

DJs' Perspectives on Interaction and Awareness in Nightclubs

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ABSTRACT

Several researchers have recently proposed technology for crowd-and-DJ interactions in nightclub environments. However, these attempts have not always met with success. In order to design better technologies and systems in this area, it is important to start with an understanding of how nightclub interaction currently happens. To build this understanding, we carried out an interview study focusing on DJ-audience interactions. We interviewed eleven DJs from several different cities, and asked them to discuss the ways that they interact with the audience, and the ways that they maintain and use awareness of the audience. We found that DJs gather a wide variety of information about their audiences, and that this information is important to them as they plan and shape the evening's musical experience. DJs are adept at gathering visual information about the audience, despite poor lighting conditions and a heavy workload of selecting and mixing music. Despite the difficulties, DJs took a dim view of technology designed to let crowds exert more control over the music. This study is one of the first to look closely at the interactive relationship between the DJ and the nightclub audience through the lens of HCI, and our findings provide a number of guidelines for the design of new DJ-focused nightclub technologies.

Author Keywords:

Nightclubs, crowd-based interaction, DJ awareness.

ACM Classification Keywords:

H.5.3 [Group and Organization Interfaces]: Collaborative computing, synchronous interaction.

INTRODUCTION

Technology for audience and crowd-based interaction has recently received considerable attention from the HCI community. Researchers have considered a range of scenarios from using GPS sensors for collaborative learning [1], to camera phone games for outdoor entertainment [2], to

interactive badges for matchmaking [3].

Several projects have looked specifically at technology for crowd-based interactions in the nightclub environment. For example, Feldmeier and Paradiso [4, 5] distributed low cost wireless sensors to give the audience direct control over the music, and Cliff [6] developed an automated DJ that used several kinds of audience biofeedback to influence a sophisticated algorithm that selected and mixed music. Other researchers have designed new technical tools for the DJ (e.g., Final Scratch [stantondj.com] or D'Groove [7]).

However, in many cases this technology has not caught on in nightclubs, and part of the reason may be that little is known about how interaction actually occurs in these environments. Several systems have introduced totally new methods of gaining awareness, such as biofeedback or force sensors, but have sidestepped the DJ's role in the process of connecting the awareness information to the music.

Future technologies and techniques for nightclubs will be improved if designers can work from a richer understanding of how audiences and DJs actually interact in nightclubs. To begin building this understanding, we carried out an interview study that focused on the role of DJs in nightclubs. We interviewed eleven established club DJs from across the country, and asked them to tell us about what information they use during performances, how they gather and use this information, and what problems they encounter in maintaining awareness of their audience.

Our results provide rich detail on one small part of the overall nightclub environment. We found that DJs interact with audience in complex ways, and that DJs are adept at reading the audiences, despite the demands of selecting and mixing music. DJs watch for early signs of disengagement in the dancers, to give themselves enough time to smoothly work their musical response into the presentation before the dancers start to leave the floor. DJs often plan musical energy changes several songs in advance, in order to take the dancers on a cohesive and dynamic musical journey.

The DJs in our study reported that they do have some problems in gathering awareness and interacting with the crowd – as mentioned, DJs are busy, nightclubs are dark, and DJs have to deal with frequent interruptions. Even so, the DJs felt that interactions in the nightclub were not 'broken' in any major way, and not in need of a technological fix –

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particularly those that would reduce the DJ's freedom to plan and present a particular musical experience to the audience.

Our findings have implications for the design of new crowd-based interaction techniques, because they focus on the details of the awareness process that human DJs are concerned with in the real world setting. Our findings suggest directions for technologies that would work with (not against) the existing relationship between the DJ and the audience, respecting the culture while enhancing interactivity.

RELATED WORK

Theory-based, historical, and popular texts [8, 9, 10, 11, 12, 13] have mapped many aspects of the interactive audience-based technologies and the performative space of nightclubs, as well as the distinct cultural development of the DJ in popular culture, but there has been no previous published HCI-centred research that has specifically mapped the way in which DJs perceive their detailed work of interacting with their audiences. Our unique lens provides information that is valuable and novel because we represented the DJ, we generated our own primary data, and we framed our study for use by the HCI community.

There are three main areas of development in interactive nightclub technologies: audience-centered applications, DJ-centered applications, and applications developed for interaction between audiences and DJs.

Audience-Centered Applications: *playful applications and performative spaces*

Audience-to-audience interaction has been supported with mobile devices and communications technology. For example, Lovegetty is a system of matchmaking badges for use in nightclubs [3]. Participants answer a simple set of questions about various kinds of personal information (such as personality features, zodiac sign, blood type, etc.) and then they are given an RF badge that they wear on their clothing. When two 'compatible' participants are in a close proximity, the badges glow, alerting them of the presence of a possible match.

Boomerang Mobile Media has also experimented with providing text message banners in nightclubs during concerts [14]. Guests were able to send text messages to the performers during the performance via cell phones. The messages would be displayed on huge banners overarching the performance areas. Guests were also able to upload photos to the overhead displays, changing the way in which the audience could interact with the performer as well as the greater audience.

DJ-Centered Applications: *mixing assistance, media management, and mechanization*

Many new applications are being made to assist the DJ with the technical aspects of mixing music in a live performance. Examples of these technologies include D'Groove [7], Final Scratch (stantondj.com), Mixmeister (mixmeister.com), and

Traktor (nativeinstruments.de). These technologies simplify the technical challenges of mixing, beatmatching, and scratching, while still allowing the DJ the freedom of choosing which tracks to play, when to play them, and how to play them. Digital means also offer the DJ access to a huge volume of portable music. However, automating the technical aspects of the DJ's performance could be considered 'lazy' or 'cheating' and taking away from the DJ's ability to express themselves through creative vinyl mixing techniques, hence the rise of vinyl-based mp3 technologies like Final Scratch. Yet, digital DJing methods may be able to shorten the DJ's cognitive load by simplifying their technical tasks, allowing the live DJ to focus on selecting their music, observing the audience, and participating in the nightclub's space of mutual visual spectacle.

On the far end of this spectrum, DJ I-Robot [15] is a robotic DJ that can mix and scratch real records without human intervention. However, as DJ Qmaxx420 states about DJ I-Robot [16], "It doesn't have taste and it doesn't have a sense of music," he said. "There's no algorithm for funk. We're faking the funk."

DJ-Audience Interaction Applications: *biosensors, playlists, triggers, and feedback-fueled remixes*

The geMuse system [17] allows nightclub patrons to download a sample of the nightclub's music onto a PDA before ever entering the nightclub, allowing audiences to investigate clubs before they pay entrance fees. However, geMuse requires that DJs manually enter their playlist either before meeting their audience (which does not reflect the interactive performance of the DJ), or while they are performing (adding to the DJ's cognitive workload).

Applications for automating various tasks of the DJ have also been developed, and several of these involve collecting biofeedback and using it to make musical decisions [4, 5, 18, 19]. *A Sophisticated Soirée* at Ars Electronica 2001 involved electrodes that tracked heartbeat rates, and used this information to trigger various aural and visual elements in the room [19]. Feldman and Paradiso [4, 5] conducted an experiment where they built small wireless RFid tags that measured the g-force of each of the individual audience members wearing the tags. This information allowed a computer to control the speed and sequencing of preset overlapping synthesized musical patterns and tracks so that the audience controlled the music without a DJ.

Cliff [6] recently introduced the hpDJ, which uses biosensor information in combination with sophisticated genetic algorithms to allow the hpDJ to use recombinant strategies to generate new music that is unique to each employment of the system with new audiences. The genetic algorithm allows the hpDJ to recombine the musical elements from each source track that are deemed successful, based on the biofeedback signals. Yet, in a London nightclub test of the hpDJ, 45 out of 72 audience members could identify correctly whether they heard a human DJ or the hpDJ. However, these numbers do

not reflect how the hpDJ could be perceived as a replacement for a human DJ.

These technologies take into account new kinds of bioinformatics that DJs do not normally have access to, which changes the context of interaction. Biosensor-based information is very different from the rich contextual cultural, social, personal, and emotional referents that DJs currently refer to when they innovate within a performance. The visual spectacle of the DJ's performance is also bypassed with these types of technological developments.

Other ventures in this field have focused on allowing the audience to interact with real-time event triggers at interactive 'stations'. iClub [20] replaces the DJ with a computer that plays mp3 files, and various audience input stations allow for real-time manipulation of filters and speed, while including options for triggering singular audio events through touch-screen interfaces. Touch screens are also used to allow the audience to vote on which song is to be played next from a list of options. SIGGRAPH 1998's 'Interactive Dance Club' allowed audience members to interact with various input devices to trigger musical and visual elements that were presented in real-time within the nightclub space [21], much like iRave [22]. An 'Experience Jockey' (DJ Deko-ze), along with a team of on-site programmers, controlled the meta-structure of the interaction, controlling overarching elements of the sound, as well as controlling which musical and visual elements were available to be used by the audience at specific times. Deko-ze also participated in our study, and had this to say to us about the SIGGRAPH experience:

As a DJ, it made you have to be extremely aware as to what was going on, how many people were in zones, how they were interacting, and what they were triggering...I wish I had eight sets of eyes to really see everything that was happening.

However, these kinds of experiments with diverse arrays of separate audience inputs gives the audience so much control that it may be difficult to create a cohesive musical experience.

Deko-ze: I think it might have been a little bit more difficult if I was a bit more of a control freak...It was really making me work...I had to really listen and hear what was going on. There were plenty of times where sounds came in and it just didn't make any sense, or was in time, or worked at all...

THE NIGHTCLUB SETTING

Nightclub environments are playful spaces where the atmosphere encourages exploratory relationships with music, dance, visual elements, and performance. DJs exist in this space to facilitate these explorations with their technical and performative presentation of a live mix of recorded music. The DJ's mix responds to the environment and the audience in varying ways at varying times. DJs provide this presentation of music for enhancing the atmosphere, which is usually oriented towards socialization, relaxation, and dancing. Interaction between DJs and their audiences vary depending on many factors, and although the DJ is ultimately responsible for the enjoyment of the music by the club

patrons, they are also encouraged to innovate and introduce new styles of music to the audience, enhancing the sense of expectation and discovery by nightclub patrons [8, 10, 11, 13].

There are many types of DJs and many specific genres of music that are associated with distinct cultural codes, values, and practices. We decided to focus on club DJs who choose to perform smooth mixes of popular and underground electronic music that are conducive for socializing and dancing for long periods of time. For an interesting, in-depth representation of the various types of DJs and musical styles performed in electronic music club culture, see "Ishkur's Guide to Electronic Music" (www.di.fm/edmguide/edmguide.html).

Most DJs use vinyl records to mix their music on turntables. But mixing music from CDs and MP3s are gaining popularity. Whatever the medium of choice for mixing music, DJs only bring a finite collection of music with them to the nightclub. DJs often prepare by pre-selecting a number of *tracks* (songs) that they think would be a good mix for the particular club. Before the event, DJs often practice mixing various sequences of these pre-selected tracks and realize several good mixes that might be interesting for the club audience. They use these practiced sequences at the club along with many other improvisations and new mixes that are created on the fly. The pre-selection of tracks is grounded in several factors that DJs research before and event, such as the clubs' layout, the theme of the particular event (where applicable), the expected audience, and the specific desires of the club owner or event promoter [13]. The decisions a DJ makes about the music they will bring with them to the club defines the parameters of the DJ's ability to respond to the environment, as well as any potential musical requests put forth by the nightclub patrons.

WORKING CONDITIONS OF THE DJ

The workspace of the DJ is a busy place where there are many demands and many distractions. The DJ is placed in a position of authority with their power over the musical sphere of the club, but with that authority comes a responsibility that the DJ maintains a professional technical and aesthetic presentation while being perceived as friendly and approachable. Our site visits revealed that DJs are often approached by club patrons, staff, and event promoters, while performing, so they must be able to juggle technical tasks with frequent interruptions while appearing personable and relaxed.

Spatialization of the nightclub also affects the workspace of the DJ and their ability to maintain awareness of the environment. We noticed on our site visits that DJ booths are sometimes placed beside the dance floor on the same level as the audience so that the audience and DJ are visible to one another. Sometimes, DJs are positioned within booths that are off to the side of the dance floor and are often encased with glass windows or walls so that the DJ and audience can see one another, but the DJ maintains a level of distance from

both interruptions and helpful dialogue. Other setups have the DJ positioned on a high balcony or stage overlooking the crowd, making it difficult or impossible for the DJ and audience to see one another. Regardless of the physical position of the DJ booth, there are usually 'blind spots' where the DJ cannot see parts of the room. DJ booths are also often quite compact, leaving little space for the DJ to spread out their records to look through them. Sometimes these booths are poorly lit, and sometimes the air is hot and smoky.

Although many factors make the work of the DJ challenging, the ability of many DJs to work within these conditions demonstrates the considerable skills they must possess to perform their art. For a breakdown of the low-level tasks of the DJ, see Timothy Beamish's DJ Taxonomy (www.timothywisdom.com/science/djtaxonomy/introduction.html)

The current status of DJ-audience interaction is not dysfunctional, as demonstrated by the ecstatic crowds in many nightclubs across the world dancing on any given Saturday night. Yet, our study of the perspectives of club DJs revealed that there are many opportunities to enhance club space, improve interaction and awareness, and challenge the status quo within nightclubs.

A STUDY OF HOW DJS MAINTAIN AUDIENCE AWARENESS

To successfully introduce any new interaction technology into nightclub environments we need to understand the interaction between DJs and audiences. We need to know if and to what extent they interact with each other. We also need to understand the role of the DJ's awareness of the nightclub space and how it informs their decision-making processes if we are to create innovative solutions for nightclubs. To begin this understanding, we carried out a study that focused on the role of the DJ in nightclubs. We focused our attention on identifying the kinds of information DJs use during their performances, the problems that they have in maintaining an awareness of their audience, and the social structures that constrain or afford the introduction of new types of technology. The primary researcher also has 10 years of experience as both a DJ and a nightclub patron.

Methodology

We selected 11 DJs from 5 major Canadian cities to study. The DJs had each played many different kinds of music at different points in their careers, and they each had between 5 to 17 years experience performing at different nightclubs, as well as alternative venues like outdoor festivals, warehouse parties, galleries, or public meeting halls.

The study was conducted in three steps. The primary researcher spent many hours doing basic fieldwork in various clubs during all stages of the research, where she went from initial exploratory research to looking for evidence of patterns that supported or contradicted the statements of the DJs in question. A quantitative survey was given to the selected DJs to allow us to hone in on most interesting

aspects of DJ awareness and interaction with nightclub audiences, from an HCI perspective. This survey required that DJs rank different types of awareness information based on how useful they found it to be, and then they were asked to briefly discuss how they used this information. Many strong congruities were observed within certain types of data, yet there were several questions where diversity of answers was characteristic. After we analyzed the survey data, we interviewed the DJs about some of their answers either over telephone or in person, asking the same questions to all of the DJs. Interviews lasted between 2 and 3 hours, during which they were asked to discuss their survey answers, and answer more open-ended, qualitative questions about how they observe their audiences, what information they looked for, and how that information informed their practice. The DJs were also encouraged to discuss any existing problems they had with gathering this audience awareness information and discuss any of their ideas for technological solutions to these problems. The interviews were recorded to digital audio and were analyzed according to the categories found in the following section.

RESULTS AND DISCUSSION

Based on our fieldwork, surveys, and interviews, we were able to draw several insights about what aspects of the nightclub environment were most useful to DJs when making decisions about their performance. We provide quotes from the DJs to explain our results. All DJs but one preferred that the quotes use their name, and not be anonymous. The results are organized around the discussion of how DJs interact, how they gain, maintain and use audience awareness, and what problems they face with these tasks.

Do DJs and Audiences Interact?

We asked DJs how they felt about playing to audience they couldn't see and how they felt about playing to audience who couldn't see the DJ. All of the DJs responded that they would be uncomfortable playing in a club where the DJ and audience were not mutually visible to one another.

tobias c. van Veen: I've tried it, I don't like it...they did some experiments with it in the Midwest, to create alienation. I think it works if that's your intent. I don't like it. I don't like booths that are separated by glass. I don't like booths that are high up...I want to be with the people.

It was clear from our interviews that DJs and audiences do interact. DJs gather information from the audience throughout the event, and the interaction is complex. Interaction between the audience and the DJ also significantly differs as a priority from DJ to DJ. Personal preferences and style, and awareness appear to be the major factors in determining exactly to what degree, and in what ways, the DJ interacts with their audience.

The participants regularly reported that they would interact with and observe individuals, usually through body language or verbal dialogue, but they reacted more with their music to the overall observations about the entire audience. We also found that about half of the DJs surveyed spontaneously

mentioned during the interview that they play for audiences as a whole, not for individuals.

What Types of Interaction Occur?

DJs primarily interact with their audience by performing a live mix of music that is composed at the nightclub, taking the context of the environment and the audience's behavior into consideration, to varying degrees.

Mike Waiser: The music of course is the ...main energy you put out. There's also the energy of your own person as a performer that can add, and the way that you interact with the crowd.

DJs also communicate with their body language and facial expressions. About a third of the participants noted that they make a point of visibly demonstrating their enthusiasm to the audience by smiling, waving their hands, cheering, or dancing while they are playing.

Timothy Wisdom: I try to show the audience that I'm having a good time while DJing. I do this by smiling lots, waving my hands, and dancing to my own music. This helps them become more excited about my performance. They relax and become more immersed in the show.

About half of the participants mentioned that they slightly dramatize their technical movements in order to display what they were doing more clearly to the audience.

Timothy Wisdom: I'm actually in support of DJs who put a little elbow grease into twisting their knobs and put a little bit of flair into moving sliders around, because I think it just looks better.

Three of the more experienced DJs we interviewed said that they sometimes take on the additional role of MC (oral entertainer using a microphone), VJ (video jockey), or lighting technician. One of the DJs in our study mentioned that he would enhance his interaction with the audience by speaking to the entire audience as a whole over the microphone, telling jokes or enticing the audience to cheer or act in unison. This type of interaction can greatly enhance the audience's perception of the DJ's presence as a live entertainer.

Individuals may also interact with the DJ by engaging in verbal dialogue with them. Conversations between the DJ and individual audience members can be very important for establishing camaraderie and sharing information.

The individuals within the audience communicate with the DJ primarily through the subtleties of body language, and DJs are experts at interpreting these signals. Many audience members dance facing the DJ, and when dancers are close to the DJ, it is easier for the DJ to observe and interact with them on a more personal level by exchanging small gestures, glances, smiles, winks, and nods. These interactions can communicate a mutual understanding or enjoyment while making the individual audience member feel valued and recognized.

What are the Aims of DJs and Why do DJs need Audience Awareness?

We found that the DJ's main goal is to help people enjoy the environment by presenting a creative mix of music that

balances elements of excitement, energy, and suspense with a respect for the diversity of functions of the nightclub space for various patrons. Very often the DJ's goal also includes building an active and engaged dance floor.

How DJs go about achieving these goals and negotiating this space differs greatly from performer to performer, and from time to time. This is one of the main areas where the art of the DJ comes into play. The audience is not a static group, so the DJ must constantly monitor the changing audience in order to reflect upon the actual formation of the audience from moment to moment and make quick decisions on the spot about how to facilitate engaging, enjoyable experiences through their musical presentation. Therefore, DJs need different kinds of audience awareness at different times in order to understand the constantly shifting experiences of their constantly shifting audiences in relation to their musical presentation and creative vision.

DJs consistently ranked it essential to know how the audience is enjoying the music. They reported that this awareness allows the DJ the opportunity to modify their presentation in response to the audience as they see fit.

Timothy Wisdom: I'm a performer, and I need to be able to build a relationship with my audience...I depend on learning things about my audience based on their reactions to certain songs.

Awareness of the dance floor activity is crucial for DJs, especially when considering how the music impacts the energy levels and intensity of the dancing.

Machine: It's really important to watch the dance floor and watch who's doing what.

The majority of the DJs in our study also mentioned that since they are playing to the entire club, they also need to maintain an awareness of the people who are not dancing. However, the DJs usually ranked the dancers as more important to maintain an awareness of. DJs often adjust their musical presentation in order to reflect the dancers' energy levels, changing musical elements such as tempo, mood, or intensity in order to entice dancers to remain engaged with the music, yet they will also try to entice the rest of the audience to join the dance floor.

Kyro: If they have lots of energy, you want to give them something that lets them use that energy.

Dislexik: It can even come down to health issues if the people are pushing themselves really hard and they need to slow down...it's good to keep an eye on people and realize 'hey these people are getting really overworked, let's take it back a notch.'

It is also important for the DJ to monitor the audience's engagement with overarching musical themes and narratives. About half of the DJs described how they often compose their sets to create an overarching narrative structure or 'journey', integrating their awareness of the audience into their musical selections on a broader level that would allow them to plan musical energy changes several songs in advance, effectively 'taking' the dancers on a musical journey. DJs also need to stay aware of their dance floor so

that they can plan these energy shifts in time enough to prepare smooth musical transitions in advance.

Dislexik: If you're building up to something and the crowd can tell that you're doing that, they'll start feeling it too and start building up inside as well.

We discovered that as the audience composition shifts throughout the night, awareness of the changing audience's general musical tastes and backgrounds is very helpful for DJs in order to be able to musically challenge and excite the audience by introducing new music to the mix. DJs match their perception of their audience's backgrounds to an awareness of the broader culture of contemporary electronic music so that they can make musical selections that are considered tasteful, timely, and culturally significant. Playing new or rare music can greatly add to the 'insider' or 'underground' status of the DJ, but this is usually balanced with playing more familiar tracks that tend to draw the audience out to the dance floor.

Dislexik: I think there are times where it's great to see people go crazy for a song they've heard a million times and you know it works and it's not a risky situation. But...I'd rather see someone go crazy for something they've never heard before...I don't mind sprucing up a set with a couple familiar songs or something just to beef it up a little bit and maybe draw the people out who are feeling a little alienated, but...I'd rather never play the same record twice if I never had to.

Since DJs acknowledge that audiences shift throughout the event, naturally moving from activity to activity, and since the individual audience members all have different backgrounds and preferences, the notion of making the 'right' musical choices is somewhat subjective.

Insomniak: People will drink for a while, then they'll dance for a while. We're always recycling the dance floor...so we have a lot of turnover between groups of people. You can't always please everybody.

The agency granted to DJs to negotiate these choices about the musical environment and its relation to the ever-changing audience is where a great deal of the artistry of the DJ lies. The technical and stylistic details of this negotiation define and distinguish these artists from one another, adding value to the performance [10, 11, 12, 13].

How Do DJs Gather Awareness Information?

The DJs in our study were strongly united on their methods of collecting awareness information about their audiences. Our study showed that vision is, by far, the main way that DJs gather awareness information about their audiences. When DJs are given good visibility of the nightclub, they are surprisingly fast and effective at general visual observation, especially when one considers their demanding, busy workspace.

To visually read the audience, the DJs often subtly look into the crowd, quickly glancing away from their technical workspaces. They must be able to do this very quickly, as they may miss time-sensitive cues, either on the dance floor or in their technical mixing if they spend too long doing

either activity. DJs look for several things, both on the dance floor and off to the sides and the bar area.

tobias c. vanVeen: is there a swell of movement, is there head nodding or grinding, intensity or dispersion?

Mike Waiser: The dancers channel your music into a visual form...[dancers] can really change the atmosphere of a club very quickly.

From our site visits and interviews, we found that DJs often register preemptive signs of disengagement in the dancers before they leave the dance floor, thereby allowing the DJ time to work their musical response into the presentation before the dancers actually disengage from the dance floor. These signs take the form of subtle and not-so subtle gestures within facial expressions, dramatic larger body movements, and small movements of the hands, feet, head, shoulders, and hips.

Away from the dance floor, DJs look to the sidelines, the tables, and the bar area for information about what the rest of their audience is doing.

Deko-ze: Part of my job is to be able to gage how many people are coming off and on the dance floor, who is coming off and on the dance floor, what sort of people are coming off and on the dance floor.

Machine: It's a lot harder to judge people who are sitting at the bar...or sitting up in the seating section and talking to people...

We found an interesting discrepancy between many of the DJs when we asked them about how they dealt with certain influential people in the nightclub. Over half of the DJs in our study acknowledged that they observe a set of key individuals, either enthusiastic and energetic dancers, other DJs and promoters, or even knowledgeable mavens of the particular community who often sit on the sidelines instead of dancing. To some, these key individuals are influential people whose demonstrated support can influence others increase their engagement with the DJ's performance.

Timothy Wisdom: one good tactic is to satisfy 'key dancers' who will help raise the excitement level in a room, causing others to join in on the dance floor. Identifying 'key dancers' consists of seeing people's reactions to certain songs.

Deko-ze: Those are the sort of people that kind of make everyone else think 'oh it is okay to come and approach the dance floor'...So, I want to find out and figure out, by watching them, and maybe even share a smile with them from across the dance floor...or figure out what is making them dance, and what is going to keep them dancing...Bless those key dancers!

Paul Who?: I think that focusing on them, instead of the entire dance floor, sometimes is misleading. If I focus on those few people who are key dancers and cater more to them to keep them going all night it might entice more people to the floor, but those dancers might be into something that the general population or general dance floor isn't, and if I keep catering to them, I might force people away from the dance floor. And...if for some reason they need to leave the dance floor...and I've been catering to them, I've just lost everybody else.

Yet, others do not recognize this type of stratification:

tobias c. vanVeen: I've never locked on to any key dancers nor realized there were any: a dancefloor is not a hierarchy.

Two of the DJs commented that listening to the general hum of the audience is another way in which awareness is maintained. Most DJs have trained their ears to be able to selectively shift their awareness to be able to focus on different sounds. Conversations, laughter, yelling, cheering, or even silence can give the DJ plenty of information.

Participant 5: If you've been in the industry long enough, you can kind of almost hear over the music...crowd reaction. A lot of the sound of a good event is really vocals of other people talking over the music mixed into it, too. It's that entire experience.

Most of the other DJs commented that they also understand their audience by engaging in dialogue with them. Nightclub guests often initiate conversation, approaching the DJ with comments, questions, or even requests. This dialogue gives the DJ information as to how the guests are experiencing the event, but it also gives the DJ an opportunity to ask questions to the audience members. This exchange may build camaraderie and understanding between the DJ and the audience member, but it may be perceived as an interruption if timed poorly or if the DJ and audience member have different expectations.

How Do DJs Use Awareness Information?

We received very diverse answers from the DJs about how audience awareness information affects their actions. It seems that although DJs collect much of the same information in similar ways, their decision-making processes are complex, and not necessarily always directly linked to any one type of awareness information. Their decisions are based on both personal values and the many environmental and social factors that shift throughout an event. Even knowing whether or not the audience is enjoying the music affects each DJ differently. The DJs in our study reported a wide spectrum of responses as to how important the feedback is from the audience in their decision-making process. Since DJs are also artists with their own ideas about what they wish to present, the process is an ongoing trade-off between the DJ as artist and the DJ as crowd-pleaser and dance floor catalyst. As mentioned, it is the specific way in which each DJ negotiates this dialogue that separates DJs from one another as artists.

Deko-ze: If it doesn't involve the people and their energy and their emotions, well then I'm not doing my job.

Dislexik: I tend to be a fairly egotistical DJ. So I like to do what I want to do, and if it works, it works. I mean, obviously if the situation is suffering, and you know you're out of place or something, you might slow things down a little bit. But I kind of like to take myself on a journey, and lead other people with me, and hopefully they follow [laughs].

Several DJs in our study also reported that they often plan the music that they are going to play 2 or 3 selections in advance. This is not only so that they have time to cue the coming tracks, but also so that they can create smooth musical bridges between changes such as different songs, melody lines, tempos, intensities, or percussion sounds.

Deko-ze: I try to think at least 2 to 3 records ahead... how am I going to program it to make it work with the rest of the tracks that I have selected?

About a third of the DJs in our study mentioned that they practice mixing certain combinations of tracks before performing so that they can perfect certain mixes, although when they are actually performing, they often improvise.

Timothy Wisdom: I usually come up with record combos: two or three tracks that go well together...and then when I play, I usually clump all my little combos together in my crate... depending on what the mood of the night is, I'll either start slowly or I'll start in the middle or I'll start really fast, and then I'll either go up or down the tempo scales. I'll use these three or four record combos as I'm going, and I don't quite know what combo is going to come next, so there is a little bit of play in that. If I start off a combo, I know pretty much what the exact next record is going to be, and where it has to start and end for things to fit in properly, and when I finish that combo, I have to figure out what the next combo is and then I glue those together.

The most immediate way that DJs can respond to their audiences is through affecting the sound (such as scratching or EQing the mixer), speaking to the audience on a microphone, or using their body language to communicate. When DJs seek awareness of their audience, they integrate these observations into their decision-making and technical processes for both long and short-term responses.

In order to engage their audiences, over half of the DJs we studied said that they balance playing a mix of familiar and new music. However, the ability to do this is contingent on having a general awareness of what music the audience is likely to have heard before. This is not a simple task, considering the ever-changing nature of audiences and the limited awareness that DJs can have of individual audience members tastes.

Mike Waiser: When I DJ I try to play primarily new music or music that I don't think they've heard, [I] contextualize it in a way that's related to something they know...the simplest way would be to put a song that [the audience has] never heard next to a song that [the audience has] heard that go really well together...or to play a remix is a good way to do it...maybe incorporate a vocal sample or something like that...

What Problems Do DJs have in Gaining and Maintaining Awareness and Interacting with their Audiences?

The job of a DJ is high-pressure. Selecting and mixing tracks are cognitively demanding tasks, especially in the busy, loud, dimly lit environment of the nightclub. Observing the audience is a task that never ends. We found that there are often some complications for DJs in gaining and maintaining detailed awareness of their audiences. Understanding the problems DJs encounter and their current methods of dealing with these problems make excellent starting points for discussing the possibilities for new technologies through a set of design recommendations.

Most of the DJs we spoke with mentioned that there were not that many serious problems that they have in gathering a general awareness of the audience when mutual visibility is not an issue. Interestingly, DJs are very skilled at gathering general information about their audience by just glancing into

the club for just a few seconds. However, when the DJ is positioned in such a way that limits their visibility, it greatly compromises their ability to read and interact with their audiences. Ironically, the loud volume of the music in the nightclub can make it difficult for the DJ to hear what is happening around them. Unfortunately, our study participants regularly reported occurrences of such nightclub setups that complicate their ability to gain awareness of and interact with the audience.

Even when the DJ has a high degree of visibility of the nightclub, it is not always as easy to infer a detailed awareness as it may seem. Many of the things DJs are looking for are not easily seen, such as an individual's musical background, or whether or not they are familiar with a particular musical selection. Currently, DJs must often make informed speculations about this information, based on the appearance and behavior of individuals, a method that can only be considered somewhat satisfactory.

Participant 5: You catch a lot of half facial expressions within a well-visualized room, so that gives you a chance to see what the reaction is.

Machine: It would be interesting...to have a little bit more of a gage of what people are into, and what names they know and what they don't know, so that you can find similar stuff.

The problems that were discussed most often had more to do with researching social or cultural aspects of the audience demographics.

Insomniak: What other clubs they like, or if they are going somewhere before or after [the event], sometimes I know where the people work, which actually helps...it kind of gives an indication of their personality a little bit.

People have many reasons for dancing (or not dancing). Since the nightclub is a social space, it is not only the music that influences how people engage with the music in the nightclub. This complicates the DJ's ability to read the audience on a literal or behavioral level.

Dislexik: If they're really, really tired, you don't have to worry about being offended if they leave the dance floor, because, you know, there's nothing you can do.

Machine: To be so worried that...everybody's not totally dancing at this moment...it's a little too much.

All of the DJs in our study said that they often speak directly with audience members while they are playing. However, some conversations are more helpful to the DJ than others, and much of this balances on the timing of when the audience member approaches the DJ to talk. Since the task of DJing is so demanding, audience-initiated dialogue can easily be seen as an interruption.

Deko-ze: it is an interruption, but on that same token...that is a really good way to interact with people, so therefore I think it is necessary. Even though sometimes it can be the biggest pain in the ass. 'Cause you know, sometimes they just want to come up and dance [on the stage]...which can make the record skip, or they want to do lines off a CD or whatever...always something...A lot of people when they want to talk to you, they want to talk to you now...they're not going to wait.

Currently, the DJs we studied said that they manage this type of interruption by using simple gestures and speech to communicate to audience members when they are busy concentrating on their technical performance when someone wants to speak to them.

tobias c. van Veen: When I play very, very, very hard techno... I can't talk to anybody...if people are trying to talk to me – they usually interpret it as being...very rude – but I just put my hand up – just don't – I don't want to hear language because I'm not thinking in terms of language...I'm thinking in terms of rhythm.

We found that across the board, DJs noted that music requests are rarely welcome or well informed. Audience members making requests can even be seen as abrasive or inconsiderate of the DJ's authority on the specific musical style they were hired to play. Since the DJ is often concerned with the overall stylistic and narrative structures of their set, requests can undermine their creative decision-making process that is necessary for them to make a cohesive presentation. Yet, DJs often face nightclub guests that consider their immediate musical preferences more important than the current presentation of the DJ or the musical preferences of the entire nightclub audience. We found that when DJs are approached by audience members that wish to make requests, it is not necessarily easy, nor always desirable, to satisfy their requests. DJs perform for entire audiences, not just for individuals.

Kyro: One man's perfect song is another man's atrocity.

tobias c. van Veen: I am not a jukebox.

On top of this, the DJ is expected to appear approachable and friendly at all times, even, for example, when getting a request for Aerosmith during a German minimal house set.

Galaxy: My style is so only defined by me, making it my style...Why these people are so offensive is because the instant you play it, yes it goes over well for those people, but you detract other people that were really feeling where you were going with your set. Moreover, these offensive people now think that you are now their servant, so they keep coming with requests. That's another reason why I won't take requests.

Some of the DJs we spoke to mentioned that they are sometimes concerned about playing tracks that other DJs have already played at the same event. Currently, DJs have the option of showing up early and listening to the other DJ's sets in order to get that information. They can also try to find out this information, to varying degrees of success, by asking other people at the nightclub when they arrive. Interestingly, almost all of the DJs we surveyed said that they would find it very useful to have a track listing of all of the other musical selections other DJs had already played at that venue that night. Yet, few of the DJs were enthusiastic about sharing their own playlists. DJs spend a lot of time researching music, and possessing rare, underground tracks can be considered a type of trade secret.

Dislexik: When I was younger, I really cared a lot more that people did not know what I was playing. I was really particular that what I played was 'my records and my records alone'...I didn't want other DJs stealing my tracks. Now...it's not as big of a

deal to me, as it's for the benefit of everyone in this industry that music gets out as much as possible.

Overall, we found that DJs have a full cognitive workload and a high degree of responsibility to providing an enjoyable experience for all of the nightclub patrons. Problems happen when the DJ is prevented from focusing on the technical aspects of selecting music, mixing the music, and observing the audience. Problems happen in the form of blocked visibility, lack of information, and interruptions. They are expected to always appear friendly and approachable, despite the demands of their workload.

DESIGN IMPLICATIONS

There are ten main recommendations stemming from our research that we propose to designers in the HCI community. Some suggest limitations for design, other suggest opportunities. These recommendations will assist in designing more effective, engaging, and responsible technologies that respect the realities of nightclub DJs.

1. Awareness information gathered by technology must not be superficial if it is to assist DJs in maintaining awareness of their audience. That is, the technology must really be better than the human DJ in gathering the information. When visibility is not an issue, DJs currently have relatively few problems with general observation, yet gaining a detailed awareness is much more difficult.
2. Most DJs have difficulty finding out the specific musical backgrounds and preferences of their constantly changing audience, since their primary means of gathering information is by watching people's behavior and appearance. In the busy nightclub space, where the DJ can only gain a general awareness of an audience that is always changing, there is an opportunity to assist the DJ in gathering this 'invisible' information.
3. Allowing the audience to make too many direct decisions can cause many types of problems. Requests often express the desires of only the person making the request. Audience-triggered audio events risk sounding chaotic. Voting mechanisms fail to respect the significance of introducing new music to audiences. Passive information-gathering and the development of non-musical audience-to-audience level interactive applications may be more promising than direct-input methods. It is possible that audiences only like the *idea* of more control, not the *results* of what it might actually sound like.
4. Changes to musical presentations should not be instantaneous; the overall flow and movement between different kinds of music is an important part of the overall experience. DJs take their dancers to different energy levels by watching them carefully and planning their musical selections two or three selections in advance to keep smooth progressions between movements. Immediate changes are usually too direct and abrupt, unless they take the form of a short sound event, such as a singular sound effect, scratch, or a spoken response by the DJ or MC.
5. The composition and content of a DJ's set does matter. DJs are very good at improvising meaningful, high and low-level reflections upon their personal musical style as well as the experiences and energy levels of the ever-changing audience. If one is designing technologies that select music, it is very important to note that the sophisticated cross-referencing and dynamism in most DJ's musical programming is based off of both the DJ's careful observation of the audience as well as their cultural backgrounds as experts in electronic music.
6. Technologies that only measure success in terms of direct dance floor feedback will miss out on many of the subtleties of the different ways in which people express themselves, as well as the nightclub interaction as a whole. Not all people who are enjoying the music express it through energetic dancing. The DJ plays to the entire audience, not just to the people who are dancing.
7. Biofeedback mechanisms introduce a totally new way of observing the audience, but they do not reflect the current methods successfully employed by most DJs. Although biofeedback is an intriguing area in HCI developments for crowd-based interactions, it is uncertain how meaningful or useful it could be for DJs. It would be wise for designers to reconsider exactly what biofeedback data actually signifies, and compare that signification with the rich contextual data DJs are able to get from their environment and the power of the human mind to make meaning from that data.
8. DJs are interested in knowing the music that other DJs have played at the event, but many DJs are tentative about sharing their own playlists. Makers of technologies that aim to provide playlist information to either audiences or other DJs must balance the desire for information-sharing with the DJ's need to have the freedom to improvise, and the right to choose their own level of privacy.
9. Any new technologies for nightclub spaces must not add to the DJ's cognitive load. They are already very busy, so new technologies must allow them to spend more time on the creative tasks associated with DJing rather than on using complicated new equipment.
10. Give the DJ information, but don't tell them what to do with it. DJs are skilled artists that value the challenges of the creative improvisational process. Allow DJs the agency to use their judgment and make their own choices. These choices are what separate the DJs as valued, distinctive artists. This type of solution is a 'best of both worlds' scenario, where the established cultural and aesthetic roles of the DJ are respected, but the advantages of using new technologies are provided as tools for the DJ with which to enhance their performances. Since DJs utilize information differently, it would be wise to design customizable, flexible interfaces that support creativity over automation.

CONCLUSION AND FUTURE WORK

The interest in designing new technologies for nightclub settings has not been matched by research into the details of

how interactions currently occur in nightclubs. In this paper, we report on a study that was intended to start building this knowledge. We interviewed club DJs from several Canadian cities to understand how they interact with crowds, maintain awareness, and adapt their music to the audience's feedback and energy levels. We found that DJs use information about the audience in many ways, and that despite the heavy workload and challenging environment, most DJs do not have difficulty gathering enough basic information to help them plan a set that is tailored to the audience. The main problems faced by DJs are the lack of visibility in many nightclubs, the difficulty of gaining a detailed awareness, the cognitive and temporal load of selecting and mixing music, and dealing with interruptions from the crowd. We suggested ten principles that can help designers build technologies that will better fit the existing structures and practices in a DJ-led nightclub setting.

In future, we will be looking at systems that provide the DJ with dynamic information about audience tastes without increasing their workload. We also plan to look at the issue of nightclub interactions from the audience's side of the booth, by surveying and interviewing audience members about their experiences and observing people in nightclub settings. We plan to compare their expectations and perspectives with those of DJs and other stakeholders (VJs, MCs, club staff, event promoters) to gain a higher-level understanding of nightclub interaction. These understandings, new to the lexicon of HCI, will drive prototype development for new nightclub interface design.

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