UNDERSTANDING USER REQUIREMENTS FOR MUSIC INFORMATION SERVICES

Jin Ha Lee
The Information School
University of Washington
jinhalee@uw.edu

Nichole Maiman Waterman
The Information School
University of Washington
maiman@uw.edu

ABSTRACT

User studies in the music information retrieval and music digital library fields have been gradually increasing in recent years, but large-scale studies that can help detect common user behaviors are still lacking. We have conducted a large-scale user survey in which we asked numerous questions related to users' music needs, uses, seeking, and management behaviors. In this paper, we present our preliminary findings, specifically focusing on the responses to questions of users' favorite music related websites/applications and the reasons why they like them. We provide a list of popular music services, as well as an analysis of how these services are used, and what qualities are valued. Our findings suggest several trends in the types of music services people like: an increase in the popularity of music streaming and mobile music consumption, the emergence of new functionality, such as music identification and cloud music services, an appreciation of music videos, serendipitous discovery of music, and customizability, as well as users' changing expectations of particular types of music information.

1. INTRODUCTION

Understanding what kinds of music information services people use, how they use them, and what they expect from them is critical in designing successful services. We have seen a gradual increase in different types of user and usability studies in recent years. However, many of these studies are based on a limited number of subjects, and tend to employ analysis of qualitative research methods, like in-depth interviews or focus groups. While these kinds of studies can help uncover rich data about music users, large-scale user studies are also necessary in order to test the generalizability of results and to complement the insights obtained from smaller qualitative studies.

To fill this gap, we have conducted a large-scale user survey questioning people's music needs, uses, and music seeking and management behaviors. This survey is an extension of previous research conducted in 2004 by Lee and Downie [7]. The information we acquired through this new study can help improve our general understanding of music users and their behaviors, as well as how they have changed as compared to the 2004 survey results.

2. LITERATURE REVIEW

We conducted an extensive literature search in order to find out how many large-scale user studies exist in the MIR domain. Of the 87 studies discovered, only 6 involve more than 100 subjects (with the exception of studies analyzing user generated content such as queries/reviews). Ellis et al. [4] developed a web-based game named "MusicSeer," which collected over 6,200 responses; they found that "subjective artist similarities are quite variable between users," suggesting that the concept of a single ground truth may be problematic. Barrington et al. [1] studied 185 subjects and asked them to evaluate results from multiple music recommender systems. Both of these studies focused on highly specific ideas, such as responses about artist-to-artist relationships [4] or recommendation results [1], rather than general music behaviors.

Some studies dealt with particular organizations' user groups. Lai and Chan [5] surveyed 244 Hong Kong Baptist University Music Library users to improve understanding of their needs, usage patterns, and preferences toward various collections. The authors found that participants used scores and multimedia more frequently than other types of library materials, although they believed that electronic journal databases, books, and online music listening were also important to their academic and performance needs. In their survey of visitors to the Experience Music Project in Seattle, Maguire et al. [9] found that improving the user interface was the most important suggestion for changes to the museum's digital collection.

Other studies dealt with broader topics and more general user populations. Lesaffre et al. [8] collected 663 qualified survey responses to clarify the influence of demographics and musical background on how people describe music's semantic qualities. Their research listed several characteristics that average MIR system users likely would have, and found that gender had the most significant influence on music perception. Brinegar and Carpa [2] also surveyed 184 respondents on how they manage music across multiple devices, and provided empirical data on the sizes of user collections, the methods/reasons for synchronization, how users dealt with mu-

sic loss, and so on. Lee and Downie [7] conducted a large-scale music survey in 2004 asking two groups of respondents (University of Illinois community, and general adult public) about their music information needs, uses, and search/browse patterns. Their analysis revealed the social aspects of music information seeking – that it can be a public and shared process, and many users felt positively towards reviews, ratings, and recommendations from other people. The authors also stressed the importance of providing context metadata (i.e., metadata on a music item's relationships with other items, and its associations with other works). Our study aims to add further insights into music users' behaviors; in particular, this paper focuses on discovering how people use currently available music services and why they favor them.

3. STUDY DESIGN

3.1 Study Population and Sampling

The design specifics of the 2004 and 2012 surveys are summarized in Table 1. For the 2004 survey, the candidate respondents for Group I were randomly selected from a list of students, faculty, and staff from the University of Illinois at Urbana-Champaign. For Group II, invitations to the survey were posted in music-related mailing lists/forums in order to recruit participants. For the 2012 survey, we posted invitations on mailing lists at University of Washington as well as music-related mailing lists. We also recruited participants through the authors' social media network such as Facebook, Twitter, and Google+.

	2004 Survey		2012 Survey
Study population	Group I: UIUC community	Group II: General population	UW community + General population
Sampling	Random	Convenience	Convenience
# questions	19	21	23
# responses	436	312	520

Table 1. Basic statistics of the surveys

In the 2004 survey we asked 19 questions for Group I and 21 questions for Group II (2 additional questions on job type and education level). The questions covered why, where, how, and how often users seek and obtain various kinds of music information; who they ask for help; how they use music information; what music-related websites/apps they use; and so on. The design of the 2012 survey was based on the previous survey to facilitate results comparison. The 2012 survey included 4 additional questions about how users manage physical and digital music collections, what devices they use to listen to music, and any comments related to the survey. In both surveys, there were follow up questions that were asked based on how users answered the main questions.

3.2 Limitation

One concern is that the different populations and sampling methods might affect the comparability of the results. For the 2004 survey, we were able to obtain a full list of all UIUC community members, and thus were able to randomly select participants. In the 2012 survey, it was not possible to obtain such a listing of the UW community for survey purposes, due to privacy concerns. When we compared the demographic information of respondents, [Table 2], there were in fact some differences. The average age was slightly higher for the 2012 survey respondents and the dominant gender was also different. However, most of the respondents did come from the United States for both surveys. In the article reporting the full survey results, we will be presenting the results controlling for these particular variables in order to see if there are significant differences between these sub-user groups. Nevertheless, it is important to be aware of this limitation in interpreting the findings and implications of this study.

	2004 Survey	2012 Survey
Age	Average: 30	Average: 37
Gender (excluding unanswered)	M (50.4%) F (46.1%)	Male (36.2%) Female (58.8%)
Geographic location	73.8% US	60.3% US

Table 2. Demographic information of respondents

4. DATA AND DISCUSSION

4.1 Overview

In this section, we present a detailed analysis of one of the open-ended questions, which asked about users' favorite music-related websites/applications. We also compare the responses we obtained for this question in 2004 and 2012, and present excerpts from users' responses and quantitative data on user responses from other relevant questions.

4.2 Summary of Results

4.2.1 Favorite Music-related Websites/Applications

The exact question asked was "*What are your favorite music-related websites or apps? What do you like about them?*" We received a total number of 237 responses from Group I, 229 from Group II in the 2004 survey, and 419 responses in the 2012 survey. Many users mentioned more than one website/application in their responses, so the total number of references to individual websites/apps added up to 1002 for the 2004 survey (combined) and 945 for the 2012 survey. Table 3 summarizes the services that received 5 or more responses from both surveys.

We can observe that a variety of different types of services were mentioned: Internet radio/streaming, music management and purchase, music identification, dictionary-type sources, reviews, etc. Many of our users seemed very savvy and knowledgeable, and specified multiple favorite websites and applications, explaining that they use each of them for very specific purposes.

When we compared the results from both surveys, we noticed a heavier concentration of responses with particular websites in 2012 survey. Only 5 websites were mentioned more than 5 times in both surveys and another 16 were new (in bold). There are a few completely new types of services, such as music identification (e.g., Shazam, Soundhound), and cloud music (e.g., Spotify, Groovesshark, Google Music). Peer-to-peer file sharing applica-

tions like Kazaa (in 2004) or general search engines like Google disappeared from the top list in 2012. The significant increase in the popularity of iTunes can probably be explained with the increasing use of mobile devices.

2004 Survey (combined)			2012 Survey		
Websites	#	%	Websites/Apps	#	%
Amazon	58	12.4	**Pandora**	149	35.6
All Music Guide	36	7.7	**YouTube**	68	16.2
Launch	25	5.4	**Spotify**	57	13.6
MTV	20	4.3	iTunes	56	13.4
Kazaa	19	4.1	**Shazam**	32	7.6
CD Now	18	3.9	Amazon	30	7.2
iTunes	17	3.6	**Naxos**	25	6.0
Mudcat Café	15	3.2	**Last.fm**	25	6.0
Rolling Stone	12	2.6	**Grooveshark**	25	6.0
Billboard	10	2.1	Pitchfork	20	4.8
Pitchfork	10	2.1	All Music Guide	20	4.8
Google	9	1.9	**NPR**	16	3.8
Lyrics.com	8	1.7	Grove Music Online	12	2.9
Grove Music Online	7	1.5	**Wikipedia**	11	2.6
eBay	6	1.3	**IMSLP**	11	2.6
Netscape Radio	6	1.3	**Soundhound**	10	2.4
Tower	6	1.3	**Rhapsody**	8	1.9
Andante	5	1.1	**Google Music**	8	1.9
CMT	5	1.1	**KEXP**	7	1.7
			Soundcloud	6	1.4
			ArkivMusic	5	1.2

Table 3. Services mentioned by 5 or more users.

We conducted a more thorough analysis of how these services were being used. Table 4[1] shows a list of how users specified they used different services, and how often those behaviors were mentioned in the surveys. We noticed a general trend of greater direct music consumption from these websites and applications, mostly due to the increased number of streaming and cloud music services. There was a significant drop among the several responses related to general music-information seeking, i.e., "To learn about the artists/bands." We conjecture that this has to do with the emergence and rising popularity of major music related websites and applications that serve purposes other than just providing music information. The existence and popularity of these websites now seem to heavily affect users' perception of what to expect from music services. Considering that 16 of the 21 top-rated services did not exist in 2004, this is not very surprising.

The data also suggest that the expectations from users regarding access to particular types of music information may have changed. For instance, websites providing lyrics information were sought by 7.3% of users in the 2004 survey, whereas in 2012, only 1.2% of respondents mentioned the need for lyrics information. Instead of visiting a particular website for lyrics, we suspect that many users are able to utilize a phrase search option in search engines like Google and are able to find links to numerous websites that provide lyrics. In addition, certain websites such as YouTube are not lyrics websites, but provide video content that often incorporates lyrics information. Thus, users might not even think of particular lyrics websites as one of their favorite music related websites. This may also be true for information on local events, which is much easier to find through social media in 2012.

We also saw a drop in responses indicating participation in or value for activities of social interaction [Table 5]. In 2004, online forums were extremely popular as a place to interact with other people. However, in 2012, social media such as Facebook, Twitter, and Google+ are now providing a space for users to discuss music, and users may not even think of these websites as specifically music-related, thus not showing up in the survey data.

The other category included: To track listening (new in 2012); save wish lists; find blogs; compare versions; etc.

Usage \ Response	2004 Survey		2012 Survey	
	#	%	#	%
To listen to music recordings	70	10.8	143	22.2
To discover new music/artists	14	2.2	80	12.4
To obtain/purchase music recordings	95	14.7	46	7.1
To obtain music information (general)	56	8.7	35	5.4
To identify/verify a particular song	6	0.9	34	5.3
To learn about the artists/bands	110	17.0	31	4.8
To read reviews	37	5.7	30	4.7
To search for/browse music recordings	22	3.4	23	3.6
To listen to samples before purchase	32	5.0	23	3.6
To get recommendations	11	1.7	22	3.4
To interact with other people	48	7.4	22	3.4
To obtain current news/information	26	4.0	21	3.3
To watch performances/music videos	14	2.2	18	2.8
To learn more about recordings	37	5.7	18	2.8
To obtain information for work/research	20	3.1	15	2.3
To obtain scores	29	4.5	13	2.0
To create playlists/stations	0	0.0	13	2.0
To store/manage music and metadata	0	0.0	9	1.4
To obtain lyrics	47	7.3	8	1.2
To find out about events	29	4.5	7	1.1
To share music recordings	2	0.3	6	0.9
To obtain ranking/rating information	11	1.7	4	0.6
Other	22	3.4	16	2.5

Table 4. How the websites/applications are used

4.2.2 Reasons for liking the Websites/Applications

From the user responses on why they like these websites/applications, we were able to infer what kinds of qualities users perceive to be important for these services. As shown in Table 5, there was a variety of different qualities mentioned by users in both surveys. We found it surprising that the quality mentioned most often was actually being exposed to new artists/music and serendipitous discovery, even more so than being free or inexpensive. The design aspects of the system (e.g., easy and convenient access to music; user-friendly system) were also perceived as important qualities. In fact, users' expectations on these aspects seem to be much higher compared to

[1] Table 4 and 5 are based on responses where the user specified the reason for liking the service. Some responses only specified the name or URL. 646 responses specified the reasons in 2004 and 644 in 2012.

how they were in 2004. Being able to customize or personalize the service was also highly appreciated. The responses for comprehensive coverage of music, including particular styles of music, and good music content that is updated frequently and matches users' interests/tastes, all dropped. We think it is unlikely that users do not believe these qualities are important anymore; rather, users probably just expect that current music services have these qualities to begin with. With the increasing use of mobile devices and a variety of applications, compatibility also surfaced as a new important quality for users.

The other category included: innovative, high quality recordings and writing, different purchase options, providing alerts, being able to listen to the whole album, not posting to Facebook, not hogging resources, directly paying artists, fewer bugs, etc.

Quality \ Response	2004 Survey		2012 Survey	
	#	%	#	%
Exposure to new things/Serendipity	18	2.8	80	12.4
Free/Inexpensive	50	7.7	68	10.6
Ease of access/Convenience	9	1.4	52	8.1
Customizability/Personalization	8	1.2	49	7.6
User-friendly/Ease of use	28	4.3	46	7.1
Comprehensive/Exhaustive coverage	64	9.9	37	5.7
Variety/Wide selection	51	7.9	36	5.6
Access to particular style of music	69	10.7	28	4.3
Compatibility/Use with other devices	1	0.2	25	3.9
Access to music samples	18	2.8	23	3.6
Good search/browse functions	8	1.2	23	3.6
Social/Ability to interact with others	52	8.0	22	3.4
Matches user's interest/taste	67	10.4	21	3.3
Good music/content	61	9.4	16	2.5
Quick/Instant service	7	1.1	16	2.5
Comparative data/Similar music	8	1.2	14	2.2
No rights management/restrictions	0	0.0	10	1.6
Fun/High entertainment value	2	0.3	9	1.4
Authority/Credibility of information	7	1.1	8	1.2
Does not require much user input	1	0.2	8	1.2
Rare/Obscure recordings/information	17	2.6	7	1.1
Familiarity/Set as default	8	1.2	6	0.9
Ability to store/archive recordings	0	0.0	6	0.9
New content/Updated frequently	48	7.4	5	0.8
Accuracy/Reliability of information	5	0.8	5	0.8
Access to local information	5	0.8	4	0.6
Good organization/design	11	1.7	3	0.5
No or fewer ads	6	0.9	3	0.5
Other	12	1.9	31	4.8

Table 5. The list of qualities valued by users

4.3 Discussion of the Trends in 2012

4.3.1 Popularity of Streaming Services

Analyzing the responses from both surveys clearly reveal the increasing popularity of Internet radio/music streaming services. With the rising use of various mobile devices such as tablets and smartphones, it is not surprising that streaming service is also becoming increasingly prevalent. Music is only one of many types of digital media users store on mobile devices, in addition to photos, videos, games, documents, etc., and numerous apps. This means that even though the storage space of these devices is always growing, the space allocated for music will always be limited. Listening to streaming music services rather than carrying one's own collection is one way to resolve that issue, as noted in comments below. Some comments also implied that there are songs users want to own vs. songs they just want to listen to now and then.

"I like them because I can still listen to music without cluttering up my phone or work computer with extra files."

"I also use things like spotify and pandora to listen to music that I don't necessarily want to own but have a hankering for now and again."

The quantitative data also support this trend. Table 6 shows various response statistics to questions related to Internet radio/streaming services and mobile music consumption. When we compare the frequency of users listening to these services from the 2004 and 2012 surveys (the first and second rows), we see a significant increase in the proportion of respondents (+30.7%) who use these services 5 or more times per month as well as a large decrease in the users (-16.5%) who never use these services. Two new questions were asked in the 2012 survey about how often people use music/music-themed apps on mobile phones (third row), and search for music heard through online streaming services (fourth row). 20.7% indicated they use music related apps "a few times a week" (8.4%) to "almost every day" (12.3%), implying a heavy mobile consumption of music by these users. Streaming music was also an important trigger for music searching; a total of 77% of respondents indicated that they search for music heard on streaming services at least once a month, and 22.8% do it "a few times a week" (12.0%) or "almost every day" (10.8%).

Source \ Response	Positive Frequency (times per month)			Never Total	Count Total
	1	2-4	5		
	%	%	%	%	#
Listening to streaming music/ online radio (old)	25.5	27.5	25.5	21.6	1066
Listening to streaming music/ online radio (new)	13.3	25.4	56.2	5.1	488
Using music or music-themed apps on mobile phone (new)	14.0	18.4	20.7	46.9	478
Searching for music heard from online streaming service (new)	24.6	29.6	22.8	23.2	501

Table 6. Various statistics related to streaming services and mobile music consumption

4.3.2 Emergence of Music Identification Services

Music identification services like Shazam and Soundhound also seem quite popular (42 responses combined). To provide a baseline for comparison, Table 7 shows the responses to different options for the question, "*How often to do you ask the following people/services for help*

when you search for music or music information?" Friends and family members received the most positive responses. Over half (56.6%) of the responses indicated users consulted their social networks, and 43.5% of the 503 users said they have used music identification services. Overall the proportion of users who use this kind of service is still less than those who ask other people.

Responses from 2012 / Frequency	Friends and family	People on Social Network	Music ID service
Almost every day	2.4%	1.6%	1.0%
A few times a week	7.9%	6.3%	4.6%
About once a week	10.4%	6.5%	5.6%
2 or 3 times a month	20.0%	12.4%	5.6%
Once a month or less	37.7%	29.9%	21.1%
Never	21.6%	43.3%	56.5%
Total responses	509	508	503

Table 7. Frequency of users asking for help when searching for music or music information

However, when asked about how likely they would be to use the search/browse option of a music identification service, only 28.1% answered positively (Very likely + Somewhat likely), 62.4% answered negatively (Not very likely + Not at all likely), and 9.5% said "Don't know." We may infer that some people might use it out of curiosity but would not use it again. Considering that this type of service is still relatively new, we suspect that users' responses may change over time. We have observed similar results for a number of other search/browse options when we compared the responses from 2004 and 2012 surveys (e.g., "purchase patterns" (+20.6%), "recommendations from other people" (+14.9%), "mood/emotional state induced" (+7%) of positive responses in 2012).

4.3.3 Music combined with other Multimedia

It is interesting to note that YouTube was the second most preferred service by users in the 2012 survey, despite that the main objective of the website is not to provide music content. In addition to the benefit of being able to see music videos and concert/performance footage, the extensive coverage of YouTube was also highly valued by users as noted in the comments below:

"…gives an incredibly large choice of uploaded music to listen to (once again, including some specialized and rare items I wouldn't be able to find in my local library)."

"…I practically never searched for a song I didn't find on their servers."

YouTube was also seen as a place where many new artists post their work, where you can find "official" music videos, and hear a great deal of covers or different versions of songs. Some users also think of YouTube as an archive of old and rare music related materials. In addition, users appreciated that they do not need special hardware/software to use the service.:

"…the clips will play on any reasonable electronic platform (not restricted to certain brands or types, not requiring certain software beyond what it [sic] is likely to be on computers or smartphones already)."

4.3.4 Serendipitous Discovery of New Music

Exposure to and serendipitous discovery of new music/artists were very important to users in the 2012 survey [Table 5]. We conjecture that the popularity of services like Pandora or Spotify is greatly affecting user expectation. 32 responses specified that serendipitous discovery is the very reason why they like Pandora. Users gave split responses to the question asking how likely they would be to use the search/browse option "by recommendations from recommender systems": 50.8% positive, 46.9% negative, and 2.2% "Don't know." We saw a few responses that shed insight into why some people may not be pleased with current recommender systems:

"I've found a few new songs and artists I like through it, but I get frustrated with it sometimes when it thinks I like a whole genre because of one song, and it doesn't repeat the songs I REALLY like often enough."

"…even though it has stupid ads and plays music I don't like half the time... just because it's easy."

Recommender systems, of course, play a major role in the serendipitous discovery of music, but users mentioned employing other resources (e.g., YouTube, Pitchfork) to find new music, as well. By interviewing users about how they evaluate playlists, Lee [6] found that people definitely like learning new things, but still want them contextualized in familiar territory. We saw several comments that resonate with this finding:

"it exposes me to artists I'd never heard of before in genres I enjoy."

"they either play music I already like/know or introduce me to music that suits my tastes in an easy, unobtrusive way."

4.3.5 Customizability vs. Not Requiring User Input

As shown in Table 5, users' belief that a service is customized for them or that they are able to personalize it themselves seems very important and has a strong, positive effect on how they feel about that service. Some examples of comments include: "*stations tailored to my musical tastes and moods*," "*nice customization opportunities*," "*I like that you can say you like or dislike songs*," and "*I can adjust it to play music I like*." It is actually difficult to say how much these beliefs are objectively justified; for instance, do users understand the technical process of what happens after they like or dislike particular songs recommended by the service? We suspect that most users do not know how much these services actually incorporate their input to modify the results presented, except for the vague idea that they are somehow making it better to suit their tastes. This sense of control seemed to be what was important to them, rather than a set of perfect results [further discussion in Section 5].

It is also important to note that there exist a smaller number of users who prefer "not doing much." In order to appeal to these users, it will be important to provide an option to have an automatic algorithm learn their tastes and do the work on their behalf. Some of their comments include: "*I like that Pandora streaming radio lets me be lazy,"* "*making playlists is too much work most of the time*," "*they are free and do not require me to download or own anything. Streaming is key.*"

5. CONCLUSION AND FUTURE WORK

This work is part of a bigger research agenda that aims to provide an empirical basis for the development of music services reflecting the needs of real users. Our findings suggest several changes in the kinds of music services people like: an increase in the popularity of streaming services and mobile music consumption, an emergence of new types of services like music identification or cloud music services, an appreciation of music videos, serendipitous music discovery, and customizability, etc.

However, it also became apparent that many of the users' music information needs in 2012 did exist in 2004. The difference we see is that in 2012, a few dominant services are being used to fulfill those needs rather than a number of different websites. For instance, access to music videos/performances has always been important; users in the 2004 surveys were going to Yahoo! Launch, MTV, and VH1, and now seem to use YouTube for the same purpose. Users also told us that getting recommendations and discovering new music was important in 2004 [7]. In 2012, Pandora has become one of the major applications that serve those needs. The social aspect of music search was revealed in 2004 survey responses, where users said they were asking friends and family members about music and going to different forums to talk to other users [7]. Now we have Spotify and last.fm, where people can find out what their friends are listening to, and Shazam and Soundhound to help identify music.

Another interesting aspect of the survey was that many users recognize and accept the limitations of the services they like. As noted by the excerpts below, users seem willing to accept and forgive a few flaws if there are some other attractive aspects:

"…incredibly easy to use, awesome service, great wide-ranging library, integrated information, always being updated - glitchy at times and doesn't have everything but more than makes up for it in convenience and design."

"…it will do song identification, including humming/singing (still a little buggy, but a great idea),it pulls up lyrics for songs identified, gives you links to where you can purchase the music or to listen to it via the Slacker Radio app. It's really great!"

We believe that this is an important point with strong implications for developers of music systems and services. Much of the efforts in the MIR domain have been focused on improving the accuracy of particular algorithms, resulting in the "glass ceiling" problem where the effectiveness of techniques has reached its limits [3]. Maybe we should also start asking about what really matters to users; as the users in our survey told us, ease of use, a wide variety of music, innovative ideas, compatibility with other devices/apps, etc. are maybe as important as getting "accurate" results. We hope that the list of qualities valued by users of music related websites/applications will help inform system designers and developers in modifying existing services or creating new services.

A journal article reporting the detailed analysis of the 2012 survey and comparison of the results from 2012 and 2004 surveys is in preparation. For our future work, we plan to conduct additional user studies surrounding the expectations of specific music services, in particular, cloud music services. We are also interested in analyzing the failed cases, asking people what kinds of music related websites/applications they do not like and why.

6. REFERENCES

[1] L. Barrington, O. Reid, and G. Lanckriet: "Smarter than Genius? Human evaluation of music recommender systems," *Proceedings of the ISMIR*, pp. 357-362, 2009.

[2] J. Brinegar and R. Capra: "Managing music across multiple devices and computers," *Proceedings of the iConference*, 2011.

[3] J. S. Downie: "The music information retrieval evaluation exchange (2005-2007): A window into music information retrieval research," *Acoustical Science and Technology*, Vol. 29, No. 4, pp. 247-255, 2008.

[4] D. P. W. Ellis and B. Whitman: "The quest for ground truth in musical artist similarity," *Proceedings of the ISMIR*, pp. 170-177, 2002.

[5] K. Lai and K. Chan: "Do you know your music users' needs? A library user survey that helps enhance a user-centered music collection," *Journal of Academic Librarianship*, Vol.36, No.1, pp. 63-69, 2010.

[6] J. H. Lee: "How similar is too similar?: Exploring users' perceptions of similarity in playlist evaluation," *Proceedings of the ISMIR*, pp. 109-114, 2011

[7] J. H. Lee and J. S. Downie: "Survey of music information needs, uses, and seeking behaviours: Preliminary findings," *Proceedings of the ISMIR*, pp. 441-446, 2004

[8] M. Lesaffre, L. D. Voogdt, M. Leman, B. D. Baets, H. D. Meyer, and J. P. Martens: "How potential users of music search and retrieval systems describe the semantic quality of music," *Journal of American Society for Information Science and Technology*, Vol. 59, No. 5, pp. 695-707, 2008.

[9] M. Maguire, D. E. Motson, G. Wilson, and J. Wolfe: "Searching for Nirvana: Cataloging and the Digital Collection at the Experience Music Project," *Journal of Internet Cataloging*, Vol. 7, No. 1, pp. 9-31, 2004.