Can you feel it? The information behaviour of creative DJs

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Abstract

Design/methodology/approach

From a set of semi-structured interviews with twelve experienced DJs in Scotland, UK, that were subjected to inductive thematic analysis, we present a model of how DJs undergo the process of planning, performing, and evaluating a DJ performance.

Purpose

This paper investigates the information behaviour of creative DJs, a group previously not considered from the perspective of information studies. The practice of DJing is a musically creative process, where a performance can draw on a vast range of music to create a unique listening and dancing experience. We study what are the information behaviour processes involved in creative DJing and what roles embodied information play in DJing practice.

Findings

From this study a model of creative DJs' information behaviour is presented**.** This three-stage model describes the information behaviours and critical factors that influence DJs' planning, decision-making and verification during the pre-performance, performance and post-performance stages, with particular emphasis on DJs' performances as a rich site of embodied information interactions.

Originality/value

This research provides insight into a new activity in information behaviour, particularly in the use of embodied information, and presents a model for the information behaviour of creative DJs. This opens the way for future studies to consider minorities within the activity, the audience as opposed to the performer, as well as other creative activities where physicality and performance are central.

Introduction

The term DJ, short for Disc Jockey, was first coined in the 1940s and broadly applies to someone who selects music for other people to listen to (Brewster and Broughton, 2014). The first recorded act of DJing was by Reginald Fessenden, a colleague of Thomas Edison: during an experiment in 1906 to transmit radio waves between the United States and Scotland, Fessenden played a musical recording of Handel's 'Xerses' (Brewster and Broughton, 2014). The activity of playing music for others has since developed into a widely applied form of creative practice.

A DJ's creativity comes from the vast range of recorded music available to them as a palette and their ability to blend a selection of music together to create a performance for the enjoyment of others. This requires knowledge of the audience and space in which the performance will take place, knowledge of the music available, and the ability to 'read' the audience and create a memorable lived experience.

This paper considers the musical creativity of DJing practice from the perspective of Human Information Behaviour. Information Science research into music has so far not considered DJs, however the practice of DJing can be viewed as musically creative, with remixing practices at its core (Navas and Gallagher, 2014), and as a rich vein of novel perspective for the field. Parallels have also been drawn between the practice of DJing and of information professionals, such as librarians, in their synthesising of information for others (Kumasi, 2018).

Remixing practices are widespread in our contemporary and participatory culture (Navas and Gallagher, 2014), including but not limited to DJing, visual arts, videogames, genetic engineering, food, and more. DJs critically deconstruct, transform, contrast, reuse, reconstitute, and combine music to produce novel creative outputs that deliver new value. Discussing musical remix practices, it has been argued that '*in remix culture each player is both a sender and a receiver of information; in both cases the ultimate goal is to synthesize new information*' (Flusser, 2011, cited in Campanelli, 2014). Remixing practices including DJing are characterized by participatory rather than contemplative interactions with the audience. This presents an opportunity to partially answer Cox et al.'s (2017) call for attention to embodied information in music.

Our qualitative fieldwork investigates what are the information behaviour processes involved in creative DJing and what roles does embodied information play in DJing practice. Results are based on twelve semi-structured online interviews with practicing DJs in Scotland, UK which leads to a three-stage model for the information behaviour of DJs, of relevance to the consideration of information behaviour in creative practice and the use of embodied information in creative practices.

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Literature review

We first present a brief background to DJing as a creative and cultural practice. We then highlight some important contributions to music-related information behaviour, and finally discuss the relationship between music and embodiment.

DJing as a cultural practice

DJing has a creative side that goes beyond individual performance, reaching a primary role in the creation of musical genres. Many early examples of creative DJing originate from Jamaica, where the development of Reggae music took place (Bradley, 2001, Brewster and Broughton, 2014). The earliest roots of Reggae are found in the establishment of sound systems by DJs, known colloquially as selectors. Selectors would grow the reputation and popularity of their sound systems by playing music exclusive to them, initially rare imported American records. Once this resource was exhausted, DJs created their own music to meet the need for exclusivity. Sound system operators such as King Tubby began making their own unique versions of popular songs, breaking down songs to their constituent elements and reassembling them in a way designed to receive a positive reaction from a crowd. This is the earliest form of what became known as remixing, a repurposing of an existing piece of music (Bradley, 2001, Brewster and Broughton, 2014). Similar instances of breaking down musical works and creatively remixing them lay behind the development of Hip Hop (Brewster and Broughton, 2014, Katz, 2012).

Further to this, new techniques for playing music were being developed by DJs such as Francis Grosso, who would cue up the next record to be in time with the music already being played, allowing for a seamless transition from one song to the next and allowing the audience to keep dancing without interruption. This became a staple technique in styles of dance music grounded in Disco such as Garage, House, and Techno (Brewster and Broughton, 2014, Collin, 2010, Reynolds, 2013). By acting creatively and being aware of others' techniques, a DJ can meld together a wide variety of genres, moods, and styles to create a unique performance.

The rise in popularity of DJs results in part from their position in broader cultural movements. For example, the Jamaican sound system culture was imported to the UK via Afro-Caribbean immigration and helped birth a vast array of DJ-driven musical genres including Bluebeat, Ska, Lover's Rock, Rave, Jungle, Drum & Bass, UK Garage, Grime and Dubstep (Bradley, 2013, Brewster and Broughton, 2014, Reynolds, 2013). Similarly, the importing of Jamaican DJ culture to New York, via DJ Kool Herc, was pivotal in Hip Hop becoming one of the predominant forms of popular music worldwide (Brewster and Broughton, 2014, Katz, 2012). Francis Grosso, pioneer of beat matching in mixing, was DJing around the corner from the Stonewall Inn on the night of the Stonewall Uprising

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(Brewster and Broughton, 2014). The resultant emancipation from this event was a key factor in the explosion of dynamic energy in clubs, soundtracked by DJ's playing a wide range of music, and attended predominantly by the Black and Latino gay community (Brewster and Broughton, 2014, Jones and Kantonen, 2011, Lawrence, 2004). This resonated far beyond the era of Disco, into the genesis of Garage, House, and Techno and, in turn, the DJ driven UK Acid House and Rave movements that flourished in the late 1980s and early 1990s (Brewster and Broughton, 2014, Bussman, 1998, Collin, 2010, Reynolds, 2013). These examples serve to highlight the potential for cultural impact which a creative DJ possesses.

Musical creativity and information behaviour

Whilst both performance musicianship and DJing are both creative endeavours, the information behaviour literature has tended to focus on the former over the latter. However, frameworks on performance musicianship are useful for thinking about DJing practice. For example, Lavranos *et al.* proposed a model of musical creativity that combines two theoretical frameworks, Wilson's (1999) information seeking behaviour model and Webster's (2002) creative thinking in music model, to create a hybrid model, (2015) consisting of three stages. This combination of Wilson's and Webster's models is also suggested as a useful means of analysing music related information behaviour in a study of information seeking amongst musicians in Corfu (Kostagiolas et al., 2017).

The first stage is initiated by the desire to be musically creative. From this motivation phase several information needs will occur (Kostagiolas *et al.*, 2015) leading to the second stage, that of information seeking for musical creativity (Lavranos *et al.*, 2015). The information needs may be hedonic or functional depending on the musical creativity sought. From literature reviewed by Lavranos *et al.* (2015) several possible needs are identified: specific pieces of music, information about a genre of music, music theory, historical, cultural, or social background to music, printed music sources and other music related media. This was borne out in a study of Greek musicians who would seek information relating to genre, specific pieces of music, instruments, electronic music formats and music theory (Kostagiolas et al., 2017).

The range of sources a musician will consult to meet their information needs is vast, including personal music collections, archives, physical and online music shops, live music events, online databases, internet searching, social media, interpersonal social networks, printed and digital music press as well as other forms of mass media. Relatedly, Lee and Downie (2004) suggest that music listeners will consult several different sources in the process of music information seeking. In looking at the information seeking behaviour of musicians in a community concert band, Kostagiolas *et al.* (2015) also noted that musicians used digital, interpersonal, and print material to locate useful

material, with an expressed preference in one study of general internet searching, real life social networks and within personal music collections (Kostagiolas et al., 2017).

The third musical creativity stage itself relating to musical creative activities, such as composing, performing, improvising, listening, and analysing (Webster 2002), and musical creative products which can include written compositions, performances of pre-composed or improvised music and listening and analysis of music (Webster 2002).

In these studies, barriers have been identified when seeking information to be musically creative. Manus (2009) for example found that barriers could arise from the environment in which the musician worked. Other potential barriers to music information found by Lavranos *et al.* (2015) include expense, lack of time, poor computer skills and large volumes of music related information to sift through. Research by Liew and Ng (2006) amongst ethnomusicologists demonstrated barriers to musical information, including scarcity of material, copyright issues and the expense of attaining the resources they needed.

There are also enablers to finding information to be musically creative. The importance of social networks to musicians is key (Taheri-Panah and MacFarlane, 2004) and interpersonal information resources of musicians are seen as highly valuable (Hunter, 2007) with sources such as family, friends and social media being identified in music information seeking studies (Laplante and Downie, 2006, Laplante, 2010).

Using the body as a source of information

The use of the body as an information source is a recent direction in information science and information literacy (Lloyd, 2010). Lloyd describes corporeal information as *'information that is experienced through the situated and sensory body as it interacts with material objects, artefacts and other people that inhabit the same landscape'* (Lloyd, 2010). From this she posits that to not consider embodied information is to ignore information that is acquired and learnt in an informal manner, often in social situations, as opposed to knowledge gleaned through interacting with formal information systems.

In Cox et al.'s (2017) paper calling for the further consideration of embodied information in information behaviour, particularly in creative pursuits, there is discussion of embodied information in music. They identify music as a multi-modal sensory activity that incorporates aural and visual information, viewing the music being played as much as part of the experience as hearing it. In many circumstances, music is designed to illicit a physical response such as dancing.

Performing or listening to music is dependent on embodied experiences (Leman, 2008). During a performance, musicians will use movement not just to play their instruments, but also to express the emotion of the music being played (Muñoz, 2007). Complex emotions can be related by music and it can adjust the frame of mind those listening (Shifriss et al., 2015). From the same research it is also observed that the way people dance to music is expressive of the nature of the music being played.

Research has shown the connected relationship between dance music commonly played by DJs and enthusiastic, physical dancing responses from a crowd (Zeiner-Henriksen, 2010). Renowned DJ Andrew Weatherall describes DJing as being a '*vampiric*' act, the invigoration of observing how dancers react with enthusiasm to a piece of music previously unheard (Crack Magazine, 2020). Another DJ, Jeff Mills, talks of conceiving themselves as part of the audience to anticipate what music should be played, suggesting that imagination is combined with embodied information from a crowd (Lynch, 2019). This idea is reinforced by Disco DJ David Mancuso' statement that a DJ's mindset should be half amongst the crowd, observing their actions and half behind the turntables (Brewster and Broughton, 2014, Brewster and Broughton, 2012). Another form of embodied information relating to DJs is their use of the volume and frequencies of speakers in a club environment to play music with a strong bass resonance, beyond the range of frequencies that the human ear can detect, thus having a physical effect on the body (Byrne, 2017, Goodman, 2012). Further to this, work in neuroscience demonstrates the concept of human mirror neurons: humans communicate, react to and replicate actions of another human, and these neurons react when we listen to music (Molnar-Szakacs and Overy, 2006). This, in turn, is applicable to the act of dancing (Byrne, 2017) and therefore to the interaction between a DJ and their audience.

Based on the review outlined above we set out to investigate two broad research questions in our study:

1. What are the information behaviour processes involved in creative DJing?

2. What roles does embodied information play in DJing practice?

Research design

This qualitative study used semi-structured interviews to gather insights into the information behaviour of the creative DJ community. Creative DJing is defined as a DJ having the freedom to play whatever they choose during a set, as opposed to what could be defined as a more functional form of DJing where a DJ will be expected to play certain well-known pieces of music to fit with a social event, such as a wedding or birthday party. The freedom afforded the creative DJ allows for a rich source of information decisions. DJing can be viewed as having similarities and crossovers with other

forms of musical performance, as well as other creative performances such as theatre (Olsson, 2010) and stand-up comedy (Quirk, 2011).

The first author is a practicing creative DJ: over a twenty-year period he has DJed in clubs, bars, on the radio and at music festivals, as well as running music events. Further to this, he has ten years' experience working in record shops, an environment frequented by DJs looking for music and equipment, as well as being a social hub for meeting other DJs. Therefore, his personal experience was used to inform the methodology and enrich the analysis from an insider perspective (Merriam et al., 2001).

Participants

The selection of research participants was based on a mix of purposive and convenience sampling process, seeking to recruit DJs with broad experience of creative DJing practice who could provide rich data on DJing practices. All participants had either DJed alongside the first author at a music event, ran a music event that they had played at, or had engaged with him as a DJ through his work in a record shop or while DJing on the radio. All participants could draw on years' worth of DJing experience in clubs and at festivals either locally or internationally.

Twelve creative DJs were able to take part in the study (Table 1), all based in Scotland, UK. Two participants were between 18-25 years old, five participants were aged between 26-35 years old, and five between 36-45; nine participants were male, three female. DJing was the main source of employment for four participants. Eight participants had another job as their main source of employment, and although some of these were non-music related, all described how their career choices were based on allowing space for DJing. For our interviewees, DJing is a serious leisure activity that can be seen as aligned to Robert Stebbins' concept of the occupational devotee (2009), someone for whom the boundary between work and leisure is so blurred it is almost indistinguishable.

Table 1: Participant demographics

ID	Age	Gender	Creative DJing as main source of employment	Main source of employment if not DJing
Participant 1	26-35	Male	No	Illustrator
Participant 2	36-45	Male	No	Music Retailer
Participant 3	36-45	Male	No	Parliamentary Reporter

Participant 4	18-25	Male	No	Restaurateur
Participant 5	36-45	Male	Yes	-
Participant 6	26-35	Male	Yes	-
Participant 7	26-35	Female	No	Hospitality staff
Participant 8	26-35	Male	No	Architect
Participant 9	36-45	Female	No	Massage therapist
Participant 10	26-35	Male	Yes	-
Participant 11	36-45	Male	No	Laboratory manager
Participant 12	18-25	Female	Yes	-

Data collection and analysis

Semi-structured interviews were conducted in July 2020 through video calling applications. The interview questions, listed in the Appendix, were informed by the research models described above, as well as the first author's practical experience. Eleven questions were asked on the relationship between DJing and other careers, how they prepare for a performance, how they seek music, how they evaluate performance, barriers faced in DJing, and how they communicate with the audience whilst performing. This study was granted approval by our Departmental Ethics Committee, in line with institutional processes for research with human participants. Participants were not compensated for their involvement in the research.

The interview data was automatically transcribed using Otter.ai, checked for accuracy, and then subjected to a process of thematic analysis by the first author using guidelines in Braun and Clarke (2006, 2019), and critiqued by other authors. The draft themes that were used to guide the research questions, based on the key models and concepts of higher things (Kari and Hartel, 2007), music information seeking for creativity (Lavranos et al. 2015) and the call to study embodied information in information studies (Cox, Griffin and Hartel, 2017), were used to initially code the interview transcripts, following a deductive approach of reflexive thematic analysis (Braun and Clarke, 2019). Through further iterations of analysis these themes were developed in an inductive manner based on the content of the interview data relevant to the activity of DJing: Pre-performance planning, Performance decision-making, Performance and Post-performance verification and embodied information. Together, these themes were used to create the model presented in this paper.

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Each DJ contributed novel insights and experiences to our study but overall, we managed to reach saturation of the themes and main factors in the model. Therefore, at the level of granularity at which it is presented, we believe that our model is stable.

Research limitations

The first author's status as an insider contributed to selecting and recruiting participants to the study, and building a rapport with the interviewees. However, we are aware that the first authors' positionality (Coghlan and Brydon-Miller, 2014) could lead to an overly personal perspective on the data gathering and analysis, forcing a set of experiences onto the questions asked. To mitigate this potential bias, the interview script was critiqued during its development by other authors from an information behaviour perspective and was designed to be open and allow participants to tell their own stories.

The participant demographics is indicative of the first author's personal demographic: a 38-year-old, male, working in music retail for whom DJing was not the main source of employment. However, the age range of participants is wide (mostly 26-45) and the male dominated, second career nature of DJing is common.

Our sample is skewed towards male participants, as is DJing generally, and this is an area where future research could hear more female voices or consider the DJing experience wholly from a female perspective. There was no consideration of race or sexuality in this research, although some themes did later emerge from the interview data, which given the key role that these factors played in the genesis of much of DJ culture (Brewster and Broughton, 2014, Lawrence, 2004), could be further represented in future research on the topic. New studies are welcome to further enrich this work.

Findings and discussion

This study sheds light on specific creative aspects of creative DJing. The analysis of the collected data allows us to define a model unique to the act of DJing. This model includes three activities identified in the thematic analysis of the interviews: planning, decision-making, and verification (Figure 1), occurring pre-performance, during performance and post-performance. Within these three activities there is a wide range of inputs to a DJ's creative actions, generating an understanding of the thought processes and information behaviours of their craft. Key to a DJ's information behaviour is embodied information from an audience, with evidence of it being presentfrom within the DJ's themselves and mirrored between DJ and audiencethe two, illuminating the decision-making and verification activities.

In the following sections, we present this model, explaining each activity and the transversal role played out by embodied information. Quotes from the research participants are presented to illustrate some of these aspects.

A model of creative DJ's information behaviour

Our research data showed that for creative DJs the three principal activities are best represented as planning, decision-making, and verification (Figure 1). These three activities occur in three chronological stages; pre-performance, during performance and post-performance. Planning occurs pre-performance but also incorporates prior experience of other DJ sets, so is not isolated. Then, during the performance itself, there are cycles of decision-making and verification, with a constant feedback loop where the DJ assesses reactions to the music they are playing, informing their decision of what to play next. This feedback loop is only broken at the end of a set, the post-performance stage, where a cumulative response is received to every piece of music that has been played during a set, and every decision made, resulting in a final verification. Principally, this places the information behaviours of creative DJs as a dynamic synthesis of wide-ranging information, involving new decisions to be made every few minutes during a set. A key element in the perception of feedback from a crowd was identified as embodied information.
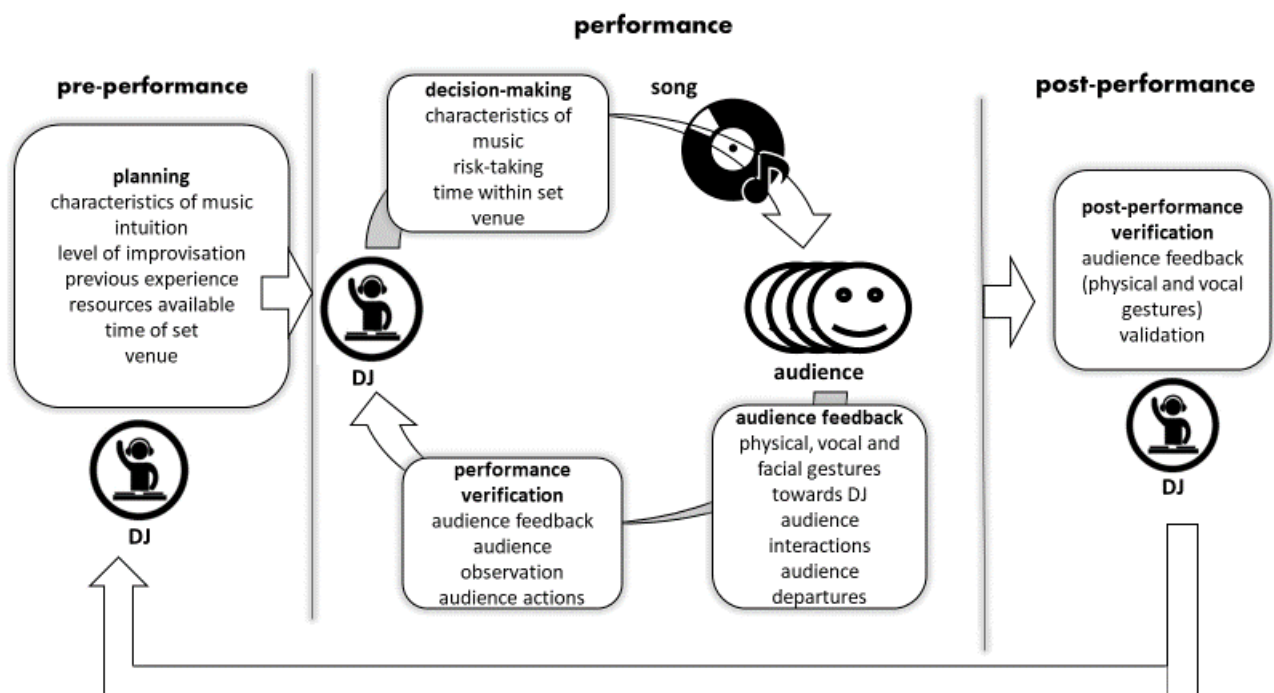

Figure 1: Model of creative DJ's information behaviour

Pre-performance

Before a performance the primary activity is planning, this is how creative DJs prepare for a set, a commonly used DJ term for a performance. This ties in with the impetus stage from Lavranos et al. (2015) model as planning for a set is a motivating factor for musical creativity. It includes considerations such as resources, information seeking methods, barriers, preparing to improvise, time and space, characteristics of music and instinct. The interview data identified a wide range of resources and sources which DJs would consult when looking for new music, one of the first stages of planning. These included physical record shops (Participants 2, 3, 4, 6, 7, 8, 10, 11 & 12), online record shops (Participants 3, 5, 7, 9 & 11), real life social networks (Participants 3, 4, 6, 7, 8, 9, 10 & 12), social media (Participants 3, 4 & 8), radio (Participants 2, 4, 8 & 11), DJ mixes (Participants 1 & 2), nightclubs (Participants 2, 4 & 7), file sharing platforms (Participants 3 & 8), promotional sources (Participants 4, 6 & 10), YouTube (Participants 10 & 11), online music publications (Participant 1), Bandcamp (Participants 1, 2, 3, 4, 5, 7, 8, 9 & 12), Spotify (Participants 4, 7 & 11), and Discogs (Participants 6, 8, 10, 11 & 12). The diversity of resources and sources ties in with findings related to sources utilised in music related information studies (Kostagiolas et al., 2015; Lavranos et al., 2015, Lee and Downie, 2004). In seeking new music to play, the participants demonstrated a number of identifiable information seeking methods, linking with methods identified by Wilson (1999), including chaining, serendipity, browsing through large volumes of music, and using multiple resources in conjunction.

As proposed in Lavranos et al. (2015) and Wilson (1999) many participants discussed barriers. These included financial barriers relating to cost of equipment and music (Participants 2, 4, 8 & 12), type of music played (Participants 4, 5, 8 & 11), cliques (Participants 4, 5, 6 & 11), competition (Participants 1, 2, 8 & 10), confidence (Participants 4, 6, 8 & 10), sobriety- (Participant 5), and gender (Participants 4, 7 & 12). While these are not necessarily direct barriers to information, they represent barriers to participation, which in turn prevents accruing knowledge of creative DJing through experiential learning. There was also an awareness of barriers faced more broadly in the DJ community with race, gender, sexuality, and disability identified as examples. Several enablers were also mentioned, including community run radio stations (Participant 7), female led DJ collectives (Participant 7), and workshops teaching DJ skills (Participant 12).

Improvising is identified as a musically creative activity (Lavranos et al., 2015) and all participants were asked whether they prioritised planning or improvisation when preparing for a set. All but one (Participant 3) stated that they would incorporate improvisation into their planning, ranging from a roughly equal weighting between improvising music selection and having pre-planned choices

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(Participants 2 & 6), to favouring a more improvisational approach (Participants 1, 11 & 12). Planning and improvisation were linked by some (Participants 4, 8, 10 & 12), of *"planning to improvise"* (Participant 2), while the idea of abandoning plans in order to improvise was also discussed, *"I've been doing it long enough that I know I need to be ready to throw everything out of the window"* (Participant 5).

Key to planning were considerations of the time and space that they were playing, mirroring contextual considerations mentioned in other music creativity studies (Hickey, 2003). There was a common theme of preparing appropriate music for the time of night, from a warm up (Broughton and Brewster, 2006), where setting a welcoming musical atmosphere was key, to more energetic music for the latter portions of a night, described by one interviewee as "*I enjoy playing warm up sets as well, where there's more of an opportunity to play like more subtle music"* (Participant 1). An awareness of the type of space was also apparent (Participants 2, 3, 4, 5, 6, 7, 8, 9 & 12): the type of venue, the size of a venue, the location of a venue and previous experience playing in that space.

Common to planning was a contemplation of musical characteristics, similar to characteristics set out by Lavranos et al. (2015). Frequently this would be related to genre of music, with the intention of playing multiple genres (Participants 3, 4, 6, 8, 9, 10, 11 & 12), but others discussed included the tempo of music (Participants 2, 3 & 12), the style of vocals in music (Participants 11 & 12), musical motifs (Participants 3 & 7), bassline, and bass dynamics (Participant 12), as well as percussion or percussive elements (Participants 8 & 12). Several non-musical characteristics were also discussed, ranging from functionality (Participants 2, 4, 5 & 6) to emotional resonance (Participants 2, 5, 7, 11 & 12), the format of the music, both physical and digital, as well as slang terms like '*bangers*' (Participant 1) a track they feel confident will induce a positive response.

When asked how they could know whether a piece of music would work with a crowd when they were listening to it on their own in advance, half of the participants explicitly mentioned an element of doubt, demonstrating an element of risk taking in preparing music for a set. To mitigate this risk, participants talked of relying on a feeling relating to a piece of music, *'trusting your gut is really important'* as Participant 4 noted. Participants also drew on previous performances, *'you can go on previous experiences, prior knowledge and knowing what elements work'* (Participant 2) and using their imagination to visualise a crowd reaction, as related by DJs like Jeff Mills and David Mancuso (Brewster and Broughton, 2014, Lynch, 2019).

Performance decision-making

After planning for a set pre-performance, the next key activity in our model is decision-making during performance. An emergent theme from the interview data was of DJs describing the factors that went into their decision-making processes, linking to creativity concepts (Wallas, 1926, Webster, 2002). Distinct from planning, the information used in making decisions is sought in real-time during the performance and consists of judging feedback from a crowd, often in the form of embodied information, considerations of time and space, risk taking and the characteristics of music.

Key to the decision-making process was gauging audience reaction to the music being played and this was described as instinctual, or an *'innate'* sense (Participant 8), as well as an ability to *'read the room'* (Participants 3, 6, 8, 9, 10 and 12). There was also discussion of entering a *'flow state'* (Participants 4 and 10) when DJing, being able to decide what music to play in an unconscious manner, also described as, *'a state where you divine for the next record'* (Participant 4). This is when a set is going well and the feedback is positive; when a DJ perceives the feedback to be negative, this can cause feelings of anxiety and lead to difficulty in decision making and have an adverse effect on their performance.

Central to a DJ's understanding of feedback, both positive and negative, from a crowd is embodied information (Cox et al., 2017), such as observing the movement of bodies dancing and the flow of people to and from the dancefloor. There is also a description of sensing crowd feedback from being able to read several *'micro-expressions'* (Participant 2) at once. This points to the centrality of embodied information to the decision-making processes of a creative DJ.

As with the planning element of DJing, factors to do with time and space are key to decision making, as in other areas of musical creativity (Hickey, 2003). The time that a set is taking place is important for choosing what to play next, with both sets and events typically involving an arc of beginning at a slower pace and energy, before building in intensity towards the end. The space of a venue is also discussed when observing embodied information during a set: a common theme among participants was that it was much easier to gauge crowd reaction in a smaller venue than it was at larger clubs and festivals. How an audience occupied a space is considered, with ensuring a safe environment for dancers viewed as important, possibly leading to deliberately alienating some members of an audience to ensure this. The rationale for this is that in prioritising the reaction of one group of people, typically described as a boisterous group of males, above the rest of a crowd risked making the environment less safe or welcoming, and that, by alienating them through choices

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of music played, DJs create a better atmosphere for others, *'what tends to be not good for them tends to be better for everyone else'* (Participant 8).

As with planning, risk-taking was identified by several participants during decision-making. This risk arises when there was an element of doubt about whether a piece of music would work with a crowd. Participants described the positive feedback from a taking a risk on a song that paid off as extremely rewarding, relating embodied experiences such as hair standing on end or a *'buzz'* (Participant 7). The reward in risk taking was described in the following terms;

'When you play some record that is quite obscure, not many people are going to have heard it, and you get the sense that you've played it in the right way, or at the right time, you've presented it really well to people and it feels really amazing.' (Participant 1)

As with receiving negative feedback, a perceived risk that does not pay off causes a sensation of deflation, of leaving them *'heartbroken'* (Participant 7).

Another link between the pre-performance planning and during performance decision-making components of the model is the consideration of the characteristics of music being selected. The musical characteristics discussed are the same as in planning, with a focus on genre, particularly playing across genres, tempo, vocals, motifs, bass, and percussion. There is an indication from some participants that musical characteristics, such as vocals or tone, or non-musical characteristics such as songs with emotional resonance, could be used to attempt to communicate to a crowd how they felt. Indeed, many participants described a form of communication between them and the crowd as an unspoken conversation.

Performance verification

The third key activity in our model is verification, taking the term from Wallas's model for creative thinking (Wallas, 1926), which in turn was used in the creation of the model of information seeking behaviour as motivator for musical creativity (Lavranos et al., 2015, Webster, 2002). For creative DJs there are two different stages of verification. The first form, occurring during a performance, areis the responses described earlier in relation to each new piece of music a DJ plays, thus forming a feedback loop which informs their decision making as to what to play next. The second type of verification occurs post-performance. As with elements of the decision-making process, there is clear evidence of embodied information, which is key to a DJs interpretation of how well a set is going or has gone. During performance verification, in terms of positive feedback, is described by one interviewee as:

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'Just when you see everybody cheer, and everybody going for it and screaming and it's… it's just a brilliant feeling. You just know as well, you can get it, you pick up on the energy… It's just yeah, it's really hard to express or talk about that feeling, but I guess there's a sense of like, unity between you and the crowd and you and the people around the booth, and there's just this kind of sense that something's happening and you're at the heart of it and everything's really exciting.' (Participant 8)

Verification can also take the form of more personal interactions, such as the one related by another interviewee:

'I get emotional talking about that. There's these people who are there, um, who are shy and they might have their head down and be in their own space but in between, then we'll check, hey, is someone with me and if they… if there's a connection, if there's a smile with someone like that, that is, wheew! That's the big moment. That's the deep meaningful one, if someone who is in their own space and then holds a gaze with you or holds a gaze with, with another person on the dancefloor, that is…yeah!' (Participant 5)

Post-performance verification

The second form of verification arrives at the end of a performance, when the total of every decision made and piece of music selected results in a final response from the crowd. This verification comes in the form of direct feedback from the crowd, described by participants as vocal gestures, facial gestures, and perhaps even a round of applause. Another common theme amongst interviewees is the term *'validation'* (Participants 2, 3, 5 and 7) a term used when describing the sensation of positive feedback from a crowd. The joyful sensation of verification at the end of a DJ set is depicted by one of the interviewees in the following way:

'A lot of the joy, excitement and an ecstasy that people experience, isn't just because I'm playing good music that makes them happy, it's because they are in a physical space with other people physically interacting in ways that is just not... it's just not possible... the social norms prevent us from doing in day to day life. That kind of physical interaction and that kind of... merging... the kind of dissolving of the individual into the group, it's a really kind of powerful, almost political kind of act. There's a huge amount of power and magic and kind of force, like healing and inspiration and invigoration and... the generation of power and magic inside people is... what happens when it works, when I've done a good job of putting on a night and playing the right music.' (Participant 3)

Embodied information in creative DJing

The call from Cox et al. (2017) to further incorporate the study of embodied information in information behaviour studies is a key concept in informing and framing this research. As demonstrated in the model presented above, embodied information is key to the decision making and verification components. Relevant aspects of embodied information in DJing includes sensing embodied information from a crowd, and embodied information from within, and mirrored by, the DJ. These aspects are discussed below.

Embodied information from a crowd

This research suggests that judging atmosphere and monitoring crowd feedback is central to a DJ's performance through embodied actions such as dancing, facial gestures, vocal gestures, and the composition of the audience. Dancing was cited by every participant as a bodily action that they would monitor for a sign of how well a set was going. Several facial gestures were also mentioned by the participants as positive signs: smiles from audience members, eye contact, and *'knowing looks'* (Participant 9) from a crowd were signifiers of a set going well. Further to the facial gestures described here, several vocal gestures were detailed by the participants including cheering, whooping, and screaming.

As noted in the model for DJ's musical creativity, the space in which they are playing and how it is occupied are a key measure for judging atmosphere and interpreting crowd feedback. One common theme was a consideration of the flow of the crowd, described as being in a constant *'state of flux'* (Participant 6), for example observing the number of people leaving the dancefloor to go for a drink, to the toilet, or outside for a cigarette. If many people do these at once, this is an indicator of a dip in energy, in direct response to a piece of music that DJs select. Such perception shows that embodied information of people in groups is as important to DJs as embodied information from individuals. In relation to reading crowd feedback while making decisions during a set, the size of the venue is relevant. A common theme emerging from participants is that it is much easier to observe body language in an intimate venue, as opposed to a difficulty in doing so in a large venue or a festival stage where there may be a bigger physical distance between performer and audience. DJs also observe the composition of the crowd in front of them with a view to crowd safety and enjoyment, perhaps choosing to prioritise the happiness of a less vocal majority over a shouty minority. The physical effect that the sonic dynamics of the music played at loud volume, for example deep bass frequencies, was also noted as a consideration amongst some interviewees, with one describing it in the following terms:

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'I think it's also that bodily thing of like, I also dance and so I think the way that I experience music is definitely through that mindset of really feeling it through, you know, we all feel it through our body. So when you feel people dancing in that way, that's also the strength of connection, like you're doing this ritualistic dance.' (Participant 12)

Interviewees mentioned several other gestures and actions. A grouping of these gestures can be described as physical signs of approval from audience members, such as high fives, raising their hands in the air, applauding, pumping their fists, and thumbs up signals. Crowd members taking their tops off and finding the musical atmosphere conducive to *'making out'* (Participant 3) were also seen as positive signs of engagement. If people were seen to be observing what the DJ was doing, this was taken as positive indicator. Some of the participants noted how often crowd members check their phone as an indicator of engagement. Similarly, audience members chatting is also considered a sign that they are not fully immersed in the music being played. When DJs are playing in a bar, an environment not designed for dancing, different types of body language are observed such as tapping feet or nodding heads.

As with assessing crowd feedback, many of the participants described observing an audience in qualitative terms such as feeling the *'vibe'* (Participants 4, 6, 7. etc) or *'reading the room'* (Participants 3, 6, 8. etc). One participant mentions sensing what is happening with a crowd just from movements in the air, *'I can almost not be looking at the crowd and I can still get a sense of the room'* (Participant 2). It is posited, as with reading crowd feedback when taking decisions, that the interviewed DJs can sense and read a serious of *'micro-expressions'* (Participant 2), that is gestures and movements made by an audience and interpret this embodied information into their performance in real time, an extension of the feedback loop discussed in the model for DJ's musical creativity.

Embodied information mirrored by the DJ

The interview data demonstrate many examples of DJs observing the audience, but there are also examples of DJs perceiving an awareness of embodied information from within. Half of the participants described an element of mirroring behaviour displayed by the audience: these activities may include reciprocating gestures such as eye contact, smiling, giving a thumbs up motion, fist pumping, and taking their top off. The most stated mirroring behaviour is that of the DJs dancing along with the crowd to the music they are playing. Broadly speaking, the participants described their embodied actions during a set in a positive manner, reflective of the set going well and that they are relaxed and enjoying themselves, as the crowd is too. A further example

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of embodied information mentioned by the participants is that, when a set goes well, there is a

sense of a chemical reaction occurring in their brains, described in the following manner:

'It's pretty unparalleled in terms of being able to control a room through music, that's why we do it

right? It's very euphoric, everyone's dopamine is firing at the same time.' (Participant 4)

Links to literature on embodied information

Key to decision making and verification, during and after a performance, is feedback from embodied

information and our findings further confirm the presence of embodied information in musical

activities discussed by Cox, Griffin and Hartel (2017). These can be seen in embodied experiences

arising from music (Leman, 2008), musicians expressing themselves to a crowd (Muñoz, 2007), music

inducing complex emotions and changes in state of mind (Shifriss *et al.* 2015) and the way that

people dance to music expresses feelings (Bowman, 2004). There also appears to be evidence of the

bodies in an audience possessing, producing and disseminating information to the performing DJs

(Lloyd, 2010). The data also suggests there are links to the work of Lueg, in that there is a

consideration amongst the interviewed DJs of how different bodies experience an environment,

evidenced by prioritising the enjoyment and safety of some crowd member over others, as well as

the effect that the emotions induced by a piece of music can have on a body in the form of

enthusiastic response (Lueg, 2014, Lueg, 2015). Tying in with the research of Keilty (2012, 2016) are

the bodily reactions of DJs to the information they are receiving from a crowd, such as pleasure or

anxiety, depending on how well a set is going. Also, the art of DJing can be likened to the non-verbal

communication noted in research by Hyden (Hydén and Antelius, 2011, Hydén, 2013). The physical

sensations of experiencing loud music put forward in the literature review (Byrne, 2017, Goodman,

2012), were also evidenced by the participants. Finally, the mirroring behaviour noted by Molnar-

Szakacs (2006) and Byrne (2017) in relation to music and dancing could be noted in the embodied

actions of audience and DJs.

Summary of findings and discussion

In this paper we have established a new model for understanding DJ performance and its

relationship to information behaviour. In this model, we see distinct stages, firstly a pre-

performance planning stage that is partly informed by previous experience, imagination, instinct and

a wide range of musical sources. Then a performance, a DJ set, where decision-making is central to

being musically creative, involving information seeking from the music available, improvisation, risk-

taking and reacting to crowd feedback in the form of embodied information. Lastly, these embodied

reactions inform verification of audience engagement during a performance, both as a real-time

response to music being played and, post-performance, as a cumulative response to the set as a

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whole. Our model is distinguished by its focus on live performance and the complementary activities of decision-making and verification.

This research expands our knowledge of information behaviour in a new domain. It particularly focusses on an area in which physical and emotional sensations, rather than cognitive ones, are the goal of information behaviours and the source of vital feedback that informs information behaviour. DJing is a real time reactive experience and the audience feedback plays an important role in improvisation. Improvisation in the case of DJing is different to improvisation in other forms of musical creativity as there are differences between improvising notes being played by an instrument and improvising in terms of selecting a piece of pre-recorded music based on a perception of crowd feedback. However, there may be similarities between our model of DJing practice and performance with other areas that have a similar plan-perform-validate structure such as theatre (Olsson, 2010), stand-up comedy (Quirk, 2011), or teaching (Sawyer, 2004). We expect that there may be both interesting differences, e.g., that stand-up has a higher emphasis on creating material rather than remixing it, and similarities, e.g., that embodied audience reactions is a key feedback mechanism.

Future work could also place a stronger emphasis on those DJ groups that are under-represented in DJing and this study, particularly female DJs. There is also a gap in understanding the perception of audience members during a DJ set, rather than just the DJ's themselves, to fully understand both sides of this reciprocal relationship. As well as indicating the use of embodied information in the information behaviour of creative and performing activities, there is also an indication that embodied information from the physical act of dancing is suggestive of embodied information occurring within information behaviour in other physical activities such as outdoor pursuits. Doing so would create a deeper understanding of people possessing, producing and disseminating embodied information (Lloyd, 2010). Further to this should be the consideration of embodied information and its affect on users of information systems and services, as well as more broadly on humans' information behaviour in different circumstances.

Conclusion

This paper investigates the information behaviour of creative DJs. From a set of semi-structured interviews with experienced DJs we have presented a model of how DJs undergo the process of planning, performing, and evaluating a set. This model describes information behaviours and the critical factors that influence DJs' decision-making and verification with particular emphasis on DJs' performances as a rich site of embodied information interactions. We have detailed the factors that affect how DJs plan their performance, how they make decisions about musical choices, react to feedback, and the range of embodied feedback they receive and act upon. Future studies

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considering minority groups within the activity, audience members as opposed to performers and other creative pursuits, particularly those with elements of physicality and performance, are welcome.

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Appendix - Interview Questions

1. How did you first get into DJing?

2. When did DJing become more than a hobby to you?

3a. How does DJing interact with your career, does it relate to your main source of employment?

3b.* If DJing is your main source of employment, is there another avenue of your career that isn't DJing?

* This question will depend on whether participants state in the initial questionnaire if DJing is their main source of employment

4. When preparing for a set, do you put an emphasis on planning or on improvisation?

5. When you are looking for new music to play, what sort of characteristics of music are you seeking?

6. Where do you look for new music to play?

7. How do you know a piece of music will work with a crowd when you are listening to it on your own?

8. Have you faced any barriers in DJing and, if so, how did these barriers affect you?

9. When playing a set, what signs do you look for from a crowd to know if your set is going well or not?

10. Can you try to explain the sensation of playing a piece of music that gets a positive, or negative, reaction from the crowd?

11. To what extent is it possible to communicate what you are feeling during a set to the crowd and, vice versa, for a crowd to communicate how they are feeling to you, without speaking?