this sphere of activity" (p52). Her study of online fan communities dedicated to the television show *Xena: Warrior Princess* illustrates how the Web has "mainstreamed fandom," making it more readily available to a

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 193–209.

wider community (p56). I hope this article might further the study of Internet fan communities, as well as offering insights into the dynamics of the fan cultures of popular music and digital gaming. As I will demonstrate, the use of music and dance in DDR, combined with access to an international online community of players, helps to shape fan experience in distinct ways.

There are numerous DDR websites hosted by fans all over the world, and they contain a phenomenal amount of discussion about the game and its music. Most fans will agree that the preeminent website is the US-based ddrfreak.com, and much of my study is based on the discussion forums found there. Some of the most prominent *ParaParaParadise* websites are paraparastage.com, paraparaonline.com, and neoparapara.com. In addition to information and discussion about the game, many of these websites feature digital videos of fans playing the game, providing rich texts for the examination of performance style. These videos are often taken from locally organized DDR tournaments, some of which I have attended in my hometown of Bloomington, Indiana. I have also clumsily played the game myself, but can't claim to be a regular or even competent player. In fact, while I take great pleasure in watching and listening to others play the game, I find playing it myself to be remarkably difficult. This only increases my admiration for the skills of the typical "DDR freak," and also underlines one of the notable aspects of both DDR and PPP as arcade games: their tendency to draw crowds and so turn game-play into a public performance. As such, DDR and PPP have some important precursors in both karaoke and certain aspects of the Japanese hip-hop scene. A discussion of these forms will establish a theoretical and historical foundation for my examination of the cycle of Japanese music video games of which dancing arcade games are a part.

2. Karaoke for the Feet

DDR is sometimes referred to in the popular press as "karaoke for the feet," and both in terms of its technology and the shape of the social interaction around it, karaoke is an important predecessor. Karaoke originated in 1972 in the western Japanese city of Kobe "when a bar owner who could no longer afford to pay bands to entertain customers began using tapes of popular songs without vocals to accompany singers he hired" (Drew, 1997: p450). Soon customers were taking turns as well, and in a decade karaoke had become a global pastime, making its public debut in the US in 1983 (Lum, 1999: 167). Karaoke singing has been the subject of some rich cultural analysis. This has frequently emphasized its global nature, examining how karaoke performances change in different cultural contexts with the influence of local popular musics. Rob Drew's (2001) ethnographic examination of American karaoke culture, *Karaoke Nights*, contains numerous insights concerning the way in which cultural ideas about performance, gender and community are reflected by and embodied in the karaoke performance, many of which will become pertinent in my descriptions of DDR-play below.

In addition to the social organization around the game, DDR also shares important aspects in common with the karaoke apparatus itself. Johan Fornas (1999) describes karaoke as a "polystratic" form: that is, one comprised of multiple layers of interacting "texts:" written lyrics, musical sounds, pictorial images and the sung performance itself (Mitsui, 1999: p120). Karaoke leaves a gap in which the performer's voice restructures the surrounding layers of media. That gap allows the singer to enter into the text, affording "opportunites for forms of meaning-creation:" "When entering the voids in the music, the karaoke performers bring along their own voices, laden with subjectivity. They sing in styles and to recordings over which they have no autonomous control, but their voices none the less express something unique that makes each performance special" (p132). In this way, karaoke is a model for media interaction, for which it has in fact become a kind of generic term.[30]

Like karaoke, the cycle of music games that includes DDR and PPP have their origins in Japan, and an examination of the Japanese hip-hop scene will illustrate the role of dance in the global flows of culture. Ian Condry (2001) discusses how hip-hop's influence in Japan came primarily via breakdance (Condry, 2001: p227). In 1983 the hip hop movie *Wild Style* was shown in Japan, and subsequently set off a nationwide interest in breakdancing (p228).[31] This primacy of dance can be contrasted to the United States where the lyrical content of rap has often been the focus. In Japan, the "street level" lyrics of gangsta rap were never as central to its popularity, and in the Japanese "party rap" style, these conventions are completely discarded: "Party rap tends to have light, funny lyrics that speak of themes from everyday life (e.g. video games, dating, teenage love songs)" (Condry, 2001: p177). The diminished importance of lyrics in the Japanese context is accompanied by the heightened importance of dance. Condry, discussing the importance of breakdance in Japan, writes that "a striking feature of global flows of popular culture…is that dance – movement of the body – moves easily across linguistic and cultural boundaries, and that movies and videos are a primary channel for this exchange" (p229). The importance of dance and the movement of the body offers an interesting revision of dystopian views of globalization like those offered by Marc Auge. Part of Auge's description of the a-local, a-social "non-place" is that it is a place without language, where one "communicates wordlessly, through gestures" (Tomlinson, 1999: p109). While Auge is thinking about interactions on highways, in waiting rooms or with bank machines, this emphasis on gesture as particularly amenable to global flow is echoed in less pessimistic tones by Japanese breakdancers.

[30] For example, an April 2, 2000 article by Wilborn Hampton in the *New York Times* describes a new exhibit in the London Shakespeare's Globe theatre as "Shakespeare Karaoke:" "you choose from one of eight plays to act in. The monitor scrolls through your lines, then you're allowed a practice run-through. When you're ready for your take, you punch a button and a voice gives you a cue. You deliver your line, punch a button again and your invisible co-star responds. At the end you hear a playback of the scene."

[31] Condry notes that the appeal of breakdancing was in part its "combination of aggressive showmanship without the violence of fighting. It is a dance form where one competes in a very masculine way" (228).

3. Playing Music

The party rap style described above is a key feature of Masaya Matsuura's trend-setting 1997 music video game *Parappa the Rapper*, which used music and rhythm as a game mechanic. Parappa, a two-dimensional dog (see figure 10-1, is taught how to rap by a series of whimsical masters such as Chop Chop Onion Head. The game uses a model of rhythmic interaction similar to the 1974 Milton Bradley game "Simon:" players hear and are shown a rhythmic pattern and then must duplicate it by pushing buttons in the correct rhythm. Matsuura followed *Parappa* with *Um Jammer Lammy*, in which the player controls a guitar-playing lamb in an all-female rock band called Milk Can. In addition to a recent Parappa sequel, one of Matsuura's most recent games, still unavailable in the US, is called *Vib Ribbon*, and features a rabbit that rides on sound waves that can be produced by the sonic contours of the player's own choice of CD.

Figure 10-1. The character Parappa

Parappa set off a cycle of music games that has become a notable genre in the landscape of home video games, some examples being Sega Dreamcast's *Space Channel 5*, PlayStation 2's *Britney's Dance Beat* and *Walt Disney's Jungle Book: Rhythm n'Groove* and the Nintendo Game Cube title *Donkey Konga*. In most of these games, the player pushes buttons in time to the beat, and so controls the dancing of a character on the screen (known in the gaming community as the player's onscreen avatar). Another recent game, *FreQuency*, created by the US-based Harmonix Group is also based on the Simon model of game-play, but adds new features and levels of complexity. For example, the game includes a re-mix mode where players can create their own mixes of music from banks of sounds, or work with tracks made by artists like Orbital and The Crystal Method. *FreQuency* also features a striking visual presentation, as game-play proceeds down a psychedelic three-dimensional tunnel (see figure 10-2). A review at Gamepro.com describes how this helps make the game enjoyable for spectators: "[Players] can't look at the geometric, rave-worthy backgrounds or you'll miss a cue, but your friends watching over your shoulder will tell you how gorgeous and psychedelic the visuals are." Those stunning visuals help to encourage the social dimension of playing these home games: its fun just to hear the music and watch the visuals. A sequel to *FreQuency* called *Amplitude* includes the ability to "jam" online with other players and features the music of well-known performers like David Bowie, Pink, and Run DMC.

Figure 10-2. The game frequency

A series of games made by the Benami division of the Konami company also used music and rhythm as the game mechanic. These included *BeatMania*, where players scratch hip hop turntables in time to the beat, *Mambo a GoGo* where they shake maracas, *Taiko no Tatsujin* which features two Japanese Taiko drums, *KeyboardMania*, and *GuitarMania*. These eye-catching machines turn the player's body into a spectacle, gathering crowds and helping to revitalize an arcade economy competing with "the increasing sophistication of home video and online games" (Tran 3). It was in this context that *Dance Dance Revolution* debuted in Japanese arcades in October 1998 and sparked a national sensation. It began appearing in US arcades a few years later, where national press stories sometimes framed it in contrast to first-person shooter games and by extension the issue of teen violence typified by the Columbine shootings (Tran 3).

4. Dance Dance Revolution

DDR game-play begins when the player first selects a skill-level and one of several characters who will dance on the screen along with the player's performance. Next, the player scrolls through a large selection of songs and chooses the one to which she will dance. During game-play, the song will be blasted out of large speakers in the game console (see figure 10-3), which makes the DDR machine a kind of interactive digital jukebox. Notably, instead of playing the Top

40, the DDR jukebox plays a selection of international music one can hear nowhere else. This music plays a large role in the DDR fan experience, and each new version, or "mix" of the game is accompanied by a much-anticipated new song list. Fans discuss their favorite and least favorite songs, scour the Internet for information about obscure DDR performers, swap the music online, and listen to it throughout their everyday lives, helping to create an all-encompassing fan experience. The DDR playlist includes Japanese interpretations of rap and disco by the Konami sound team, as well as European dance music from the compilation series Dancemania. Featured artists include Mauro Farina from Italy, E-Rotic and Captain Jack from Germany, and Thomas Howard, a US ex-patriot living in Japan.

Figure 10-3. The DDR console

Closest in style to techno, DDR songs are like short, hyper-poppy spurts of house music. Indeed, DDR fans have posted to complain that they are sometimes mistaken for ravers: they are offered fliers for raves and even MDMA while playing DDR. But if disco and rave culture are often about creating a seamless flow of groove over large stretches of time, DDR music is a techno soundbite. DDR songs are extremely short: between a minute and a minute and a half long. Some fans post to say how the short length of DDR songs has made "real music" feel interminably long: "I went into a coma last month after listening to a song that exceeded 3:15." The DDR jukebox also features re-makes of disco classics from the 1970s, although there is occasionally a condensed version of an original recording, like KC and the Sunshine Band's "That's the Way I Like It," and (inexplicably) the Specials' "Little

Bitch." But more common are re-makes of songs like Olivia Newton-John's "Have You Never Been Mellow," and the Village People's "In The Navy." This is disco read through the same cultural filter that turned hip hop into Japanese party rap: songs like "In The Navy" lose all their associations with an underground or gay subculture, instead being accompanied by surreal military images in the animated music videos that accompany each song. DDR music is techno without the rave, disco without the sex. It's bubblegum music in the best sense of the word: pure sugary pop.

Music is not the only sound in the DDR experience: a pre-recorded crowd alternately boos or cheers depending on the player's performance, and an announcer provides encouragement or derision. The announcer's comments are the source of much online discussion, their enthusiastic and awkwardly translated quality providing a campy pleasure. If a player is doing well they might hear "Your dance is like sunshine on a cloudy day," or "I see tomorrow in your dance, we can call it Our Hope." If the player is doing poorly they might hear "Are you a monkey?", "Please do not make me sad anymore," or "Did you have breakfast today?" The response and announcer comments are notable in terms of interactivity, in that they give DDR players the sense of a heightened participatory relationship with the game: their performances trigger behaviors and responses from the game itself.

Once the level of difficulty and song have been chosen, one plays the game by watching arrows on the screen that direct the player to touch corresponding dance pads with her feet. The player must coordinate her steps carefully so that she steps on the correct arrow pad at the same moment that the image of that arrow locks into place on the screen. This takes a lot of coordination and effort, especially on higher levels of difficulty, where the arrows scroll up the screen at a breakneck speed. Scoring is determined by how exactly the player's steps match the arrows. Depending on the player's timing, one can get scores like "Perfect!", "Great!", or "Miss!" At the end of each song the player is given a rating based on her stepping accuracy. The dance pads light up when they are to be pressed, recalling the lighted disco dance floor of *Saturday Night Fever*. The feel of the pads is important for scoring in the game, but also for the sheer tactile pleasure of their engagement. This is indicated by online discussions of fans that build their own pads, and even of the role of pads in fan's dreams. In a ddrfreak.com thread called "Ever Dreamed about DDR?", it was consistently the feel of playing the game that entered the subconscious of players: players dreamed of being on "this really weird machine where…the pad was built on layers of foam so it was really shaky," or pads that "wobbled," or were "like a trampoline."

5. DDR Freaks

As in karaoke, the DDR player's performance fills a gap in a polystratic media presentation: in this case, with dance. It is within that gap and amidst this constellation of music, dance, screen images and characters that the DDR fan culture exists. That the gap is filled by a dancing body allows for a particular kind of diverse and global fan culture, while also creating tensions within it. The self-appointed label for the DDR fan is the “DDR freak.”[32] Players provide quite a bit of demographic information about themselves in online discussions, and in comparison with video game culture more generally, DDR fans represent a notable diversity in terms of race and gender. Though this is certainly an over-generalization, DDR garners Asian fans via its Japanese origins and connection to anime culture, white fans via video gaming, and African-American fans via hip-hop and breakdancing. For example, a highly regarded African-American player called “DJ 8-ball” writes that he came to DDR from a “DJ battle” tradition.

Much of the academic analysis of race and gender on the Internet has stressed the ways in which online identity is fluid and virtual, and so prone to a kind of “fragmentation” (Kolko, 2000: p5). This has been discussed both in terms of the virtual “cross-dressing” that occurred in online chat rooms, as well as online multi-user games like LambdaMOO that often did not require users to specify their race (Kolko, 2000: p216). Although their bodies are hidden from other users on DDR web forums, race has, to quote Nakamura, “a way of asserting its presence in the language users employ, in the kinds of identities they construct, and in the ways they depict themselves online, both through language and through graphic images” (p31). The race of players is a recurring topic on DDR discussion threads, where users often identify themselves in terms of race, and ask about the ethnic makeup of DDR fandom. DDR websites represent players not only by text and graphic icons, but also by online videos of tournament play. Because the experience of DDR is so anchored in the body, and because video images of individual players are a frequent presence in the global flow of fan discourse, race cannot disappear online. Dance in DDR game-play thus plays a double, seemingly contradictory function, both grounding the practice in the player’s body and particular identity, and making it easily amenable to global flow via the Internet. While racial diversity seems to coexist peacefully on web forums, tensions can be found when moving to the actual spaces where the game is played. The public nature of the arcade experience and the tendency for arcades to be located in parts of town that allow for a diversity of both race and class means that conflict can sometimes arise: one post describes “black people who hate white people and purposely step on the platform while you’re playing.” DDR’s nature as a public performance is thus another reason that race consistently “asserts its presence” in fan discussion.

The gender of DDR players is also a much-discussed topic. It has consistently been noted in the popular press that women form a significant percentage of DDR fans – a rarity in the video gaming community. As Naomi Wolf writes in the New York Times, “The nature of the game…makes DDR a spectator sport…and because girls tend to be socialized to become better dancers at an earlier age than boys, DDR

[32] Self-definition is a frequent activity, and many threads dispute just what constitutes a DDR freak. Typical responses are regularly posting on DDR discussion boards, dressing as characters, listening to the music when you’re not playing, taking road trips out of state to play different versions of the arcade game, spending large amounts of time and money on the game, and other extra-curricular activities such as using the DDR logo on your car.

is one of the first video games since Pac-Man to attract female players in large numbers" (Wolf, 2001: p1). Fans also recognize the female presence: "I have seen a lot more girls playing DDR than any other arcade game. I think it is great. I don't feel like I stand out anymore." The gender equity of DDR fans can be overstated. My experience at tournaments has been that women are still a minority, and while female fans are an important presence online, part of the proliferation of threads about gender involve women seeking out other regional female players that might be hard to find locally. Still, female players are a significant part of the DDR fan community, a fact due in part to the role of dance in game-play, but also to the polystratic richness of the game, a point to which I will return below.

DDR's use of dance as a game mechanic helps foster diversity in its fandom, but also creates certain tensions for some players. Since dance in US culture tends to be gendered female, male players can feel that their masculinity is threatened. Again and again, internal and external policing of DDR fan culture is in terms of masculinity. This is demonstrated by the pervasive fear expressed both by enemies of DDR, and from its anxious proponents, that there is something "gay" about this game. For male players, a way must be found to organize DDR play so as to minimize these tensions. Fan discourses seek to define the activity of DDR as either sport, game or dance, and an athletic discourse can often be seen to "masculinize" gameplay. The presentation of DDR as a sport takes several forms. First, in DDR's transfer to the US, issues of health immediately came to the fore. A typical treatment from the popular press describes DDR as "a video fitness revolution:" "the days of pale, skinny nerds wasting their free time in arcades have gone the way of the Atari 1600" (Rice, 2001: p1)[33]. This rhetoric of health has even become a part of the game: home versions have a "special workout mode," and a recent Konami press release states that "DDR Konami is the only game to get players up off the couch, dancing and laughing while burning calories" (Jan. 25, 2002). Discussions of the physical benefits of DDR and weight loss testimonials like "the incredible Dance Dance Revolution diet" are a ubiquitous presence on fan websites as well. As with other cultural imports like Yoga and Tantrism that were introduced to a health-obsessed American culture, these practices take on a "self-help" and therapeutic cast they did not have before.

DDR's social organization can also suggest athletics since individual players frequently form teams. Rob Drew (2001) discusses how karaoke performers often begin to act as a performing team: "group members collaborate in appealing to the audience, synchronize their movements in relation to the audience, evaluate one another's conduct from the perspective of the audience" (Drew, 2001: p76). Teams

[33] "A defining characteristic of video games has long been their high couch-potato quotient. The only exercise a person could expect to get punching buttons and moving a joystick was the kind of wrist workout that put them at risk for repetitive stress injury. Playing the video game called Dance Dance Revolution, however, is nothing less than a full-body aerobic activity…imagine a Stairmaster powered by quarters…for the past several years, exercise machines have incorporated an increasing number of video-game elements. Now the arcade has begun to reach out in the other direction" (Wolf, 2001: p2).

help karaoke performers through what can be a frighteningly public solo performance. DDR teams seem to function similarly, and many fan websites are run by, and organized around regional teams. Indeed, despite its global popularity, much of DDR fan discourse is tied to regional identity: on the forums of ddrfreak.com, there are fifteen regional discussion boards for different sections of the US, as well as the UK, Australia, Latin America and Europe. Regional teams are thus another way in which DDR fan culture maintains a complex tension between the global and the local. So while teams have a social function, and help ground this global form in local practice, they also help to cast DDR game-play in athletic terms.

Another way in which an athletic discourse shapes the social organization of DDR is that teams compete at tournaments. Tournaments are advertised on websites and by fliers at local arcades (see Figure 10-4). Players compete, sometimes as a part of a team, for significant prizes like a home version of the game. Tournaments are important social meeting places for fans: "the reason the tournaments are...held is mainly not because of the tournament itself, but for getting together and meeting a few new people." This sense of comeraderie can be glimpsed in a post called "My first Tournament experience:" "After the song finished everyone clapped for me. That's what they do after everyone's routine anyway, but I didn't feel so bad. I got a pat on the back and some hi-fives from a lot of people, even though I kept tripping out on how bad my first routine was."

Figure 10-4. Poster advertising DDR tournament

While tournaments help form social connections among players and provide the opportunity to show off one's skill, they also help to athleticize and so masculinize the dancing of DDR. This is reflected in the different ways male and female players talk about tournaments. Both men and women on the boards tend to agree that women lag behind in terms of scoring. When describing their own scoring, women tend to be self-depreciating: "I'm getting better just need a lot more practice." Women also seem to be more reluctant to take part in tournaments: "Although she will claim she sucks so that she can try to weasel her way out of competing in tournaments…Tanya…is one of our resident DDR Pros." Some posts by female players denounce the competitive nature exemplified by tournament play: "you know I know games have competition involved too but not everyone is playing games to show off and what not. Me, I just like playing the game and that's what bothers me when those others are behind you waiting to play and making comments on what song you choose or what level you are doing it on."

One reason women tend to feel less comfortable in the context of tournament competition reveals similarities to karaoke performance. Karaoke's context in a bar made it a potentially troubling place for women to present themselves as a spectacle. In an ethnographic study of karaoke performance, Drew (1997) notes that it is "not uncommon for men to approach women immediately after they [perform], praising them obsequiously with the apparent aim of parlaying an extended encounter" (p455). Women find ways to minimize these tensions, often performing as a group or as a pair. DDR's location in the arcade has a similar dynamic, and women post about feeling uncomfortable doing the fast, jerky high-level dances in front of a crowd of ogling teenaged boys. One solution is to dance in pairs, and in my experience viewing Internet videos of tournaments; women appear most frequently (thought certainly not only) in pairs.

6. Dance for the Crowd, not the Machine

The tournament seems to be of particular interest to the male demographic of DDR fans for whom its athletic nature helps to masculinize dance. But while athletics is an important filter through which the DDR community sees itself, it is limited: online discussions declare that DDR is not simply a sport, that DDR is "more than a game." The "more than a game" trope appears consistently in the comparison of tech and freestyle playing. Tech play is when the goal is to get a high score. Freestyle is when the dance pad is used as a stage on which to present an original performance routine. Tournaments are often separated into Tech and Freestyle categories, with each being judged by different criteria. In the DDR community, there is a definite qualitative distinction made between the two: freestyle is the pinnacle of DDR performance, often distinguished by the moniker "real dancing". A typical post makes a distinction between the "technical dancers" and the "real dancers [who] only play for the joy, excitement and the art of expressing their own style…POWER TO THE PEOPLE WHO ACTUALLY DANCE WHEN THE [sic] PLAY DDR!"

This denigration of game play seems to reinstate certain high brow/low brow distinctions that separate art (dance) from recreation (games). But the elevation of dance, in particular "freestyle" dance, allows for an amazing array of active, creative and productive behavior on the part of players. Freestyling is defined as a kind of creative and individualized expression: a renown California freestyler named Mel B. writes that "Freestyling is almost like interpretive dance…like putting yourself into the game. It's being creative, doing something that KONAMI ™ wouldn't tell you to do in their instruction guide." Freestyling is distinguished from "gaming" by use of the upper-body (which is not required to score points) and by facing the crowd and not the screen (a recurrent slogan being "Dance for the crowd, not the machine"). Players memorize the steps to songs and learn them backwards so that they can turn and face the crowd (this has become institutionalized in home versions of the game that include a "mirror mode" that turns the steps backwards.) This injunction to "dance for the crowd" points to one of the most distinctive aspects of DDR as a video game: the positioning of the player's body as the site of public performance. Crowds tend to gather around the game, and the player becomes a public spectacle. For players then, the crowd and DDR's nature as a public performance are a large part of the appeal, helping to foster the priority given to the real dancing of freestyle performance.

Many DDR websites offer tips and guides to doing a freestyle performance. Novices visiting DDR websites encounter huge dictionaries of freestyle moves with names like the Matrix walk (where "the dancer jumps up and briefly runs across the screen of the machine and jumps back down"), the Bar vault (jumping over the bar), the hand stand, the knee drop, and the hand plant. Many of the moves used in freestyling hail directly from breakdancing and hip-hop culture, and there are multiple discussions of whether there is room on the DDR platform to do the "head spin" (a trademark of breakdancing). While individuality is prized by the DDR community, learning to freestyle is largely a matter of watching others do it. When newbies ask for advice they are usually directed to the copious banks of tournament video footage available for download on the Web. Here we see again the importance of the visual for the global transference of dance. As with the transfer of hip hop to Japan, dance can bypass language barriers and seems to flow particularly smoothly in a global context with the aid of Internet technologies. For example, a DDR team from South Korea called the A-Team, and Jason Ho in Japan attract comment by players all over the US. These videos also ensure that race keeps "asserting itself" on the online fan discourse, enabling a complex tension of global flow and individual identity.

Although drawing primarily on hip-hop culture, freestyling allows for a wide-range of activity. Two examples of alternative approaches to freestyling are the use of comedy and costumes. Freestyler Mel B. states that comedy is "making its way into routines," and refers as an example to another California freestyler known as Chango: "He doesn't dance worth a damn. He smashes vegetables and other food products on stage. He cusses like a sailor. And yet he gets love from every corner of the DDR community…the judges and spectators are often entertained by his hijinks [sic] and with his tactics, he can waltz his way into the winner's circle." Similarly, Rob Drew (2001) describes one response to the pressures of public karaoke performance is the karaoke "clown," whose antics help participants to convince themselves that they can give it a try (p47).

Another form of freestyling involves dressing as the characters on the screen – commonly referred to as "cosplaying." Cosplay originated in Japan as a feature of anime (Japanese animation) fan culture. Cosplayers dress as their favorite anime characters, often in costumes they have designed and made themselves. They meet at anime conventions where they show off their costumes and are photographed for websites (see figure 10-5). The website methodcosplay.com defines the practice like this: "To some, it's an art. To some, it's a profession. To all, it;s pure bliss. Cosplay is the act of creating and/or masquerading as an anime or manga character. The word originated in Japan as a shortened version of 'costume play.' Now, cosplay has spread like a wildfire in America and other places across the globe, with the popularity of anime and manga and the conventions that celebrate them." This practice becomes possible for DDR fans because of the presence of anime-like characters on the DDR screen. The openness of freestyling thus allows for many different fan cultures to coexist, not only a competitive, hip hop-derived form, but also an Asian and largely female tradition of cosplay.

Figure 10-5. A DDR Cosplay dancer

7. ParaParaParadise

Some of the dynamics of gender, interactivity and dance are also reflected in the fan community that surrounds the Konami arcade game *ParaParaParadise.* The striking thing about PPP in terms of player interactivity is that scoring is not determined by activating pads with the feet as in DDR, but through triggering infrared sensors with the hands. Also, although it was released in the wake of the success of DDR, PPP has a more tangible connection to pre-existing dance cultures. Indeed, Dominique Dinh, one of the webmasters of paraparastage.com, told me in an email interview that "the game is only a novelty, the dance came before the game."

The dance Dinh refers to is "para para," which had its origins in Japanese disco subcultures of the 1970s. At the website paraparastage.com, one is informed that the first "paralists," or para para dancers were women whose style of clothing and makeup were considered "more outrageous than most at the time." Their dance style involved a steady back-and-forth foot movement, coupled with complicated, choreographed hand movements. Para para has enjoyed several revivals, some spurred by its association with Japanese pop (J-pop) singers, as well as its connection to specific Japanese dance clubs like TwinStar and Velfarre. Konami released the game *ParaParaParadise* in 2000, banking both on a revival of interest in para para dancing and the success of DDR in Japanese arcades. The fact that the para para dancer stays in a relatively fixed spot while moving the hands in choreographed movements makes the mechanic of the arcade game possible: players learn the hand patterns to specific songs and so activate infrared sensors in the correct sequences.

PPP's appearance in American arcades has led to a US fan presence. Like DDR, cultural definitions of dance and gender have been a factor in the ways in which American players experienced PPP. Even more than DDR, American players have tended to consider PPP as being a female domain: Patricia Chan, the founder of paraparastage.com noted that "it doesn't help that the PPP machine is pink." This does not mean that there are no male fans of PPP, but the game's more tangible connection to dance culture seems to have made it more difficult to fit it into the kind of athletic or therapeutic frames that have become so important to male DDR players. Dinh contrasted the PPP and DDR fan communities in these terms: "with the para para communities, I think we're more open to each other. We get close and share everything. We can easily talk to each other; whether its about para para or even something personal, most of the people in that community will be there for you and will support you. With the DDR communities, there is a lot of competition (because of the tournaments) and rivalry. There's always a battle between which state/city is better."

Despite these differences, both PPP anad DDR fan practices illustrate how dance is particularly amenable to global flow through the use of the Internet. In fact, images play a particularly central role in PPP fan culture. Demonstration videos of para para routines by professional paralists like the Para Para All Stars are often a more important part of fan experience of the game than the tournaments so prominent in DDR fan culture. Further, as with DDR freestyle performance, fans choreograph their own para para routines and post them online. For example, in the wake of the demise of the Para Para All Stars, the website paraparastage.com has begun to collect and compile digital films of original para para dances designed by fans. In this project, one can again see how dance brings with it the particular identities and bodies of the dancers, thus providing a complex blend of the global and local. PPP fandom thus underscores how technologies like digital gaming and the Internet can create social spaces around musical performance; complex, hybrids of local arcade and global communication system that combine to form a stage for musical performance and the construction of community.

8. I Can See Tomorrow in Your Dance

The global nature of DDR and PPP fan cultures can be thought of in terms of John Tomlinson's discussion of banal globalization (Tomlinson, 1999). His model is useful because of the ways in which it connects the local and "mundane" with the global, via his concept of "banal globalism:" the ways in which a global identity is "routinely reinforced" through everyday imagery and practices like the consumption of "foreign food" and "globalized youth culture" (p119-120). Tomlinson sees hope in this model of globalization for the development of a "cosmopolitan disposition:" the "awareness of the wider world as significant for us in our locality, the sense of connection with other cultures and even, perhaps, an increasing openness to cultural difference" (p200).

DDR freestyling and the para para dancing represent the kind of everyday cultural work that Tomlinson suggests might produce a discourse of banal globalism. Fans engage with a global popular culture via images, dance moves, music and costuming. DDR functions as a kind of global jukebox, enabling the average American fan to interact with different forms of music, as well as presenting a reflection of American music as heard through a global translation. But while the dance facilitates a particularly smooth global flow, the player's dancing body is rooted in the physical spaces of local arcades. The centrality of dance as broadcast through Internet videos allows the local and the global to remain in tension, keeping the individual body from being lost or fragmented in cyberspace. The regional inflection of DDR fandom, as embodied in teams and tournaments, makes clear that the global practice of DDR is adaptable to local culture.

In DDR and PPP fan culture I see one possible future for the synergistic combination of music and gaming. Fans fall in love with original DDR songs and PPP dance moves while they also struggle to beat high scores, and even design and perform their own dance routines. DDR players who choreograph their own freestyle performances are, I believe, moving from activity to agency; from following the steps of the game to becoming the author of their own procedures and texts in concert with the game. More explicitly, some fans even hack into the game and make their own "edits," programming their own step patterns for DDR songs.

This is truly a case of writing both the dance and the rules for making the dance[34]. As different media slouch towards interactivity, DDR and PPP's use of music and rhythm provides a new way to think about bodies interacting with pre-recorded sounds and images. Now not just thumbs and fingers interact, but whole bodies. But beyond issues of immersion in and interaction with digital technologies, these games demonstrate how music and dance continue to be powerful vehicles for the formation of community and the performance of identity.

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References

Condry, I., 2001, "A History of Japanese Hip-Hop," in Mitchell Tony (ed) *Global Noise: Rap and Hip-Hop Outside the USA*. Wesleyan: Middletown.

Drew, Rob, 1997, "Embracing the Role of Amateur: How Karaoke Bar Patrons Become Regular Performers," in *Journal of Contemporary Ethnography*, Vol. **25** Issue 4.

Drew, Rob, 2001, Karaoke Nights: An Ethnographic Rhapsody. Walnut Creek: Altamira.

Fornas, Johan, 1999, "Filling Voids along the Byway," in Mitsui, Toru (ed) *Karaoke Around the World: Global Technology, Local Singing.* Routledge: New York.

Herz, J.C., 2000, "Making Music without the Instruments" in the *New York Times*, p. G17, January 20.

Jenkins, Henry, 1992, *Textual Poachers*. Routledge: New York.

Kolko, Beth E., Nakamura, Lisa, and Rodman, Gilbert, B., 2000, *Race in Cyberspace*. New York: Routhledge.

Lum, Casey Man Kong, 1999, "The Karaoke Dilemma," in Mitsui, Toru (ed) *Karaoke Around the World: Global Technology, Local Singing.* Routledge: New York.

[34] In discussions of 'edits' an interesting similarity to the freestyle discourse surfaces. Some edits are renowned for their incredible difficulty, but these are criticized for their reliance upon a purely "gaming" mentality. For example, a player posts that they "dislike the [edits] that are just difficulty for its own sake, where the steps don't actually have anything obvious to do with the music."

Murray, Janet, 1997, *Hamlet on the Holodeck*. Cambridge: MIT.

Nakamura, Lisa, 2002, *Cybertypes*. New York: Routledge.

Pullen, Kirsten, 2000, "I-love-Xena.com: Creating Online Fan Communities," in Gauntlett, David, (ed) web.studies: Rewiring Media Studies for the Digital Age. London: Arnold.

Rice, Adrienne, 2001, "Untitled" in *Reno News and Review*, May 17.

Tomlinson, John, 1999, *Globalization and Culture.* Chicago: University of Chicago.

Tran, Khanh T.L., 2000, "In the Latest Arcade Craze, Players demonstrate their Fancy Footwork," in *Wall Street Journal*, August 16, 2000.

Wolf, Naomi, 2001, "The Video-Game Workout," in *New York Times,* Dec. 9, 2001.

Chapter 11

"SORT DRUGS MAKE MATES": THE USE AND MEANING OF MOBILES IN DANCE MUSIC CLUB CULTURE

Karenza Moore

1. Introduction

This chapter examines contemporary clubbing culture and its relationship with the mobile phone in terms of the organisation of dance music consumption practices in clubbing spaces. It also examines the ways in which the mobile phone is being used to establish and maintain clubbing friendship groups and wider clubbing communities, which often coalesce around particular dance music scenes in localised contexts. This chapter presents the preliminary findings of research with consumers of dance music and 'dance drugs' (Lifeline, 1992; Forsyth, 1996) in club settings in the North-West of England. As a popular leisure pursuit amongst young people in the UK (Finch, 1999), clubbing acts as an empirical probe with which to think about social and cultural aspects of the mobile phone as a leisure and leisure-organising technology. This chapter draws on extensive observational work, a small-scale questionnaire and interviews with young people who define themselves as 'clubbers'. These young people are consumers of dance music in all its many and varied forms, consumers of licit and illicit substances, and users of a variety of digital leisure technologies, including mobile phones. Mobiles are positioned as technologies which both create and enable clubbing-community activities and as technologies which enable music and attendant substance consumption within various clubbing spaces and clubbing 'times', that is pre-club, in-club, post-club and 'real-life'[35]. It is argued that given the historically and culturally-embedded

[35] I use the term 'real-life' here in a similar way to how it is used by clubbers in my sample. 'Real-life' refers to any spaces/times deemed 'outside' of clubland such as time at work

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 211–239.

relationship between substance consumption and dance music consumption within club culture[36], and evidence regarding the continuation of this relationship (Deeham and Saville, 2003; Moore and Miles, 2004 forthcoming, Parker et al., 2001), any consideration of dance music consumption enabled by mobiles needs to take into account the consumption of recreational drugs. Given the telecommunications interest in dance music-related services and applications, it is argued that we need to move towards an understanding of how 'clubbers' actually use mobiles in various clubbing contexts, and how they relate to their mobiles through the lens of an emotional commitment to clubbing (Moore, 2005) and 'club culture' with its myriad of 'underground' and 'commercial' scenes (Thornton, 1995), its destructive excesses (Harrison, 1998) and its joys (Lasen, 2004).

As a mundane artefact in people's everyday lives in contemporary times, it can be difficult to make strange (Cooper, 2002) the use of the mobile in specific spheres of socio-cultural life. Clearly young people involved in dance music club culture use mobiles, but exactly how and why do they use them? And what socio-cultural and emotional significance do particular patterns of usage have for them? Here the focus is on the ways in which 'clubbers' infuse their mobiles with certain meanings through their contemporary consumption practices. The mobile in this context becomes a technology with various meanings specific to the localised contexts of clubbers. The emotional and symbolic significance of mobile-enabled social practices such as the exchange of text messages (Taylor and Harper, 2002) can vary across different clubbing times and in different clubbing spaces. An examination of music and drug consumption practices in pre-club, in-club, post-club and 'real-life' settings moves us towards a better understanding mobile usage amongst clubbers, an understanding which goes beyond the notion that clubbing is 'simply' a group of people coming together to listen to music at a set time in a set place.

In this chapter I start by looking at some of the mobile services and applications currently on offer to clubbers as dance music consumers, moving on to summarise ways of studying the mobile as a key socio-technical and cultural artefact in modern social life. I then look at the ways in which club culture has been studied and suggest that there has yet to be sufficient research undertaken on the role of new technologies amongst clubbers in clubbing contexts. Within the empirical sections I combine these two interests, concentrating on the use of mobiles to arrange clubbing nights out, nights out which are the focal point of music and drug consumption. I also examine how the mobile is implicated in the procurement of (illegal)

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and/or university. The term 'real-life' indicates time/space relations with the sometimes 'dream-like' or 'surreal' experience of clubbing and the 'time-out' and 'escape' from 'normal' responsibilities that is a valued quality of clubbing amongst many young people (Measham et al., 2001).

[36] Thornton (1995) defines 'club culture' as 'the colloquial expression given to youth cultures for whom dance clubs and their eighties off-shoots 'raves', are the symbolic axis and working social hub. [They are] associated with a specific space which is both continually transforming its sounds and styles and regularly bearing witness to the apogees and excesses of youth cultures' (1995: 3).

substances, how it is utilised to initiate contact with ‘randoms’[37] and sustain the clubbing friendships which can develop from such contact. When considering the possibilities for dance music-related services and associated design implications we need to unravel these socio-cultural, organisational and consumption practices, practices that make club culture what it is today. The illegality of some of these social practices can make research in this area difficult to undertake, yet I suggest that researchers into new (music) technologies should attempt to look at all possible aspects of music consumption (and production) amongst users. In the case of UK clubbers this inevitably involves engagement with debates about the role of recreational drugs in dance music contexts.

One example of these related social practices is the use of ketamine[38] amongst clubbers, a drug which can physiologically enhance music consumption, but which can also dissociate the user from his or her immediate physical environment (Dillon and Degenhardt, 2001: p11), rendering mobile screen displays indecipherable (Moore, 2004a). The exchange of clubbing photos with context appropriate music file attachments is an apt example of the possibilities of the mobile as a clubbing community-enabler, and as a technological site of dance music consumption. However, the socially and pharmacologically embedded timing of such exchanges is vital given the physiological effects of certain club drugs such as aforementioned ketamine. In terms of developing mobile dance music services, this example reiterates the importance of in-depth knowledge of the nuances of UK club culture, including substance consumption. In order to better investigate the possibilities of mobile-enabled dance music consumption and community services and applications, we need to explore the ways in which clubbers (as dance music fans) actually use and relate to mobile phones across clubbing spaces and times.

Within club culture I maintain that the mobile is viewed as essential artefact in the clubbers’ socio-technical repertoire, just as decks and an i-Pod may be. The mobile is an artefact imbued with shifting meanings (enhancing or undermining personal safety for example) and deployed to strengthen and demonstrate the user’s

[37] ‘Random’ is a term currently used by clubbers in the UK to denote a stranger one interacts with in a clubbing space and with whom one may or may not develop a friendship with in ‘real-life’. ‘Real-life’ is used by clubbers to differentiate spatially and symbolically between clubbing settings (such as pre-club bars, clubs, and post-club parties) and non-clubbing settings (such as work and university).

[38] Ketamine is a short-acting general anesthetic for pediatric and veterinary use. Positive effects sought by recreational users include temporary paralysis, dissociation, heightened visual/aural awareness and novel experiences of body consistency such as being made out of rubber or wood (Curran and Monaghan, 2001). It is consumed recreationally by clubbers in the UK both in-club and post-club settings, although predominately use occurs post-club. The exact extent of usage amongst UK clubbers remains difficult to evidence due to the ‘hard to reach’ nature of the using population. Some research has been undertaken on the experiential elements of use (Dalgarno and Shewan, 1996, Jansen, 1993, 1997, Tori, 1996, Dillon and Degenhardt, 2001).

sense of 'belonging' to the clubbing community. Following a summary of my epistemological approach to the study of the mobile phone, I briefly review literature on club culture, focusing on work which deals with the relationship between technologies, identity and experiences. I then deploy my empirical work to consider the mobile phone's role in the procurement of club drugs such as ecstasy, cocaine and ketamine, in the organisational practices of clubbers, and in the creation and maintenance of clubbing friendship groups. The 'unholy alliance' between recreational drugs, dance music consumption and club culture needs to be properly considered when thinking about mobile music and mobile community services and applications. Throughout the chapter, I keep this 'unholy alliance' very much at the forefront of my analysis of relevant literature and empirical material.

2. Mobile Clubbing Communities and Dance Music Consumption Services

Within the mobile industry there exists an interest in generating revenue through the provision of applications and community-specific content for particular 'pre-existing', 'interest-driven' or 'event created' communities[39]. The Mobile Entertainment Forum (MEF), created for and by the emergent mobile (entertainment) industry, has an ongoing 'mobile community' initiative, launched in 2002, to support those within the industry attempting to develop community-based applications and content. MEF states,

> *"The concept of 'community' lies at the very core of telecommunication… In identifying opportunities for facilitating the growth of mobile communities and current obstacles, the MEF looks to explore the concept of mobile communities as a central revenue-generator for the mobile entertainment industry."* [40]

Yakara, a mobile company based in Edinburgh, UK, has a number of 'personal mobile community services', or more snappily 'm-groups', based around this version of community. One of their 'm-groups' is for clubbers or 'clubber friends'[41]. Another example of the telecommunication industry's offerings to clubbers, here in terms of mobile-enabled organisational activities, is 'CLUBFIND', a 'connected community' available on T-Mobile, Vodafone, Orange and O2 networks. CLUBFIND automatically matches a subscriber to the 'best available what's on, where listings' through location-based data and user-specified keywords e.g.

[39] See for example *Mobile Communities: Building loyalty and generating revenue through chat and other community applications*, Baskerville, September 2002, available at www.telecoms.com.

[40] The MEF Mobile Communities Initiative, see http://www.mobileentertainmentforum.org/activities-initiatives.html#4 for more details.

[41] Yakara 'M-groups: Clubber friends', see http://www.yakara.com/text/txtx_products.html for more details.

FINDNCUK + LEEDS + DJ +HOUSE MUSIC + DATE[42]. Another more dance music-specific mobile service is O2's recently launched Dance Chart run in association with a number of dance music record labels. A Dancefrontdoor.co.uk press release on the service describes how,

> *"The chart will comprise of artists featured on O2's site and on their WAP services. With the launch of 'Ibiza Summer Anthems' at the end of August 2004 expect to see some of your favourite labels, including the likes of Skint, Southern Fried, Defected, Trusted Records, Pias Recordings, Positiva, Offset music, Hed Kandi, Rock Solid Productions, Born2Dance…Anyone who is using O2 as their service provider can now get their favourite Ibiza Summer Anthems downloaded to their mobile phones"*[43].

For mobile network operators such as O2, collaboration with the vanguards of dance music offers the opportunity to re-deploy already-established (sub) cultural capital, here in terms of dance music producers and record labels. Thornton's (1995) seminal work on dance music cultures and subcultural capital highlighted the rapidity with which what is deemed 'cool' by clubbers can change. Given the ever-shifting sands of dance music and club culture, such 'borrowed' (sub) cultural capital may be vital to a mobile service's success, although no guarantee of it.

Clearly the mobile industry is interested in clubbing communities and dance music consumption services as potential sources of revenue. What exactly is meant by a community in this context, and what might being part of a 'clubbing community' mediated by mobile communication technologies involve? The term *community* has a diverse range of meanings within the social sciences (Anderson, 1991; Delanty, 2003; Lash, 1994; Maffesoli, 1996; Poster, 1995) and amongst mobile service developers[44]. Ahmed and Fortier (2003) ask, 'To what do we appeal when we appeal to community? When is community appealing? Who appeals to community and who doesn't? How else can we appeal for or to others if we do not do so in the name of community?' (2003: p252). In raising such questions about 'community' Ahmed and Fortier (2003) highlight that the word 'community' does not itself secure a common ground from which to speak to and with others. 'Community' is sometimes used to refer to the decline of particular (often romanticised) ways of life and/or social 'institutions' such as 'the family' and religion. 'Community' may also refer to the creation and maintenance of new social and cultural formations such as virtual, post-traditional, and global forms of communication and experience (Hand and Moore, 2005 forthcoming). Debates about the emergence of information and communication technologies, computer-mediated-communication and 'cyberculture' have led writers such as Poster (1995) and Stone (1991, 1995) to examine ideas around community and identity in attempts to explain apparently novel forms of interaction and representation.

[42] See http://www.nightclubbinuk.com/uknightclubs.htm for more details of this service.

[43] From http://wwwdancefrontdoor.co.uk, (accessed September 2004). See http://downloadso2.co.uk for the Dance Chart service.

[44] As acknowledged in the MEF Mobile Communities Initiative, see http://www.mobileentertainmentforum.org/activities-initiatives.html#4 (accessed August 2004).

Given the difficulty of definition in relation to notions of community and the avowed fluidity of contemporary forms of lifestyle 'identifications' such as clubbing (Malbon 1999), it may be problematic to insist that young people who regularly club amount to a 'clubbing community'. Yet the provision of stability and order to sometimes chaotic lives, the possibility of an internalised sense of identity from clubbing, and the creation of sustained friendships through involvement in club culture (Moore and Miles, 2004), are all aspects of identification with a (imagined) clubbing 'community' which can be overlooked in talk of post-modernist 'style surfing'. It may be that this 'community' is imagined in the sense that it does not reside in one specific locale, nor does it have constant symbolic markers through which membership is displayed. Not many clubbers wear clubbing-gear to the office. However clubbing remains in the imaginaries and the 'ways of being' (Jackson, 2004) of its participants and, I argue, provides a sense of identity often built on resistance to societal norms which delimit the possibilities of pleasure through discourses of the 'youth problem', criminality, and of subjects depoliticised through ruthless and reckless hedonism. This said, clubbers' euphoric declarations of peace, love and unity are sometimes at odds with the 'snobbery, excess, and ignorance' that continues to exist within contemporary club culture[45].

People who identify themselves as 'clubbers', and who see themselves as part of 'club culture', which has local and globalised aspects (Hunt and Evans, 2003), already use mobiles extensively, although perhaps not always in the ways in which the mobile industry envisages, and perhaps not always in ways which can be translated into the creation and/or maintenance of a 'mobile community' based more explicitly on commercial interests. The historical and socio-cultural alliance between dance music and (illegal) substance consumption in a sense 'disrupts' commercial narratives of mobile (dance) music consumption. However, given that the mobile is already used by clubbers to organise the consumption of dance music across clubbing times and spaces, and to enable the establishment of friendship groups built on the enjoyment of dance music, the possibilities for services and applications built on a thorough understanding of club culture seem highly promising. Having explored notions of community and the possibility of mobile-enabled dance music and clubbing community services and applications I now present my epistemological approach to looking at the mobile phone as a socio-technically-shaped and socio-technically-shaping technical artefact.

3. Studying the Mobile

The mobile is a key socio-technical and cultural artefact in modern social life within 'developed' countries (Cooper, 2002). Just as club culture in the UK is an ever-shifting landscape, meaning different things to different social groupings, so

[45] I would like to thank Barry Brown for these helpful comments about the need to be more cautious with regards to clubbers' euphoric claims.

the mobile phone can be understood, from a non-essentialist perspective, as a technological artefact imbued with meanings which shift across space and time. In the UK at least a number of sometimes conflicting and continually shifting meanings have been ascribed to mobile communication technologies. They are ‘status symbols’. They are devices which can secure a loved one’s safety if his or her car breaks down at night. They are health-damaging devices. They are convenient for conducting one’s social life (and conducting affairs) and inconvenient when trying to sleep on a commuter train. They are regarded as invaluable devices to some. In Green’s (2002) research on gay men’s perceptions of their mobiles, one participant in response to the question ‘Which piece of technology that you own could you not live without?’ answered ‘My mobile phone definitely, without a doubt, I couldn’t live without it’ (2002: p6). They are devices owned, loved and personalised by millions of teenagers who use them to ‘manage’ interactions and ‘surveillance’ from their parents (Ling and Yttri, 2003). They are mundane devices that we have quickly got used to having. Finally, despite their perceived mundanity and ‘pedestrian’ nature, they are often produced as being ‘cutting-edge’, and even ‘futuristic’ (Moore, 2004b).

Using the ‘social shaping’ or ‘constructionist’ approach to technology involves locating technology (here the mobile) as a heterogeneous network of the ‘technical’ and ‘social’ (Bijker, 1985). Technologies become part of the social world we live in, rather than being an outside ‘force’ which ‘impacts’ upon the social, as the prevalent technological deterministic view holds. We can argue that the very idea or notion of mobile communication technologies is socially constructed. This means that the ways in which we make sense of mobiles, what we think them to be capable of, and not capable of, are produced within and across the ‘social’ sphere, predominately through discursive means with material implications.

To adopt a purely social constructivist approach to the study of the mobile as a digital (leisure) technology would involve a concern with the ways in which human actors are involved in constructing the device; the rhetoric they employ to make their notions of ‘the future’ of mobile communication technology ‘commonsensical’ for example (Moore, 2004b). Here the temptation is to cast technological artefacts as ‘merely’ the product of texts, rendering their materiality invisible. Conversely a strong programme of technological determinism would involve looking at the ‘impact’ that certain technological artefacts, in this case mobile communication devices, may have on the social sphere. As Akrich (1997) points out, to adopt one or other of these approaches involves a separating out of the ‘social’ from the ‘technological’. Rather than concentrating on the ways in which technical artefacts ‘impact’ upon human society, we may be better served thinking about the associations between the two, the ways in which the human and non-human implicate one another in attempts to stabilise ‘society’ (Latour, 1986). It is these associations, between ‘young person’, ‘clubber’ and ‘mobile’ that are of interest to me in this chapter.

I do not consider the mobile as a technological artefact which has had a discernable and traceable ‘impact’ on British club culture. Instead I think of ‘it’ as a technology which is imbued with a variety of different meanings and is used in a myriad of different ways by those involved in club and/or dance music culture. As Sorensen (1997) suggests, technology and the social world can be analysed as rather ‘messy’ contingencies. By exploring the usage and meanings of the mobile within club culture, one can start to illuminate the ways in which the ‘social’ is implicated in ‘technical’ spheres and vice versa, until this well-worn binary becomes rendered messier than either social constructivism and technological determinism allows for.

Studying the mobile phone through ethnographic fieldwork is one way to disrupt the technological determinist stance and explore the design possibilities that social context-specific usage suggest. Taylor and Harper’s work (2002) on mobile-mediated ‘gift-giving’ amongst teenagers is an excellent example of how social research can inform design. They explore, in relation to the exchange of text messages amongst their teenage participants, the ways in which ‘gifts’, as material offerings, can embody meaning, making ‘tangible something of us as givers and our relationship with the recipient (2002: p2). The ‘embodiment’, through mobile text, mobile pictures and possibly mobile music, of memories of clubbing nights out is one example of the importance of studying actual usage embedded in the social practices that constitute contemporary clubbing. This chapter does not deal explicitly with the design implications of club-related social practices. However, reference to Taylor and Harper’s (2001, 2002) work on the importance of the emotional, symbolic and organisational work that goes into phone usage offers an alternative to technologically-driven research into mobile development, whilst providing a framework with which to think about the symbolic meanings of the mobile for contemporary clubbers.

4. Studying Club Culture and ‘Clubbing Communities’

Clubbing is a popular leisure pursuit amongst young people in Britain, and one with which legal and illegal drug use is closely associated, both historically (Beck and Rosenbaum, 1994; Wright, 1999) and in contemporary times (Measham et al., 2001; Moore and Miles, 2004). According to the consumer research group Mintel (whose figures only include the UK’s ‘official’ 4,000 nightclubs, excluding many of the other leisure spaces young people consume licit and illicit drugs in), one in two 18-24 yr olds are regular clubbers (Finch, 1999). Of the four million people who go out clubbing in the UK, it is thought that about half of them are regular (dance) drug users[46]. The National Criminal Intelligence Service indicates that users may be spending up to £10 million a week on ecstasy[47]. However, all figures regarding club culture and in particular dance drug use should be treated with caution given the difficulties of procuring a representative sample of users and producing reliable and valid statistics (Measham et al., 2001).

[46] ‘Home Office Research Study 224 – Drug Misuse Declared in 2001: results from the British Crime Survey’, *The Home Office*, 2001, http://www.homeoffice.gov.uk/rds/pdfs/hors224.pdf.

[47] ‘United Kingdom Threat Assessment of Serious and Organised Crime: Class A Drugs Trafficking’, *NCIS* 2003, http://www.ncis.gov.uk/ukta/2003/threat03.asp.

Given the extent and popularity of clubbing in the UK, it is reasonable to assert that clubbing can have an impact upon a person's sense of self, their identity, identifications and 'belongings' (Malbon, 1999: p68). As Thornton maintains, 'The sense of place afforded by these events is such that regular attendees take on the spaces they frequent, becoming "clubbers" or "ravers"' (1995: p3). Her point mirrors my findings on young people in dance clubs and events in the North-west of England. Of the 54 survey participants, 24 said they thought of themselves as 'a clubber', whilst 12 said they did not, and a further 18 responding 'don't know'. Even among those respondents who did not necessarily think of themselves as clubbers, or were unsure, mention was made of the sense of community, identifications and friendships with others that can be garnered from regular excursions into 'clubland', as the following quotes demonstrate,

> *MASH questionnaire, Respondent 10: Q.43.*
>
> *"It's always nice to make new friends".*
>
> *MASH questionnaire, Respondent 2: Q.43.*
>
> *"It's a great feeling of togetherness, just happy people enjoying themselves as much as you…I love the closeness to other people around you".*
>
> *"I don't know if I'm a clubber but I definitely love me clubbing like. It's well easy to make friends if you go clubbing. It gives you a sense of place in the city. I never feel lonely now as I can always hook up with me clubbing friends" (Female clubber, MASH, 13th September 2003: Sheffield: Tidy Magna 7 dance event).*

'Clubbing' has been identified as a crucially important development in youth culture (Measham et al., 2001; Redhead, 1997). Contemporary club culture in the UK is open to a myriad of interpretations and can be studied from a wide range of perspectives. Researchers from criminology, sociology, psychology, pharmacology and cultural studies have all written extensively on 'club culture' in Britain, Europe, America and Asia (Hunt and Evans, 2003). Given that British young people are the most drug-experienced of any European country (Griffiths et al., 1997) and given Britain's place in dance music history, it is perhaps unsurprising that much of the work on clubbing focuses on Britain.

There has been a concentration on substance use amongst academics writing on UK club culture, with Akram (1997) noting a strong association between the use of certain substances (predominately ecstasy, speed, LSD, and 'ubiquitous' cannabis) and the popularity amongst some young people of dance events, particularly clubs and 'raves'. Ketamine (Ket) and GHB (liquid ecstasy or GeeBee) are also associated with club culture in Britain (Moore and Miles, 2005 forthcoming). Work on substance use within club culture includes analysis of the 'pathways' that young people take into substance use and dance culture (e.g. Coffield and Gofton, 1994), the harm reduction strategies they adopt (Hart and Hunt, 1997; Boys et al., 2000), patterns and meanings of drug usage amongst young people in general (Parker et al., 1998) and amongst clubbers in particular (Measham et al., 2001; Moore and Miles, 2004). The possibility of a trend of 'normalisation' surrounding recreational drug use (particularly cannabis, ecstasy and powder cocaine) amongst British young people has also been explored at length (Measham et al., 2001, Parker et al., 2002). Other writers have concentrated on the place of music within club culture and youth culture more generally (Bennett, 2000) and the role of DJs in club culture (Haslam, 1998). Gender, ethnicity, sexual identity and race relations within dance/club culture have also been extensively explored (Collin and Godfrey, 1997, Henderson, 1999; Huq, 1996; Lewis and Ross, 1995; Pini, 2001; Reynolds, 1997). However, despite the continued academic interest in dance/club culture, and its place within youth culture more generally, there has been only limited work on the usage and in particular the meanings, of digital (leisure) technologies amongst (self-defined) 'clubbers' in the UK. I now turn to some examples of research on technologies which are of significance for my consideration of the usage and meanings of mobile communication technologies in UK club culture.

5. Technologies, Identities and Experiences

There have been research precedents with regards the usage and meanings of digital leisure technologies amongst particular social groupings. Green et al's (2002) work on the integration of new technologies into the lives of British gay men is one example of writing which concentrates on the intertwining of identity and community with 'new' technologies such as the Internet and the mobile phone. Green et al (2002) argue that for the gay men in their interview sample, the Internet was viewed as a 'technology of freedom' (Sola Pool, 1984) in that it offered the opportunity to,

> *"...explore the gay world and meet like-minded others, i.e. it is the effects of the technology that are valuable to this group because it enables them to do something that is highly significant in their lives that they couldn't do before." (Green et al.,2002: p3).*

This quote indicates that those who have, or at least see themselves as having, and/or are perceived by others as having, a 'non-mainstream' identity and/or lifestyle, tend to value information communication technologies for the opportunities they proffer for meeting others with similar 'world-views'. I suggest for example that for many (self-defined) 'clubbers', the Internet (and e-mail usage) provides the opportunity to visit chat rooms, listen to dance music online that may or may not be 'club-branded' (e.g. www.digitallyimported.com), buy records online (e.g. www.chemical-records.co.uk) and (virtually) meet other clubbers. Club-specific message boards[48] and clubbing-specific message boards[49] are used by

[48] See www.filthy-music.co.uk/forum.htm and http://www.tangled.info/forum/index.php for Manchester specific examples.

[49] See www.harderfaster.net, www.skiddle.com and www.4clubbers.net for examples.

clubbers across the world. These are all social practices implicated in the production and maintenance of a clubbing-related identity. Taylor and Stone (2004) also look at technologically-enabled social practices through the use of mobile and networked technologies by a musical and visual community of artists centred around 'The Festival', an annual UK event which has spawned friendships and artistic relationships, as well as 'spin-off' events and a record label. Referring to the conversations with their informants regarding the online forum that has built up around 'The Festival', Taylor and Stone (2004) note,

> *"The exchanges on the Festival forum are recounted in such a way that they articulate the presence of a heterogeneous collective. The forum is described as a space where members meet; the many styles and tastes blend into one another and catalyse to assemble The Festival collective. As part of the collective, the forum is enrolled to stand as evidence-documentary information-of the collective." (Taylor and Stone, 2004: p5)*

Here we see the ways in which technologies are 'enrolled' by human actants to both produce and 'stand for' communities, communities which are constantly shifting from online spaces to off-line spaces. As with 'Club Culture', 'The Festival' becomes a meaningful entity in its own right (Taylor and Stone, 2004: p4) which technologically enables and emotionally signifies togetherness, collaboration and socio-cultural exchange by those who identify themselves as 'members' and/or participants.

Digital technologies have long had a role within dance music/club culture, most obviously in terms of musical production, and music consumption within dance music spaces such as clubs. Work on music-related (and visual) technologies and their role in the consumption/production of dance music/club culture (Cunningham, 1998; Gilbert and Pearson, 1999; Goodwin, 1992; Milestone, 1996) is vital to an area of research in which people's experiences are mediated by and through technology (i.e. laser and lighting displays, the 'decks' and mixer in the DJ booth, the club's sound system, even entry to clubs via metal detectors). All such technologies produce the 'spectacular spectacle' of clubbing. Yet there has been a neglect by researchers of the more 'mundane' technologies that shape and are shaped by clubbers' experiences and perceptions of club culture, such as the mobile phone and the digital camera. The latter technology could be an interesting focus given the usage of digital cameras in club culture to 'capture' nights out, with the resultant photos posted on dedicated club-specific and/or clubbing websites. Indeed 'photo galleries' are now an expected feature of club-specific and clubbing websites, with pictures usually falling into four categories as below (See figure 11-1 – All images accessed from www.gurn.net, April 2004).

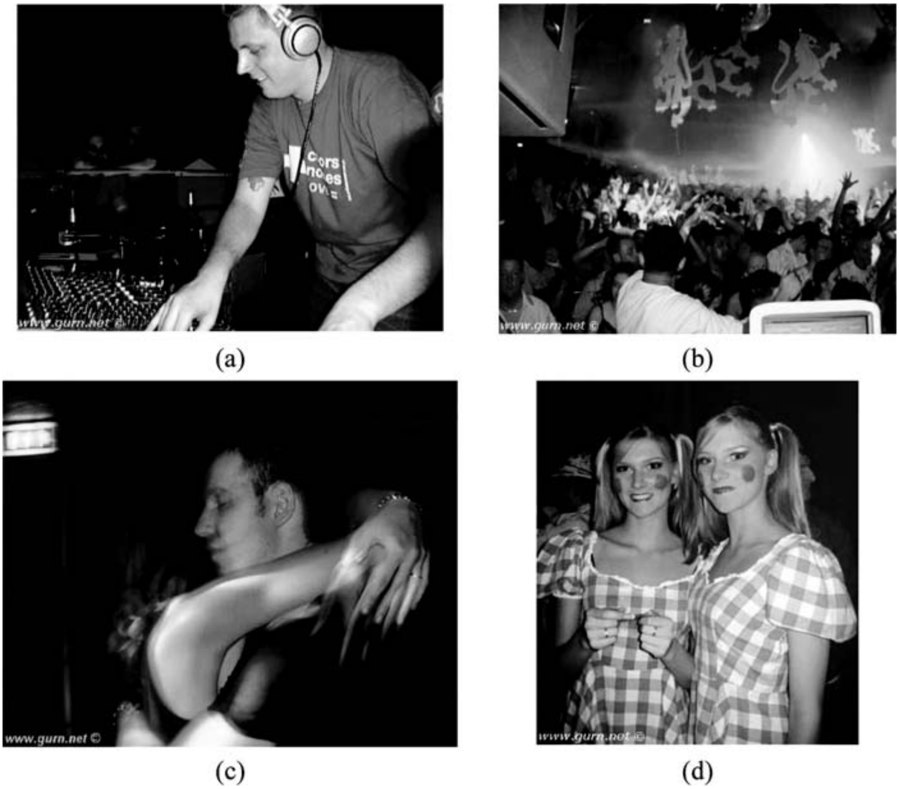

Figure 11-1. Clubbing photos from gurn.net: (a) ‘The DJ’, at Riot! London; (b) ‘The Crowd’, at Crasher, Sheffield; (c): ‘The Hug’, at Pure Filth, Manchester; (d) ‘Playfulness and Performers’, at Federation, Leeds

Such images are part of the enactment of clubbing identities, mediated through the use of now relatively familiar and ‘mundane’ digital leisure technologies. The common elements of such photos (i.e. of the crowd, of groups of friends, of the DJ, and of clubbing ‘playfulness’) offers the researcher an insight into the production of an ‘imagined community’ (Anderson, 1991) or re-imagined community (Ahmed and Fortier, 2003) which is ever-changing yet has repetitive elements of identification ‘markers’ that can and have been ‘captured’ through the use of technologies. Again the exploration of the use of digital technologies by clubbers can challenge the notion that clubbing is predominately about a group of people dancing to music in a fixed time and space. Rather ‘doing being’ a clubber involves interacting with a variety of technologies (across various clubbing and ‘real-life’ times and spaces) that enable (feelings of) involvement with ‘club culture’. By not separating out the use of technologies from social contexts of usage we begin to see possible design implications, say in relation to the ‘ritual exchange’ of clubbing-related photos and context-dependent music files via the mobile. Regarding the aims of design-orientated sociology, Taylor and Harper (2001) note,

> *"Specifically we have aimed to show that mobile phones enable young people to perform what they see as common sense, everyday practices-to use the rituals of exchange to cement and demonstrate their social networks: that phones have, if you like, provided young people with new ways to perform old rituals." (Taylor and Aorper, 2001: p32)*

Hence by looking closely at the ways in which technologies such as digital cameras (and mobile phone cameras) are used by specific groups of people (here 'clubbers') to 'cement and demonstrate their social networks' (Taylor and Harper 2001: p32), we can begin to understand the management of space, time, boundaries of the self and relations with others which make up social contexts of technology use, social contexts, including social 'rules', which may in turn inform design (Murtagh, 2001: p89-90).

One writer who has concentrated on the use of technologies in terms of the ways in which they may be used to manage space, time and boundaries of the self is Michael Bull. Whilst his work is not directly related to club/dance culture, Bull's writings on the Walkman (Bull, 2000; 2001) and more recently the iPod (Bull, 2004; Bull, this volume), demonstrate that technologies can mediate experiences of one's surroundings, and in particular contemporary urban spaces. Bull (2001) notes how choice is a key element of this mediation, since choosing one's aural 'surroundings' reclaims some of the world, with music acting as a 'shield' or 'cocoon'. He writes,

> *"Walkmans allow the user to prioritise their experience in relation to their geographical, social and interpersonal environment and as such enables them to attempt to exist within their own private soundworld. The site of experience is therefore reconstituted through the medium of the Walkman." (Bull, 2001: p181).*

Technologies can mediate, and perhaps give the 'illusion' of experiential control over, one's surroundings. As I suggest in the final sections of this chapter, the mobile phone may be used by clubbers to garner experiential control over their surroundings, by texting absent friends and thus creating a 'personal space' within the sometimes 'overwhelming' in-club and/or after-club space. From sociologically-orientated research precedents, I think it is reasonable to at least explore the possibility that the mobile phone can mediate clubbers' experiences of 'being a clubber' and 'belonging' to club culture. In turn, the mobile, as a non-essentialist technological artefact, is imbued with shifting meanings by 'clubbers' and so is socially shaped through their very consumption practices.

6. Studying the Mobile in Club Culture

This chapter draws on data from my on-going work with 'clubbers' in the North-west of England. It is part of a wider project (the MASH project) looking at the music, dance and substance related leisure pursuits of young people in this geographical area (see Moore and Miles, 2004, for more details). The main sources of data for the MASH project are field notes from numerous nights out clubbing in the North-west of England, and a questionnaire developed specifically to target clubbers in Manchester and more generally the North-West of England.

Questionnaire respondents were contacted through 'snowball sampling', which involves identifying possible participants who are then used to refer researchers on to other respondents. The snowball sampling method is particularly effective for reaching hidden and hard-to-reach populations but does have considerable disadvantages (Atkinson and Flint, 2001), not least the sacrifice of the possibility of representativeness (Van Meter, 1990). The questionnaire, which thus far has been filled in by 54 young people, aims to gather data on clubbing in terms of the ways in which 'mundane practices' work as a 'foundation' for a night's activities. Participants, for example, were asked to detail the ways in which they procured (illegal) substances for their clubbing nights out, including questions about their use of mobiles to contact 'dealers'. They were also asked about their use of mobiles to contact friends and 'randoms' in pre-club, in-club, post-club and 'real-life' settings. In hindsight the questionnaire may have included more or different questions on the usage and meanings of Information Communication Technologies (ICTs) and other digital (leisure) technologies, perhaps with a section on participants' use of the Internet, e-mail, Walkman/iPod and (digital) cameras. However, the survey remains in its initial stages and is likely to be adapted in the future following feedback from this round of respondents and from other researchers[50].

In terms of the demographics of the questionnaire sample, of the 54 respondents thus far, 24 are female and 30 are male. The youngest respondent is 19 years of age and the oldest is 33 years of age. The average age of respondents is 23 years of age. In terms of socio-economic background the survey (snowball) sample consisted of 20 students and 34 young people currently working in a wide variety of occupations. All respondents reported lifetime use of dance drugs (ecstasy, cocaine and amphetamines) and all reported lifetime use of cannabis. All respondents reported consuming dance drugs in the past month, apart from one respondent who reported that he had 'given up drugs about a year ago' (MASH Questionnaire, Respondent 17). Respondents also reported having tried a variety of other substances, including acid/LSD, 'magic mushrooms', ketamine, and GHB/liquid ecstasy. All respondents had attended a 'dance event' within the previous month, the average attendance in one month being two nights out clubbing.

The participant observational work began before the questionnaire was developed, and continues today. As a regular clubber in the North-West of England I have used my interest and participation in dance music events to generate field notes on my own experiences of clubbing and observations on the experiences of others. In terms of process, my participant observational work involves attending dance music events (be they clubbing nights or dance music festivals) and directly observing the social practices undertaken by other participants (i.e. other clubbers) within the sites of dance music and drug consumption such as pre-club bars, clubs, dance tents and after-parties. Following my attendance I write notes about my

[50] I would like to thank all those who attended the second event (held at the University of Surrey) in the Digiplay seminar series (26th April 2004) for their comments on this chapter.

observations which are of course directed by my research interests, my sociological training and my own past and present experiences of the night-life. Given a prior interest in mobile communication technologies (Moore, 2004b) I have made exploring the use of mobiles in these settings a research priority.

7. Meanings and Belongings

My key question with regards the mobile phone relates to the ways in which they are used by clubbers in three clubbing times/spaces (i.e. pre-club, in-club and post-club) as well as this usage's relation to usage in 'real-life' or 'the straight world' (Malbon, 1999). In addition I focus upon the meanings with which clubbers imbue this technology, thus producing 'the mobile' in these varied contexts. To explore the organisational practices undertaken by clubbers via their mobile phone may seem a long way from community-based mobile services, and indeed from mobile music services and applications. However, I would like to re-iterate the view that without sufficient research-based exploration of these (organisational) practices, it is unlikely that we will reach a rich understanding of the emotional and symbolic significance of mobiles amongst clubbers. Comprehension of the emotional and symbolic significance of mobiles for users has proved useful elsewhere in terms of design possibilities (Harper and Taylor, 2001). To be a clubber is not solely about one spectacular 'moment' of music and drug consumption at a set place and time-it is also about engaging with (here mobile) technologies, technologies which enable those spectacular moments to occur.

7.1 Procuring Illegal Substances

Of the 54 young people who have so far participated in the MASH clubbing survey, all regularly purchased the substances they planned to take on a clubbing night out *before* entering the club. Several respondents did indicate that they had previously bought substances in-club from a friend, although the interpretation of 'friend' here is obviously dependent on the respondent's perception, and of course friend and drug distributor, or 'dealer' may be one and the same person (Dorn and South, 1990; Parker et al., 2002: p954). Other participants indicated that they had previously bought substances in-club from a 'dealer', with most reporting that they felt slightly uncomfortable doing so, as the quotes below demonstrate in answer to the two part question "Have you ever bought pills from a dealer inside a club? If yes, how did this make you feel?",

Mash Questionnaire, Respondent 15, Q.34.

"Bad, it felt dodgy and I only advise it if no one else can 'sort out' a friend".

Mash Questionnaire, Respondent 12, Q.34.

"Paranoid that the bouncers were watching me and thought the drugs would be rubbish".

MASH Questionnaire, Respondent 47, Q.34.

"Didn't care, was battered at the time!"

However, in line with Measham et al's (2001) analysis of in-club dealing, some clubbers with whom I spoke during my field-work were relatively at ease with buying drugs in-club from familiar dealers who were perceived as being sanctioned or condoned by (door) staff. In one Northern England city centre club, regular clubbers knew who the sanctioned dealer was, and expressed few reservations about purchasing ecstasy from him or his 'runner' (salesman) who circulated the clubbing space. Whilst respondents to the MASH survey indicated their preference for purchasing substances before entering the main clubbing space given concerns about purchasing in-club, it would seem that a combination of the two practices are being undertaken.

All the 54 MASH survey respondents bar one reported regularly using their mobile phone to procure substances *before* entering the club. These substances range from ecstasy and cocaine for pre and in-club use, through to cannabis and ketamine for 'chilling out' purposes in post-clubbing spaces/times. All respondents used voice as opposed to text to contact a dealer and/or dealer-friend, with indications that texts are viewed as 'evidence' of a drugs transaction (Male clubber, MASH, 10th March 2004: Manchester). Respondents used their mobiles to make initial contact with dealers/dealer-friends. Respondents indicated that dealers/dealer-friends would either 'do delivery' (that is drop the substances off at the buyer's house) or would make arrangements to meet in a public space (the latter being less the norm, again presumably given the risks involved of being in a public space). Deals were made usually on the evening that the respondents were planning to go out, although 7 respondents indicated their preference to procure drugs in the days running up to their clubbing night out. Such preferences are likely to be due to the (perceived) unreliability of dealers, as this quote indicates,

"Our bloke (dealer) is well hard to get hold of sometimes and he's always late, does my head in, but you can't exactly complain about crap customer service can you? (laughs)" (Male clubber, MASH, 10th March 2004: Manchester)

I suggest that the perception that the mobile phone is an individualised technology, belonging to a person rather than a household (and an address), means that it is perceived by clubbers as a 'less risky' technology to use in the procurement of illegal substances than fixed line telephones. This point also relates to the 'social etiquettes' surrounding the procurement of drugs. One participant noted for example that she did not like using the fixed-line phone in her house as she shared it with other people and did not think it "fair to them if some dodgy bloke (dealer) had their number" (Female clubber, MASH, 25th Oct 2003: Manchester: Tomcraft All-nighter). Little or no concern was voiced by the survey sample with regards the tracing of mobiles through cell data. However, other clubbers suggested that the mobile is in a sense a 'riskier' technology than the fixed-line phone given the mobile's 'individual nature'. One participant wondered whether, if her dealer was under police surveillance, her call could be traced, or whether the presence of his number on her phone implicated her in his activities (Female clubber, MASH, 27th Sept 2003: Manchester after-party).

No mention was made by my research participants about concerns over the possible security implications of Bluetooth, now a standard feature of many high-end devices. It is possible that those in my sample did not own Bluetooth-enabled devices or had yet to consider the implications of Bluetooth for security in relation to their drug procurement activities or their clubbing activities more generally. Bluetooth technology allows users to exchange data between mobile phones, PDAs and notebook computers located in close proximity to one another. It would seem that the peer-to-peer networking capabilities of Bluetooth may undermine the perceived relative 'safety' amongst clubbers of using mobiles to source illegal substances. However, any consideration of the risks of exchanging information (e.g. the numbers of drug dealers or of new-found clubbing friends) through Bluetooth, or of the security implications of Bluetooth 'hackers' (who may connect to mobiles and download personal information such as address books) is likely to be assessed by clubbers as a context-specific risk understood in association with the perceived risks of other communication technologies (e.g. the fixed line phone). It is is this sense that clubbers simultaneously manage the risks, anxieties, pleasures and 'identifications' (Malbon, 1999) of 'doing being' a clubber partially through technology use. Further empirical work into the use of Bluetooth-enabled devices by UK clubbers may throw some light on possible relationships between technologically-based security models for Bluetooth, socio-culturally significant usage and more general risk perception and risk management strategies amongst clubbing 'communities'.

My research indicates that mobiles are profoundly implicated in activities related to the purchase of illegal substances. In terms of dance music/club community-enabling mobile services, this finding is important due to the emotional connotations of using this 'personal technology' to procure Class A and Class B drugs. One participant for example noted that, "I delete all records of my calls to the dealer as soon as I've made them. Kind of makes my phone seem safer" (Female clubber, MASH, 27th Sept 2003: Manchester after-party). Some clubbers wondered how people procured illegal substances before the advent of mobiles, highlighting the ongoing production of the mobile as a mundane and 'indispensable' communication technology. Coupled with this mundanity is the perception of the mobile amongst clubbers as simultaneously a 'less risky' and 'riskier' technology, as compared to the fixed line, 'home' phone. Here we see how the mobile can be made to mean relative to other 'similar' technologies, and in a seemingly contradictory manner; 'less risky' and 'riskier'. Perceptions of risk shape the meanings of mobiles, technologies which are embedded in the specificities of clubbing-related activities, with clubbers prepared to take the risks associated with drug dealing and drug procurement through their 'commitment' to the clubbing scene (Measham et al., 2001: p116) and the enjoyment that clubbing offers (Lasen, 2002). The mobile thus becomes a technology understood and emotionally related to through the strategies of risk management undertaken by clubbers. These strategies are necessitated and given meaning by perceptions of, and interactions with, private corporations such as mobile operators and public bodies such as drug law enforcement agencies, the judiciary system, and government policies.

7.2 Organising Clubbing Nights Out

Aside from procuring illegal substances, clubbers also use mobile devices to organise their nights out. As suggested in previous work, being 'a clubber' can be hard work,

> *"Young people who regularly go clubbing in the North of England can be said to invest considerable time and effort into ensuring that their nights out, dancing till the early hours of the morning, will be fun, and to a certain extent trouble-free." (Moore and Miles, 2004: p12).*

The mobile phone is implicated in the organisational practices clubbers undertake. Of the 54 respondents to the MASH questionnaire, 49 used their mobiles 'Always' to organise nights out, with the remaining 5 indicating that they 'Occasionally' used their mobile to do so. These organisational activities take several forms and are spread across the different spaces and times of club culture.

Clubbers indicated that they use both voice and text to 'round up' groups of friends and sometimes 'randoms' to go clubbing with. This activity takes place in 'real-life' or sometimes in 'pre-club' spaces. One male clubber described how he would usually write a text to three or four friends a few days before the event. "Like fancy going to Sankeys, so-and-so is DJ-ing?" (Male clubber, MASH, 17th August 2003: Manchester: *Addiction* after-party at *Presha*). If they responded positively they would talk on their mobiles to finalise details. In addition, he described how, if a big clubbing night (i.e. an all-nighter, or a one-off monthly event) was approaching, he would "Just write a text and send it to all the randoms on my phone. The more the merrier like" (Male clubber, MASH, 17th August 2003: Manchester: *Addiction* after-party at *Presha*). Other participants described how they would send a 'standardised' or group text to everyone that they thought might like to go out, sometimes including 'randoms' whose numbers they had collected on previous nights out, "I like to see how many people I can round up" (Female clubber, MASH, 19th July 2003: Sheffield: After-party).

Here we see the enactment of clubbing-related identities and 'belongings' being mediated through the mobile, specifically mobile text. The female clubber mentioned above told me that she was out with a group of about ten people, some of whom she did not know in 'real-life'. To be able to 'round up' a considerable number of people via text and voice can be viewed as a technologically-mediated enactment of the 'friendly vibe' (Jackson, 2004) which clubbers value so greatly, and which is employed in (sub)cultural distinction practices, i.e. the 'drinking club' crowd/atmosphere versus the 'pilling club' crowd/atmosphere (Thornton, 1995, Moore, 2003a). Contacting 'randoms' via text prior to a night out acts as a demonstration of the (supposed) inclusive and tolerant 'attitude' of clubbers. In terms of community-enabling mobile services, an awareness of clubbers' management of collective and self-presentation as one of friendliness and tolerance is important for the development of clubbing community content and for the security models of emergent peer-to-peer technologies such as Bluetooth. Bluetooth could undermine the perceived 'safety' amongst clubbers of using mobiles to procure illegal substances. However, peer-to-peer applications may simultaneously prove to be one way in which mobile technologies could be utilised by clubbers to enable the 'friendly vibe' (Jackson, 2004) that many value so greatly. These are tensions which may have to be (at least partially) resolved in the minutae of usage contexts i.e. Does this club feel safe? Is the crowd friendly? Does this 'random' seem trustworthy? Should I switch my mobile to 'hidden' mode or switch off the Bluetooth functionality?[51].

Many clubbers highlight the friendliness of clubbers, and subsequent feelings of connection with others, however temporary or nomadic (Pini, 2001: p167), as key to their enjoyment and commitment to clubbing. So mobiles are used by clubbers to organise nights out in terms of gathering together groups of people before entering pre and in-club spaces, in turn becoming implicated in the symbolic production of a 'subculture' (Bennett and Kahn-Harris, 2004). Here we see the use of the mobile in terms of creating (small-scale) clubbing 'communities' that shift and mutate over time. Clubbers in my fieldwork described how some 'randoms' become part of a circle of clubbing friends, whilst others seemingly disappear, "I texted him but he's fallen off the radar" (Male clubber, MASH, 30th April 2003: Manchester: Sunrise All-Nighter). Contacting other clubbers, be they 'friends' or 'randoms', is thus integral to organising a night out with the mobile playing a central role in this practice. Again, as argued elsewhere (Moore and Miles, 2004), the 'spectacular' aspects of clubbing valued by clubbers (i.e. communicating with strangers, making new friends, 'connecting' with people on the dance floor) are predicated on organisational practices which may become mundane to the clubber, and which are now mediated in part by mobile communication technologies. It is at this point that community-enabling mobile services may intervene with design and application predicated on 'real-world' practices via an understanding of emotional investments in technologies, the social contexts of usage (Taylor and Harper, 2001, 2002) and consumer perceptions of contemporary and future-possible mobile entertainment services (Moore and Rutter, 2004).

The use of mobiles to organise clubbing nights out was perceived by some clubbers in the survey sample as a source of annoyance and frustration. This negativity with regards the mobile centred on the mutability of arrangements for a club night out. Clubbers sometimes experience anxiety and nervousness before a night out (see Moore and Miles 2004), not least because ecstasy remains a Class A, and, culturally-speaking, 'dangerous' drug which, unlike cannabis, is only 'normalised' amongst relatively small groups of people (Parker et al., 2002). The mobile enables changes in times and places of (pre-club) meetings, changes which were reported as adding to general feelings of anxiety (Moore, 2003b). As Ling and Yttri (2002) write, drawing on empirical work on mobiles in Norway,

[51] These actions are recommended by Nokia in response to concerns about Bluetooth security. See http://www.nokia.co.uk/nokia/0,,65909,00.html for more details (accessed January 2004).

> *"One of the impacts of mobile telephony is the opportunity for nuanced instrumental coordination…With the use of mobile communication systems, one need not take an arrangement to meet at a specific time and place as immutable. Rather those meeting have the ability to adjust the agreement as the need arises." (Ling and Yttri, 2002: p139).*

Whilst clubbers in my research highlighted their frustration with the mutability of time/place arrangements for a clubbing night out, they simultaneously highlighted the 'benefits' of the mobile for enabling this mutability, hence imbuing the 'disrupting' mobile with positive attributes. Fluidity of arrangements becomes a signifier of an (already) valued aspect of clubbing amongst this particular 'community', that of the 'flow' (Moore and Miles, 2004) of nights out, which are "always the same but so different each time. Try not to make any plans like" (Female clubber, MASH, 12th July 2003: Manchester: *Logical* after-party at *Satan's Hollow*). The sense in which clubbing nights 'flow smoothly', but are punctuated with "funny things" (Female clubber, MASH, 12th July 2003: Manchester: *Logical* after-party at *Satan's Hollow*) and unexpected events and experiences (Moore, 2003b), is not necessarily perceived as 'spectacular' by clubbers, but is perceived by some as an integral part of clubbing. Perhaps due to the practices of searching out after-parties and after-hours clubs in the post-club time, and meeting with friends in post-club spaces who have attended events at other venues, the mobile becomes, for clubbers, an emotional 'symbol' of the centrality of making 'new friends', conversation and 'communication' and living in and for the present moment (Pini, 2001: p167). The designs of mobile (dance) music services and clubbing community services need to account for and hopefully enable those social practices (already) valued by clubbers, thus further securing the mobile's place in clubbers' socio-technical repertoires.

7.3 The Mobile Phone's Role In-Club and Post-Club

Mobile phones are also being used by clubbers to 'account for' their friends when in main clubbing spaces, and in particular when leaving the main clubbing space and moving onto the post-clubbing space (be it an after-hours club or 'chill-out' at friends' houses). The following text message and excerpt from MASH field notes highlights this point,

> *"Hey trouble, where are you?!!! Going to Presha? Wanna meet us here or shall we come and get you?" (Female clubber, personal text message, 4th October 2003, texted from Manchester: Presha, after-hours club).*

> *"The venue was massive with really high ceilings. Seven rooms (although I only found five of them). In a way it was too big as I spent a bit of time worrying about where everyone was, hard to keep track of 15 people! Getting everyone together to get the minibus back to Sally's flat was a nightmare, but managed it in the end. We had to text Nick and James and get them to meet us in the car park as 7,000 messy people attempted to get out the main door." (MASH field notes, 13th September 2003: Sheffield: Tidy Magna 7 dance event, names changed).*

Here 'organisation' by clubbers through the mobile is predominately related to concern for other's and one's own safety and wellbeing. Indeed it exceeds notions of 'organisation'; signalling the further enactment of clubbing friendships as mediated by mobile text, and the emotional significance that such (voice and text) exchanges hold for people in terms of embodying thoughts, feelings, memories and meaningful events (Berg, Taylor and Harper, 2003: p4). It is clear from my survey data that the mobile is a valuable and valued device to clubbers. Concerned about losing the device when in the main clubbing space, some respondents preferred to leave it (in a bag or coat pocket) in club cloakrooms, although the majority of respondents would keep it in their own or a friend's pocket/bag. Some spoke of the mobile as a kind of 'safety talisman',

> *"Just having it with me makes me feel better." (Male clubber, MASH, 12th July 2003: Manchester: Logical after-party at Satan's Hollow).*

> *"I like having my phone on me just in case something nasty happens to me or my mates" (Female clubber, MASH, 30th April 2004: Manchester: Sunrise All-nighter).*

Concepts of safety, and experiences of violence and intimidation by club staff, the police and other young people, depend to an extent on gender and sexuality (Measham et al., 2001: Chapter 6). It has been suggested that young people taking 'time-out' often inhabit physical and symbolic urban 'wild zones' which are characterised as 'beyond the panopticon of modern regulatory culture where crime and leisure are linked on a continuum between ordinary consumer culture and deviant play, where speed and movement are prioritised…' (Measham et al., 2001: p159, see also Stanley, 1997). Clubs may be located either in city centres, where levels of alcohol related crime at the weekend tend to be high, or in areas within or at the edges of the urban space which are yet to be 'gentrified'. *Sankey's Soap* in Manchester for example is located in the run-down industrial 'Northern Quarter' of Manchester, which is peppered with massage parlours, has inadequate street lighting and generally feels 'unsafe'. Given such contexts it is perhaps unsurprising that clubbers in the MASH survey indicated that their mobile made them feel safer on the way to and from clubs.

Perceptions of security, safety and co-ordination related to mobile ownership and usage have been highlighted by other researchers, most notably Ling and Yttri (2002, 2003). Specifically in relation to mobile usage amongst clubbers, there are mobile service possibilities surrounding the importance of personal and friendship-group security, safety and co-ordination. Mobile services could for example offer club drug health and safety advice, practical information regarding the location of services such as police stations, hospitals and public transport and 'find-your-friends' services all presented in such a manner as to appeal to contemporary UK clubbers. Such services need however to acknowledge that clubbing spaces and times may be experienced differently according to gender, sexuality, substance usage and the like. For female respondents in particular the mobile represents a point of contact to various means of safety, *MASH Questionnaire, Respondent 42, Section 8.*

“I’ve got a couple of reliable cab firms’ numbers saved on my mobile just in case”.

MASH Questionnaire, Respondent 13, Section 8.

“I can always phone my housemates or my boyfriend if I get stuck”.

“I always carry my phone as I don’t get in cars with people that pill” (Female clubber, MASH, 10th March 2004: Manchester: Tangled All-nighter).

Here the mobile is perceived as a device that safeguards personal security, and acts as a ‘link’ or ‘lifeline’ to others (Ling and Yttri, 2002: p142). Such feelings of technologically-mediated ‘security’ (one thinks of CCTV cameras here) also extend to in-club spaces. Here the mobile symbolises a ‘link’ to the ‘straight world’ (Malbon, 1999). As one male clubber indicates,

“It’s like a link to people who aren’t fucked” (Male clubber, MASH, 30th April 2004: Manchester: Sunrise All-nighter).

Here technologically-mediated ‘security’ differs to the sense of ‘security’ offered by the mobile in terms on contacting cab firms or calling friends or family if one becomes stranded. Here ‘security’ relates directly to both the pharmacological ‘effects’ of ecstasy and to specific in-club settings. ‘Coming up’ on ecstasy can be an ‘intense’ and sometimes overwhelming feeling (Thomas, 2002). It would appear that some clubbers are using the mobile to manage this ‘intense’ experience. Drawing on my participant observation I maintain that some clubbers use their mobile to call and/or text absent friends both in an enactment of friendship and as a means of creating a personal ‘safe’ space within the wider in-club space, as the following quotes indicate,

“I just focus on the screen and listen to the music and I’m fine” (Male clubber, MASH, 22nd April 2004: Manchester: Venomous).

“I don’t really like coming up, gets a bit much for me, but I usually just sit down, chat to my friends and text people, gets me through it” (Female clubber, MASH, 10th April 2004: Manchester: Toast: Alice in Wonderland 12 Hour Spectacular).

“It’s Traffic honey, Tiesto is messing with us!!! Wish you were here; o)” (Male clubber, personal text message, 30th May 2004, texted from Sheffield: Crasher One).

Texting absent friends when ‘coming up’ and/or when favourite ‘tunes’ come on entails the creation of perceived personal ‘safe’ spaces, the maintenance of social networks and the demonstration of clubbing subcultural capital. Such activities, mediated through the mobile, also shape the ways in which clubbers understand their mobile, that is as a ‘link’ to other people and other physical and symbolic spaces (i.e. the ‘straight world’) which are situated ‘outside’ the urban ‘wild zone’. It is in this way that the mobile becomes implicated in clubbers’ experiences and perceptions of urban spaces and clubbing spaces, making them ‘friendlier and safer’ through contact with ‘straight world’ friends for example.

7.4 Creating and Maintaining Clubbing Friendships

The mobile is also being used by clubbers to collect contacts. Amongst clubbers, exchanging mobile numbers, as with giving hugs and exchanging smiles, amounts to an enactment of the ‘friendly vibe’ that clubbers still (self-consciously) evoke, are in a sense are proud of, and which they sometimes perceive as ‘spilling over’ into ‘real-life’ (Jackson, 2004: 98). It would seem that the mobile is currently facilitating the building of the often temporary and ‘nomadic’ friendships borne of participation in and commitment to contemporary club culture. In answer to the question ‘Have you ever contacted a ‘random’ and become friends with them outside of the clubbing space?’ (MASH questionnaire, Q.45) 45 of the 54 young people who have participated thus far answered ‘Yes’, with 9 answering ‘No’. All of the 45 participants who answered positively used either text only (12) or a combination of voice and text (33). Here we see the role of the mobile in creating and maintaining clubbing friendships. Clubbing and related drug consumption acts as a source of stability for many young people with clubbing as a resource through which young people create ‘parallel lives’ that counter-balance the uncertainties of everyday life (Moore and Miles, 2004). One of the key aspects of these ‘parallel lives’ is the production of clubbing identities and identifications (Malbon, 1999) of which clubbing friendships are an essential part. Indeed the fact that there is a particular widely-used word (at least in the UK) for acquaintances one meets in clubbing spaces, i.e. ‘random’, indicates the acknowledgement amongst those committed to ‘club culture’ that meeting new people and perhaps making new friends (who become part of ‘real-life’ friendship groups) is a valued aspect of being a clubber. The following quotes from the MASH survey highlight this point,

MASH Questionnaire, Respondent 2: Q.52: ‘What do you love most about clubbing?’

“The closeness to the other people around you”.

MASH Questionnaire, Respondent 3: Section 8.

“When the night gets going it is really good as it is easy to talk to anyone, not just friends but strangers as well”.

MASH Questionnaire, Respondent 8: Q.52: ‘What do you love most about clubbing?’

“Music, dancing, meeting people, the release of letting yourself go”.

Given that the mobile phone is being used by clubbers to create (clubbing) friendship groups it would seem reasonable that the mobile industry can exploit this as a resource for the creation of ‘community’ related applications and services.

However, from my research at least it would appear that clubbers are quite able to create and maintain clubbing communities using applications and services currently available (particularly short messaging services, and to a lesser extent multimedia messaging services). Further user-orientated research into the possibilities for clubbing community services and applications is needed to explore possible patterns of user acceptance and resistance. Such research should be mindful of the nuances of club culture, with its ever-shifting definitions of 'cool' and 'uncool', and should not be naïve to the fact that mobiles are profoundly implicated in illegal activities within and across clubbing spaces and times.

8. Conclusions

Communication, identifications and friendships however defined are all highly valued amongst clubbers, whether it be a fleeting exchange with a never-to-be-seen-again 'random', or a 'comedown' conversation with a close 'real-life' friend. Notions of what 'counts' as communication are expressed by clubbers as any exchange with a person or persons which is deemed a 'friendly' exchange, so exchanging smiles with a stranger can mean as much to a clubber as a lengthy conversation (Moore 2004b: 12). In this chapter I have explored the ways in which mobiles are used within club culture, at least club culture in the North-west of England. This exploration has led to tentative suggestions for dance-music/club community-enabling services and mobile music applications and services, such as context-specific music file downloads linked to the exchange of texts across various clubbing spaces and times.

I have focused upon the ways in which (self-defined) clubbers imbue the mobile device with different emotional and symbolic meanings. For clubbers the mobile is a valuable and valued artefact. It is a key technological 'tool' used in order to procure illegal substances. It is employed to perform the 'mundane' tasks of organisation on which the more 'spectacular' aspects of clubbing rest. The mobile can create a personal 'safe' space for the clubber in the in-club setting, helping to manage feelings of nervousness and anxiety. It is also used to 'account for' friends in main clubbing spaces and in post-club settings. Given the majority of clubbers in some dance events will have consumed at least one substance this use of the mobile to account for friends, and enhance personal safety could be exploited by agencies concerned for clubbers' welfare, through 'Dance Safe' mobile text campaigns linked to Greater Manchester Police's 'GM Club Safe' scheme for example. However, it is suggested that further research is needed to better explore the possibilities for mobile services and applications specifically aimed at UK clubbers.

The mobile is used to create and maintain clubbing friendships, and aids in the enactment of the 'friendly vibe' that those committed to club culture value so greatly. The mobile is also implicated in the enactment of subcultural capital in terms of dance music-related logos and ringtones (*Crasher* logos for one's mobile for example, see www.gatecrasher.co.uk) and dance music downloads. The usage and meanings of mobiles are likely to shift given the ever-changing nature of British club scene (the recent 'explosion' of Breaks and Beats nights in Manchester is one example of this fluidity) and the advent of 'new' mobile applications and services. Some patterns of mobile usage amongst clubbers (such as picture messaging) warrant further investigation. For now this chapter contributes both to our understanding of the mobile's place in contemporary British culture, and the ways in which technologies are used, and clubbing identities and friendships enacted, in the club 'scene' (Newcombe, 1991) in the North-West of England.

References

Ahmed, S. and Fortier, A-M., 2003, 'Re-Imagining Communities', International Journal of Cultural Studies, Vol.6, No.3. pp. 251-259.

Akram, G., 1997, Patterns of Use and Safety Awareness among Users of Dance Drugs in Nottingham, Master of Public Health, Nottingham: University of Nottingham.

Akrich, M., 1992, The Description of Technical Objects, in E. Bijker, and J. Law, (Eds) Shaping Technology/Building Society: Studies in Sociotechnical Change, Cambridge, MA: The MIT Press.

Anderson, B., 1991, Imagined Communities: Reflections on the Origin and Spread of Nationalism. London: Verso.

Atkinson, R. and Flint, J., 2001, Accessing Hidden and Hard to Reach Populations: Snowball Research Strategies, Social Research Online, 33, <www.soc.surrey.ac.uk/sru/SRU33.html>.

Beck, J. and Rosenbaum, M., 1994, The Pursuit of Ecstasy: The MDMA Experience, Albany: State University of New York Press.

Bennett, A., 2000, Popular Music and Youth Culture: Music, Identity and Place, New York: St Martin's Press.

Bennett, A., 2003, The Use of 'Insider' Knowledge in Ethnographic Research on Contemporary Youth Music Scenes, in A. Bennett, M. Cieslik and S. Miles, (Eds) Researching Youth, London: Palgrave Macmillan.

Bennett, A. and Kahn-Harris, K., 2004, After Subculture: Critical Studies in Contemporary Youth Culture, London: Palgrave Macmillan.

Berg, S., Taylor, A. S., and Harper, R., 2003, April 5-10). Mobile Phones for the next generation: Device designs for teenagers. Paper presented at the Conference on Human Factors and Computing systems, CHI 2003, Fort Lauderdale, Florida, ACM Press, pp. 433-440.

Bijker, W.E., 1995, Of Bicycles, Bakelites, and Bulbs: Towards a Theory of Sociotechnical Change, Cambridge, MA: MIT Press.

Boys, A., Fountain, J., Marsden, J., Griffiths, P., Stillwell, G. and Strang, J., 2000, Drug Decisions: a qualitative study of young people, drugs and alcohol, London: Health Education Authority.

Bull, M., 2000, Sounding Out the City: Personal Stereos and the Management of Everyday Life, Oxford: Berg.

Bull, M., 2001, The World According to Sound: Investigating the world of Walkman users, New Media and Society, 3(2) pp. 170-197.

Bull, M., 2004, 'iPod Culture', Mobile Leisure and Technology Mediascapes, Digiplay Seminar Series, University of Surrey, UK.

Coffield, F. and Gofton, L., 1994, Drugs and Young People, London: Institute for Public Policy Research.

Collin, M. and Godfrey, J., 1997, Altered State: The Story of Ecstasy Culture and Acid House, London: Serpent's Tail.

Cooper, G., 2002, The Mutable Mobile: Social Theory in the Wireless World, in B. Brown, N. Green and R. Harper (Eds) Wireless World: Social and Interactional Aspects of the Mobile Age, London: Springer.

Cunningham, S., 1998, Digital Culture-the View from the Dance Floor, in J. Sefton-Green (Ed) Digital Diversions: Youth Culture in the Age of Multimedia, London: UCL Press.

Curran, H. and Monaghan, L., 2001, In and Out of the K-hole: A comparison of the acute and residual effects of ketamine in frequent and infrequent ketamine users, Addiction, 96, pp. 749-760.

Dalgarno, P, J. and Shewan, D., 1996, The illicit use of ketamine in Scotland, Journal of Psychoactive Drugs, 28(2), pp. 191-9.

Delanty, G., 2003, Community, London: Routledge.

Dillon, P. and Degenhardt, L., 2001, Ketamine and GHB: new trends in club drug use?, Journal of Substance Abuse, 6, pp. 11-15.

Dorn, N. and South, N., 1990, 'Drug Markets and Law Enforcement', British Journal of Criminology, 30(2), pp.171-188.

Finch, J., 1999, Death Dance of the Disco, The Guardian, 23rd January.

Forsyth, A. J. M., 1996, Places and patterns of dance drug use in the Scottish dance scene. Addiction, 91, pp. 511-521.

Gilbert, J. and Pearson, E., 1999, Metal Machine Musics: Technology, Subjectivity and reception, in J. Gilbert and E. Pearson, Discographies: Dance Music, Culture and the Politics of Sound, London: Routledge.

Goodwin, A., 1992, Rationalisation and democratisation in the new technologies of popular music, in J. Lull, (Ed) Popular Music and Communication, London: Sage.

Green, N. et al., 2002, "Someone I Should Have Deleted": The integration of new technologies in the lives of gay men in the UK, INCITE events: Sapient Project, The University of Surrey, <http://www.soc.surrey.ac.uk/incite/smtnicolagreenpaper.htm>.

Griffiths, P., Vingoe, L., Jansen, K., Sherval, J., Lewis, R. and Hartnoll, R., 1997, New Trends in Synthetic Drugs in the European Union, Lisbon: EMCDDA.

Hand, M. and Moore, K., 2005 forthcoming, 'Cultures of Gaming: Digitised Communities and Identities', in Rutter, J. and Bryce, J. (Eds) Understanding Digital Games, London: Sage.

Harrison, M., 1998, High Society: The real voices of club culture, London: Piatkus.

Haslam, D., 1998, DJ Culture, in S. Redhead, D. Wynne and J. O'Conner (Eds) The Clubcultures Reader: Readings in Popular Cultural Studies, London: Blackwell.

Henderson, S., 1999, Drugs and culture: the question of gender, in South, N. (Ed) Drugs: Cultures, Controls and Everyday Life, London: Sage.

Hunt, G. and Evans, K., 2003, Dancing and drugs: a cross-national exploration, Scenes, Subcultures and Tribes: Youth Culture in the 21st Century (unpublished paper) British Sociological Association Youth Study Group Conference, University College Northampton, 11th-13th September 2003.

Huq, R., 1996, Asian Kool? Bhangra and Beyond, in Sharma, S. Hutnyk, J. and Sharma, A. (Eds) Dis-orientating Rhythms: The Politics of New Asian Dance Music, London: Zed.

Jackson, P., 2004, Inside Clubbing: Sensual Experiences in the Art of Being Human, Oxford/New York: Berg.

Jansen, KLR., 1993, Non-Medical Use of Ketamine (letter), British Medical Journal, 306(6878), pp. 601-2.

Jansen, KLR., 1997, Questions and Answers: Ketamine, Drug News, Summer 1997, pp. 19-21.

Jenkins, R., 1996, Social Identity. London: Routledge.

Lasen, A., 2002, Notes of Extreme Happiness: The Dance Music Experience, in PAC2 (Pensament I Arts Contemporanis), Barcelona, JG Samsa, pp. 53-61.

Lash, S., 1994, Reflexivity and its Doubles: Structures, Aesthetics, Community, in Beck, U. Giddens, A. Lash, S., 1994, Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order. Cambridge: Polity Press.

Latour, B., 1986, The Powers of Association, in J. Law. (Ed), Power, Action and Belief. London: Routledge, pp. 164-80.

Lewis, L. and Ross, M., 1995, A Select Body: The Gay Dance Party Subculture and the HIV/AIDS Pandemic, London: Cassell.

Lifeline, 1992, The Big Blue Book of Dance Drugs, Manchester: Lifeline.

Ling, R. and Yttri, B., 2002, Hyper-coordination via mobile phones in Norway, in J.E. Katz and M. Aakhus (Eds) Perpetual Contact: Mobile Communication, Private Talk, Public Performance, Cambridge University Press.

Ling, R. and Yttri, B., 2003, Control, emancipation and status: The mobile telephone in the teen's parental and peer group control relationships, available electronically at http://www.privateline.com/ling/, accessed September 2004.

Maffesoli, M., 1996, The Time of the Tribes: The Decline of Individualism in Mass Society. London: Sage.

Malbon, B., 1999, Clubbing: Dancing, Ecstasy and Vitality, London: Routledge.

Measham, F., Aldridge, J. and Parker, H., 2001, Dancing on Drugs: Risk, health and hedonism in the British club scene, London: Free Association Books.

Milestone, K., 1996, Regional variations: Northerness and new urban economies of hedonism', in J. O'Conner and D. Wynne (Eds) From the Margins to the Centre: Cultural Production and Consumption in the Post-Industrial City, Aldershot: Arena.

Moore, K., 2003a, E-Heads Versus Beer Monsters: Researching Young People's Music and Drug Consumption in Dance Club Settings, in A. Bennett, M. Cieslik and S. Miles, (Eds) Researching Youth, London: Palgrave.

Moore, K., 2003b, The MASH research report: April 2003-October 2003, unpublished research report, Centre for Research on Innovation and Competition (CRIC), University of Manchester.

Moore, K., 2004a, Childs Play or Childish Risk?: The Use of Ketamine amongst Manchester Clubbers, in The MASH research report: November 2003-May 2004, unpublished research report, Information Systems Institute, University of Salford.

Moore, K., 2004b, Versions of the Future in Relation to Mobile Communication Technologies, Unpublished PhD Thesis, Digital World Research Centre, University of Surrey.

Moore, K., 2005, 'A Commitment to Clubbing', Peace Review: A Journal of Social Justice, 17(1).

Moore, K. and Rutter, J., 2004, 'Understanding Consumers' Understanding of Mobile Entertainment', in Moore, K. and Rutter, J. (Eds) Proceedings of Mobile Entertainment: User-centred Perspectives, 25-27th March 2004, Museum of Science and Industry, Manchester.

Moore, K. and Miles, S., 2004, 'Young People, Dance and the Sub-Cultural Consumption of Drugs', Addiction Research and Theory, 12(6).

Newcombe, R., 1991, Raving and Dance Drugs: House Music Clubs and Parties in North-West England, Liverpool: Rave Research Bureau.

Parker, H., Aldridge, J. and Measham, F., 1998, Illegal Leisure: The Normalisation of Adolescent Recreational Drug Use, London: Routledge.

Parker, H., Williams, L. and Aldridge, J., 2002, The Normalisation of 'Sensible' Drug Use: Further evidence from the North West England longitudinal study', Sociology, Vol.36, No.4.

Pini, M., 2001, Club Cultures and Female Subjectivity: The Move from Home to House, London: Palgrave.

Poster, M., 1995, The Second Media Age. Cambridge: Polity Press.

Redhead, S., 1997, The End-of-the-Century Party: Youth and Pop Towards 2000, Manchester: Manchester University Press.

Redhead, S., Wynne, D. and O'Conner, J., 1997, (Eds) The ClubCultures Reader: Readings in Popular Cultural Studies, Oxford: Blackwell.

Reynolds, S., 1997, Rave culture: living dream or living death?, in Redhead, S. Wynne, D. and O'Conner, J., 1997, (Eds) The ClubCultures Reader: Readings in Popular Cultural

Studies, Oxford: Blackwell.

Reynolds, S., 1998, Energy Flash: A Journey Through Rave Music and Dance Culture, London: Macmillan.

Roseneil, S., 2000, Queer Frameworks and Queer Tendencies: Towards an Understanding of Postmodern Transformations of Sexuality, Sociological Research Online, 5(3), www.socresonline.org.uk/5/3/roseneil.html#fn41.

Stanley, C., 1997, Not drowning but waving: urban narratives of descent in the wild zone in S. Redhead, D. Wynne and J. O'Connor, (Eds) The ClubCultures Reader: Readings in Popular Cultural Studies, Oxford: Blackwell.

Sola Pool, I., 1984, Technologies of Freedom, Harvard: Belknap Press.

Sorensen, K. H., 1997, 'Constructivism and the Analysis of Technology: A pragmatic approach to a sociology of technology', seminar paper delivered at the Centre for Technology and Society, NTNU, April 1997.

Stone, A. R., 1991, Will the Real Body Please Stand Up?: Boundary Stories About Virtual Cultures in Benedikt, M. (Ed) Cyberspace: First Steps. Cambridge: MIT Press.

Stone, A. R., 1995, The War of Desire and Technology at the Close of the Mechanical Age. MA: MIT Press.

Taylor, A. and Harper, R., 2001, The Gift of the Gab?: a design orientated sociology of young people's use of 'mobiliZe, (electronic) submitted to Computer Supported Cooperative Work (CSCW), available at www.surrey.ac.uk/dwrc, accessed June 2004.

Taylor, A. and Harper, R., 2002, Age-old practices in the 'New World: A study of gift-giving teenage mobile phone users, CHI 2002 April 20-25, Minnesota, USA.

Taylor, A. S. and Stone, A., 2004, Information on-the-go. Paper presented at the conference on The Life of Mobile Data: Technology, Mobility and Data Subjectivity, Guildford, Surrey.

Thomas, G., 2002, This is Ecstasy, London: Sanctuary Publishing.

Thornton, S., 1995, Club Cultures: Media, Music and Subcultural Capital, Cambridge: Polity Press.

Tori, S., 1996, Ketamine Abuse 'Special K', Middle Atlantic-Great Lakes Organised Crime Law Enforcement Network, Pennsylvania.

Van Meter, K., 1990, Methodological and Design Issues: Techniques for Assessing the Representatives of Snowball Samples, NIDA Research Monograph, 31-43.

Wright, M.A.W., 1999, The Symbolic Challenge of a New Cultural Movement: Ecstasy Use and the British Dance Scene, 1988-1998, Unpublished Doctoral Thesis, Sociology Department, City University, London.

Chapter 12

HPDJ: AN AUTOMATED DJ WITH FLOORSHOW FEEDBACK

Dave Cliff

This is the floorshow the last ideal
It's populist got mass appeal
The old religion redefined
For the facile futile totally blind.

Mundane by day inane at night
Pagan playing in the flashing light
In the violet hour to the violent sound
Going round and around and around and around and around

The Sisters of Mercy, *Floorshow.* (A. Eldritch, 1982).

1. Introduction

Many radio stations and nightclubs employ Disk-Jockeys (DJs) to provide a continuous uninterrupted stream or "mix" of dance music, built from a sequence of individual song-tracks. In the last decade, commercial pre-recorded compilation audio CDs of DJ mixes have become a significant growth market. DJs exercise skill in deciding an appropriate sequence of tracks and in mixing 'seamlessly' from one track to the next. Online access to large-scale archives of digitized music via automated music information retrieval systems offers users the possibility of discovering many songs that they like, but the majority of consumers are unlikely to want to learn the DJ skills of sequencing and mixing, and even if they had such skills, they may not have the time to devote to the mixing task. This chapter starts

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 241–264.

with a description of *hpDJ*, an automatic DJ system in which compilations of dance-music can be sequenced and seamlessly mixed by computer, with minimal user involvement. The user may specify a selection of tracks, and may give a qualitative indication of the type of mix required. The resultant mix can be presented as a continuous single digital audio file, whether for burning to CD, or for play-out from a personal playback device such as an iPod, or for play-out to rooms full of dancers in a nightclub. Results from an early version of this system have been tested on an audience of patrons in a London nightclub, with very favourable results. Subsequent to that experiment, we designed technologies that allow the hpDJ system to monitor the responses of crowds of dancers (or listeners), so that hpDJ can dynamically react to those responses from the crowd. The initial intention was that hpDJ would monitor the crowd's reaction to the song-track currently being played, and use that response to guide its selection of subsequent song-tracks in the mix. In that version, it was assumed that all the song-tracks existed in some archive or library of pre-recorded files. However, once reliable crowd-monitoring technology is available, it becomes possible to use the crowd-response data to dynamically "remix" existing song-tracks (i.e, alter the track in some way, tailoring it to the response of the crowd) and even to dynamically "compose" *new* song-tracks suited to that crowd. Thus, the music played by hpDJ to any particular crowd of listeners on any particular night becomes a direct function of that particular crowd's particular responses on that particular night. On a different night, the same crowd of people might react in a different way, thereby leading hpDJ to create different music. Thus, the music composed and played by hpDJ could be viewed as an emergent property of the dynamic interaction between the computer system and the crowd, and the crowd could then be viewed as having collectively collaborated on composing the music that was played on that night, but the act of collaboration is also one of *consumption*: it's the crowd's appreciation of currently-playing music that leads hpDJ to create the next piece of music. This *en masse* collective composition raises some interesting legal issues regarding the ownership of the composition (i.e.: who, exactly, is the author of the work?), but revenue-generating businesses can nevertheless plausibly be built from such technologies.

2. Background: What a DJ does?

What will happen when the major problems in music information retrieval are solved? Imagine if they were solved now, so the 1,000,000-plus songs held by sites such as Mp3.com or Napster.com could be automatically ranked in order of similarity to your entire record collection, or maybe your current favorite five songs. The resultant ranking would be a personalized music recommendation service based not on the purchasing patterns of strangers, but on your personal taste in music. This could be a good way of finding new music to listen to.

Say that such a recommendation service came up with a bunch of songs. How would you want them presented to you? Maybe streamed over the web as a "virtual radio" channel, or maybe burnt onto a CD, or possibly downloaded to an mp3 player such as an Apple *iPod*. However, many young(ish) people listening to radio, or dancing to CDs, want their songs to have been ‘mixed’ by a disk-jockey (DJ). The job of a DJ isn't simply just playing a bunch of records. There's art and skill in deciding the order of the records, and in mixing between successive records.

For these reasons, many radio stations and nightclubs employ DJs to provide a continuous stream or “mix” of music, built from a sequence of individual song-tracks. Moreover, sales of commercial compilation CDs of DJ mixes (a type of CD unknown until 1992: Brewster & Broughton, 1999, p.368) have boomed in recent years, constituting a major sector of chart CD sales (in the UK at least). The London *Ministry of Sound* nightclub was estimated to have income from sales of its compilation CDs (produced by its own *Sound of Ministry* independent record label*)* in excess of £20m for the year 1999 (Kershaw, 2000, p.60), although there are reports of sales having subsequently slowed in this sector. The shelf-life of a typical DJ compilation CD is short (often no more than 6 months), but in that time it may sell 500,000 copies (Kershaw, 2000, p.60).

In recent years, DJ’s have become a new breed of music performer (Haslam, 2001). Top DJs are international stars, earning millions of dollars. According to Kershaw (2000), the fee a top DJ receives for producing a compilation CD (a task that may take little more than a couple of hours) may be up to £50,000. Kids who want to be cool want to be DJs: sales of DJ equipment now exceed sales of guitars in the UK. Nevertheless, working as a DJ requires skill at two levels: the macro-level of *sequencing* and the micro-level of *mixing*.

Sequencing (also sometimes referred to as *programming*) involves deciding an appropriate ordering of tracks. While this is manifestly dependent on the DJ’s personal taste in music, there is an element to sequencing that is somewhat more mechanistic. In many instances, the music’s tempo (traditionally measured in units of beats-per-minute or “bpm”) will be systematically and smoothly varied over the duration of the DJ’s playing session (which typically lasts anything from 30-40 minutes to 5 or 6 hours). The tempo is dynamically varied to follow some trajectory, in a manner analogous to the distinct movements that constitute a symphony in classical music. In a nightclub, there will be definite periods of “warm-up” (when the tempo of the tracks rises over time – encouraging the clientele onto the dance-floor), plateaus (keeping the dancers dancing) and peaks (aimed at driving the dancers into a brief frenzy, after which they need to buy another drink). Toward the end of a DJ session, there may be a period where the tempo is progressively reduced (the “come-down” or “chill out”), to start to encourage people to think about leaving, or about buying another drink. Commercial DJ-mixed compilation CDs almost always follow some such trajectory – sometimes split across multiple disks.

The micro-level of mixing 'seamlessly' from one track to the next depends on artful “cross-fading”: fading down the volume of the outgoing track while simultaneously bringing up the volume of the incoming track. DJs typically employ multi-channel audio mixers with at least two input channels (each of which is usually stereo), and most often the cross-fade is effected by moving a linear slider across from its extreme left position (where the output of the mixer is 100% of the signal from input channel A; and 0% of the signal from input-channel B) through its mid-point (50% A and 50% B); to its extreme right position (0% A, 100% B). Thus, for some duration during a cross-fade, both tracks will be audible simultaneously:

this works best if the two tracks are playing at the same tempo and in perfect synchrony (that is, in more technical language, with zero phase difference between the major rhythmic elements of the two tracks). Getting the two tracks to play at the same tempo and in synchrony is a process known as “beat-matching”, which allows one track to be faded into the next without any discernable alteration in the underlying rhythmic beat. Figure 12-1 shows the effects on the output mix of a poorly executed cross-fade with no beat-matching, while Figure 12-2 shows the results of a well-executed cross-fade.

Hence, seamless mixing often requires dynamic alteration in the pitch, tempo, and phase of the two tracks being mixed between. Alterations in pitch and tempo are achieved by reducing or increasing the playback speed of a track, while phase differences are rectified by very briefly slowing or pausing the playback of one of the tracks. Sometimes it is not possible to beat-match two tracks because even when their tempo is identical and there is no phase difference, their interaction sounds bad. In such cases the DJ may choose to cross-fade at a point where the beat is absent in one of the tracks – that is, during a so-called “breakdown” in the beat of the track, or alternatively to apply filters to either or both of the two audio signals in the cross-fade, boosting energy in some frequency ranges and/or reducing energy in others. This latter technique is known colloquially as “EQ’ing” (from *frequency EQualization*). An example of EQing in a cross-fade might be to cut (or “kill”) all high-frequency energy in the new (incoming) track, and then during the cross-fade the DJ might progressively filter out (i.e. reduce from full to zero) the bass frequencies in the old (outgoing) track, while progressively filtering in (i.e. bringing up from zero to full) the bass frequencies of the incoming track. Thus, for some part of the cross-fade, the audience will hear the low frequency components (e.g. bass drum, bass synth) of the incoming track, but with the high-frequency components (e.g. snare drum, hand-claps, voice) of the outgoing track still dominant in the mix. At some appropriate point soon after the cross-fade, the DJ would then bring back the high-frequency components of the new track by cutting out the high-frequency filter. Basic DJ audio mixers typically offer rotary control knobs for two or three limited-bandwidth frequency filters (e.g. “high” and “low”; or “high” and “mid” and “low); more sophisticated mixers also offer two or three corresponding “kill switches” which each cut their specified frequency range to zero “instantly” (i.e., at the push of the button) rather than requiring the DJ to twist a knob.

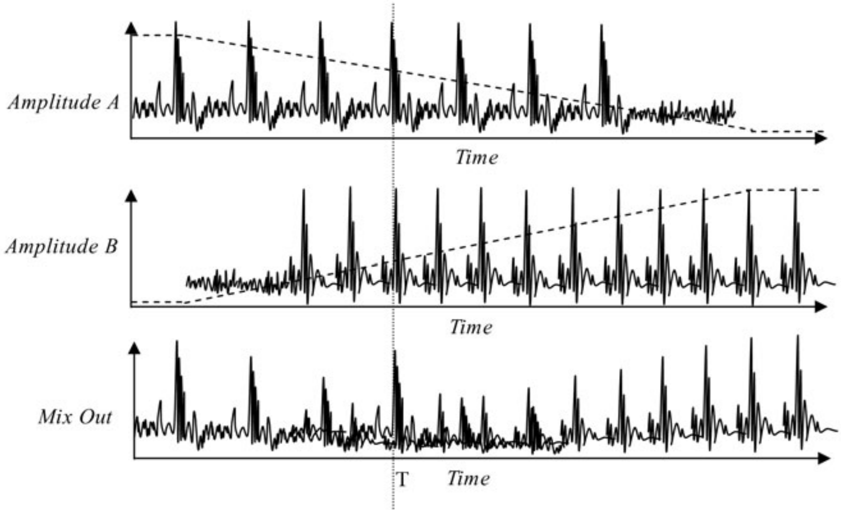

Figure 12-1. Cross-fading done badly. *The upper two graphs show illustrative amplitude-time plots of the audio in two songs being cross-faded:* A *is the outgoing track and* B *(with a faster tempo) is the incoming track. If the amplitude is signal strength following low-pass filtering, then the pronounced peaks are likely to represent the songs' underlying beat (i.e., the bass drum). The dashed diagonal lines show the relative volumes of tracks* A *and* B *during the cross-fade: note that the sum of the two volumes is constant. Note also that the beats in* A *and* B *are only coincident at time* T *(indicated by the vertical dotted line). The bottom graph shows the resulting mixed output. Because the beats in* A *and* B *are not coincident elsewhere, there is a noticeable drop in the amplitude of the beats in the mix. Also, around time* T *the beats in the two tracks combine to give a brief section in the output mix where there is an audible beat-pattern that is quasi-periodic and that has approximately twice the tempo of* A *and* B.

The audio-source hardware used by DJs usually consists of two or more playback devices, or "decks". Each deck typically provides a stereo input to an audio mixer that allows cross-fading between two or more of its inputs. For historical reasons, the most popular music playback technology is still analog 12-inch vinyl disks rather than digital Compact Discs (CDs), although the market penetration of CDs does appear to be increasing rapidly. DJ decks differ from domestic hi-fi machines in several important respects. Both for vinyl turntables and for digital CD players, DJ versions of these devices will have smoothly-variable controls that can alter playback speed: typically by up to plus or minus around 10% of the normal speed. This allows the DJ to beat-match the tracks being played from the two devices. On analog vinyl turntables, alterations in playback speed will affect both the tempo and the pitch of the recording being played. The same is true of lower-cost CD decks, while more expensive CD decks use digital signal processing (DSP) techniques to allow pitch and tempo to be varied independently. Alteration in phase is achieved on a CD deck via a jog-wheel controller, while on a vinyl turntable the DJ's fingers are used to either push the vinyl disk forwards slightly to give a momentary increase in playback speed, or to "brake" the disk, momentarily slowing it down.

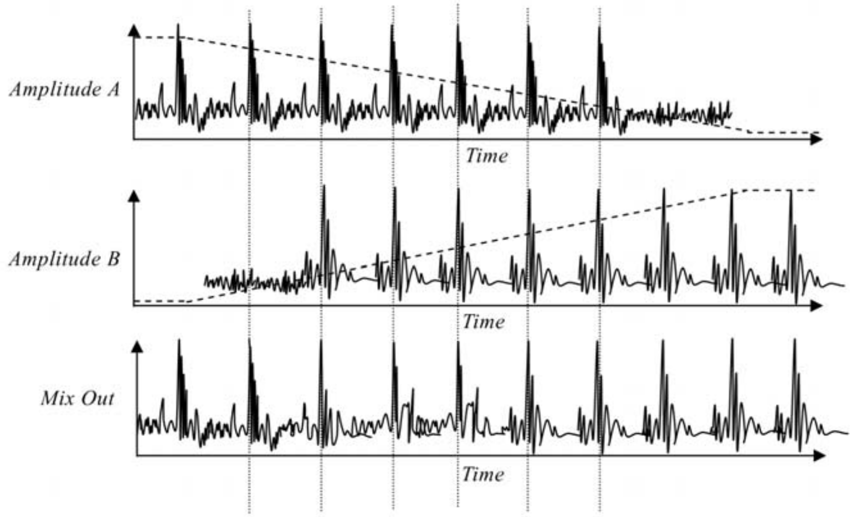

Figure 12-2. Cross-fading done well. *As in Figure 12-1, the upper two graphs show impressionistic amplitude-time plots of the audio in two songs being cross-faded where A is the outgoing track and B is the incoming track. But here track B has been time-stretched (e.g. by slowing its playback speed) so that its tempo matches that of track A, and the two tracks are synchronized such that there is no phase difference between their beat patterns. The two tracks beat-match for 6 beats (indicated by the vertical dotted lines – note that in practice the beat-matching would last for many more beats). In consequence, the mix output shows no discernable drop in amplitude, and shows a constant beat tempo as the two tracks are cross-faded. Once the cross-fade is complete, the playback speed of track B may be gradually increased (reducing the time-stretch back to zero).*

The original hpDJ computer system automates these DJ tasks, and was initially designed to be used as a component of a user interface in commercial music information retrieval systems or digital entertainment centers. hpDJ starts with some method for specifying a collection of song-tracks; those songs are then automatically sequenced to follow some tempo trajectory; and they are then seamlessly mixed, without any need for further human intervention and without any need for human preprocessing of the tracks.

The original (and so far only) version of hpDJ operates best on "dance" styles of music, where the rhythmic element of the music is very regular and pronounced. In the sublime poetry of English Law, these styles are defined in Clause 58 (1) (b) of the *1994 Criminal Justice Act* as "…sounds wholly or predominantly characterized by the emission of a succession of repetitive beats." Such music styles include those popularly known as "disco", "electronica", "house", "garage", "techno", "hip-hop", "drum n bass", and "trance". These styles are the mainstay of many nightclubs and of dance-oriented radio stations, and they regularly constitute the majority of the songs in the national top-twenty charts of many countries. In fact, the styles known as "house", "techno" and "trance" typically have the most regular beat-patterns of all, and are also very popular, and so hpDJ was first constructed to work with those. We see no reasons in principle why hpDJ could not be extended to work with the more complex beat patterns of other genres, although we have not yet pursued this in any depth.

Many prominent dance-music DJs also have a hand in producing new recordings, and in the latter part of this chapter we describe how hpDJ echoes this. It is this extension of hpDJ that allows crowds of listeners to collaborate (via their interactions with hpDJ) on the creation of new song-tracks. And that's the reason why the rather unwieldy phrase "song-track" has been used throughout this chapter to denote a single complete recording, or "song", even though in many cases the song will contain no vocal element, and even though most people commonly use the word "track" to mean "song" (as in: "how many tracks are there on your new CD?"). The usual colloquial usage of the word "track" as a synonym for "song" is avoided here because we need to reserve the word "track" for the specific context of creating *multi-track recordings* of songs. That is, in the recording of a song, multiple separate audio tracks are mixed down to create the stereo audio data. For example there might be one track each for the drums, for the bass guitar or synthesizer, for the rhythm guitar/synthesizer, for a lead guitar/synth, for lead vocals, for backing vocals, for the piano, and for the brass or horns section; so eight separate tracks (each of which might itself be a stereo pair) are mixed down to create the final audio recording. In the vast majority of dance music, each track within a song involves a pattern of repetitions of short sequences of music, perhaps only one or two bars long. Frequently, these sequences are not played by musicians (or by programmed synthesizers) but rather they are actually digital audio samples, played in repetitive loops, and many dance-music producers use multitrack nonlinear arrangement and editing systems to compose their songs: popular products include Sony's *Acid* (Sony, 2005); Cakewalk *Sonar* (Cakewalk, 2005); Digidesign's *ProTools* (Digidesign, 2005); Steinberg's *Cubase* (Steinberg, 2005); and Apple's *Logic Audio* (Apple, 2005).

Those DJs with an involvement in music production often start out by *remixing* existing songs. This involves being given access to the original multi-track source material and altering some or all of the tracks in the song. So, for example, a new bass line and an altered vocal could be recorded and these could replace the original bass and vocal tracks in the song, leaving all the other component tracks in their original form, such that the remixed version of the song is clearly a revised version of the original. However, more extreme remixes show ever greater departures from the initial song, and in some cases the remixed version of a song is barely recognizable as having any resemblance to its source.

Relevant prior work is reviewed in Section 3. Section 4 then describes hpDJ in detail. In Section 5 we give results from a test of hpDJ in a London nightclub, and in Section 6 we discuss the extensions to the system that allow it to monitor the audience's reaction to the music as it is playing, and to use this crowd-feedback data to alter the selection of tracks being played and also to dynamically remix and compose new tracks – something we discuss in Section 7.

3. Related Work

The European patent application entitled *Automatically performed crossover between two consecutively played back sets of audio data* (L'Hopital, 1999) claims the invention of a solution to the problem of automating what DJs do, but has the following disadvantages, all of which are remedied in hpDJ:

- It requires pre-specified "begin" (end-of-fade-in) and "end" (start-of-fade-out) cue-markers to be added to each track's audio data. It gives no indication of any automatic method for doing this, and so the only reasonable interpretation is that skilled human operators are employed to decide on these begin and end points for each and every track.

- Each track has only one "begin" and one "end" marker, whereas in most situations the end of fade-in and the start of fade-out for any one track will depend on the circumstances of its usage (i.e., the particular sequence it is being used in, and its location within that sequence).

- In the third claim of L'Hopital's patent, varying the speed of playback over the "begin" or "end" periods of a track is claimed as an aspect of the invention. Yet no method or apparatus is specified or claimed for dealing with the nontrivial effects that variations in playback speed routinely have on the pitch, tempo, and phase of the tracks being mixed between.

- It says nothing about ordering of tracks within an extended sequence of tracks (i.e., more than two) and the temporal evolution (trajectory) of music tempo that skilled DJ's devise in such extended sequences.

A commercial product called *Databeat DJ Master* is marketed by Sound Management Services Ltd of Newbury, UK, to bars and pubs (see Databeat, 2005). At the time of writing, *Databeat* is installed in over 1000 sites around the world, with remote updating of each installation from the *Databeat* archive. All music in the *Databeat* system is catalogued by human operatives who record production data (such as year of release) along with data used by their proprietary mixing software. This mixing data includes the start-chord, end-chord, track tempo (bpm), and the location of (human-placed) "begin" and "end" cue-points similar to those involved in the method claimed by L'Hopital. Thus, unlike hpDJ, the *Databeat* system is not fully automatic in that it requires human operatives to generate the cataloging meta-data. Details of how the human-generated meta-data is employed by the *Databeat* system are not available.

With the rise in popularity of DJing as a pastime for young people, a number of software vendors have started to offer "virtual DJ" systems that give a software simulation of the physical hardware used by a DJ. In most cases, the software amounts to a graphical user interface (GUI) showing two simulated decks and a simulated mixer. The user selects digital audio files to be "played" by the two decks and has the capability to allow the user to beat-match by altering the playback speeds of the tracks and also by altering their relative phase by "jogging" the tracks slightly forwards or backwards in time. However, when using such software, just as when working with real physical decks and mixers, all the DJing skills in producing the mix have to come from the human operator: in this respect the computer is entirely passive. Thus no such virtual DJ software packages are comparable to hpDJ, because they do not automate the tasks performed by the human DJ.

One notable product that goes beyond this is *MixMeister*, produced by MixMeister Technology of Seattle, Washington, USA (Mixmeister, 2005); a company founded in May 2000. MixMeister works in a similar fashion to hpDJ. It allows a user to define a "playlist", i.e. a set of song-tracks to be mixed, and it then analyses those songs to determine their tempo, and can perform beat-analysis to allow automated "snap-to-beat" positioning of one track relative to another in time, thereby giving a form of beat-matching. MixMeister has an attractive and well-designed GUI, allowing the user to vary the arrangement and settings of the mix, in a manner similar to the professional multi-track music-production software systems described in Section 2.

This similarity with music-production software is revealing. *MixMeister* offers a GUI onto a set of tools that allow a user to produce a DJ-style continuous mix from a pre-existing playlist of songs, and thus MixMeister *assists* rather than *replaces* the human user in the process of creating the mix. At the time of writing, MixMeister still requires the human user to select the ordering of the tracks in the playlist (the nearest to automated sequencing it can offer is to sort the tracks by tempo, either into an ascending list or a descending list), while hpDJ has much more sophisticated sequencing capabilities. There are also more detailed points of difference, such as the fact that MixMeister's automated beat-matching works only on 8-bar overlapped sections of music (shorter or longer cross-fades require user intervention).

4. hpDJ Version 1: Hands-Free Automatic DJing

Starting with access to a collection of songs stored as digital audio files (in any format – mp3, wav, etc), the operation of the first version of hpDJ can be summarized as follows. It takes as input a list of desired tracks (which may have been specified by the user, or may come from another source such as an automatic recommendation service, or a random picker). This list of *n* tracks is referred to here as the *set*.

The first stage involves determining a sequence for the set, where the degree of user involvement in the sequencing process is variable from fully user-specified to fully automatic. The digital audio tracks do not require any pre-processing to locate fade begin and end points, because these points are calculated dynamically for each sequence and indeed the fade-in and fade-out points for any one track are likely to vary from sequence to sequence. We use pre-established digital signal processing (DSP) algorithms to automatically vary the pitch and tempo (i.e., the playback speed) of tracks as appropriate to the particular sequence, and the process then automatically sets the relative phase of successive tracks with high precision, to ensure seamless beat-matched mixing. The resultant continuous large file of digital audio can be produced as output for subsequent recording (e.g. burning onto CD) or play-out (e.g. over audio broadcast or narrowcast systems, or over a nightclub public-address sound system). Additional data, such as the time-points at which one track transitions to another, may also be recorded by the system (e.g. so as to provide a table of contents for a CD to be written with time indices for each track). Individual steps in the process are described below. Further details are available elsewhere (Cliff, 2002, 2003a, 2003b, 2003c). The process is described here as a linear sequence of steps, but in Section 4.4 we discuss nonlinear versions.

4.1 Track Mapping

Beat-detection techniques similar to those developed by other authors (e.g. Yamada et al., 1997; Scheirer, 1998) are used to determine a *tempo-map* for each of the tracks to go into the mix. The tempo-map is an indication of the bpm measured at intervals across the duration of the track. Figure 12-3 shows a schematic illustration of the beats in a sample of music and the corresponding tempo-map.

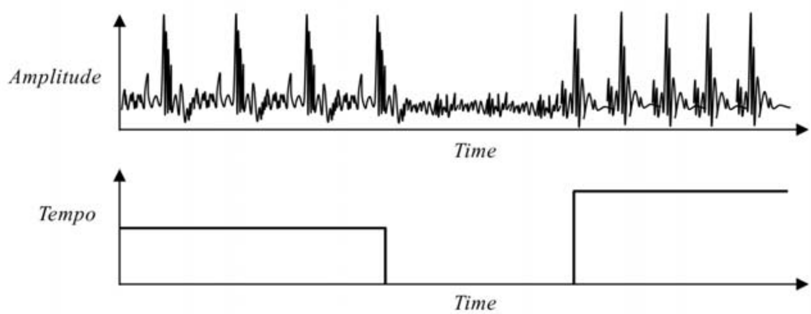

Figure 12-3. Tempo-map. *The upper graph shows a schematic amplitude-time plot for a section of a song where a tempo change occurs following a "breakdown". The lower graph schematically illustrates a corresponding tempo-map showing the initial lower tempo, followed by the breakdown (zero tempo), followed by the subsequent return of the beat at a higher tempo.*

Similarly well-established DSP techniques can be used to determine maps of amplitude and possibly also pitch/key for each track. These maps are dependent only on the original recorded version of the track, and so could be saved for the next time the track is used, or could all be computed in advance for each track in the music collection.

4.2 Trajectory Specification

The sequence of tracks can be fully and explicitly specified by the user, or sequencing can be completely automated, or it can be partially automated with some guidance from the user. This guidance can take the form of the user specifying a qualitative tempo trajectory (QTT) and optionally also by specifying some ordering constraints (e.g. “don’t play Track A before Track B”). A QTT is a specification of how the tempo should vary over the duration of the mix, expressed in relative, rather than absolute, terms. This allows the same QTT to be used when compiling separate mixes of different durations, or of different tempo-ranges. For instance, a simple “warm-up” QTT would show a monotonic increase in tempo from a minimum value at the start of the mix to a maximum value at the end of the mix. A graphic representation of this would be to plot a straight upward-sloping line on a graph of tempo over time: example QTTs are illustrated in Figure 12-4. Significantly, the duration of the mix is not explicitly specified, so the same QTT could be used for a mix lasting thirty minutes, and for one lasting three hours. Similarly, the bpm values of the minimum and maximum tempos in the mix are also unstated, thereby allowing the same QTT to be used for mixing both a compilation where all tracks have tempos in the range 100-120bpm, and for one where the set's tempo range is 125-145bpm.

The QTT for a mix might be directly specified by the user, or chosen by the user from a set of pre-specified QTTs, or randomly chosen by the system from that set of pre-specified QTTs. The user may also specify a maximum time duration for the mix (e.g., in preparing a mix to be burnt to a standard-format CD, the duration should be no longer than 74 minutes).

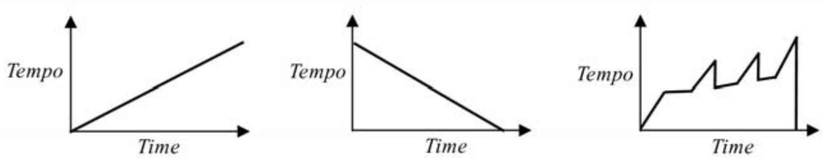

Figure 12-4. Qualitative Tempo Trajectories (QTTs). *The left-hand graph shows a QTT for a “warm-up” set. The center graph shows a QTT for a “come-down” set. The right-hand graph shows a QTT suitable for a protracted set on radio or in a nightclub: after the initial warm up comes a plateau that is followed by a sequence of three peaks of successively higher maximal tempo, with the set ending immediately after the fastest song.*

4.3 Sequencing

The QTT imposes constraints on the sequence of the tracks, constituting a partial ordering. For example, the (qualitative) point in the mix where the lowest tempo is specified on the QTT indicates the approximate location of the slowest track in the set; and the point where the highest tempo appears in the QTT indicates the approximate location of the fastest track in the set. Turning these approximate indications into a concrete sequence is a straightforward procedure.

The QTT is discretized by dividing it into *n* sections. The tempos of these QTT sections are then ranked in order from highest to lowest. The tracks in the set are also sorted in order of their overall native tempo, from highest to lowest (a track's overall tempo is taken as the average of the nonzero tempos recorded over track's tempo-map, when the track is played at its "native" speed). These two ordered lists are then used to determine the sequence, with the highest-tempo track being assigned to the highest-tempo QTT section, the second-highest-tempo track being assigned to the second-highest tempo QTT section, and so on, as illustrated in Figure 12-5.

Elementary constraint-satisfaction techniques can be used to check for violations of any of the user-supplied ordering constraints and to take appropriate action when violations are detected. The end result is a list of the tracks in the set, in the order they are to appear in the mix: this list is the sequence for the mix.

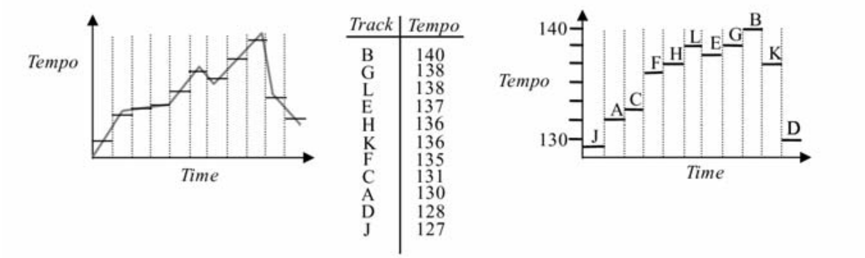

Figure 12-5. Sequencing. *Left: the QTT is discretised by dividing it into n slots (n=11 here). Center: the n tracks are ranked by tempo. Right: the highest-tempo-ranked track is assigned to the highest-tempo QTT slot; the second-highest-tempo-ranked track assigned to the second-highest-tempo QTT slot, and so on until the lowest-tempo-ranked track is assigned to the lowest-tempo QTT slot. The final sequence of tracks in this example is thus* J-A-C-F-H-L-E-G-B-K-D.

4.4 Overlapping

In order for the mix to be "seamless", there should be no "dead-spots" between tracks. While the avoidance of absolute silences is trivial, it is insufficient because many dance-music tracks have long (and relatively boring) "intro" (start) and "outro" (end) sections, where often the main melody or vocal content is absent, with only the rhythmic component of the song being present. Few listeners would want to hear the outro of one track playing to its very end, followed by the intro of the next track played from its very beginning. Indeed, the intention of the music producers is that these intro/outro sections are to be played while cross-fading from/to the outgoing/incoming track in the mix. Thus, the tracks in the mix have to be overlapped.

Determining the degree of overlap between tracks depends on whether the user has specified a maximum duration for the mix. If no duration has been specified, an initial arrangement of overlaps can be set by making each track overlap with the next by some pre-specified amount – either a fixed number of seconds, or a number of seconds that is a fixed proportion of that track's duration. If a mix-duration of d seconds has been specified, and the total combined length of the n tracks in the mix is l seconds, then the initial arrangement of overlaps can be set by overlapping each pair of tracks by $(l\text{-}d)/(n\text{-}1)$ seconds. Note that this assumes that $d<l$ (if $d>=l$ then the duration set by the user is irrelevant, and the overlap is set as if no duration was specified).

Once the initial overlaps have been determined, a number of fine-tuning heuristics can be automatically applied. For example, if on examining the tempo-maps for two tracks in the areas where they are currently overlapped shows that the planned overlap occurs near to a position where either track shows a beat "breakdown", the overlap point may be moved to allow the cross-fade to occur during the breakdown. Also, if a maximum duration has been specified for the mix, moves that lengthen the mix-duration are forbidden. A number of other overlap-moving heuristics have been developed. Once any such moves have been executed, the tempo-maps for the tracks are combined to create an overall tempo-map for the entire mix.

4.5 Time-stretching and Beat-Matching

Comparison of the tempo maps for overlapped tracks may reveal areas in the mix where those overlapped tracks have different tempos. In such cases, one or both of the tracks are time-stretched so that the tempos of the tracks in the overlapped portion are near-identical. For example, in a three-track set where the track tempos are 100, 110, and 120 bpm respectively, the first and third tracks could be left in their native states while the second track could be time-stretched so that its tempo is 100bpm for its intro overlap period (when it is cross-faded in over the 100bpm first track). Then, in the main portion of the second track a "gliding" time-stretch could be used that takes the tempo from 100bpm, through the track's native tempo of 110bpm, and up to 120bpm. Then in the second track's outro-overlap section, a constant time-stretch (strictly, a time-compression) could be applied to give a fixed 120bpm tempo while it is cross-faded out under the incoming 120bpm third track. Note that strict equality of tempo is desirable but often unachievable because of imprecision in the tempo-detection process. Alternatively, the same three racks could be mixed by performing gliding stretches to all three tracks so that their tempo ranges are 100-105, 105-115, and 115-120 respectively. Choices between such alternative but functionally equivalent uses of time-stretching may be made by the user, or may be left to hpDJ.

Once the time-stretching has been applied to bring all the tempos into line, simple beat-detection algorithms can be re-applied to identify the positions of the beats in the tracks and to align overlapping tracks such that there is zero (or minimal) phase difference between them. This involves moving the tracks in the sequence by small amounts of time – typically less than half a second.

4.6 Cross-Fading

Finally, the volumes of the tracks are altered in the overlap areas, in a manner analogous to the cross-fading volume alterations a DJ performs. In the simplest case, linear amplitude decay/increase modulates the outgoing/incoming track, but other curves for these amplitude envelopes are possible.

While a simple "blind" strategy of reducing the volume of the outgoing track while increasing the volume of the incoming track will give acceptable results most of the time, such an approach has an implicit assumption that the amplitude of each track's recording is constant during the cross-fade. In some instances, the music producer will have recorded the music with a fade-in at the start of the "intro" section or fade-out at the end of the "outro" section, and these systematic variations in intrinsic amplitude need to be detected and compensated for. How hpDJ does this is described in (Cliff, 2003c).

However, as was discussed in Section 2, most hardware DJ mixers are built not only with a linear-travel potentiometer for the cross-fader control, but also a small number of rotary potentiometers affecting the frequency equalization or "EQ" for different frequency ranges on each input channel. Each of these rotary controls can be set to cut or boost signal components for that channel within the specified frequency ranges (in much the same way as a linear-travel potentiometer does on a domestic hi-fi *graphic equalizer*). Often the DJ will use these controls in situations where there is a perceived "clash" between the musical components of two tracks being cross-faded. For example the bass guitar component of the incoming track may clash with the bass of the outgoing track, in which case the DJ might choose to reduce or eliminate ("kill") the bass frequencies of one of the tracks during the overlapped period when the cross-fade occurs. A typical arrangement of EQ controls might be a "bass" control for low frequencies up to around 250Hz, a "mid" control for perhaps 0.25-5kHz, and a "high" control for frequencies over 5kHz.

Although uncommon on DJ mixer devices, professional recording-studio mixing desks (which might have 16, 24, or 48 input channels in comparison to the 2, 3, or 4 of a DJ mixer) will often have more sophisticated "swept" EQ controls. Swept EQ controls typically have one rotary controller for the degree of cut or boost, and another rotary that controls the center frequency of the filter. Typically, the number of sweepable EQ controls is fixed to a small number (one or two) and is identical for all input channels; often only the mid-range EQ controllers are sweepable in this manner.

However, because hpDJ operates in the pure software realm of digital signal processing (DSP), it is possible to create as many sweepable band-pass/cut filters as is desired for any particular cross-fade from one track to another. As with traditional hardware mixers, each DSP filter can have variables that control the degree of attenuation or boost, and its center-frequency. In addition to this, the shape of the DSP filter's transfer function (e.g. the nature and rate of the fall-off or boost) and its bandwidth can also be under automatic control. Recording studios do have filters with these added controls, but such filters (known as a *Parametric EQ*) are too expensive to be built into each channel of professional mixing desks on a many-per-channel basis.

Thus, it becomes possible to specify hpDJ so that it analyses the audio frequency-time spectrogram for the incoming and outgoing tracks in the cross-fade, and uses a number of heuristics to determine how many DSP Parametric EQ filters are necessary and what their settings should be. This can be used to, for instance, selectively suppress the frequencies for a synthesizer melody-line in one track, attempting to make that melody "disappear" while keeping the bass-guitar and percussion elements in place during the cross-fade. By employing simple heuristics for detecting when one component of one track "clashes" with another component of the other track, such aesthetically unpleasant clashes (which may remain despite perfect beat-matching) could be automatically eliminated by hpDJ. Details of this sophisticated cross-fading technique are given in (Cliff, 2003c).

4.7 Nonlinearities

Although the process as described above is linear, starting with a list of tracks to go in the set and progressing through the stages described in Sections 4.1 to 4.5, there are obvious ways in which the process could be altered to be nonlinear or iterative. A nonlinear process could be invoked if the user specifies only a small number of tracks relative to the time limit on the mix and also requests that the unspecified time is filled with tracks chosen by the system. In this case, it may be more appropriate to introduce "wild-card" (unassigned) tracks when sequencing and overlapping, and to then select appropriate songs from some song database to instantiate these wild-cards after sequencing is complete. Deferring automatic selection of songs in this way allows the system's choice of songs to be constrained by the tempo and/or pitch of the surrounding tracks. In particular, the deferred instantiation of wild-card tracks can be used to bridge over major tempo transitions in the sequence. For example, if the user's specifications and choices result in an incoming 140bpm song having to be mixed into an outgoing 100bpm song with beat-matching during the cross-fade, both tracks would require unacceptably high alterations in their playback speeds. Slowing the fast track by 14% (i.e., setting its playback speed to 86%) reduces its tempo to 120bpm, and speeding the slow track by an extra 20% increases its tempo to 120bpm also, but the songs are likely to sound unappealingly different from the familiar original versions at these playback speeds. In such cases it may be better to add a small number of "wildcard" tracks between the two user-specified tracks: these could be chosen from a song database on the basis of their tempo. In the example just given, if three wildcard tracks are introduced, constrained to have tempos of around 130, 120, and 110bpm, then the tempo changes between successive tracks in the final mix would all require less extreme (and hence more tolerable) alterations in playback speed.

5. The London Nightclub Test

An early version of the hpDJ system was tested in an experiment organized in a London nightclub called *UnderSolo*. For a detailed journalistic report on this experiment, see Graham-Rowe (2000). An invited audience of 72 people, including a number of professional DJs, were asked to listen to two 30-minute sessions of music apparently played by Jesse Rose, a professional DJ and sometime resident DJ at London's *Ministry of Sound* nightclub. The audience was told that one session would be Mr Rose playing live, and the other session would be Mr Rose miming while the crowd heard output from the hpDJ system, and that at the end of the second session the audience would each be asked to decide whether they had heard *live-followed-by-mime* or *mime-followed-by-live*. The same set of five songs were used in each session, but Mr Rose chose the sequence for his session while hpDJ automatically determined its sequence for the mimed session. From the audience's viewpoint, Mr Rose was visible only from the shoulders upward, so it was not possible for the audience to use visual cues to determine whether he was miming or not. Before the audience arrived at the club, Mr Rose was given some time to familiarize himself with the songs and to rehearse his miming. The experiment took place from approximately 8:30pm to 9:30pm on a Tuesday night, with a full bar service available from 6pm (when the audience were allowed into the club) onwards. Thus, as far as was possible, the experiment replicated one of the intended environments into which hpDJ could be deployed.

At the end of the second session, the audience was asked to cast their votes. The result was that 45 people (62.5%) correctly identified that they heard *mime-followed-by-live*, while 27 people (37.5%) incorrectly voted for the other ordering. Now if hpDJ was truly terrible, presumably 100% of the audience would have made the correct choice and 0% would have made the incorrect choice; and if hpDJ was exactly as good as the human professional, then the audience's best response would be to guess, implying that 50% would be correct and 50% incorrect. Under this reasoning, the worst that the hpDJ could score is 0% incorrect votes and the best is 50%, so the actual score of 37.5% can be expressed as three-quarters (37.5/50=75%) of the best possible score. Although manifestly an $n=1$ data-point, the results from this experiment are nevertheless very encouraging indeed.

6. hpDJ Version 2: Direct Crowd Feedback

"I can't see that the 'whites-of-their-eyes' relationship between clubbers and DJs is going to be affected in any way by this. ... [DJing] is all about spontaneity, none of which can be supplied by anything other than the human real deal."

Judge Jules (a top British dance-music DJ) commenting on the *New Scientist* hpDJ nightclub test, on Britain's BBC Radio One Newsbeat news programme, 5 January 2001.

In the nightclub test described in the previous section, the hpDJ output was based purely on its analysis of the tempo of the songs and its choice of a QTT: if the audience didn't like the music or the mix, hpDJ had no way of knowing. Thus, one function performed by a human DJ that should also be built into hpDJ is the ability to "read" the audience's reactions to the music as it is played and to alter the subsequent selection of music accordingly.

In response to this perceived lack, we have designed technology that passively monitors the responses of an audience in a suitably pre-wired and instrumented nightclub (Cliff & Wilkinson, 2004). We use the word "passive" here to denote the fact that the audience do not need to actively participate in the monitoring: their presence in the venue is all that is required of them. Multi-modal sensor technologies such as under-floor pressure sensors, laser break-beams, video surveillance (both in visual and infra-red bands), and so on, are used to detect patterns of activity in the bar or nightclub and to infer from this the crowd's reaction to the music being played. A simple set of rules then determines whether the tempo of the music being played should be increased, decreased, or remain unchanged. In effect, the hpDJ commits to an initial QTT but that QTT may then be dynamically altered on the basis of crowd responses, and new song-tracks that fit with the emerging QTT are selected from a database of songs in the nonlinear fashion described in Section 4.6.

Although such passive monitoring is readily achievable using off-the-shelf technologies, it is typically very expensive. One issue is that it is not sufficient to monitor only the dance-floor: knowing that there are twenty people dancing on the dance-floor does not tell you much. Knowing there are twenty people dancing and two hundred people standing around in the bar area tells you that the music is not very popular, and it's probably time to change the tunes; knowing that there are twenty people dancing and the rest of the club is empty tells you that you're doing as well as could be expected. So, you have to monitor pretty much the whole nightclub. Because the costs of adding, calibrating, and maintaining this passive sensor technology to a nightclub are likely to be somewhere between "high" and "prohibitive", and because each such club requires an installation-specific design, we have also designed alternative solutions that achieve the same result but with much more portability and/or less cost. Our first alternative is a highly portable and personal technology that actively monitors the responses of individual members of the audience, using Bluetooth wireless communications links to read a combined sensor/feedback device worn as a wristwatch-sized personal appliance (Cliff & Wilkinson, 2004). The appliance could report on its approximate location using well-established techniques (e.g. triangulation) and it could also contain accelerometers (to detect movement of the arm when dancing); thermometers and galvanic skin resistance sensors (to report on the temperature and perspiration levels of the wearer), and possibly also could monitor the wearer's heart-rates using technologies commonplace from the wristwatch wearable heart-rate monitors currently sold in sports shops. Although this solution is much cheaper and less installation-specific than installing passive sensors throughout a nightclub, providing one such appliance per user in a large-capacity nightclub it is still likely to be too costly for many applications (unless the technology becomes so wildly popular that economies of scale drive the cost per unit down to affordable levels).

For this reason, in a third attempt at allowing users to give feedback to hpDJ, we hit upon the idea of a simple wristwatch transmitter device, with two big buttons (Cliff & Wilkinson, 2004). Let's say that one button is green and has a simple drawing of a smiley face on it, and the other is red with a drawing of a sad face on it. Each member of the crowd in the nightclub wears one such watch. When one of the buttons is pressed, it sends a "vote" to hpDJ over a Bluetooth wireless link. When listeners are enjoying the music, they can signal their pleasure to hpDJ by pressing the green button: the more they press the button (e.g. the longer they hold it down, or the more frequently they hit it), the more they signal to hpDJ that they are enjoying the current song or mix. Conversely, the more they press the red button, the more they signal their lack of enjoyment of the current song or mix. Such a "voting watch" would require comparatively little in the way of internal electronics and so could be produced much more cheaply than the other means of monitoring crowd feedback. As with the initial passive crowd monitoring system, the original intended use for the voting watch was that responses gathered from the crowd were used to dynamically alter the QTT, and that those dynamic alterations in the QTT would affect what music was selected to fit the current desired tempo. That is, initially the only motivation was to monitor crowd responses in order to guide the selection of songs to add to the mix in the immediate future of the hpDJ "performance".

However, it rapidly became clear that the feedback signal from the crowd is a source of information that could be put to much more use than merely deciding whether to alter the tempo of the music being selected for the mix. And this is true, however that crowd feedback is gathered: it could be gathered from a simpler but less user-friendly source, such as having "voting terminals" positioned around the room, with hardwired rather than wireless connectivity to the hpDJ server; or it could even come from a geographically dispersed "crowd", such as the listeners to an "internet radio" broadcast, voting via their home PCs.

Specifically, having developed such crowd-feedback technology, it becomes possible for the audience to play an active role in the dynamic on-the-fly *composition* of the music they are listening to, thereby dispensing not only with human DJs but potentially also with human recording artists too. That is a development discussed next.

7. The Crowd as a Mass Collaborative Composer

Feedback received from the crowd via the monitoring technologies introduced in the previous section gives hpDJ a means not only of helping to decide what song to play next, but also of estimating the crowd's view of the merits of each song. For the sake of this discussion, let's assume that the feedback data, however it is gathered, is boiled down into one rating-value or "score" from the crowd for each song, and let's say that the score is a percentage so that a song rated at 10% is pretty unpopular while a song with a 90% score is really very popular. And remember that here the notions of "popular" and "unpopular" are relative to the particular crowd that is being monitored or doing the voting or otherwise providing the feedback – a different crowd, or even the same crowd on a different night, might give different scores to the songs.

Now it happens that such single-value feedback scores are commonly found in a popular class of automated optimization systems that draw inspiration from Darwinian evolution via random variation and natural selection – so-called "evolutionary computation" techniques, the most widely practiced of which is a specific approach known as a *genetic algorithm* (see e.g. Goldberg, 1989; Mitchell, 1996). Given the availability of crowd feedback scores, it becomes possible to explore the use of genetic algorithms in automatically designing (i.e. authoring) new songs, in an attempt to "optimize" those songs (i.e., to create songs that yield high scores from the crowd). To explain how to do this, it is necessary to give a brief general overview of how a genetic algorithm works, before talking about the specifics of how to apply the genetic algorithm in the hpDJ context of using crowd feedback in automatically creating new remixes of existing songs, or indeed in automatically creating entirely new songs.

A genetic algorithm (GA) operates on a bunch of candidate solutions to some problem, referred to as a *population* of *individuals*. For the sake of this discussion, each individual is just a string of values – numbers and/or letters – and that string of values is referred to as the individual's *genes*. In a GA it is also necessary to have some method of testing an individual, to assign that individual a score known as its *fitness*. To start with, we create an initial population by randomly generating each individual – that is, by randomly choosing values for each gene in each individual. All these randomly-generated individuals can be tested, and assigned a fitness value. Because the individuals in the initial population are all randomly generated, they will all typically score very low fitness values (that is, they are all rubbish), but across the entire population there should be some variation in the scores (that is, some are less rubbish than others). Then, we select individuals for *breeding*, such that the higher an individual's fitness, the more likely it is to be selected. In the breeding process, the genes from two selected "parent" individuals are mixed up to create one or more "child" individuals – in a manner inspired by sexual reproduction in plants and animals. Additional random changes (*mutations*) may also be introduced to the child genomes, to introduce additional variation in the GA's gene-pool. This breeding process continues until we have sufficiently many "children" to replace the "parent" population. At that point, the parent population is thrown away, and the children are then all tested to give them their fitness scores which can then be used to determine which of them will be selected for breeding. This sequence of test-breed-replace is referred to as one *generation*, and (so long as it is set up correctly) a GA will show improvement in fitness scores over a number of successive generations. A common intriguing aspect of GAs is that the final population will show a set of individuals with high fitness scores (i.e., good solutions to the "problem"), yet these solution have not been designed by a human designer and so may possibly show unexpected but attractive "design features", which might be attributed to creative flair if they had been thought up by a human designer or creator.

So, we can consider each song in some collection as an *individual*, and the crowd feedback scores can clearly be used as the *fitness* for each song, but what about the *genes* of a song?

Recall that, as was discussed in Section 2, most dance-music songs are created via multi-track recording techniques, and that the individual tracks on each song are typically some small number of musical phrases or samples, repeated in some appropriate pattern. For example, the bass track for a song might be composed of a patterned placement/repetition of two distinct phrases, *A* and *B*, and let's say they're each four bars long; then if the placement pattern for these two phrases in the bass track is this *AAABAAABAAABAAABABBBAAAA*, we have 24 placements each of four bars, so a 96-bar track in total.

Now a minimally-different remix of that example track could be generated by replacing one of the two bass phrases with a new phrase, which we'll call *C*. If we choose to replace phrase *A* with phrase *C* then we'd get a new bass track of: *CCCBCCCBCCCBCCCBCBBBCCCC*. But in the language of GAs, we could consider this as a bass-track *mutation* of Gene *A* to Gene *C*. Similarly, we could note that the original bass-track placement pattern has its own internal repetitions: the pattern *AAAB* is repeated four times at the start of the track. So, we might also consider these four-phrase chunks as "genes" in the specification of a placement pattern: if we allow "*X*" to represent the pattern *AAAB*, "*Y*" to represent *ABBB*, and "*Z*" to represent "*BBBB*" then the initial bass-track placement pattern could be written more concisely as *XXXXYZ*, and possible mutations of this pattern include *XXXXZZ*, *XXXXYY*, *XXXYYZ*, and so on.

So the genes for any one track within a song would consist of an encoding of the placement-pattern (e.g. *XXXXYZ*) and a set of mappings from placement-pattern encodings to actual phrase-placement sequences (e.g. *"X=AAAB"*) and a set of specific phrases or samples that are substituted into the phrase-placement sequences. All of these could be subject to mutations, as just described, and also to so-called *crossover* or recombination, which is the GA version of sexual mixing of genes. For example, if one of the parents has a placement pattern *XXXXYYYYZZZZ* and the other parent has placement pattern *yyyyxxzzxxyy* then possible children resulting from the breeding of these two parents could include *yyyyYYYYZZxy* and *XXyyxxYYZZZy*. Of course, all of the discussion so far has been in terms just of one track within the multi-track recording. The genes for each track could be kept separate and considered as different *chromosomes* for the individual song, or the genes could be all strung together into one long gene-sequence for the song; in practice there's not much difference. Note also that this does not require all songs to have the same number of tracks, or for all songs to have music playing in all tracks at all times, as some of the samples or phrases in the gene-pool could represent so many bars of silence, thereby allowing specific tracks to be muted for all or part of a song.

So, we have here a sketch of how to encode a multi-track specification of a song (represented by a set of samples/phrases and a set of placement patterns for those phrases) as the genes of the individuals in a GA; and with the crowd-monitoring technologies we have a means of evaluating the fitness of each song. One important point of departure from the sketch of the GA that was provided above is that, for the hpDJ system to stand a decent chance of generating acceptable or interesting new remixes and compositions, it is important *not* to start with an initial population that is generated at random. The music resulting from randomly generating songs according to the scheme laid out here would almost definitely be judged by the audience to be really very poor indeed: rubbish, in fact. The point that some of the songs sound less rubbish than others will just not compensate for the fact that, actually, *all* the songs in an initial randomly-generated population will sound like rubbish. If the audience has any sense, they will probably leave the nightclub rather than attempt to dance or otherwise respond to a set of randomly-generated songs. So, the trick is to seed the initial population not with random songs, but instead with an archive of songs that have been written by skilled musicians. The likelihood then is that "mutants" of the original songs really are like minor remixes, and that some of the "child" songs show characteristics of their mixed parentage, representing a "fusion" of different styles of composer/composition within the genre. Thus, the "composition" of new work by hpDJ is not an *ab initio* process, but rather one of successive tinkering with existing forms and of opportunistic plagiarism of ideas from different pre-existing sources. It mirrors a process that is clearly observable in the high-turnover world of the human-composed dance-music industry, where every now and again one innovative producer releases a new song with a particular sample or sound or compositional feature which makes that song distinctive (and popular) and which is then quickly copied by a number of other composers, rapidly being replicated in the songs released over subsequent weeks, until it is judged passé or otherwise part of the norm, thereby motivating a search for a new innovative sound or sample or style. So, in essence, the mechanism proposed here for hpDJ just echoes the process that is already evident in the real world.

Of course, there are some legal and commercial considerations. We need to make sure we can do this without breaking any laws or infringing any copyright, and we would like (in principle at least) to be able to actually make money out of hpDJ – if nothing else, it would be good to recoup the costs of building an hpDJ system.

For revenue, the most obvious potential source of income is the people in the crowd doing the dancing and interacting with hpDJ. If a bank of CD-writing hardware is installed somewhere in the nightclub, the punters can be offered copies of that night's music for sale as they leave the club. The fact that many of them will be leaving in an intoxicated state will, presumably, increase the likelihood of purchases being made. The sales pitch is part an appeal to impulse-purchase, and part an appeal to sentimentality: as the music made each night is a (hopefully unique) function of that particular crowd's responses on that particular night, the CDs can be sold to the departing clubbers on the promise that if they don't buy the CD tonight then they will never have the chance to listen to *exactly* that mix of music ever again.

The legalities of getting hpDJ to generate its own remixes and compositions is straightforward enough: the authors of the original songs that seed the initial population need only to sign over appropriate rights (presumably in return for appropriate compensation). So long as appropriate copyright clearance is given for compositional use of all the constituent samples in the "gene pool", the compositions made up of those samples will not be violating the copyright of the owners of the original samples. For example a successful company called Zero-G (Zero-G, 2005) has for many years sold CDs of original "copyright cleared" samples, where the copyright in the individual samples rests with Zero-G, but the samples are licensed to the user in such a way that, so long as the samples are not re-sold as-is (i.e., so long as they are actually used by being combined with other samples or recordings in the final song), the composer of the song owns the copyright on that song.

There is an old saying in the music industry: "where there's a hit, there's a writ". Now although it is really extremely unlikely that an hpDJ composition would ever climb to the top of the charts, it is worth pointing out here, for sake of completeness, that the authorship (and hence ownership) of the music on the CDs sold to the crowd as they leave the club is just a little bit murky. In principle, it could be argued that *all* of the people in the club whose activity was monitored in any way by the hpDJ system are partial authors of the music. So if a copy of the music they helped to make ever made it to Number One, they would each be due a share of the royalties (or could each have grounds to sue a plagiarist). Such is the future.

8. Conclusion

The hpDJ system described here goes some way towards replacing the tasks performed by human DJs. It has potential use as a component in the user-interface to audio-based consumer digital entertainment systems, converting the audio data stored on such systems from a set of songs into a continuous seamless mix. Such mixes are suitable for play-out over streaming media (e.g., in personalized internet radio), or for writing to an appropriate recording medium (such as CD, the hard disk of an iPod, or a flash ROM card) for subsequent playback, or for playing to crowds of dancers in real nightclubs. Results from the nightclub experiment are promising, and our subsequent development of monitoring technology allows crowd feedback to influence hpDJ's choices of songs, making it even more human-like. The use of human-inspired heuristics in dynamically selecting customized DSP filters for the cross-fade has the potential to allow hpDJ to perform cross-fades in ways that would be virtually impossible for a human DJ playing live. While there is a growing market for software products that give a "virtual" version of traditional human-DJ hardware, and while *MixMeister* provides a pleasant interface to a set of software tools that allow an unskilled human to create professional-quality continuous mixes, hpDJ as described here is as far as we know the first and only system that aims to totally automate the tasks performed by a human nightclub DJ, including dynamically reacting to the responses from the crowd in real-time. Although we have yet to test Version 2 in a real nightclub, it is clear that the prospect of crowd monitoring opens up new possibilities for the computer-assisted composition of music. But, whereas most computer-aided music composition systems assume a single human author working with the machine, the vision in hpDJ is that the author is an entire crowd of participants, collaborating indirectly, giving feedback as they consume the music. That feedback being generated either actively by the members of the crowd hitting the buttons on their voting watches; or passively by them merely dancing and having a good time, while the computer watches them.

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about hpDJ Version 1, then we would probably not have been prompted to invent Version 2. So, sincere thanks to Judge Jules for his critique. Ball in your court, Jules.

References

Apple, 2005, website at www.apple.com/logic

Brewster, B., & Broughton, F., 1999, Last Night a DJ Saved My Life. London: Hodder Headline.

Broughton, F., & Brewster, B., 2003, *How to DJ Right: The Art and Science of Playing Records*. London: Grove Press.

Cakewalk, 2005, website at www.cakewalk.com

Cliff, D., 2002, *Automated Compilation of Songs*. US patent number 6,344,607; issued on 05 February 2002; assignee: Hewlett-Packard.

Cliff, D., 2003a, *Automated Compilation of Music*. US patent number 6,543,700; issued on 18 March 2003; assignee: Hewlett-Packard.

Cliff, D., 2003b, *Method and Apparatus for Composing a Song*. UK patent number 2,379,076; issued on 17 Sep 2003; assignee: Hewlett-Packard.

Cliff, D., 2003c, *Automated Mixing of Musical Tracks*. UK patent number GB 2,378,626; issued on 19 Nov 2003; assignee: Hewlett-Packard.

Cliff, D., & Wilkinson, T., 2004, *Portable Apparatus Monitoring Reaction of a User to a Performance*. UK patent number GB 2,379,987; issued on 21 April 2004; assignee: Hewlett-Packard.

Databeat, 2005, website at www.databeat.com

Digidesign, 2005, website at www.protools.com

Goldberg, D.E., 1989, *Genetic Algorithms in Search, Optimization, and Machine Learning*. Addison Wesley.

Graham-Rowe, D., 2000, "Hang the DJ". *New Scientist* 23rd/30th December 2000, pp. 56—59.

Haslam, D., 2001, *Adventures on the Wheels of Steel: The Rise of the Superstar DJs*. London: Fourth Estate.

Kershaw, M., 2000, Compilation Wars. *Mixmag* 104, pp.58—64, January 2000.

L'Hopital, C., 1999, *Automatically performed crossover between two consecutively played back sets of audio data*. European patent application EP0932157A, July 1999.

Mitchell, M., 1996, *An Introduction to Genetic Algorithms*. MIT Press.

Mixmeister, 2005, website at www.mixmeister.com

MP3, 2005, website at www.mp3.com

Napster, 2005, website at www.napster.com

Scheirer, E. D., 1998, "Tempo and Beat Analysis of Acoustic Musical Signals", *Journal of the Acoustic Society of America.* 103(1):588-601, January 1998.

Sony, 2005, website at: mediasoftware.sonypictures.com/products/acidfamily.asp

Steinberg, 2005, website at www.steinberg.de

Yamada, Y., T. Kimura, T. Funada, & G. Inoshita., 1997, *Apparatus for detecting the number of beats.* US Patent 5,614,687, March 1997.

Zero-G, 2005, website at www.zero-g.co.uk

PART 6

CONSUMPTION AS PRODUCTION

Chapter 13

INTERACTION, EXPERIENCE AND THE FUTURE OF MUSIC

Atau Tanaka

1. Introduction

Digital personal music systems today offer conveniences where listeners can carry their whole music collections with them at all times. However this has come at a price where the richness of musical experience is compromised, leaving only remnants of a living, vibrating, dynamic musical past. Music has always pushed the envelope of what defines interaction. The systems described here create deep human interaction facilitated by live musical dynamics deployed on networks, sensors, and portable digital technologies.

This chapter introduces a vision for evolving definitions of music encouraging a return to it as a living form of cultural expression. The challenge put forth is how this goal can be attained for future end-user digital music systems. The arrival of new infrastructures for music rendering and distribution has the potential to change modes of music appreciation. Social interaction has already evolved with the advent of decentralized, peer-to-peer systems. The argument is that application of social computing coupled with artistic creativity can combine to point out ways in which technological evolution can be assimilated directly in cultural production, ultimately leading to possible new forms of musical content.

The problem is broached in two parts. First, I present projects from the fields of sound and media arts as examples of the assimilation of these concepts in contemporary artistic practice. In particular, the notion of *idiomatic* writing, borrowed from instrumental compositional technique, is used to describe innate musical capabilities of interactive technologies. Second, I retrace how notions of *interaction*, *agency*, and *experience* form the theoretical underpinnings guiding the conception of these works. In particular, I call upon cultural theory to situate this musical vision within a wider societal and historical context.

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 267–288.

Even before the advent of digital technology, instrumental music provided compelling examples of the use of mechanical technology for cultural ends. Through processes of instrument making, composition, and performance, composers and musicians have built established channels for cultural transmission. We can link directly to each of these steps in cultural production as inspiration for reconsidering technical acts of system building, programming, and execution. In this way, we thwart the onus of economic value chains, proposing social alternatives whereby human imagination is paramount. In this way digital music is freed from banal questions of rights management, and instead becomes a catalyst for creating meaning for the listener.

Experiments in musical tele-presence that challenge notions of locality are called upon to inform the design of end-user network music systems. Technical problems of network transmission delay are confronted from musical points of view to create music specific to network media. In doing so, it is crucial to preserve the sense of agency of a participant. This ultimately leads to the possibility of establishing musical identity of an individual within a community of listeners.

An understanding of artistic and compositional practice sheds light on the musical potential of interactive technologies. Composition implies *authoring* and conception of new forms and *formats*. The compositional perspective can be extended beyond musical media to serve as a valuable point of view from which to consider humanistic use of digital technology. This text seeks to draw a line connecting artistic practice and research to propose novel concepts for possible future musics. Whether it subscribes to tenets of efficient design, or whether it holds commercial potential is not the criteria on which this thinking is based. Instead, the goal is to understand, guided by musical and cultural theory, the potential for new technology mediated musical experience.

2. Artistic Practice

2.1 The Instrument

The term musical instrument has a clear connotation across many cultures. An instrument is imagined to be a known physical apparatus that allows human performers to express themselves artistically through sound. Musical instruments in the traditional sense are assumed to be acoustic, constructed of wood, metal, and other materials, having resonant qualities. Sound is articulated when the user intervenes and excites vibrational modes. Music is made through skilful manipulation of the instrument, resulting in melody, harmony, and rich sonic timbre. There has been remarkably little questioning as musical instruments have embraced digital technology. Synthesizers often mimic the traditional piano keyboard layout, maintaining the assumption of manual articulation. Meanwhile the reprogrammable software nature of digital instruments adds a layer of generality or “virtualness”. Instead of considering the possible extension of the definition of a musical *instrument*, these digital music devices are often also referred to as *tools*. Traditional acoustic instruments are never confused with tools. Why then do the expanded expressive powers of digital instruments banish them to be considered utilitarian? Perhaps it is the generality and chameleon-like qualities of digital musical instruments. Or could it be that our cultural associations with instruments are trapped in the mechanical era and hinder us from imagining the expressive potential of these new instruments? If we are to see how the instrumental perspective may lead to conception of new consumer music formats, it maybe helpful to review the distinction between “instrument” and “tool”.

A musical instrument becomes an expressive object in the hands of a performer, and is a vehicle in an engaging concert performance. This gives the instrument a distinguishing characteristic when compared to a simple tool. The term tool implies that an apparatus takes on a specific task, utilitarian in nature, carried out in an efficient manner. A tool can be improved to be more efficient, can take on new features to help in realizing its task, and can even take on other, new tasks not part of the original design specification. In the ideal case, a tool expands the limits of what it can do. It should be easy to use, and be accessible to wide range of naive users. Limitations or defaults are seen as aspects that can be improved upon.

A musical instrument’s *raison-d’etre*, on the other hand, is not at all utilitarian. It is not meant to carry out a single well defined task in the way that a tool is. Instead, a musical instrument often changes context, withstanding changes of musical style played on it while maintaining its identity. A tool gets better as it attains perfection in realizing its tasks. The evolution of an instrument is less driven by practical concerns, and is motivated instead by the quality of sound the instrument produces. In this regard, it is not so necessary for an instrument to be perfect as much as it is important for it to display distinguishing characteristics, or “personality”. What might be considered imperfections or limitations from the perspective of tool design often contribute to a “voice” of a musical instrument.

Computers are generalist machines with which software tools are programmed. By itself, a computer is a *tabula rasa*, full of potential, but without specific inherent orientation. Software applications endow the computer with specific capabilities. It is with such a machine that we seek to create digital musical instruments with which we can establish a profound creative rapport.

An input device is the gateway through which the user accesses the computer functionality. As a generalist device, input devices like the keyboard or mouse allow the manipulation of a variety of different software tools. Music software endow the computer with specific sonic capabilities. Special input devices can be built to exploit these particular capabilities. On what begins life as a generalized platform, we begin to build specialized musical systems, each component – input device, signal processing algorithm, audio output module – becoming part of the total instrument description.

The goal is not to find fault with technological systems, but to observe a difference of purpose. The goal of creating an efficient software tool differs fundamentally from that of creating an expressive musical instrument. The definitions distinguishing *tools* from *instruments* in the physical realm also apply in software. As music has increasingly become deployed on digital technologies, the question arises: is the digitization of music driven by a desire for optimization and convenience, or is there a creative potential inherent and particular to digital technology that can be harnessed and heard in the resulting music? If this is true, then what can we do to transform a generalized *tool-like* technology into an expressive *instrument-like* medium? Does the generality inherent in digital technology represent the democratization of the creative process, or is it okay to conceive of music software with steep learning curves if the pay off is a kind of virtuosity?

2.2 The Idiomatic in Digital

A conservatory curriculum in composition systematically includes a study of *instrumentation*, or *orchestration*. This includes not only the knowledge of combinations of instrumental sounds that create rich arrangements, but is a detailed understanding of each instrument, its workings, and character (Berlioz, 1991).

When a composer finds what an instrument is capable of expressing, he is finding its *voice*. The term *idiomatic* is used to describe this characteristic of an instrument. To give an example, the violin and flute are two instruments that share a nearly identical note range, from low note to high note. Although they may be able to play melodies in a similar *tessitura*, each instrument has its own distinct character. This is predicated on the mechanical and acoustical make up of the instrument – a violin being a stringed instrument while the flute a woodwind instrument. This differentiates not just articulatory modes producing sound, but also musical qualities such as polyphony or typical melodic intervals. These elements all contribute to distinguish idiomatic violin music from idiomatic flute music.

Digital synthesizers and samplers are sophisticated enough today to mimic the sounds of orchestral instruments. But no matter how faithful a timbre a synthesizer may attain, if the mode of articulation remains a generalized piano keyboard interface, the uniquely idiomatic *violin-ness* or *flute-ness* of a melody are lost. This is not purely the fault of digital representations – traditional musical notation in itself has no capability of transmitting *idiomaticity* of an instrument. It is the composer who ultimately holds responsibility for "knowing" each instrument to write music that respects the character of that instrument. We will see below how this notion of idiomaticity can be directly applied to digital content authoring to create compelling experiences specifically for digital media.

I claim that digital technologies have a *voice* in the way that traditional instruments do. Whereas in the case of digital instruments, these may be processes running on general purpose computers, each interactive system brings with it a personality of its own. Here I present an artist's project where this thinking was applied directly to new instrument design and performance.

2.3 Sensor Instruments

Sensorband is a trio ensemble that has performed internationally in the experimental music and media arts scenes since 1993. The three musicians, Edwin van der Heide, Zbigniew Karkorwski, and the present author, perform on instruments made of gesture sensing interfaces. Van der Heide plays hand-worn devices resembling virtual reality gloves, where multiple ultrasound transmitter/receivers detect the relative orientation and distance between the two hands. Karkowski plays inside a scaffolding structure armed with infrared beam arrays detecting spatial percussive gestures, their speed and direction. Tanaka's instrument is his own body, where arm muscle tension is sensed by electromyogram (EMG) electrodes translating neuronal muscle activity to digital musical control data.

The three instruments in the Sensorband instrumentarium all allow free space gestures of the musician to be captured via a sensor system to articulate digitally synthesized sound on the computer. Each instrument, however, has its distinct mode of operation, be it ultrasound, infrared, or biosignal sensing. The similarities and differences among the instruments result in a musical identity that consistent with the above discussion of idiomaticity. The similarities of the instruments, the fact that they are sensor-based gesture instruments, make them members of a single instrument family. Much in the way that traditional instruments constitute families such as the stringed, woodwind, brass, and percussion instrument families, these three technological instruments together comprise the family of *sensor instruments*.

At the same time, the distinctiveness of each instrument within the instrument family creates a diversity and richness. A flute and oboe are both members of the woodwind family, and even share a similar melodic range. But the flute is a non-reed instrument while the oboe is a double-reed, setting acoustical waves by the excitation and mutual vibration of two wooden slivers while the flute creates acoustical jets across a hole. This defines each instrument's characteristic timbre and expressivity. While they share similar articulation, by breath, they differ in their tone, rapidity, and dynamic. Each instrument in this way, as members of a common family, takes on their own specific musical identity.

These sensor instruments are indeed members of the same instrument family, with each exhibiting a uniqueness of voice, each one distinguishing itself from the others by mode of operation and aptness for articulating specific types of sounds. The infrared cage of Karkowski has the clearest idiomatic identity – infrared beams are interrupted by swift gestures causing impulses to be sent to the computer. The sensing of directionality and velocity as well as the dense sensor array make this deceptively simple interface more complex than it may first seem. This instrument is ultimately best suited to a palette of percussive sounds. Compared to the impact nature of the infrared instrument, the ultrasound and biosignal instruments are more apt to sculpting longer continuous sounds. Each, however, has its defining characteristic. The ultrasound sensors have a stability and precision, and their layout on the gloves create an orthogonality for rapid switching and holding. The biosignal, while also apt for continuous data sculpting, presents a living signal to the computer. The performer cannot hold a single value constant, and makes continuous effort to maintain a level. This physicality is reflected in the jittery data transmitted to the sound synthesis modules.

These articulative modes of the three sensor instruments define their character and ultimately the music that is idiomatic to each (Tanaka, 2000). It is by composing music for the ensemble all while respecting the idiomaticity of each constituent instrument that a music identifiable as that of Sensorband arises. Beyond the musical identity of a group, the idiomatic writing becomes a key to listener comprehension of layers and parts within the music. Listeners empirically use instrumental identity to decode and understand music. Even in the absence of formal musical education, most lay people have an idea of the sound that a certain instrument makes – the sound of a trumpet compared the sound of a violin as distinguished from the sound of a drum. While the human auditory perception system has sophisticated physiological mechanisms in place to parse complex audio streams (Bregman, 1994), this cognitive parsing is a key to higher level musical appreciation (Deutsch, 1998). This game of musical association tied to instrumental identity aids the listener in comprehending a polyphonic musical stream to decipher the melodies, parts, and motifs that make up the musical whole.

With electronic sounds, listeners lose the grounding they had with the familiarity of acoustic instruments. The very power of sound synthesis to create new, never heard before sounds has the equal potential to disorient the listener. While electronic music in its various flavours is ostensibly the exploration of uncharted territories, the position put forth here is that idiomatic writing can help to re-establish a sense of listener comprehension of these new forms. The sound of Sensorband, at first, is a wall of electronic sound. To the untrained ear, it could be created by three people or it could be created by one single person, or it could be completely dehumanized and machine generated. Quickly, however, the listener senses the human agency in the music as corporeal gesture manifests itself in sound. This invites the listener to try to unravel the puzzle while solos and turn taking introduce each of the instruments more clearly. With these associative keys in place, the listener becomes able to continue to decode the music when ensemble play resumes. The linear melodies and lines are those of van der Heide's ultrasound measures. The swelling beds that come and go in waves is Tanaka's muscular gesture. The intense percussive strikes are Karkowski striking in thin air through invisible infrared beams. If the performance were to stop here, it would be suspiciously similar to a straightforward technology demonstration, showing the wonders and workings of various interfaces. But far from a demonstration, a concert must exploit these keys of comprehension to first pull the listener in, and then modulate the nature of the relationships between instruments. At times ultra-clear, at times distorting idiomatic sense to create total confusion, a Sensorband concert becomes a drama of corporeality mapped to technology, leading the audience through alternating clarity and mystery.

2.4 Network Music

I next present a series of network music projects – music and sound art works realized on the Internet. I include them here as a way to demonstrate the use of idiomatic writing, applied not to objects such as instruments, but to communications infrastructures. This section first presents network performances, followed by public space installations, works for web browsers, and finally hybrid pieces (Tanaka, 2004a).

There is a history of music performance practice on networks (Gresham-Lancaster, 1998). One of the central themes of interest has been about perturbations of musical communication. Remote performance configurations are created to conduct investigations of the musical effects of network data transmission. This meant setting up video conferencing systems where we could send audio and video from a camera onstage in one city to another stage in another city, to organize a performance connecting the two cities with musicians at the remote sites in live musical interaction. Such concerts were organized over a period of ten years, from 1995, connecting Paris and New York, Barcelona and Rotterdam, Budapest and Montreal, and Tokyo with Paris.

One of the claims of the Information Age is that the modes of communication made possible by the Internet can collapse geographical distance. In attempting to carry out this promise, one quickly confronts the reality of time delays and quality losses as musical data is transmitted over the net. I did not wish to hide these realities but instead highlight them as qualities to be considered in the musical process.

The first challenge was to find a way to maintain eye-to-eye contact over the videoconferencing system The single stage of a traditional concert had been extended by a pair of video cameras and video projectors. Part of the challenge was to maintain a compelling performance dynamic for the local audience while keeping musical contact with the remote performer. As there were audiences on both sides, the remote performer had the same responsibility at his site. Once communication established, the musicians' concerns shifted to the quality of communication – for example, the trade off between picture pixelization, fluidity of motion, and time latency

There is forcibly a time delay inherent in network data transmission. In playing network concerts, the first concern of participating musicians is the *latency*, or time delay, of the system. The data-compression algorithms and data transmission times resulted in delays ranging from 0.5 seconds to 30 seconds or more in older systems. Given this kind of situation, a traditional musician could not expect to perform music as if he is was normally accustomed to. "But the timing is strange," the musician might say, "how can we play our music this way, it's not going to work." My reply always was that the musician could not expect to impose *his* music unaltered onto a new time/space domain. The technology, contrary to what is often advertised, is not transparent. While the typical reaction of a musician was to ask if the technology could be improved to eliminate latency, my response as composer was not to re-program network algorithms, but to write music for the given situation. To me it was somehow appropriate that any given music could not simply be transplanted and successfully performed on a network infrastructure.

If networks had significant latency for real time applications, to me it meant that the network had a specific temporal characteristic. Seen in this light, it was the same as when composers consider the acoustical characteristic of a concert space in which their work might be performed. Composers of sacred music in the Medieval era were writing for reverberant cathedral architectures. They were fully aware of this, even taking advantage of the long reverberation times to "hide" secular melodies within the long, slowly moving lines of the *cantus firmus* (Grout and Palisca, 2000). Be-bop jazz musicians meanwhile responded to the intimacy and short reverberation time of jazz clubs to play blazingly fast solos. Playing a be-bop solo in a cathedral would just smear the rapid melody, make little musical sense.

I wanted to extend this instinct enabling musicans to respect the acoustics of physical spaces and apply it to the time latency of network spaces. Music exists in space, in acoustical contexts, in the environments that it is played in. If music is made on networks, the network infrastructure becomes the space the music occupies. The time characteristic of that infrastructure defines the musical quality of that medium. Network transmission latency thus becomes the *acoustic of the network*, to be respected and exploited, just as one does when composing for specific physical spaces (Tanaka, 2003).

2.5 From Time to Space

As the temporal characteristics of networks posed significant musical challenges, I began to question whether networks were not better suited for musical activities other than real-time performance. If time is not the strength of the network, then, I wondered if the other axis of the time-space domain might hold more promise. I began an investigation of the musical qualities of spatial dimension of the Internet. For this, I created works that were not concert pieces, but rather gallery and web-site based installations.

Constellations is a gallery installation, premiered at the Coexistencias design festival in 1999 in Lisbon Portugal. The aim was to juxtapose the physical space of an art gallery with the so-called *virtual* space of the Internet. Five computers were set up in a gallery space, each connected to the Internet and each with its own speaker system. Software running on each machine presented an abstract graphical interface of spheres (like planets in a constellation). Gallery visitors were able to click on planets to invoke the streaming of MP3 sound files from the Internet. The visitor could click on more than one planet, thus streaming multiple sounds. In this way, the software was fundamentally different than the CD player-like interface typical of MP3 player software, limited to listening to one piece of music at a time. The visitor could mix the multiple streams of music by gliding through the constellations space – closer planets would have their sounds stronger in the mix than streams of planets further in the graphical interface. Each of the five computers in the gallery, then, could create its own mix of sounds from the Internet. And as the speakers of each of the computers played out into the physical space of the gallery, there was also a spatial, acoustical mix taking place of all the five computers' individual mixes heard together.

These two levels of sound mixing – Internet mixing and acoustic mixing, constitute the dynamic at the core of the piece. The goal was to sonify, or represent in sound, the multitude parallelism of data flow on the network. It seemed to me that this did not differ so much from the simultaneity of aural stimuli in which we live in everyday life. By superimposing audio mixes of these two environments, I sought to situate the listener in network space and acoustical space at once.

While Constellations juxtaposed mixing of multiple network MP3 streams alongside acoustic mixing of multiple sources in the gallery space, *MP3q* (2000) did away with physical space, but added a participative element by the possibility of user upload. MP3q is a web browser based piece. The listener mixes multiple music streams using an abstract graphical text interface, and also could contribute his own sounds. Driven by participation, the piece was at its outset but an empty shell. MP3q is an open piece, a participative system where contributions from listeners became the base musical materials of the piece. In fact this was where, for me, as a composer, I was starting to try to let go of total control, asking myself if I could make a musical piece without making the music itself, but by composing with the social dynamic of the Internet, to create situations that exploited web surfing behavior to musical ends. In that sense it was a composition with no original sound, a *content-less composition*.

The questioning, from the artist's point of view, was about his continuing pertinence in an open system (Tanaka, 2001). How does the role of the artist change, what is the job of the artist? Does he retain authorship when the piece is an open form? My answer is 'yes'; it is definitely still my piece even if it is music and even if I have made no sound; I am the composer of the piece because I have created the system, I have created it as an environment where people must figure out how to react. This is completely different from a generalized user interface. The "interface" of MP3q is not optimized for ease of use or for productivity. It is instead an idiosyncratic artifact, a situation created by the artist that incites or naturally filters certain reactions. I am, as the composer, gently guiding or deviating the user or pulling him through my way of seeing things and inviting them to send in a piece of sound that becomes part of the piece. In that way it is my piece because I have created that instantaneous dramaturgy that drives usage and the kinds of sounds, ultimately, that would be uploaded.

By creating a participative dynamic, I wanted to explore the supposed democratic quality of the Internet. The first question that arose was, if I made a completely open work, would I be able to rightly claim title to be composer of the work? How could I reconcile the hierarchical status of the composer with the democratic nature of the medium? The converse to these two questions were: If I made an open form, how could I assure that it would not become random and meaningless? If I was to put my name on the piece, how could I justify it as being a product of my creativity, and how could I guarantee its quality? While today, we begin to have rights licensing models, such at the Creative Commons, that permit appropriation and re-sampling, my interest was to look at the actual musical impact of such culture.

This musical questioning in these participative works were the application of ideas from post-modern thought, where the artist's role was no longer one to create an *object*, but rather to create a *situation* (Levy, 2000). By orchestrating participative channels, I created natural filters without imposing commands on the users. The dynamic of interaction provoking reaction allowed the contributor to speak freely, but in response to a proposition that was relevant to the composition, and ultimately instigated by the composer.

2.6 Hybrids: Physicality and Virtuality

The next type of work presented is one where I try to bring together the work with sensor instruments and the work with networks. One example of this is a piece called *Global String*, created in collaboration with the composer and electric bassist, Kasper Toeplitz. The idea was to make a musical string like a guitar string, but of monumental proportions. The “string” is a steel cable, 16mm diameter, 15 meters long. Although this seems big already, it’s only part of the string as the concept was to use the network to make an instrument that connects two cities.

On each cable are a series of sensors detecting vibration, as well as an actuator capable of inducing impulses in the string. Actions on one end of the string would be picked up by the sensor subsystem and transmitted over the network connection to the other end. Striking the string in one city would cause the endpoint in the opposite city to vibrate. Remote players could play in a collaborative fashion on physical interfaces that conceptually constitute a single instrument, a monochord spanning two distant locations.

The use of sensors in conjunction with networks allowed me to make physical action the musical information transmitted on the network. By building a single “string”, it was a use of the network not as a medium to collapse distance, but a resonant medium to span distance. While the endpoints are massive cables, the body of the string is the Internet. It is a musical instrument made up of parts, very physical on its two ends but very invisible and immaterial and ultimately just data in the middle. There is the mixture of the virtual and the real; the network acts as its resonating body, with network traffic conditions tuning parameters affecting the sound. This maps network processes into a physical experience (Shedroff, 2001).

It was an instrument, not just destined for concert performance, but also to occupy public space as an installation. Museum visitors could approach it, touch it, hit it, make some sound and maybe find someone on the other end. It thus responds to naive use, drawing the visitor in to explore further. At the same time it is a performance instrument on which a pair of virtuoso performers can and do give concerts. These performers know intimately the intricacies of the instrument, it’s responsiveness, its various articulatory modes. The goal was to make a single musical instrument that could adapt to different levels of playing. Like on a piano, if a young child comes to and bangs on the instrument, he can make noise and have fun, but if a virtuoso sits down to play on the very same instrument, he can make incredible music. The instrument has not changed – it has a depth that makes it accomadate these different levels of use. I was interested to see if we could bring that same sort of musical depth to digital technology. In video games there is typically a setting for user levels where the software can be tuned to respond accordingly to beginner or advanced players. There are no “levels” in musical instruments – it is a constant that should be rich and deep enough to react and respond in an organic way to varying levels of play (Tanaka and Bongers, 2001).

3. The Music of Social Dynamics

The recurring theme in these projects was the search for musical qualities of the network, to create work that is *idiomatic* for the medium. It seemed to me that *downloadable* music was anachronistic and tells only half the story in a medium that was by nature bidirectional. What was the *voice* of *uploadable* music? While a musician's instinct might be to try to exert his mastery and ego on a situation, finding the musical voice idiomatic to a democratic medium also meant learning to let go. Rather than controlling time and space with sound, I seek to create architectures for collective musical processes.

The fact that my artistic projects led me to the logical conclusion to embrace the openness of networks, I developed a vision that idiomaticity in network music would be borne out through social dynamic. This would lay the groundwork for a musical research project I carried out on wireless netowork infrastructures. In this project, mobile systems are used to support compositional structures allowing groups of people to participate in the musical creation process. Subconscious acts while listening to music and moving around urban environments are stimuli to the system. *Musical avatars* represent geographic location and shared co-experience create a *social remix*.

I sought to bring the questioning of continuing pertinence of the artist to its extreme endpoint, and see if we could simply take the artist out of the system. Although we will see that the artist retains a crucial position in the content authoring process, I wanted to leave the user or a community of users to create the musical dynamic at rendering time. The interest was to see if we could create musical experiences by and among non-musicians that nonetheless called upon the tenets of interactivity established in the art pieces described here.

With this in mind I created a system where mobile musical devices were in social communication over wireless networks. These musical objects did not resemble musical instruments as much as they did personal music listening devices. They were however endowed with advanced capabilities borrowed from the sensor instrument and network music projects, including the ability to receive a continuous stream of dynamically generated music, an upload channel permitting a context aware information to be sent up, and a sensor sub-system capable of capturing user gestures.

The project is called *Malleable Mobile Music*: "mobile" like a cellular telephone, "music" because it's about organized sound, and "malleable" meaning something that's plastic, that can be shaped like clay. It is a concept for a consumer music system where music can be played, and be played with. Deployed on mobile systems and taking urban dynamic and listener gestures as input, the system places communities of listeners together in a shared musical experience.

Each device in the system is equipped with sensors that measure the pressure of user grip on the device as well as gross device movement and rotation, sensing gestures such as swinging the device along in rhythm to the music (Tanaka, 2004b; Tanaka, 2004c).

Music delivery is a generative service running on the network on the *Malleable Music Engine*. It receives sensor input from clients on the network and generates a musical stream. The musical output can be shaped, its structures manipulated, in response to incoming data from the clients. Modules that make up a musical piece include rhythms, fragments of sequences, and samples. Time domain re-sequencing of elements is applied at multiple musical levels. The low level re-sequencing allows user actions to intuitively create variations in rhythm and melody. High level re-ordering allows song structure to be *malleable*, to match the corresponding social activity that drives the progress of the music. These techniques are applied to standard popular songs and assume a constant meter and tempo. The system is context aware, but above all sensitive to the human state. Existing music is rendered interactive by the system, giving listeners new ways to listen to familiar music.

What do I mean by shared experience or co-experience? The idea is to take urban mobility and make a system where people can listen to music together and have a music that is sensitive to social dynamic. People could be far away, remote, as we were in network music projects, but participating in a collective act. They have a common activity where active listening is an input to the system. Their implication in the evolution of a single piece of music turns this common activity into common purpose. Listening to a Walkman is no longer a passive, isolated activity, but a participative social activity. Geographic location, user's grip holding the device, their swinging along to rhythm, all contribute to creating a communal *social remix*.

4. From Interaction to Experience

4.1 Music and Interaction

Music played on digital systems implies some level of interaction with the "user" or listener. As digital music is most commonly practiced on computers, it should benefit from techniques from human-computer interaction research. The richness and complexity of music, however, make it a challenging application area for HCI. It is argued that music, be it digital or acoustic, independent of technology, is inherently interactive. Interaction patterns observed in music could in fact inform technology design. Music is a cultural practice that has the potential ultimately to contribute to a deeper understanding of interaction.

Here I briefly retrace the history of interaction design practice, and draw parallels to musical practice. Early work on human-machine interaction was inspired by seminal work in social interaction by Goffman. Goffman introduces the notion of *line* and *face*, line being patterns of acts by an individual in light of social situations, and face being the external social value of that individual (Goffman, 1967). We are familiar with the notion of face in the social concept of "losing face." These social rites create the basis of human-human interaction in what Goffman calls an *expressive order*.

This expressive order is taken up in early formulations of human-machine interaction. Norman applies this directly to his *decision cycle model*, a seven step model defining the interaction between user and system (Norman, 1986). The steps consist of:

goal formation
translation to intention
translation to commands

execution
perception of state
interpretation
evaluation against original expectations
reformulation of goals, restart loop

This model in its simple form is better suited to describe pragmatic aspects of interfaces such as windows, buttons, and menus, than to describe creative processes such as music. The basic decision cycle loop has been expanded upon in more recent work allowing for more spontaneous modes of interaction (Kirsh, 1997). This work begins to draw upon the social nature of Goffman's original work, extending human-computer interaction research to embrace humanistic values such as engagement and sociability. This leads to improvisation, progression, interruptability, mutuality, and turn taking (Rafaeli and Sudweeks, 1997), concepts which are all directly pertinent to music making. A successful interaction dynamic gives rise to jointly produced meaning, or the creation of shared interpretive contexts. This ties directly to musical ensemble performance as well as transmission of meaning in a musical performance.

Music is interactive because there are multiple dimensions of dynamic relations. There is a relationship between the musician and his instrument, a bi-directional exchange of give and take. When a musician plays a violin, this violin is a dynamical system, and organic entity, with which the artist is in a relationship. The violin gives as much back to the performer as the player puts in in energy and verve. There is also interaction between musicians. If a group is on stage there is a live, human interaction between musicians. And, finally, there is interaction between the performer and the audience. There must be some kind of relationship set up, a communication or perhaps a dis-communication, some kind of dynamic that goes out but also feeds back. It is in such a situation of appreciation or controversy when a performance is deemed interesting. These are all examples of interactivity that are not in the domain of the digital, but are more than simply social. Instrumental music, then, already establish rich forms of human-"machine" interaction that catalyze human-human interaction. The artistic work I have presented here seeks to bring this organic depth into the digital domain, assimilating musical instrument interaction to extend the potential of human-computer interaction. The Malleable Mobile Music system then draws upon social interaction as observed in peer-to-peer networks applied to more than simple file sharing to create rich musical experiences.

4.2 Agency

Digital music systems will forever be compared with acoustic musical instruments. Guardians of tradition claim that acoustical instruments have a richness and expressivity that cold digital devices do not. By extending the notions of idiomatic writing from existing instruments to new media, I sought to take a hard look at the digital instrument, seeking out qualities that endow it with musical depth. In the discussion of interaction, I define the richness of the dynamics created in the user-instrument system. I turn now to look at the user, to see what are the needs to elicit satisfaction from a digital music system. We continue our tactic of looking towards traditional instrument practice for inspiration. The satisfaction of a musician lies in the sense he has of his own actions in the resulting music. This can be the responsiveness of an instrument turning subtleties of articulation into expression. It is also the identifiability a musician maintains in feeling the contribution his part is making in an ensemble. I call these notions a *sense of musical agency*.

Agency can be defined as an ability to take actions, to have initiative. The notion of *agency* appears in the fields of complexity and artificial intelligence as well as in moral and cultural studies. While related, the scientific and cultural views towards this concept fundamentally differ. We would assume that music, being a cultural activity, would tend towards the latter viewpoint. However, music as a cultural form albeit with technical basis in acoustic and mathematics, has always drawn upon science. Digital music underscores this technical link, and serves as an area rich in potential for establishing a middle ground, or superposition, of the scientific and the cultural. With this in mind, I attempt to develop here this double view on the term *agency* to demonstrate their relevance in the conception of the artistic works presented above.

In the realm of computer science, agents, or autonomous hardware or software processes, can be categorized as having weak agency or strong agency. Weak agency (Woolridge and Jennings, 1995) is characterized by traits of:

autonomy
reactivity
pro-activity
communicativeness

Strong agency builds upon weak agency by adding elements of intentionality (Dennett, 1997), including traits such as:

knowledge
belief
choice
obligation

Despite the seemingly epistemic qualities ascribed to strong agents, this is a strictly cognitive viewpoint where agents simply seek survival and not reason. While this approach may one day lead to an understanding of meaning making, they are far from characterizing the elusive magic of artistic creativity. The terminology, however, may be useful in grounding otherwise intuitive and subjective human activity.

Moral philosophical approaches to agency are observed in Greek antiquity by Williams (1993). Agency also plays an important part in the Enlightenment philosophy of Kant (1998) where sense of duty and universality leads to notions of responsibility that places a subject in his environment.

In post-modern thought, Lyotard defines *grands récits* as the master narratives of society (Lyotard, 1984). This is akin to the collective conscience, forming the environment in which an individual exists. In contrast, *petits récits* are the personal narratives of an individual agent, describing its unique history. Personal narrative colors an agent's interpretation of the master narrative. From this point of view, free will is fundamental, empowering in the agent acts of self-construction (Bruner, 1990). Agency becomes at times a rebellious act to re-shaping an agent's place within the master narrative, thereby building identity (Bamberg and Andrews, 2004).

How do we integrate these notions of agency into music, in particular potential musics arising from digital technologies? In the present context, the intentionality of agency can be embodied in the traditional acts of composition and performance. Though accountability could be considered elements for sense of obligation to give a good performance, or to transmit good (or deviant) messages through stage presence and lyrics, they are beyond the scope of this text. Agency that gives rise to musical identity, on the other hand, is a core concern to be discussed here. The negotiation between master narrative and personal narrative allow music heard by groups of people to shape the personal identity of individual listeners, at times leading to feedback where the behaviour of a fan-base could drive marketing efforts ultimately affecting output of the artist of the originating music. If the listener becomes more implicated in the musical creative process, bypassing the influence of traditional marketing channels, agency can be directly linked to musical creation. Much in the way that a musician in an ensemble assumes agency for his part, a participative listener needs the satisfaction, consciously or subconsciously, to have a sense of his own agency in a collective musical process. In order for the user to fulfill these social needs, the components of a system must facilitate agency. In a digital music system, this means that individual elements can take on characteristics of strong agency to respond to human need and desire (Håkansson et al., 2005). In Social Computing the term *translucence* is used to describe the use of social information to support collective action (Erickson and Kellogg, 2000). Here I apply these concepts to music, and extend them to distinguish *reflexive translucence*, where an agent is endowed with a sense of his actions within the collective whole. Ultimately, a dynamic interactive music system will exhibit technical agency providing musical means for channeling humanistic agency of an individual within his listener community.

In practical terms, this comes back to the responsiveness of an instrument, and the identifiability of an instrumental voice within an ensemble context. With a digital instrument, these challenges become a question of system design. A sensor system needs to be *reactive* to the gestures of the user. The *mapping* from sensor input to sound synthesis must maintain a simplicity and directness at the same time it needs to have complexity and richness. A network music system inevitably exhibits *latency* (transmission delay), within which a local user's actions need to be identifiable.

4.3 Shared Experience

The sum of instrumental idiomaticity, of user-instrument interaction, and user's sense of agency together contribute to the total *musical experience*. A musical experience can range from the simple happenstance of hearing a new piece of music all the way to a life changing moment where a piece of music becomes a personal revelation. Experience is the term often associated with the magic of music. Seen in this light, experience is an intangible and undescribable concept. However, throughout history, philosophers have attempted to characterize experience, and more recently the design and marketing fields have attempted to exploit experience. I attempt here to synthesize these views of experience to situate musical experience as I have developed it in my artistic and research work.

The word experience has recently received a lot of attention, attaining buzz-word status. It has even been appropriated by the marketing industry as an economic model (Pine and Gilmore, 1999). The desire to understand the mechanisms to provide compelling experiences to end users has become a preoccupation of the design field (Shedroff, 2001). While these are sources often cited, the true roots of experience run much deeper. Are these models of experience satisfactory to desribe the magic of music?

What was experience before being co-opted by Madison Avenue? In the Enlightenment era, Rousseau called upon inner experience as a guiding light in lifelong learning (Rousseau, 1755). Romantic era Hermaneutics thinkers defined experience as way a for building meaning (Dilthey, 1996). Experience is defined to be personal and self-referential, and implies that an individual can be proactive in shaping its own destiny. Transmission of experience takes place through expression and interpretation which in turn create new experiences (Turner and Bruner, 1986).

Transmission of experience has traditionally been focused on verbal expression. With the increasingly media-centric society, visual imagery has become the predominant medium for propagating experiences (Baudrillard, 1979). This has led to a situation where culture and commerce compete for the public's attention in an over-saturated media space. Sound, on the other hand, has been relatively unexploited to this end. The projects I have presented here attempt to create unique experiential situations through the power of sound. An understanding of experience from this perspective could lend a richer more profound understanding than a design or economically motivated exploitation of the term.

Even if sound as a medium has been less exploited than image for generating experience in the industrial sense of the term, music is a cultural form has always drawn upon personal experience. Experience feeds the inspiration that motivates creators of music. In a well known example, J.S. Bach was so moved by ear opening sounds of a contemporary master, Buxtehude, to have traveled over a hundred kilometers by foot in order to hear his music. While Buxtehude is recognized by scholars, he is a minor figure in the public eye. However, this moment in the musical awakening of one of history's great composers has been referred to as the *Buxtehude Experience* (Wolff, 2001).

In popular music, songs such as Jimmy Hendrix's *Are You Experienced?* allude to mind opening experiences. Here music became a vehicle to represent and communicate the flower power of the 60's in challenging social mores, and of psychedelic drugs as the catalyst to personal revelation. In the contemporary era the link of musical experience to underground music culture continues, with the stylistic evolution of the techno movement shaped on the template of an extended psychedelic experience (Reynolds, 1999).

As in the case of agency and translucence, my work attempts to situate the individual musically in collective action. The notions of personal narrative and master narrative can be applied to experience to distinguish private experience from shared experience. Techniques in cognitive science such as joint attention can lead to shared experience. In my work, I seek to create *shared musical experience* empirically through collective action. I extend notions of ensemble performance, democratizing the privelage of group musical participation without placing technical demands on the users. I tap into personal experience of each listener, coupled with networked group dynamic, to generate collective musical output that can be considered experiential.

5. Fulfilling Cultural Theory

While the concepts underlying the projects described here came out of thought and purpose, they can be viewed through the lens of post-modern thought. The sociological effects of music are well described, here in this book and elsewhere, by cultural theorists. As sociological texts they look at the effect of existing music on society. With my stance of a composer, I am interested in the inverse, that is to say the effect of society on music. I am interested to see in what ways music as a form could directly respond to streams of cultural thought. I am interested in the effect that ideas from post-modernism could have not just as a way to analyze music's impact on human behavior, but as a way to drive the evolution of music so as to reflect current cultural conditions. If successful, this line of thinking has the potential to inform the design of music systems and new content formats to have a direct relevance to contemporary society.

I draw upon the writings of Baudrillard, Attali, and Levy to formulate my culture-to-music mappings. I briefly describe here the parts of their discourse that are pertinent to my musician's point of view, and then demonstrate how the projects described here bear out their ideas in real musical situations.

Baudrillard retraces turning points in socio-economic history, deriving a view of the displacement of *value* in society (Baudrillard, 1995). In the 19^{th} century pre-industrial era, value in society was generated in the *original* object, typically hand crafted. Uniqueness held ultimate value. By the end of the 19^{th} century, with the advent of the Industrial Revolution, came the means of mass production, the capability to make unlimited copies of an original. Value then shifted to the *reproduction*, or the capacity of replication. Today in the post-industrial era, technological advances have obviated the original-mould-copy sequence. Using computer-aided design (CAD) processes, it has become possible to generate a design that is fabricated with no original template as basis. Value has shifted to the *model*, the conception of an object in virtual form.

This displacement of value can be directly mapped onto the evolution of music. Before the industrial revolution, the transmission of music was through live performance. Before the radio and the phonograph, people's enjoyment of music came through playing music in its *original* sense. Children of good families would learn how to play the piano for enjoyment of the family in the salon (McCutcheon, 2001). With the industrial revolution came the tape-recorder and the phonograph, allowing the mechanical reproduction of music (Benjamin, 1969). Musical value passed from the original to the *reproduction* and the infrastructures of distribution. This is borne out by the importance of the Billboard charts tracking the number of copies sold of a hit record.

Following this logic, today in the Information Society, with peer-to-peer sharing of MP3 files, reproduction has moved beyond the mechanical – it is now just a trivial case of data replication. We no longer have the need for the physical artefacts of recorded media, be they vinyl or compact disc, they have lost all apparent value as carriers of music. What then could correspond to the *model* in Baudrillard's chain?

One possible answer comes to light in Attali's *Noise*, where he retraces a similar path, but directly related to the history of music (Attali, 1985). Attali reaches further back in history than Baudrillard, ascribing a *sacrificial* function to the original experience of music. Organisations like the church eventually formalized sacrifice in the mediated rites of church services. The second phase for Attali is *représentation*, catalyzed by the invention of the printing press in the 15th century through the formalization of copyright in 18th century France. Music could be represented on a separate medium, allowing its transportation across time and space for deferred execution. The French term *représentation*, however, differs in nuance from the English in its connotation of a performative element. In French, the word is literally re-*presentation*, the reenactment of a performative act. In this way, *représentation* is Attali's musical equivalent for Baudrillard's *original*, with the rights infrastructures to support and defend the original musical act. *Répétition* follows, lining up with Baudrillard's *reproduction*. Repetition in the form of recordings differs from representation in that it obviates the need for the original performer. Music is thus commodified, having lost its ritualistic power, and becomes a product for mass production and consumption.

Finally Attali concludes by predicting a forth phase, that of *composition*. Again the word is employed in the French sense where it does not connote the act of the composer. Instead, for Attali, composition is the state where,

"Production melds with consumption…invested in the act of doing. It becomes a starting point rather than being an end product…"

My interpretation of this phrase, from a musician's point of view, is that Attali is alluding to future potential musical forms that are not finished works, but instead generated at the time of listening. Taken together, Baudrillard's *model* and Attali's *composition* begin to define incipient content formats that correspond to the information driven society we currently inhabit. I sought to test the real-world viability of these claims by integrating them into the conception of the projects I have presented here. The art pieces and end-user prototypes described conceive of a music that is constructed not as a deterministic product, but as structures of possibility, to be completed only at render time with the active participation of the listener.

6. Conclusions

The work discussed here spans the worlds of art and research. They are however motivated by a single vision of music as a dynamic, living form. The presentation of the work includes description of finished work, followed by terminology for design criteria, finishing with theoretical justifications. This at first glance may seem like a complete inversion of the hypothesis-theory-proof sequence of scientific method. I chose to present my work in this way because ultimately music must stand on its own, independent of any explanation. At the same time, the artist has a responsibility to society, and must maintain relevance for his work to have impact. In this way, artistic production is not a whimsical or capricious act, but a reflection on the contemporary condition. The music and musical projects I propose are not proofs of theory, but are the result of conceptual reflection.

After all theoretical and conceptual considerations, music must move its creator and its listeners. The ultimate criteria is one of *satisfaction*, be it intellectual, emotional, or physical. The discussion of interaction, agency, and translucence, map out the means by which musical satisfaction might be attained. Music poses a unique challenge in the application of design principles in that efficiency is not necessarily the final solution. Musical instruments are expressive artefacts far from utilitarian in nature. Optimization does not necessarily allow an instrument to become more articulate. Instead, an understanding of of a medium and a respect for its character through idiomatic writing allow the voice of an instrument to speak.

It is this view of musical expression that brings us to a conception of music that can have social relevance. Artistic expression is not the sole prerogative of the artist. His responsability is to see what can be expressed through musical mediums. By making an instrument speak, the artist sets in motion a dynamic of transmission and sharing. Seen in this light, interactive systems and networks are technologies that exhibit this expressive, instrumental potential. The creative process is completed when the listener enters the loop. It is only then that expression takes place, as the sum total of the satisfaction lived out by artist, instrument, and listener. I do not seek to confuse these roles, but to create rhizomes of participative exchange. It is in doing so that shared musical experience can be created.

This text attempts to create a vision for future music by grounding these ideas in real world projects. The art projects presented redefine traditional hierarchical presentation structures. The research prototype described extends this to leverage social roles for musical creation. In this way I hope to pull up end-user expectations about engagement in the musical process. However, I am not asking the listener to become composer or musician. This was a harsh lesson learned in the 90's in the heyday of CD-ROM multimedia – ultimately the consumer does not have a pressing need to become sole creator of a work. We can, however, take notice of other cultures, where music permeates life to the point where participation is a given and where Western European notions of who is a creator and who is a spectator do not apply. I envision scenarios where digital technologies empower the layperson to inhabit musical spaces that are sensitive to them and representative of their social situations.

Artists display an intuitive sense for creative appropriation of new technologies. The arrival of the radio, and of recorded formats such as the 45rpm vinyl, 33rpm, and compact disc, have given rise to new musical formats such as the rock 'n roll single and the concept album (Tanaka, 2005). Deployment of music over networks should be no exception. Why then has this creative potential been supplanted by legalistic battles on profiteering of music as commodity? This is ironic especially in view of the fact that digital technology is meant to democratize the power of creativity. If this is indeed true, then we must identify mechanisms by which this creative potential can be harnessed. In the case of music, I believe that this requires a re-examination of existing musical form and content formats. I have argued that it is instructive to apply instrumental notions of idiomaticity to the otherwise utilitarian conceptions of computers. This leads us to create systems that open up, and give the listener a sense of participation in, the musical creation process. We bring music back to its origins as a dynamic cultural medium, and by doing so re-invent music.

References

Attali, J., 1985, *Noise: The Political Economy of Music*. Brian Massumi (Transl.) Minneapolis, MN: University of Minnesota Press.

Bamberg, M., and Andrews, M., 2004, *Considering Counternarratives: Narrating, Resisting, Making Sense*. Amsterdam: John Benjamins.

Benjamin, W., 1969, The Work of Art in the age of Mechanical Reproduction. In *Illuminations*. New York: Schocken.

Baudrillard, J., 1979, *de la Séduction*. Paris: Galilée.

Baudrillard, J., 1995, *Simulacra and Simulation.* Sheila Glaser (Transl.) Ann Arbor, MI: University of Michigan Press.

Berlioz, H., Strauss, R., 1991, *Treatise on Instrumentation*. New York: Dover Publications.

Bregman, A. S., 1994, *Auditory Scene Analysis: The Perceptual Organization of Sound*. Cambridge, MA: MIT Press.

Bruner, J., 1990, *Acts of Meaning*. Cambridge, MA: Harvard University Press.

Dennett, D. C., 1997, *Kinds of Minds: Towards an Understanding of Consciousness*. New York: Basic Books.

Deutsch, D., 1998, *The Psychology of Music*. Burlington, MA: Academic Press.

Dilthey, W., 1996, *Selected Works, Volume V: Poetry and Experience*. Princeton, N.J.: Princeton University Press.

Erickson, T., and Kellogg, W. A., 2000, Social Translucence: An Approach to Designing Systems that Mesh with Social Processes. In *ACM Transactions on Human Computer Interaction*, **7**(1), 59-83.

Goffman, E., 1967, *Interaction Ritual*. New York: Anchor Books.

Gresham-Lancaster, S., 1998, The Aesthetics and History of the Hub: The Effects of Changing Technology on Network Computer Music. In *Leonardo Music Journal,* **8**, 39-44.

Grout, D. J., and Palisca, C. V., 2000, *A History of Western Music*. New York: W. W. Norton.

Håkansson, M., Jacobsson, M., and Holmquist, L. E., 2005, Designing a Mobile Music Sharing System Based on Emergent Properties. In *Proceedings of AMT 2005, Third International Conference on Active Media Technology*, Takamatsu, Japan.

Kant, I., 1998, Groundwork of the Metaphysics of Morals. In Gregor, M. J. (Ed.) *Cambridge Texts in the History of Philosophy*. Cambridge: Cambridge University Press.

Kirsh, D., 1997, Interactivity and multimedia interfaces. In *Instructional Science,* **25**(2), 79-96.

Levy, P., 2000, *Collective Intelligence: Mankind's Emerging World in Cyberspace*. Bononno, R. (Transl.), New York: Perseus Books.

Lyotard, J-F., 1984, *The Postmodern Condition: A Report on Knowledge*. Bennington, G. and Massumi, B. (Trans.), Minneapolis: University of Minnesota Press.

McCutcheon, M., 2001, *Everyday Life in the 1800s: A Guide for Writers, Students & Historians.* Cincinnati, OH: Writer's Digest Books.

Norman, D. A., 1986, Cognitive Engineering. In Norman, D. A., and Draper, S. (Eds.) *User Centered System Design: New Perspectives on Human-Computer Interaction*. Hillsdale, N.J.: L. Erlbaum Associates, 31-62.

Pine, B. J., Gilmore, J. H., 1999, *The Experience Economy*. Cambridge, MA: Harvard Business School Press.

Rafaeli, S., and Sudweeks, F., 1997, Networked interactivity. In *Journal of Computer-Mediated Communication,* **2**(4).

Reynolds, S., 1999, *Generation Ecstasy : Into the World of Techno and Rave Culture*. London: Routledge.

Rousseau, J., 1755, *Creed of a Savoyard Priest*. In Emile. Everyman Edition (1911).

Shedroff, N., 2001, *Experience Design 1*. Indianapolis, IN: New Riders Publishing.

Tanaka, A., 2005, Malleable Contents and Future Musical Forms. In Hoffman, K. (Ed.) *Receiver* **13** http://www.receiver.vodafone.com/

Tanaka, A., 2004a, von Telepräsenz su Co-erfahrung: ein jahrzehnt netzwerkmusik. (From Telepresence to Co-experience: A Decade of Network Music.) In *Neue Zeitschrift für Musik,* **2004**(5), 27-28.

Tanaka, A., 2004b, Malleable Mobile Music. In DVD *Proceedings of the Sixth International Conference on Ubiquitous Computing*, Nottingham, U.K.

Tanaka, A., 2004c, Mobile Music Making. In *Proceedings of International Conference on New Interfaces for Musical Expression (NIME04)*, Hamamatsu, Japan, 154-156.

Tanaka, A., 2003, Composing as a Function of Infrastructure. In Ehrlich, K., and LaBelle, B. (Eds.) *Surface Tension: Problematics of Site*. Los Angeles: Errant Bodies Press.

Tanaka, A., 2001, Musical implications of media and network infrastructures: Perturbations of traditional artistic roles. In Balpe, J.-P., Leleu-Merviel, S., et al. (Eds.) *Actes de H2PTM'01: Hypertextes hypermédias, nouvelles écritures, nouveaux langages*. Paris: Hermes Science Publications, 241-250.

Tanaka, A., and Bongers, B., 2001, Global String: A Musical Instrument for Hybrid Space. In *Proceedings of cast01: Living in Mixed Realities*. St. Augustin, Germany: Fraunhofer IMK, 177-181.

Tanaka, A., 2000, Musical Performance Practice on Sensor-based Instruments. In Wanderley, M., and Battier, M. (Eds.) *Trends in Gestural Control of Music*. Paris: IRCAM, 389-405.

Turner, V., and Bruner, E., 1986, *The Anthropology of Experience*. Champaign, IL: University of Illinois Press.

Williams, B., 1993, Shame and Necessity. In Sather *Classical Lectures 57*, Berkeley, CA: University of California Press.

Wooldridge, M. J., and Jennings, N. R., 1995, Agent Theories, Architectures and Languages: A Survey. In Wooldridge, M. J., and Jennings, N. R. (Eds.) *Intelligent Agents. Lecture Notes in Artificial Intelligence*, Vol. **890**. Heidelberg: Springer Verlag.

Wolff, C., 2001, *Johann Sebastian Bach: The Learned Musician*. New York: W. W. Norton.

Chapter 14

HAIL TO THE THIEF: THE APPROPRIATION OF MUSIC IN THE DIGITAL AGE

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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'[52] 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'[53], 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, through examples

[52] 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).

[53] Radiohead, Hail to the Thief, Capital Records (2003).

K. O'Hara and B. Brown (eds.), Consuming Music Together: Social and Collaborative Aspects of Music Consumption Technologies, 289–306.

from research with 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 (e.g. 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 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 (http://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 (e.g. 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 is 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 (e.g. speech) and physical tools (e.gg 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 (e.g. 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.

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 Chain[54], Outkast[55] and Peaches[56]. 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'*[57]*. 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 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 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.

[54] http://www.youknowsit.co.uk/

[55] http://www.outkast.com/

[56] http://www.peachesrocks.com/

[57] 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.

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, Csikszentmihàlyi 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. Csikszentmihàlyi (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. eJay[58] 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 with 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

[58] http://www.ejay.co.uk/home/default.asp

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 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.

Table 14-1 shows Sequence 1 from the school keyboard session. It 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.

Table 14-1. (Sequence 1) School Setting: Keyboard collaboration: Dyad 1: Nursery rhythm

No	Turn	Participant	Transcribed discourse
63	2	K	Ah... in it goes
64	1	P	No, no
65	1	K	Are 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 (see Table 14-2) 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.

Table 14-2. (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 (see Table 14-3), 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.

What Sequence 3 (see table 14-3) 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.

Table 14-3. (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 (i.e. they have not yet checked out all samples)
472	1	2	No (in response to not having tried looking for all the samples)
473	1	1	Right

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

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 repertories 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.

4.3 The Beatbugs

In an effort to address the challenge of bringing IMNs to wider audiences, Weinberg *et al* (2002) created 'The Beatbug Network'[59], one of a series of musical tools developed though the 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 Fireflies[60] and Simple Things[61]. 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.

4.4 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

[59] http://www.media.mit.edu/hyperins/projects/beatbugs.html
[60] http://www.media.mit.edu/hyperins/projects/fireflies.html
[61] http://www.media.mit.edu/hyperins/projects/simplethings.html

acoustic music and synthesise it in real-time over the Internet. The best of the finished pieces where 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 (e.g. 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 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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References

Amabile, TM, 1985a, Motivation and creativity: effects of motivational orientation on creative writers. *Journal of Personality and Social Psychology,* **48**, 393-399

Amabile, TM, 1985b, *Social Influences on Creativity: Interactive Effects of Reward and Choice.* Paper presented at the Meeting of the American Psychological Association, Los Angeles, US

Amabile, TM, 1989, *Growing Up Creative: Nurturing a Lifetime of Creativity*. New York: Crown Publishing Group, Inc

Amabile, TM, Goldfarb, P and Brackfield, SC, 1990, Social influences on creativity: evaluation, coaction, and surveillance. *Creativity Research,* **3**(6-21)

Baker, M, Hanson, T, Joiner, R and Traum, D, 1999, The role of grounding in collaborative learning tasks. In P Dillenbourg (ed), *Collaborative Learning, Cognitive and Computational Approaches* (pp31-64). Oxford: Pergamon

Bischoff, J, Gold, R and Horton, J, 1978, Microcomputer network music. *Computer Music Journal,* **2**(3), 24-29

Boden, M, 1990, *The Creative Mind.* London: Sphere Books

Byrne, D, November 2004, David Byrne: interview with Eric Steuer. *Wired,* 186

Chestermann, J and Lipman, A, 1988, *The Electronic Privates: DIY Crimes of the Century.* London: Routledge

Clark, HH and Brennan, S, 1991, Grounding in communication. In LB Resnick, J Levin and SD Teasley (eds), *Perspective on Socially Shared Cognition* (pp127-149). Washington DC: American Psychology Association

Clark, HH and Wikes-Gibbs, D, 1986, Referring as a collaborative process. *Cognition,* **22**, 1-39

Cole, M, 1983, *A Socio-Cultural Approach to the Study of Re-Mediation*.

Cole, M, 1990, *Context, Modularity, and the Cultural Constitution of Development.*

Craft, A, 1999, Creative development in the early years: some implications of policy for practice. *The Curriculum Journal,* **10**(1), 135-150

Csikszentmihalyi, M, 1988, The dangers of originality: creativity and the artistic process. In M Gedo (ed), *Psychoanalytic perspectives on art*. Hillsdale, NJ: Analytic Press

Csikszentmihalyi, M and Getzels, JW, 1970, Concern for discovery: an attitudinal component of creative production. *Journal of Personality,* **38** (1), 91-105

Csikszentmihalyi, M and Getzels, JW, 1971, Discovery-oriented behaviour and the originality of creative products: a study with artists. *Journal of Personality and Social Psychology,* **19**(1), 47-52

Csikszentmihalyi, M and Getzels, JW, 1973, The personality of young artists: an empirical and theoretical exploration. *British Journal of Psychology,* **64**(1), 91-104

Csikszentmihalyi, M and Getzels, JW, 1988, Creativity and problem finding in art. In RW Neperud and FH Farley (eds), *The Foundation of Aesthetics, Art, and Art Education.* New York, NY, England: Praeger Publishers

Dewey, J, 1910, *How We Think*. Boston: Heath

Dillon, T, 2003, Collaborating and creating using music technologies. *International Journal of Educational Research,* **39**(8), 893-897

Dillon, T, 2004, It's in the mix baby: exploring how meaning is created within music technology collaborations. In D Miell and K Littleton (eds), *Collaborative Creativity, Contemporary Perspectives*. London: Free Association Books

Duckworth, W, 1999, Making music on the web. *Leonardo Music Journal,* **9**, 13-17

Engeström, Y, 1987, *Learning by Expanding: An Activity-Theoretical Approach to Developmental Research.* HelsinkiFinland Orienta-Konsultit Oy

Fessenden, 2002, *Peer-to-Peer Technology: Analysis of Contributory Infringement and Fair Use*. Retrieved 4 January 2005, from http://www.idea.piercelaw.edu/articles/42/42_3/3.Fressenden.pdf

Goetz, T, November 2004, Sample the future. *Wired,* 181-183

Gresham-Lancaster, S, 1998, The aesthetics and history of the hub: the effects of changing technology on network computer music. *Leonardo Music Journal,* **8**, 39-44

Guilford, JP, 1959, Traits of creativity. In HH Anderson (ed), *Creativity and its Cultivation* (pp142-161). New York: Harper

John-Steiner, V, 2000, *Creative Collaboration*. New York: Oxford University Press

Jordà, S and Barbosa, A, 2001, *Computer Supported Cooperative Music: Overview of Research Work and Projects at the Audio Visual Institute – UPF* Retrieved 7 January 2005, from http://www.iua.upf.es/mtg/publications/mosart2001-jorda.pdf

Latta, C, 1991, Notes from the NetJam Project. *Leonardo Music Journal*, 103-105

Luria, AR, 1976, *Cognitive Development: Its Cultural and Social Foundation*. Cambridge: Harvard University Press

Miell, D and Littleton, K (eds), 2004, *Collaborative Creativity*. London: Free Association

Newman, D, Griffin, P and Cole, M, 1989, *The Construction Zone; Working for Cognitive Change in School*. Cambridge, MA: Cambridge University Press

Oberholzer, F and Strumpf, K, 2004, *The Effect of File Sharing on Record Sales and Empirical Analysis*. Retrieved 10 December 2004, from http://www.nber.org/~confer/2004/URCs04/felix.pdf

Plumleigh, M, 1990, Digital audio tape: new fuel stokes the smouldering home taping fire *UCLA Law Review,* **34**, 733-776

Quantum, 2004, *Understanding CD Burning and Internet File Sharing and its Impact on the Australian Music Industry*. Albert Park, Victoria, AU: ARIA, Australian Recording Industry Association

Rogoff, B, 1990, *Apprenticeship in Thinking: Cognitive Development in Social Context*

Rogoff, B, 1995, Observing sociocultural activity on three planes: participatory appropriation, guided participation, and apprenticeship. In J Wertsch, P del Rio and A Alvarez (eds), *Sociocultural Studies of Mind* (pp139-164). New York: Cambridge University Press

Rossman, J, 1931, *The Psychology of the Inventor*. Washington, D.C: Inventors Publishing Co

Sonnenburg, S, 2004, Creativity in communication: a theoretical framework for collaborative product creation. *Creativity and Innovation Management,* **13**(4), 254-262

Steuer, E, 2004, The remix masters. *Wired, November,* 185-187

Toynbee, J, 2001, *Creating Problems: Social Authorship, Copyright and the Production of Culture*. Milton Keynes, UK: Pavis Centrex for Social and Cultural Research, Open University

Vygotsky, LS, 1978, *Mind In Society: The Development of Higher Psychological Processes.* Cambridge, MA: Harvard University Press

Vygotsky, LS, 1988, On inner speech. In MB Franklin (ed) *Child Language:a Reader* (pp181-187). London, Oxford University Press

Wallas, G, 1926, *The Art of Thought.* London: Watts

Weinberg, G, 2002a, *The Aesthetics, History, and Future Challenges of Interconnected Music Networks.* Paper presented at the International Computer Music Conference, Göteborg, Sweden

Weinberg, G, 2002b, Playpens, fireflies, and squeezables - new musical instruments for bridging the thoughtful and the joyful. *Leonardo Music Journal*

Weinberg, G, Aimi, R and Jennings, K, 2002, *The Beatbug Network - A Rhythmic System for Interdependent Group Collaboration.* Paper presented at the New Instruments for Musical Expression (NIME), Dublin, Ireland

Weinberg, G, Lackner, T and Jay, J, 2000, *The Musical Fireflies - Learning About Mathematical Patterns in Music Through Expression and Play.* Paper presented at the Colloquium on Musical Informatics, A'quila, Italy

Wertsch, J and Tulviste, P, 1998, LS Vygotsky and contemporary developmental psychology. In D Faulker, K Littleton and M Woodhead (eds), *Learning Relationships in the Classroom*. London and New York: Routledge in association with The Open University Press

Wertsch, JV, 1985, *Vygotsky and the Social Formation of Mind*. Cambridge, MA; London: Harvard University Press

Zentner, A, 2004, *Measuring the Effect of Online Music Piracy on Music Sales*. Retrieved 10 December 2004, from http://www.uni-kiel.de/ifw/konfer/network2004/zentner.pdf

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