The Personality and Behavioral Psychology of Personal Internet Music Service Listeners

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ABSTRACT
This study focused on personal internet music services, such as Pandora and Spotify, through an exploratory survey designed to understand their use. We asked about 188 respondents' personality types, preferences and behaviors when it comes to music listening, and the personal internet music services they have used. Through regression analysis, we found users grouped around interfaces either promoting easy access to music or providing deeper connections with music. Classifying several services into categories, we also learned there are a number of opportunities for future design work leveraging this distinction of social listeners versus deep listeners.

Author Keywords
Personal internet music services, preferences, personality, behaviors, sociality, music discovery

ACM Classification Keywords
H.5.5. Sound and Music Computing

INTRODUCTION
User-centeredness in the music industry can be explained by the ease with which users can access music to fit their situation. From vinyl to CDs, from mp3s and now to personalized internet music services, users are demanding more access, more variety, and more control. We define personalized internet music services (PIMS) as any internet service providing remote access to a database of music and music metadata. Popular PIMS include Pandora, Spotify, and iTunes. They trace their roots back to the origins of social media and web 2.0, circa 2002-2007, with the majority of services gaining popularity within the last 5 years.

In the leanest examples, these services allow users to search for—either directly or indirectly—and play music. More advanced versions allow users to share music with their friends and see what their friends are listening to; create and manage playlists for later playback; tag parts of or full songs; explore music data such as lyrics, concert dates, influences, and information about the artists; and post their own music. These features in various services match the needs and desires of the communities they serve.

For the sake of comparison, we roughly segment PIMS into five groups based on their primary functional focus. *Celestial Jukeboxes* provide users with direct on-demand access to songs within a large catalog of music [5]. They include Grooveshark, iTunes, Spotify, and Youtube. *Personalized Internet radio players* allow users to create and adapt a customizable stream of music based on a seed artist, genre or social tag. Examples include Jango, Pandora, and Slacker. *Artist webpage hosting sites*, such as Bandcamp and Soundcloud, host artist-created websites for direct-to-consumer sharing of audio content and other related music information. *Music encyclopedias*, such as Last.fm and AllMusic, provide vast amounts of music metadata (e.g., biographies, discographies, social tags) for a large number of artists. *Social music sharing sites*, including 8Tracks and This Is My Jam, allow users to suggest one or more songs to a group of followers based on a common set of interests or music preferences.

Along with many of the web 2.0 services, PIMS are reaching a point of maturity where clear leaders are shaping the nature of the PIMS landscape, but there are still many niche services serving different needs. We wanted to explore this segmentation and understand more about the people who use PIMS. In this paper, we examined the Big 5 personalities of listeners [3,4], their habits in listening to and consuming music, and the PIMS they use. Our research questions were:

1. What general musical activities and preferences match various personality traits?
2. What PIMS are used by users with various musical activities and personalities traits?

In this paper, we described the literature underlying the musical activities used and personality studies of music listening, but most of this paper focused on the study and data we collected. This study contributed to those wishing

to design their own PIMS and also helped to fundamentally classify various PIMS already on the market.

PREVIOUS RESEARCH ON THE MUSIC LISTENING EXPERIENCE

There has been a fair amount of research on consumer personality and how those consumers listen to and consume music within the fields of psychology, sociology, and music informatics. A number of these studies have focused on how listeners of various personality types gravitate toward certain genres or characteristics of music [1, 2, 9]. A number of studies have focused on the activity of music listening from the perspective of sociality and sharing in music [6, 10], music search and discovery [8, 10], active versus passive consumption of music [10] , the role of live music in the music listening ecology [8], and control over music [8].

[7, 10] in particular have commented on the role underlying technology has on the music listening experience. [10] tied sociality to search, access and sharing to control over music in a PIMS. [10] argued for design features which can help influence behavioral components such as tagging and song skipping.

We wish to further explore the relationship between personality and various musical activities described above to PIMS and music listening technology. We wish to understand how various technologies support various personality types and musical activities.

PROCEDURES

We used a survey to collect personality and behavioral data, since so many personality tests already have batteries of questions easily integrated into new surveys. The survey was segmented into four sections: listener demographics and psychographics, PIMS use, personality, and music listening habits.

We asked demographic questions of age and gender as well as psychographic question having to do with amount of internet use, frequency of music listening, devices used for listening to music, and origin of new music discovery in general.

We asked about their use of the following PIMS: 8Tracks, Bandcamp, Grooveshark, iTunes, Jango, Last.fm, Pandora, Slacker, Spotify, Soundcloud, Youtube, and any other. For any PIMS respondents identified using, we also asked how frequently they used each service, how useful the services were for music discovery, how social each was, and how much effort was needed to use each.

As for personality, we had each respondent complete a standard Big 5 personality test as part of the survey. The Big 5 [3, 4] is a recognized research instrument for categorizing personality along 5 axes: introversion versus extraversion, coldness versus agreeableness, carelessness versus conscientious organization, confidence versus neurotic anxiety, and caution versus open curiosity.

Finally, with regard to music listening habits, we created a series of grouped items. Each group was a series of three Likert scale questions. The factors we tested for included variations on "song surfing" or skipping behavior, creating playlists, using computer recommendations for familiar music (e.g., "shuffle" feature), using computer recommendations for new music, trusting computer recommendations in general, trusting friends recommendations for new music, sharing familiar songs with friends, sharing new songs with friends, listening with friends, listening by oneself, learning about the artists of songs, learning about lyrics, learning about musical influences of artists, attending concerts, listening to music in the background, and actively listening to music.

The survey was available online using Qualtrics software from August through September 2012. We invited 1806 students from a liberal arts college in the northeast United States to complete the survey. Of this sample, 315 answered some portion of the survey and 188 completed the survey for a 10.4% completion rate.

We used regression analysis to analyze the data. Each test subject was represented by 5 continuous variables for the Big 5 personality types, 16 continuous variables for the various music activities defined above, and 9 binary variables for the 9 PIMS (8Tracks, Bandcamp, iTunes, Last.fm, Pandora, Spotify, Soundcloud, Grooveshark, and Youtube). Slacker and Jango were removed because of an insufficient number of users (e.g., less than 10 users) within our survey.

FINDINGS

We compared personality types to activities (using 80 regression functions), personality types to PIMS (45 functions), and activities to PIMS (144 functions), using a total of 269 regression functions. Linear regression was used when both variables were continuous, while logistic regression was used when the response variable was binary (e.g., the PIMS data). We reported two-tailed p-values of less than alpha = 0.05, which were used to test whether the estimated slope—i.e., coefficient—of a regression function was significantly different from zero. We also reported whether the slope was positive or negative.

At the alpha = 0.05 level, we would expect to find approximately 13.4 "significant" relationships by chance. Without applying a Bonferroni correction for conducting multiple hypothesis tests, we found 69 significant relationships. When applying a Bonferroni correction (alpha = 0.0002), we found 14 significant relationships. For the sake of producing a more broad exploration of our data, we reported significance with respect to uncorrected alpha values at the 0.05, 0.01, and 0.001 levels designated as *, **, and *** respectively in the data below.

Lastly, we designated Youtube (79% of the users), Pandora (78%), iTunes (78%), Spotify (42%) as being the mainstream PIMS since a large number of test subjects used

them. Similarly, we designated Soundcloud (26%), Groveshark (23%), Last.fm(17%), 8Tracks (15%), and Bandcamp (9%) as being fringe systems since fewer test subjects used them.

Analysis

From the PIMS usage, personality, and listening activity data, we found four general relationships within the data of note. These patterns demonstrate a strong relationship between features designed in a PIMS and the type of user who used that PIMS. These relationships included:

1. positive relationship between fringe services, high openness personality scores, and deep listening behaviors
2. positive relationship between mainstream services, high extraversion personality scores, and a preference for socially-related musical listening activities
3. positive relationship between mainstream services and a preference for computer selection and recommendation of music
4. positive relationship between specific personality scores with social behavior, deep listening, and trusting computer selections and recommendations.

As can be seen in Table 1, high openness scores, which related to trying new things, had a positive connection with the fringe PIMS Grooveshark, BandCamp, Soundcloud, Last.fm and 8Tracks. When exploring into aspects relating to connecting more deeply with the music, we looked at connecting with the artist, connecting with the artist's influences, and attending concerts, which each shared certain connection with all of these PIMS except for 8Tracks. We also considered connecting with lyrics to be involved somewhat in deeply connected with the music, but none of these services had a connection. However, Pandora (+*), iTunes (+*), and Youtube (+*) did and we feel this has more to do with specific features in each interface supporting this type of activity. Spotify (+*) also had a relationship with attending concerts. We cannot explain this relationship because it is the only significant relationship Spotify had with any activities or personality features—it may be an anomaly.

	Celestial Jukebox	Artist Website Hosting Service		Music Encyclo-pedia	Music Sharing Site
	Groove-shark	Band-camp	Sound-Cloud	Lastfm	8Tracks
Openness	+*	+**	+***	+*	+*
Connect w. Artist		+***	+**	+*	
Connect w. Influence		+***	+***		
Attend Concert	+**	+**	+***	+**	

Table 1. Logistic Regression of deep listening activity and openness to PIMS

	Personal. Int. Radio	Celestial Jukebox			Hosting Service
	Pandora	ITunes	You-tube	Groove-shark	Sound-cloud
Extraversion	+**	+**	+***	+*	
Share new songs		+**		+**	+***
Share familiar songs		+*	+*		+***
Listen with others	+***	+***	+***	+*	+***

Table 2. Logistic Regression of Social Activities and Extraversion to PIMS

In table 2, we also see a relationship between mainstream services and extraversion with Pandora, iTunes, Youtube, and Grooveshark. Looking at the various aspects of social behavior with music such as sharing new and familiar songs and listening to music with others, we see connections with these services (particularly listening with others) as well as SoundCloud. Grooveshark and SoundCloud are interesting in this respect as they share characteristics of use with both mainstream and fringe services.

We also looked at computer supported selection and recommendation with various services. We found Pandora (+***), iTunes (+***), and Youtube (+**) listeners in general trust computer selection of music. More peculiar is that we found Soundcloud (+*) and 8Tracks (+**) listeners trust computer recommendations for new music. This is strange because neither SoundCloud nor 8Tracks relies on a traditional computer-based recommender system for music discovery. Rather, they use a "following/follower" model where users explicitly link to one another based on common

	Listen With Others	Share Songs Familiar
Extraversion	+**	+***
Agreeableness	+***	+***
	Trust Comp. Selection	**Comp. Selection New**
Extraversion	+***	+**
Agreeableness	+*	
	Connect with Artist	**Attend Concert**
Extraversion	+*	+***
Openness		+**

Table 3. Linear Regression comparing personality traits to various activities

music interests or social connections.

In Table 3, we were able to find a relationship between agreeableness and extraversion with social activities, trust in the computer for selecting and recommending music, and engaging deeply in music such as going to concerts and connecting with the artist (in this case, switching out agreeableness with openness). This means being more sociable increases the likelihood in engaging in these activities.

IMPLICATIONS FOR THE DESIGN OF PIMS

From this data, we see that there are two groups of users emerging clustered around two types of interfaces. Some interfaces are mainstream such as iTunes, Youtube, and Pandora as well as Soundcloud and Grooveshark, to some extent, where people can use these relatively simple interfaces to quickly listen to or play music, particularly in social situations. Some interfaces encourage much more deep engagement with the music, its content, and its artists such as BandCamp, Last.fm, SoundCloud, and Grooveshark. Users are latching on to these interfaces based on their own personality and music interests due to what the interfaces offer.

Even though most celestial jukeboxes are designed for mainstream audiences and most artist website hosting services tend to serve more niche markets, there are opportunities to design interfaces encouraging more social interaction, sharing, and easier "set-it-and-forget-it" behavior for all categories including music encyclopedias and artist website hosting services. There is also a great deal of room for personalized internet radio and celestial jukeboxes to include interfaces for engaging more deeply in the music. This could encourage new audiences to use these services (particularly from the standpoint of the role lyrics play in engaging more deeply in the music, where users already enjoy engaging in those aspects).

Finally, this study also shows the draw of many PIMS rests on sociality (extraversion and agreeableness) forboth mainstream and fringe services in the interfaces for sharing music, trusting computer selection and recommendation, and connecting deeply with artist and music. We see this finding as confirming from [6, 10] PIMS interfaces need to provide an outlet for social behavior of some form to be successful. This may be the case even if there is just an indirect social interaction with the artist.

This study has focused on what types of users in terms of personality and musical activity preferences are using PIMS. We have found evidence of two clear groups focused more on open exploration and deep listening and another group focused more on explicit social aspects of music (e.g., sharing, listening together, and so forth). We have also demonstrated that among the many PIMS in existence today many accommodate a wide variety of listeners' preferences, but there are opportunities for further development. Although personalized streaming music is reaching maturity, there is yet promising opportunities for research and development in the area to expand what is currently available for current and new use of PIMS technology.

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