Tuning Into You:

Personalized Audio Streaming Services and their Remediation of Radio

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Abstract

This thesis sets out to study and contextualize the discourses and structures surrounding an emerging form of music promotion, distribution, and consumption, namely personalized audio streaming driven by music recommender systems. It finds that services including Last.fm, Yahoo! LAUNCHcast, Pandora.com, and Radiolibre.ca rely on a discursive construct of 'radioness' in order to frame and legitimize their activities to their listeners, to the industry, and to the State. Simultaneously, these emergent media forms claim to surpass conventional radio by offering users agency over their listening experiences and promising artists more equal and relevant access to the 'airwaves,' with potentially revolutionary consequences. The argument of this thesis is that it is a particular conception of 'radio' that is at play in these articulations, and that furthermore, we should recognize the structuring impact of the regulatory context, industrial practices, and technological design of these personalized music streaming systems on their development and implementation, rather than take their promotional rhetoric at face value.

Résumé

Ce mémoire a pour but d'étudier et de mettre en contexte les discours et les structures liés à une forme naissante de promotion, de distribution et de consommation de musique, soit des services de programmation musicale personnalisés par des systèmes de recommandation. Il y est démontré que ces services, dont Yahoo! LAUNCHcast, Last.fm, Pandora.com et Radiolibre.ca s'appuient sur une notion discursive de ce qu'est la radio afin d'encadrer et de rendre légitimes leurs activités aux yeux de leurs membres, de l'industrie musicale et de l'État. Ils rejettent simultanément cette même notion lorsqu'ils clament dépasser la radio conventionnelle en offrant à leurs usagers de contrôler leurs expériences auditives, et aux artistes émergents un accès plus égal et pertinent aux « ondes », aux conséquences potentiellement révolutionnaires. La thèse présentée est qu'un concept particulier de la « radio » est exploité dans ces situations, et que la valeur apparente des promesses des services personnalisés ne correspond pas nécessairement à la réalité, définie par l'impact structurel de la réglementation, des pratiques de l'industrie et de la technologie sur le développement de ces nouveaux médias.

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Foreword

The first personalized recommendation system I ever came across and used was a service called RatingZone, a web-based book 'taste predictor' which pointed me to several great reads back in 2000. Later, the same site came out with a music recommendation feature, and I remember thinking, despite the positive experiences I had had with its book recommendations, how unlikely it would be for such a system to be accurate about something like music. I suppose I did not want to think of my musical taste as something that could be understood through a computerized analysis (books yes, music no—I'm not sure why). RatingZone went on to add video game, television show, film, and even wine recommendations to its repertoire. Apparently nothing was beyond the purview of the site's patented recommendation system.[1]

My second encounter with a recommendation engine, though I'm not sure I initially made the link between this experience and my first, was in early 2005, with Yahoo! LAUNCHcast's custom radio feature, which I loved immediately. I could choose from a defined yet vast list of albums, artists, and musical tracks, rate them on a scale of 1-5, and get a stream of music that seemed absolutely clairvoyant about my likes. I enjoyed the service so thoroughly that I forgot to worry about the algorithmic process behind it.

It was not until a friend told me late that year about Pandora.com, however, that my interest in music recommendation engines as an object of research was sparked. I thank her for the tip-off that got me started on this inquiry into an intriguing class of music services whose presence has been felt, at least to my interested ear, more and more strongly over the 20 months since.

[1] Except, perhaps, financial success. This year, RatingZone closed down its service, citing its inability to monetize the service after eight years of trying different business models. RatingZone website, http://www.ratingzone.com (accessed August 13, 2007).

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My late grandmother, Berta Tulia Quesada de Moscote, was among so many other things, my boombox and computer fairy. By magically introducing these objects into my life, perhaps she also helped foster in me an interest in music and technology, both of which are represented in this thesis and were necessary for its writing.

Introduction

Over the course of the last several years, a new class of music streaming services has arisen on the internet, offering a novel approach to online audio programming.[1] Variously called 'music discovery services,' 'customized audio streaming services,' or more simply, 'personalized radio,'[2] they promise a user-centred experience of musical discovery: 'radio' that plays only songs you will like. Like other audio streaming applications on the Web, such services are based on the generation of individualized audio streams that their users can initiate on-demand. But there is a twist. At the heart of personalized audio services are music recommendation engines, automated systems that aim to reflect and anticipate a user's musical desires based on the inherent qualities of the music, aggregate user ratings of it, or a combination of these methods.

How recommendation engines initially come to 'know' users' tastes differs, depending on the service. A listener might be presented with a stream of music, then be prompted to express her like or dislike of a given song through a rating (which could be as simple as giving it a 'thumbs up' or a 'thumbs down'). Alternatively, she could 'tell' the engine about her tastes more directly by providing the name of an artist or song she likes to start things off, or by feeding it a list of songs she is listening to on her iPod or computer. Based on this, the engine plays other songs that might interest her, which she can then rate, refining her 'musical profile' with each response.

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[1] The services discussed in this thesis launched online between November 1999 and January 2006, relying on audio streaming and recommendation technologies developed primarily in the mid- to late-1990s. While the technical aspect of audio streaming used here is not novel, drawing from established Web technologies, I would argue that the institutionalization of personalization and recommendation as a feature of online audio programming is new.

[2] Though often used as synonyms, each of these terms highlights a different aspect of a given service. References to 'music recommendation engines' (introduced shortly) focus on the artificial intelligence and algorithms used to generate recommendations and therefore refer to systems that may or may not involve audio streaming; 'customized audio streaming service' might be a better general term for a website that uses a recommendation engine to then create what we might call 'personalized radio,' i.e. a stream of uninterrupted music generated by the engine and hosted by the 'service'. 'Music discovery service' stresses an intended use of this class of audio programming.

In the inaugural issue of *New Media & Society*, Sonia Livingstone wrote that a shift "from one-way, mass communication towards more *interactive communication* between medium and user" is apparent on the internet as a whole, in particular in e-commerce initiatives, as well as in other media such as interactive games and interactive television.[3] Livingstone later clarifies that it is not that interactivity as such is new, since its principal characteristics were present in interpersonal communication; what differs are the ways in which it is being combined with mass media to allow audiences to have new relationships with media texts. Others have questioned the usefulness of the term 'interactivity,' given that, as Lev Manovich points out, "modern HCI [Human Computer Interaction] is by definition interactive… Once an object is represented in a computer, it automatically becomes interactive. Therefore, to call computer media 'interactive' is meaningless—it simply means stating the most basic fact about computers."[4] What is more, not only computers are interactive; Manovich contends that all classical and even modern art is also 'interactive' since it "require[s] the user to fill in missing information."[5] At stake here, it seems, are differing definitions and interpretations of what constitutes interactivity.[6] But if the claim that interactivity is what is new about new media is debatable, it is unquestionable that interactivity, personalization, and the promise of user agency are significant aspects of the ways in which new media articulate their value over older media.

Jay David Bolter and Richard Grusin write in their book *Remediation* that new media are never truly new, but that they 'remediate' earlier media (and vice versa), that is, they enact representations of other media in their own articulations. The process of remediation occurs not only on the level of media form or aesthetics (the authors' main preoccupation in the book); importantly, such a

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[3] Livingstone, "New Media, New Audiences?" 63. Emphasis in original.
[4] Manovich, *Language of New Media*, 55. In *Gaming*, Alexander Galloway (following Manovich) has also critiqued and ultimately avoided the term 'interactive,' preferring to call his object of study, video games, an "action-based" medium (3).
[5] Manovich, *Language of New Media*, 56.
[6] Definitions of interactivity are hotly debated in communication studies, computer science, marketing, and psychology. For a summary of debates and new perspectives on the concept, see Richards, "Users, interactivity and generation," 531-550; Kiousis, "Interactivity: a concept explication," 355-383; Downes and McMillan, "Defining Interactivity," 157-179.

process can also be found at work in the discursive, industrial, and policy environment and structures surrounding emergent media.[7] New media express their value by locating themselves within a lineage of existing media, yet asserting the ways in which they surpass them.

In the case of personalized audio streaming services, as I will show throughout this thesis and particularly in the opening chapter, the principal media form that they claim to refashion and improve upon is music radio.[8] There are two main areas in which personalized audio services purport to surpass radio. Firstly, as we just saw, personalized audio services claim to provide users with more agency over the music they hear on their stations as compared to traditional over-the-air radio. Secondly, while touting their user-centric qualities to their members, personalized audio streaming services, as intermediaries between music production and consumption, also generate discourses about their value to the music industry. The targeted nature of personalized services is here again central to what such services promise the industry: the opportunity to access those listeners most likely to be interested in particular music products. Personalized audio services often go a step further in their promotional discourses by suggesting that the recommendation engines on which they are based have the potential to level the playing field between artists by allowing musicians (especially independent artists) to bypass traditional gatekeepers of taste, including commercial music radio. The assertion of the identity of this emerging form contains, in other words, both a reliance on radio and a critique of its industrial practices and medial limitations. Bolter and Grusin's concept of remediation helps to explain the workings of these discourses while demonstrating that they are not, however, unique to personalized audio services; rather, they are a feature of discourses of the new.

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[7] Bolter and Grusin, *Remediation*. The authors conceive of digital technologies as "hybrids of technical, material, and social facets," and see the process of remediation at work in all of these facets (77).

[8] This is not to suggest that personalized audio services do not owe a debt to myriad other antecedents. As Bolter and Grusin observe, new media remediate various other media, sometimes explicitly and sometimes less so. In my view, personalized radio services remediate search engines, jukeboxes, and mixtapes, and owe a dept to the concept of personal agents. Nevertheless, I argue in the body of this thesis that the remediation of radio is the fundamental reconfiguration these services enact.

Literature Review and Brief History

Approaching the New

Attempts to understand and contextualize the new have a rich history in communication studies as in other fields. Aside from an interest in the causal aspects of the emergence of new technologies, taking the form of technological determinism, cultural determinism, or the spectrum of positions in between, theories exist to describe various stages in the uptake of the new, and the ways in which institutions deal with its advent.[9] Work of this kind depends on situating the new within a medial context in a given relationship to existing practices and technologies. I briefly present two theoretical approaches that broach the issue of a medium's definitional boundaries or makeup, namely medium specificity and remediation, arguing that remediation best allows us to understand not only the inner workings and application of technologies from a relatively formalist perspective but also the self-presentations and self-understandings of emerging media as they attempt to locate themselves within existing forms and carve out a place in the market for their products and services.

Medium Specificity

Theories of medium specificity revolve around the premise that "different media have 'essential' and unique characteristics that form the basis of how they can and should be used."[10] Conceptions of this kind are often implicated in discussions of the new as theorists attempt to make sense of the distinctiveness of emergent forms from an aesthetic or formal perspective. Historically, medium specificity

[9] See Slack and Wise, "Cultural Studies and Communications Technology," 141-162 for a summary of approaches to studying technology; see Livingstone "New Media, New Audiences?" 59-66 for an argument for researching media at the moment of their domestic uptake; on new technologies and law and policy, see Price, "Newness of New Technology," 1885-1913.
[10] Maras and Sutton, "Medium Specificity Re-visited," 98.

has played an important role in the definition of new fields of study including film studies in the 1970s, television studies in the 1980s, and internet studies in the 1990s. Medium specificity approaches are apparent, for instance, in the work of Rudolph Arnheim and in that of Leo Bogart, who wrote on radio and television, respectively.[11] Arnheim in particular sought to highlight the distinguishing qualities of radio broadcasting from an aesthetic perspective; Bogart included in his study of television a discussion of the ways in which it differed from radio. More recent writings, such as Alexander Galloway's *Gaming*, a reflection on video games, display a similar interest in distinguishing the medium in question from others. This family of theoretical approaches is sometimes criticized for more often dealing with what media (or art, since medium specificity arguments have a long history in art criticism) *should* do, rather than doing descriptive work, and because they can be mobilized as 'purist' arguments against hybridization or change.[12] In the late 1980s, for instance, writers in film theory such as Dana Polan argued for a move away from the idea of fixed specificity, pointing instead to the notion of cinema as "an adjective, a modification of something else."[13] Cinema, Polan suggested, was better viewed as an 'apparatus' located at the intersection of a number of historical, ideological, and technological forces.

Despite this critique, questions regarding how a medium should be defined are still very close to the heart of numerous writers. Many of the questions about how radio should be understood are far from settled, as Chapter One will show. However, in this thesis, I do not pronounce myself definitively on the subject of whether in their present configuration such services are or are not 'radio' in any but the most basic policy sense of the word. For my interest in the ways that new media understand themselves institutionally and discursively, I find the work of two contemporary theorists, Bolter and Grusin, to be of particular worth. Their approach allows us to look at an emergent media configuration by examining the earlier media from which it discursively and structurally draws as an inseparable aspect of the form. Furthermore, medium specificity is a primarily aesthetic

[11] Arnheim, *Radio*; Bogart, *Age of Television*.
[12] Maras and Sutton, "Medium Specificity Re-visited," 98-100.
[13] cited in ibid., 101.

approach while remediation is a more robust framework for addressing the institutional and occasionally political economic questions in which I am invested here, in addition to formal concerns.

Remediation

In their influential book, *Remediation: Understanding New Media*, Jay David Bolter and Richard Grusin write that media enter into relationships of "respect and rivalry" with each other, since "no medium today, and certainly no single media event, seems to do its cultural work in isolation from other media, any more than it works in isolation from other social and economic forces."[14] As a result, they argue, new media are best understood through their interrelationships with older media and the articulation of their claims to supersede them, which, they note, takes the form of offering audiences ever greater access to authenticity.

Bolter and Grusin's concept of remediation, which they see as "the predominant convention at work in establishing the identity of new media," is based on their observation that paradoxically, "[contemporary culture] wants to erase its media in the very act of multiplying them."[15] Through this "double logic of remediation," as they refer to it, media seek to deny their mediating role, offering greater 'immediacy' to users through 'hypermediated' means. Bolter and Grusin show that these two "seemingly contradictory logics not only coexist in digital media today but are mutually dependent. Immediacy depends on hypermediacy."[16] There is also not just one kind of remediation, but rather degrees or a spectrum of such a process, from subtle nods to prior forms to

[14] Bolter and Grusin, Remediation, 65; ibid., 15. A similar approach to that of Bolter and Grusin is found in sections Manovich, *Language of New Media*, published a year after *Remediation*. Manovich approaches new media by looking at its semiotic codes and situating them within a larger history of visual and media cultures, asking, "How do the conventions and techniques of old media…operate in new media?" (8). For Manovich, software interfaces "act as 'representations' of older cultural forms and media, privileging some at the expense of others." (16). In this sense his writings fit nicely with those of Bolter of Grusin, who tend to more often acknowledge the non-formal dimensions of new media, although form remains their main interest. In his 1974 book *Television*, Raymond Williams had similarly placed his discussion of the medium in the context of existing forms while highlighting its innovations. See Williams, *Television*, esp. chap. 3, "Forms of Television," 39-76.

[15] Bolter and Grusin. *Remediation*, 54; ibid., 5.

[16] ibid., 6.

wholesale incorporations of them, which depends on the level of perceived competition between the old and new medium.[17]

Although most of the practical examples of remediation presented in the book are formalist, as in their discussion of the incorporation of linear perspective in digital visual media, Bolter and Grusin point out at several junctures in their text that media technologies are themselves a nexus of aesthetic, social, economic, and other forces; thus remediation as a process can be seen not only as the incorporation of formal features of other media in a given medium, but also in terms of the ways in which it makes claims on the social and economic terrain of the media from which it borrows.

An important corollary, or nuance, of remediation that does not get fully addressed in the work of Bolter and Grusin, however, is the way in which, from an institutional perspective, the claims of one medium (in the present case, of a newer medium refashioning an older one) are caught up in the simultaneous creation of a discursive construct about the older medium. The new medium draws on, then reinforces, a 'working idea' of the older medium, in addition to the 'medium' itself. I am particularly interested in this ideational function whereby refashioning media rewrite the territory around the refashioned medium, creating a discourse about the refashioned medium that facilitates a claim of superiority over the latter.

In this thesis, I discuss a class of audio services, personalized streaming, which I posit as a new configuration and application of existing technologies and practices, the most important of which are audio streaming and music recommendation. In examining self-presentations of these services and in drawing out their reliance on radio as an organizing construct, I hope to offer a contextual perspective on the emergent industry of recommendation-based audio streaming and to challenge some of its rhetorical claims of an often emancipatory nature.

[17] ibid., 44.

Customized Audio Streaming Services

Customized streaming services on the Web currently boast users in the tens of millions.[18] Mainstream news coverage and recent high-profile deals and acquisitions have brought these services into the spotlight, reflecting the growing recognition of their salience in the online music landscape. Coverage of the ownership and emerging business models of several services, as well as comparative summaries, editorials, and commentaries on personalized audio abound in the blogosphere and have appeared offline in both specialist publications (such as *Billboard*, *PC Magazine,* and *Wired*) and mainstream news outlets (including *BBC News*, *The New York Times,* and the *Wall Street Journal*).

However, as customized audio streaming services are relatively new offerings, their discussion in existing academic literature is limited to brief sections in articles and books written since 2000. Generally, these services are contextualized as a way in which internet radio is developing, though customization of music content has also been treated in discussions of the music industry's retail strategies on the internet.[19]

The technologies and practices that, taken together, contribute to personalized audio services are, on the other hand, well covered in academic publications, if not always within the humanities. There are many studies of audio streaming and internet radio from perspectives ranging from the technical to the social to the industrial to the philosophic, as well as discussions of the promotional work of radio and the internet for the music industry.[20] Academic

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[18] See Appendix B for a breakdown by services studied.

[19] Wall, "Political Economy of Internet Music Radio" 27-44; Walker, *Rebels on the Air,* 279-281; Atton, "Alternative Radio and the Internet," 114-137; Burkart and McCourt, *Digital Music Wars;* Anderson, *Long Tail*.

[20] For a production guide with a technical discussion, see Priestman, *Web Radio*. For reflections on Internet radio's differences from terrestrial radio, see Black, "Internet radio," 397-408; van Selm et al., "Dutch Web Radio," 265-282, Atton, "Alternative Radio and the Internet," 114-137. For discussions of the economics of internet radio, see Wall, "Political Economy of Internet Music Radio," 27-44 and Ting and Wildman, "Economics of Internet Radio." Discussions of the promotional work of radio and the internet for the music industry include Negus "Plugging and Programming," 57-68 and *Producing Pop*; Berland "Radio Space and Industrial Time," 179-192 and "Contradicting Media," 209-217; Rothenbuhler "Program Decision Making," 209-232 and "Commercial Radio as Communication," 125-143; McLeod "MP3s are Killing Home Taping," 521-531.

work on recommender systems remains, on the other hand, of a technical nature, being primarily limited to the fields of computer science and marketing.[21] This thesis will contribute to bringing the discussion of recommendation systems, which are becoming more ubiquitous in the online retail arena since the 1990s, into communication studies by treating them as structuring technologies rather than as neutral channels.[22]

Audio Streaming and Internet Radio

Chris Priestman is the author of the first book dedicated entirely to internet radio, published in 2002. Both a production guide and a reflection on the form, in *Web Radio*, Priestman dates its advent to 1995. That year, Progressive Networks (later RealNetworks), a U.S. company, developed and commercialized RealAudio, a software package that compressed audio files such that they could easily pass from computer to computer via the phone-based networks on which the internet was based; the process came to be known as audio 'streaming'. Priestman explains the packet-switching and buffering processes behind audio streaming:

> Sending anything over the internet–text, graphics, video or sound–involves chopping it up into standard sized, tiny segments or 'packets,' addressing each of them individually to their destination and sending them off to find their own way through the network, then to be reassembled in the right order by the computer at the receiving end… Arranging for the packets to arrive at the receiving computer before they are needed means building in a short delay between the arrival of the first packet and the time when it is decoded back into analogue sound. Thus, a roughly 10-second buffer allows enough sound data to be assembled in the correct order to begin recreating the first second of the transmission.[23]

[21] Descriptions of recommendation algorithms include Shardenand and Maes "Social Information Filtering," 210-217; Goldberg et al. "Using Collaborative Filtering," 61-70. Cooke et al. "Marketing the Unfamiliar," 488-497 and Ansari et al., "Internet Recommendation Systems," 363-375 have examined recommendation systems' effectiveness for product sales.
[22] See in particular Chapters 2 and 3 for a discussion of technological agency.
[23] Chris Priestman, *Web Radio*, chap. 3.

Audio streaming is thus a one-to-one process involving the sending of data from a host to a client computer in such a way as to result in a seamless listening experience even though the process itself is highly segmented.

The development of audio streaming allowed radio to be transmitted over the Web in both live and archived streams. That ability led many writers, including Priestman, to question the boundaries of radio as a form, as we will see in detail in Chapter One. Internet radio also appeared to lend itself to new business models and forms of programming, an observation that has captured the interest of several commentators. Recent studies of internet radio, including those by Carol Ting & Steven S. Wildman and Tim Wall, have recognized the online radio industry's increasing trend toward multichannel and narrowcast broadcasting, that is, "branded bundles of stations offering a great variety of specific music programming as part of a subscription service."[24] Taking this trend to its logical limit, commentators have discussed the customization that several internet radio stations have begun to offer users: "[S]ince each connection is independent of the others, it is also technically feasible for listeners to skip songs, to rate songs and decide how frequently they would like to hear certain songs in the future," write Ting and Wildman in a 2002 piece.[25] Even more so than these authors, Tim Wall is attentive to the ways in which the customization potential for 'bespoke services' is nevertheless dependent on regulatory frameworks as well as the radio industry's profit potential. As he points out, the internet has not only transformed the political economy of radio but it has also changed the terms of the music industry. "In doing so, it has also undermined the settlement between broadcasters and the owners of music which made music radio possible in the beginning. In turn, these changes in the relationship between the radio and music industries threaten the openness of Internet broadcasting," including the kinds of customization that are allowable.[26]

As both industry analysts and academic commentators realize, the potential for internet radio to become a commercial success will depend on the

[24] Wall, "Political Economy of Internet Music Radio," 38.
[25] Ting and Wildman, "Economics of Internet Radio," 7.
[26] Wall, "Political Economy of Internet Music Radio," 41.

regulatory frameworks that come into play, affecting the business models and profit-making potential of internet radio. With respect to the advent of services that allow users to have increased input into program content, an industry commentator has said that

> [t] he ability to interact, to various degrees, with the music you listen to online is what makes online radio different from terrestrial radio…The idea that Internet radio should be just like terrestrial radio is like saying e-mail should follow the same rules as snail mail. Doing it without consumer influence [doesn't make sense]… a legal victory for the RIAA [who have put pressure on emergent services incorporating customer influence] would likely curtail that huge advantage of Internet radio.[27]

In academic analyses as in industry commentary, then, internet radio would seem to have a particular potential that is at risk of being corrupted by limiting policy structures or profit maximization as an objective.

Internet radio has received a fair amount of academic scrutiny, as will become clearer in the opening chapter; however, no current study broaches, to my knowledge, recommendation-based audio streaming as a distinct object of study and existing discussions of customization are mostly speculative. Furthermore, the emerging discourses around these particular online offerings have not yet been addressed.

Music Recommendation Systems

As much as customized audio streaming services present themselves as radio-like, a central aspect of their appeal—their application of recommender systems—has a distinct lineage that has only recently been intertwined with audio programming. Recommendation systems are IT tools, 'intelligent agents' that act on behalf of users, searching through databases to find them material likely to be of interest based on their expressed preferences. Such systems are seen to have numerous applications in personalization of multimedia content and in online retail.

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[27] Bob Ohlweiler, senior vice president of business development for MusicMatch, cited in Whitney, "Interactive Music Under Attack," *Streaming Media.com*, August 3, 2001. http://www.streamingmedia.com/article.asp?id=7769.

According to John Riedl, who helped develop the technique of collaborative filtering, "[t]he effect of recommender systems will be one of the most important changes in the next decade."[28] The basis for the perceived need for recommenders is the abundance of content available on the Web. According to this line of thought, illustrated in the following two quotes, scarcity is a problem of the past; the new difficulty with which Web users are confronted is dealing with the information overload characteristic of the internet:

> We are leaving the Information Age and entering the Recommendation Age. Today information is ridiculously easy to get: you practically trip over it on the street. Information gathering is no longer the issue—making smart decisions based on the information is the new trick… Recommendations serve as shortcuts through the thicket of information, just as my wine shop owner shortcuts me to obscure French wines to enjoy with pasta.[29]

> The Web… is leaving the era of search and entering one of discovery. What's the difference? Search is what you do when you're looking for something. Discovery is when something wonderful that you didn't know existed, or didn't know how to ask for, finds you.[30]

Early implementations of recommendation systems included personalized filtering of online news content and kiosks at Blockbuster Video stores in the late 1990s called 'Take10' that recommended films to members based on their past rentals.[31] The concept of recommendation systems can be found in writings as early as 1970, in Nicholas Negroponte's *The Architecture Machine*. In his book, Negroponte describes the usefulness for architectural design of an 'adaptable machine' that would "receive direct sensory information from the real world" and also have the ability to collect data about the designer and her "definitions, activities, and methods." A 'parent machine' could then provide, based on surveillance of other architects' activities, "(1) an evolutionary mapping of

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[28] John Riedl of the University of Minnesota Department of Computer Science, cited in Jeffrey M. O'Brien, "Personal Recommendation Software Predicts Consumer Choice," *Fortune*, November 27, 2006. http://money.cnn.com/magazines/fortune/fortune_archive/2006/11/27/8394347.
[29] Frog Design, cited in Anderson, *Long Tail*, 107.
[30] O'Brien, "Personal Recommendation Software."
[31] Ansari et al., "Internet Recommendation Systems," 363-375; Cooke et al., "Marketing the Unfamiliar," 488-497; West et al., "Agents to the Rescue?" 285-300; Shardanand and Maes, "Social Information Filtering," 210-217.

popular desires, (2) a statistical overlay of solution patterns, and (3) images of architects [the designer] esteems."[32] The basic drivers behind the system imagined by Negroponte and the workings of several music recommendation systems now implemented are not entirely dissimilar, though these systems are more rudimentary than what Negroponte envisioned. His (1) could be related to the popular technique of collaborative filtering, widespread on the internet by now; his (2) might best correspond to content-based analyses used to drive some forms of recommendation, and (3) could be related to the social-networking aspects of many sites that apply recommendation.

Collaborative Filtering

Collaborative filtering refers to a process whereby user input (whether implicit or explicit) is used to infer relationships of 'similarity' or affinity between content. The most readily recognizable application of this technique is found on Amazon.com, where users' browsing behaviour (implicit) and purchasing history (explicit) is used as raw information to recommend products to other users who have displayed similar interests.

Although a straight-forward approach to collaborative filtering would merely surface the most popular items, collaborative filtering algorithms are designed to counter these 'hit-making' tendencies in order to reveal what is 'uniquely popular,' driving interest down the so-called 'long tail' of lesser-known products. As Jonas Woost of Last.fm and Todd Beaupré of Yahoo! LAUNCHcast have explained with respect to their services' music recommendation techniques,

> If you just look at artist A, everyone who listens to artist A, what else have they been listening to—which you call "combine the charts" and which is not what we do—the similar artist for every single artist on Last.fm would be the Beatles, Coldplay, Radiohead, and the Red Hot Chili Peppers. So the trick is to filter

[32] Negroponte, *Architecture Machine,* 27-29. As for the idea of knowledge-based software 'agents' on which Negroponte's imagined system would likely depend, the idea originated in the mid-1950s with John McCarthy and the term was coined afterward by Oliver G. Selfridge, both of MIT. They had in view "a system that, when given a goal, could carry out the details of the appropriate computer operations and could ask for and receive advice, offered in human terms, when it was stuck. An agent would be a 'soft robot' living and doing its business within the computer's world" (Kay, "Computer Software," 58).

> those out. So you say, in theory, 'people who listen to these artists *a lot*, what else have they been listening to *a lot*?'[33]
>
> [I]f Madonna happens to be liked by 25% of all music raters, but then you're looking at what do fans of Beck think of Madonna, if only 15% of Beck fans like Madonna, it's not particularly popular among Beck fans compared to what you'd expect. So we [account for that], otherwise we tend to get the [stations] sounding the same, so it's really looking at what's *uniquely* popular among fans of this artist as opposed to what's popular.[34]

Collaborative filtering was first introduced in 1992, with David Goldberg and colleagues' publication of "Using Collaborative Filtering to Weave an Information Tapestry."[35] The technique was first used to customize online news content and for book recommendations. Various improvements have since been suggested for collaborative filtering systems, including clustering, meaning that rather than comparing a given user's preferences to those of all other users, relevant or 'similar' users are identified and placed into clusters to produce what are thought to be more significant recommendations.[36]

As for the application of collaborative filtering to music recommendation, it happened fairly early on in the technique's development. In 1994, MIT Media Lab set up Ringo, a music recommendation service based on user ratings of various music titles. With Ringo, users received album recommendations based on their ratings of other albums, correlated to the ratings of other users who had similar identified interests. Interestingly, Ringo is a direct ancestor of one of the services discussed in detail in this thesis, Yahoo! LAUNCHcast. Ringo was the basis for Firefly's music division, which was purchased by Launch Media in 1997, coming under Yahoo! ownership in 2001.[37]

If Launch Media through its purchase of Firefly's music division was a pioneer in the area of recommendation derived through explicit ratings, then Audioscrobbler, an open-source software program designed by Richard Jones,

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[33] Woost, personal interview.
[34] Beaupré, telephone interview.
[35] Goldberg et al., "Using Collaborative Filtering," 61-70.
[36] Ungar and Foster, "Clustering Methods for Collaborative Filtering."
[37] Burkart and McCourt, *Digital Music Wars*, 94.

then a third-year computer science student at the University of Southhampton in the UK, was equally on the cutting edge of recommendation, using implicit inputs rather than ratings to collect preference data. Through Audioscrobbler, users simply listened to the music as always while the software logged their listening habits. This enabled the creation of listening charts, and collaborative filtering based on these implicit inputs was also feasible.[38]

Content-based Approaches to Music Recommendation

Content-based music recommendation services take a very different tack than those based on collaborative filtering. With the song or sound file as their starting point, relationships of 'similarity' between tracks are extracted based on varying criteria. Content-based approaches can be based on something as simple as a categorization of songs as belonging to particular genres or moods or as complex as Pandora.com's 'genomic' approach to song analysis, explained briefly below. Content-based approaches can be further distinguished depending on whether a human-based or automatic approach is used for the initial analysis of musical content.

Jesse Walker has noted that the advent of computerized scheduling systems for terrestrial radio like RCS Selector presaged content-based recommendation of music. Developed in 1979 by Andrew Economos, Selector allowed professional radio programmers to design automated playlists for their stations:

> Once a catalog of the music library has been entered…the [music] director gives Selector a series of instructions and the program produces a playlist. Those parameters might be broad genre restrictions ("no rap"), general patterns ("two upbeat songs, followed by one ballad, then repeat"), or more narrow rules ("no more than three songs with female vocalists per hour"). Selector then chooses which songs will be played, and in what order, for the next twenty-four hours, seven days, or whatever horizon the programmer prefers.[39]

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[38] "Website offers new view of music," *BBC News Online*, March 27, 2003. http://news.bbc.co.uk/2/hi/technology/2888431.stm.
[39] Walker, *Rebels on the Air*, 277.

In the mid-1990s, several companies came into being that were dedicated to music recommendation based on the music itself, including Savage Beast Technologies and Double V3, the precursors to Pandora.com and Radiolibre.ca (two of the services studied in this thesis) respectively. Currently gaining ground as a recommendation technique in audio streaming services (though only implemented in the new Lycos Music version of Radiolibre.ca) is automatic spectral analysis, which involves automatically extracting musical similarities from the features and characteristics of the sound file. Content-based approaches, especially automated ones such as spectral analysis, are a growing area of interest, but are more costly because they tend to be based on proprietary methods that have to be licensed, while collaborative filtering algorithms are more easily developed in-house. In addition, some in the industry are not convinced that automatic techniques currently available are as effective as they could be.[40]

In practice, collaborative filtering and content analysis are often combined; some element of collaborative-filtering is typical of virtually all personalized audio streaming services, either as a means of verifying the adequacy of content-based selections or in order to create various 'community' features on a given website. Furthermore, many content-based services also build in some level of user influence beyond simply selecting the artists or songs of interest; responding to Pandora's default suggestions with a 'thumbs up' or 'thumbs down' rating, for instance, entails slight tweaking in the particular weightings of the algorithms used to generate a given musical profile.

[40] Westergren, telephone interview; Beaupré, telephone interview.

Design and Outline of the Study

Methodology

In this thesis, I use a discourse analysis and occasionally political economic approach to examine the ways in which personalized audio streaming services assert their identity as emergent media, using the concept of remediation introduced earlier as a guiding framework. I consider as discourses the commentaries and promotional rhetoric in and around customized audio services, as well as user interface and recommendation engine design, both of which I see as discursive. The front and backend design of a personalized service, and the notion of musical 'similarity' are both subject to scrutiny as particular technological configurations.

As forms of music delivery, personalized audio streaming services operate in a space at the intersection of production, consumption, promotion, and distribution of music. As such, their self-presentations require examination from these varying perspectives. I therefore draw on theoretical and historical material relating to radio and radioness, the recording industry, marketing literature, and technical papers. While I do not present lengthy or detailed case studies of any one service, I use four services, two representing each of the two principal approaches to recommendation that I identify, to get at the range of personalized services currently available on the Web and to have a better sense of the directions of their development. This range is also an appropriate means to gauge the kinds of discourses developing around these services. I wish to draw attention to some of the competing viewpoints within the industry, in order to avoid leaving the impression that all players approach their services with the same perspectives and intentions. A range of sources inform this work, including newspaper, magazine, and blog coverage of various personalized audio streaming services. Interviews with key figures at the companies studied in this work form an important complement to the other literature. I also draw from conference presentations both attended and accessed via internet.

Scope of the Study

There are countless Web-based music services offering audio streaming, both 'on demand' and through pre-programmed channels. There are also growing numbers of services operating in what could be called the 'music recommendation space,' including retail sites such as Amazon.com that use recommendation systems to suggest products to customers based on their implicit and explicit preferences as well as those of other users on the system. Social networking services, especially music-themed sites such as Mog.com or Haystack.com, also make use of recommendation systems to highlight blogs or other content that is likely to be of interest for their users. The group of Web-based streaming services that are the object of this thesis utilize music recommendation technology in their generation of audio streams. I will use the terms personalized audio streaming service and customized audio streaming service interchangeably throughout the thesis to refer to this class of services. Although similar to 'automated music channels' on the internet in that they are automated, Web-based, and music-only offerings, personalized audio streaming services may be distinguished through their reliance on music recommendation engines. While there may be some areas of overlap between recommendation systems and personalized audio streaming services, in terms of both the functioning of the service and some parts of its promotional rhetoric, only those services that stream online will be examined in this thesis.[41] I am also limiting the discussion to free ads-based versions of services which are by far the most popular.

Personalized audio streaming services are a relatively new business on the internet. While the number of registered users on the average service numbers in the millions and is constantly growing, there is still little data on whether and how regularly these services are used by individual users, and it is beyond the purview of this study to address the reception of personalized services. There is, for

[41] For example, Goombah.com, a music recommendation service that is delivered primarily as a desktop application, offers users a means of creating streamed playlists from its library of free promotional musical tracks. This service is referred to as "Radio Free Goombah" and much of the promotional language surrounding the launch of the feature is similar to that of personalized audio streaming services.

instance, interesting anecdotal evidence that many of these services are used to DJ parties or in other intensely social contexts.[42] Certainly how people use customized services is a particularly interesting question, but there is no systematic or empirical account of such use within this thesis.

Introduction to Services Studied

Throughout this thesis, I refer continually to four services currently[43] operating on the Web and which I characterize as personalized audio streaming services: Yahoo! LAUNCHcast, Last.fm, Pandora.com and Radiolibre.ca. The services are described briefly here in order to provide context for subsequent discussions.

As there are as yet few services operating in this space, these examples are highly representative of the industry and are more or less competitors, though they would claim there is room for many approaches to recommendation.[44] Their diversity is instructive: they are U.S., U.K., and Canada-based, apply two broadly speaking different approaches to music recommendation, and a cross-section of structural and political economic features is represented.[45]

Collaborative-Filtering Based Services

Yahoo! LAUNCHcast's "My Station"

Having started out as a CD-ROM magazine company in 1994, Launch Media began its transformation with the purchase of MusicVideos.com in Spring of 1999

[42] Westergren, "Pandora and the Future of Music"; Westergren, telephone interview.
[43] There is one exception, Radiolibre.ca, which was operated by Astral Media from January-December 2006, but is no longer online in its initial iteration. The technology behind Radiolibre.ca has been retooled and as of June 2007 was relaunched as Lycos Music. The comments in this thesis pertain to the original Radiolibre.ca rather than to Lycos Music.
[44] Westergren, "Pandora and the Future of Music"; Masse, personal interview.
[45] For example, Pandora.com is an independent and dedicated music site, whereas Yahoo! LAUNCHcast is part of a portal and Last.fm is owned by CBS Corp. Furthermore, Last.fm, Pandora and LAUNCHcast use their own technology, whereas Radiolibre.ca is an example of a licensed use of a software company (Double V3)'s recommendation technology.

and through its addition of audio streaming (LAUNCHcast) in the fall of that same year. From its inception in November 1999, LAUNCHcast was one of the first services online to offer personalization in streamed music content. Brought under the Yahoo! umbrella in May 2001 to the tune of $12 million,[46] the service now operates with the tagline "music that listens to you". LAUNCHcast is the name for all of Yahoo!'s radio offerings including pre-programmed radio. "My Station" is the feature where users can customize their audio streams.[47] Users express their musical likes and dislikes by rating artists, albums, and tracks either on a scale from 1-5 stars, or as a percentage. Through collaborative filtering, the service generates music recommendations in the form of a continuous audio stream. There is a limit on how many hours one can listen to the service for free per month. Unlike the other services discussed, Yahoo! LAUNCHcast does not have partnerships with online music retailers such as iTunes and Amazon.com as Yahoo! Music is itself a music retailer. Thus links are provided in the music player to internal artist pages from which listeners can access on-demand streaming, provided they subscribe. Because of Yahoo!'s status as an online portal, it gets many more hits than the other services. Historically, over 30 million stations have been created on the system by unique users; approximately a million new customized stations are added to the system every two months, and the number of ratings that users collectively provide for the system attains the millions per day.[48]

Fig i.1 Yahoo! LAUNCHcast, detail of main page

[46] Whitney, "Interactive Music Under Attack."
[47] For the sake of simplicity, I refer to LAUNCHcast's "My Station" feature as Yahoo! LAUNCHcast or LAUNCHcast in this thesis.
[48] Beaupré, "Propelling Music Personalization"; Beaupré, telephone interview.

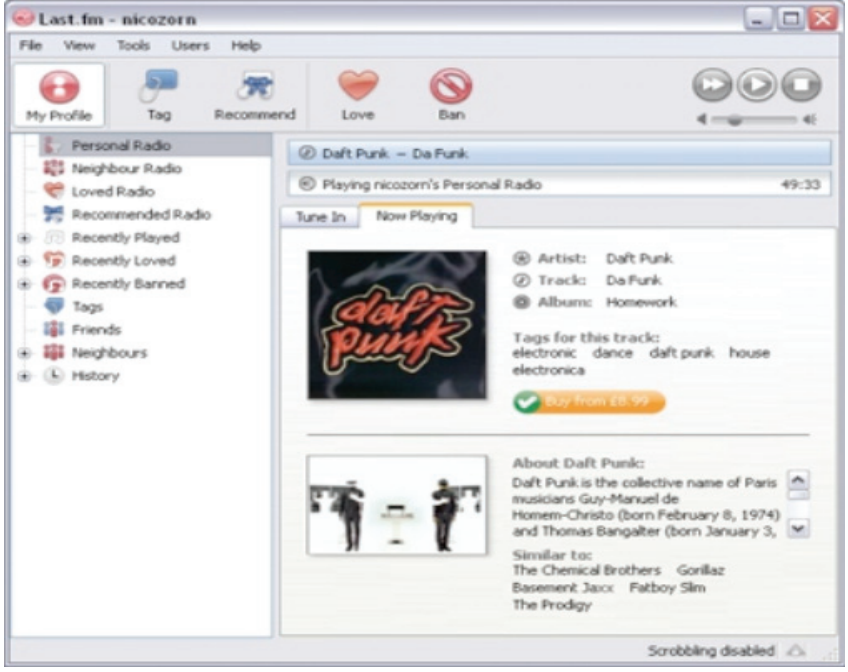

Fig. i.2 Last.fm player window

Last.fm

Branding itself "The Social Music Revolution," London, U.K.-based Last.fm works through aggregating and comparing basic track title and artist information from its users, a process of collaborative filtering. Users download an open-source software program called Audioscrobbler, which works with media players like iTunes and WinAmp to log an entry each time the user listens to a song (referred to as 'scrobbling' a track); the data is then sent to Last.fm's central servers. To date, approximately 65 million tracks have been 'scrobbled' on the system, representing 8 million artists.[49] There are two main ways to interact with Last.fm, which overlap. The first is to use the social networking aspects of the site to actively seek out new music by visiting the profiles of one's 'friends' (people added to a contact list) or one's 'neighbours' (people that Last.fm has calculated to have similar tastes through collaborative filtering). The other is to use the Last.fm player to listen to 'tag radio,' 'recommended radio,' or 'similar artist radio,' that is, to receive recommendations in the form of a continuous audio stream. Last.fm also provides users with charts representing their listening habits, which can be downloaded and displayed on a blog or MySpace page. Last.fm

[49] Woost, personal interview; Wilson Rothman, "A Radio Station Just For You," *New York Times*, March 29, 2007. http://www.nytimes.com/2007/03/29/technology/29basics.html?ex=1176782400&en=1375d070ea75dec2&ei=5070.

was purchased in June 2007 by CBS Corp. for its CBS Interactive division.

Content-Based Services

Pandora.com

Pandora.com, a popular service with about 7 million users as of June 2007,[50] is the product of an Oakland, CA-based start-up, Pandora Media. The 'underbelly' of the Pandora system is something called the Music Genome Project, which was worked on over a number of years by Pandora staff members. Essentially, over 400 musical 'genes' were identified to describe music's formal qualities (such as rhythm, uses of voice, types of melody, etc.). The thinking is that any song can be described through a combination of these traits and through their different weightings. The musical 'DNA' of a given song is used to calculate which other songs are closest to it. The database is made up of about half a million songs that have been tagged by trained musicians. Tagging a single song might take up to 30 minutes, and this, only after the musically-trained staff member has gone through about 150 hours of specialized training for Pandora.[51]

Originally known as Savage Beast Technologies, the company started out in 1999 with business-to-business operations for retail services. As of 2005, however, Pandora launched to the public as a web radio offering. A user can begin the listening experience by inputting something as simple as an artist name or a song name. From this starting point, Pandora's recommendation engine automatically generates a playlist of music with similar musical 'genes' to the initial artist or song. (Although not initially used, collaborative filtering now influences the likelihood of a song appearing on a station.[52]) As a user listens, she can respond to the music played with a 'thumbs up' or 'thumbs down' rating,

[50] Westergren, telephone interview; Rothman "Radio Station"; Chris Dahlen, "Better Than We Know Ourselves," *Pitchfork*, May 22, 2006. http://www.pitchforkmedia.com/article/feature/36524-better-than-we-know-ourselves.
[51] Westergren, "Pandora and the Future of Music"; Rothman "Radio Station."
[52] Westergren, telephone interview.

which has an effect on the weightings of the algorithms used to generate subsequent playlists. Users can create several music profiles (called 'stations') and combine them or listen to them individually. Pandora is currently only available for listening in the U.S. Although this was always the case, initially only the input of a zip code was required and many international users listened to the service. As of May 16, 2007, however, Pandora has actively blocked IP addresses of users not in the U.S., citing pressures from the recording industry.

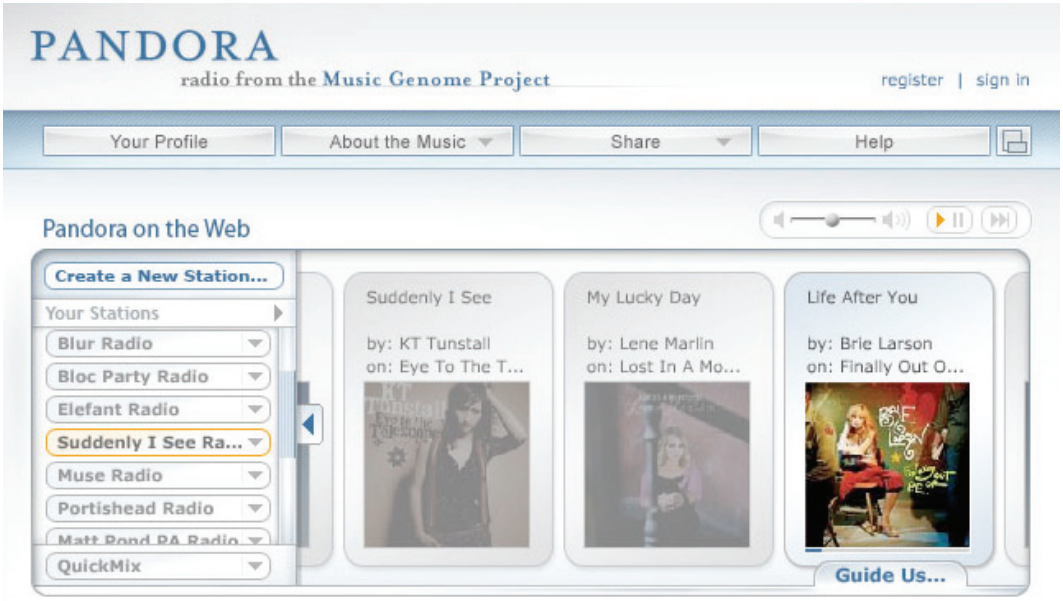

Fig. i.3 Pandora flash player

Radiolibre.ca

Radiolibre.ca was launched in January 2006 by Astral Media, a major Canadian media group that owns a number of radio, specialty and pay television, and outdoor advertising properties. Astral had licensed the technology from a Montreal company, Double V3, whose musicBOT recommendation engine was designed based on work by a team of researchers at McGill University and Université de Montréal. Radiolibre.ca tried to distinguish itself early on (at least in Québec) through its extensive database of Québécois artists and in particular of

independent and emerging local artists not being played on terrestrial commercial radio. Initially intended as a 30-day free trial followed by an option to subscribe for $6.99 per month, in late April 2006 Radiolibre.ca was launched for free, supported through advertisements. A short time later, Astral withdrew from the project and ownership of the service was officially transferred to Double V3 in December 2006 after a months-long process. Until early 2007, when it was shut down for several months before relaunching as Lycos Music, Radiolibre.ca offered streaming 'stations' driven by expert descriptors. Users could 'vote,' however, and their votes would impact the overall likelihood that a track will be played on the system, while tweaking their own profiles (collaborative filtering). Radiolibre.ca thus used a combined approach whereby expert categorizations of of music were the driving force of the service, with collaborative filtering playing a secondary role.[53] The new version of the service, Lycos Music, will use spectral analysis (automatic feature extraction from the audio file) to drive recommendations, in addition to collaborative filtering and expert tagging as before.[54]

Fig. i.4 Original Radiolibre.ca website

[53] Masse, personal interview.
[54] ibid.

Chapter Outline

The body of this thesis is divided into three chapters. Chapter One focuses on the concept of radio, and explores the ways in which radio has been historically and theoretically understood in order to set the stage for an examination of the ways in which personalized audio streaming services currently deploy the concept. In this chapter, I show that personalized audio services are reliant on an idea of 'radioness' in order to frame their own activities. Chapters Two and Three discuss the other side of the coin whereby personalized services, despite relying on radio as a discursive organizing construct, claim to improve upon and surpass the form. Initially, I address the increased user agency as compared to over-the-air music radio that personalized services promise their members. Chapter Three explores the rhetoric of opportunity that surrounds the technologies and industrial practices of recommendation-based streaming services, constructed as against a notion of traditional radio and its industrial practices that served to keep some players off the airwaves. Together, Chapter Two and Three present the case that personalized audio services do not provide an emancipatory service as their rhetoric would have it. Both user agency and the supposed 'openness' of their systems are constrained by technological and industrial factors and the realization of any emancipatory potential will depend on wider regulatory and industrial factors, among others.

As we will see in Chapter One, the definition of radioness is indeed highly disputed and in effect, unclear. To repeat, I do not, in this thesis attempt to determine whether personalized audio services are or are not radio, nor to put forth the definitive approach to radio. As a whole, this thesis can hopefully provide some context on which future researchers may continue to examine the vexed question of radio's identity in the digital age. My primary aim is instead to document some of the emerging discourses and structures of personalized audio streaming services, and to consider them against more established practices in the music radio industry.

Chapter One: Remediating Radio

According to Bolter and Grusin, new media integrate and appropriate aspects of older forms, "doing what their predecessors have done: presenting themselves as refashioned and improved versions of other media."[1] As I demonstrate throughout this thesis, the concept of radio forms an important basis for discussion and delineation of customized audio streaming services—in their design, and in promotional, industrial, and policy discourses in and around them. This chapter focuses on the ways in which customized audio services rely on a construct of radio and lays out what the construct consists of; the next two chapters discuss how these emerging services distance themselves from radio in making claims to improve upon it.

I begin this chapter by outlining some of the ways that radio has historically and theoretically been understood in order to establish that it is a continually evolving concept, but one which researchers nevertheless try to demarcate, particularly over the past decade. I then contrast the most recent understandings with the deployment of the concept of radio by personalized audio streaming services. In asserting their allegiance to radio, these music services have implicitly and explicitly privileged some characteristics or features of radio as defining ones over others. By highlighting the divergences between the former and latter conceptions, I hope to show that customized services' reliance on radio involves the assertion of a particular construct of radio that takes on certain strategic functions.

My argument in this chapter is, firstly, that radio serves as an organizing metaphor that contextualizes an otherwise unfamiliar service within a known framework. Secondly, and more importantly, this discursive construct helps to legitimize the operations of customized streaming services to the industry and to the State. This is particularly so in the United States, where the language of the 1998 Digital Millennium Copyright Act (DMCA) demands that webcasters

[1] Bolter and Grusin, *Remediation,* 14.

describe their activities in ways that suggest they do not too drastically change the terms of media experiences for their users.

Historical and Theoretical Conceptions of Radio

A dynamic medium that has "frequently reinvented itself,"[2] radio, or wireless, as it was called in its early days, has enacted and inspired numerous remediations. Early in its history, as a form of public communication and news source, radio arguably remediated newspapers and other forms of print mass media; as a broadcaster of music, it remediated live performances. Thinking of media through the ways in which they borrow or quote from others is the basis of Bolter and Grusin's concept of remediation. But it represents only one approach to understanding media.

Few writers, past and present, have been able to resist the attempt to delineate and pin down 'radio' and 'radioness'. As a result of the dynamism and internal diversity of the medium, this has been a continual challenge, not only for theorists of radio but also for those thinking about other media that have seemed to draw from it. Writing in the 1930s, Rudolph Arnheim understood radio as a broadcast medium with certain characteristics, the most of important of which was its 'blindness'—a characteristic Andrew Crisell would reaffirm as key 50 years later.[3] Arnheim felt that the effects of the 'wireless' could be replicated in other situations where the visual was absent and the aural highlighted, such as listening to records or even, he speculated, in a darkened theatre.[4] But the arrival of pictures in broadcasting complicated this conception; Arnheim believed that television stripped broadcast of its particularities as an aesthetic medium. Instead, broadcasting would become merely "a medium of dissemination" with few distinguishing qualities, since the same presentational strategies would be found in the transmitted content and in its 'real' counterpart (for example, attending a

[2] Hendy, *Radio in the Global Age*, 6.
[3] Arnheim, *Radio*; Crisell, *Understanding Radio*.
[4] Arnheim, *Radio*, 276.

lecture versus viewing a lecture transmitted live via television), the only difference being mode of transmission.[5]

Accounts of how the radio industry and its programming changed in response to the advent of television hint at other complications in understanding radio's 'nature,' 'essence,' or even uses. Writing on television in 1956, Leo Bogart was already noting that radio "ha[d] been virtually transformed into a different medium" through the advent of television.[6] From a domestic appliance around which the family gathered for many entertainment purposes, radio was being transformed into a more personal medium. New technologies for radio reception, delivery, and programming (such as the transistor radio, the clock radio, FM, and automation systems like RCS Selector) all changed the industries and the output of radio, at various points in its history, arguably remediating earlier technologies and approaches along the way.

In *Radio in the Television Age*, Peter Fornatale and Joshua E. Mills describe the changes in the U.S. radio industry and in the country's practices of radio listening in the '50s, '60s, and '70s. As the book's title suggests, these were the decades following television's replacement of radio as primary source of domestic entertainment. In the early part of this period, many programs which had previously been aired on radio were now broadcast on TV. Radio staff and personnel were migrating in droves toward television. In Bolter and Grusin's terms, television was undertaking an aggressive form of remediation, an almost wholesale incorporation of its predecessor. In reaction to these economic and social challenges, radio, despite some predictions at the time, did not fade into obscurity, but regrouped and reoriented, and "[w]here only a few years before radio had offered a standardized, coast-to-coast sound, it now spoke in a variety of voices to specialized audiences…. Between localization and specialization, radio escaped direct competition with television."[7] What emerges from this history are the ways in which programming practices, and as a result, what we, as

[5] ibid., 277. Interestingly, this appears to counter Arheim's own argument about radio. See *Radio*, esp. chap. 1.
[6] Bogart, *Age of Television*, x.
[7] Fornatale and Mills, *Radio in the Television Age,* 15-17. See also Douglas, *Listening In*.

listeners, came to understand as radio, changed a great deal. The most significant of these, in the wake of television, was the move toward the formatting of stations.

Beginning as a strategy local radio stations used in order to compete with network radio, formatting, originally known as 'formula radio,' "postulated… that listeners appreciated consistency: no matter who the deejay or what the time of day, the station would be recognizable among its competitors."[8] A major form of specialization and formatting came through the playing of recorded music on the radio. Prior to 1940, there had been legal barriers to doing so in the United States, as well as barriers of custom. Throughout the 1930s, it had become common practice for record labels to stamp their pressings 'not licensed for radio broadcast,' and as hiring live musicians to play on the radio had been the norm, airing recordings was seen as demeaning for radio networks.[9] In the 1950s, Top 40 formats became a staple of AM Radio. The rise of FM radio in the next two decades saw the development of new formats, such as progressive FM radio in the late 1960s, characterized by its use of "'sets' of music, where the disc jockey grouped songs using several criteria: songs on the same theme, several songs by the same performer, different interpretations of the same song or songwriter, or similarity of musical sound."[10] Beautiful Music formats, with their 'wall-to-wall' sound, became popular in the 1970s.[11] From a moment where radio was seen as both a threat to the music industry and above it, it evolved into a medium dependent on, and crucial to, the music industry.

Historical overviews of radio such as that of Fornatale and Mills underscore that the content and uses of the medium are not fixed and have been subject to changes as a result of economic and other imperatives. More recently, however, the arrivals of digital audio broadcasting (DAB), satellite radio, and internet radio have occasioned a moment of particularly vigorous reflection within the industry

[8] Fornatale and Mills, *Radio in the Television Age*, 13-14.
[9] ibid., 12.
[10] ibid., 130.
[11] ibid.

and among scholars writing about radio.[12] Whereas previous analyses contended with the challenges of conceptualizing radio with the advent of new receivers, new transmission technologies, new forms of programming and new economic models, in the past decade or so, radio theorists and commentators have experienced an additional complication: a change in radio's mode of transmission. For all its diversity (from ham radio to commercial broadcasting, from all-talk to music-based formats), radio could once be ultimately understood as over-the-air transmission. The advent of new means of transmission (especially digital) of what was previously less problematically termed radio complicates this premise.

Writing in the mid-1990s, radio theorist Paddy Scannell urged researchers to privilege phenomenological models of radio that focus on what radio is *for*, rather than what it *is*, gesturing away from mode of transmission as the standard for judging 'radioness'.[13] In an even bolder move, in 2000, reflecting on 'radio theory in the digital age,' Jo Tacchi wrote provocatively that "radio is what history says it is: it has no essence since it has already taken, and continues to take, different forms. Radio is what it is at a given time, in a given context of use and meaningfulness."[14] She called for more studies of the 'radio-like' on the internet and advised her peers not to dismiss internet-based radio-like forms out of hand.

Several writers have heeded Scannell and Tacchi's advice by looking into case studies of 'radio-like' services on the internet and elsewhere in the media landscape. The creation and use of terms such as 'radio-like' (as well as others that have been advanced, such as radiobility, radiogenic, and radioworld[15]) in the academe points to an increasing contemporary understanding of radio as a spectrum. However, sketching the borders of 'radioness' has involved the assertion of criteria whereby a given media object or event is more or less radio-like. Interestingly, it is in writers' encounters with automated music channels,

[12] See Tacchi, "Need for Radio Theory," 289-298; Black, "Internet Radio," 397-408; Beck "'The Death of Radio'?"; Priestman, *Web Radio*; Atton "Alternative Radio and the Internet."
[13] Cited in Priestman, "Narrowcasting," 77-88. See also Scannell, *Radio, Television and Modern Life.*
[14] Tacchi, "Need for Radio Theory," 292.
[15] ibid., 289-298; Beck, "The 'Death of Radio'?"

web-based music-only offerings, that these criteria have been most strongly affirmed.

Radio on the Internet and the Criteria for Radioness

Addressing 'radioness' on the internet has taken a couple of forms. One approach has been to pose 'internet radio' as a new medium and to then question its naming by an 'established' referent. In "Internet radio: a case study in medium specificity," for example, David A. Black is concerned that 'internet radio' (for him, potentially a new object) might inherit what we could call the 'baggage' of (commercial) terrestrial radio because of the strong effects of naming.[16] At the same time, Black points out that to some extent, internet radio involves a "functional loss and truncation" with respect to traditional radio's qualities, a loss that is strategically denied by the nascent internet radio industry.[17] As an example, he points out that internet radio was as yet (2001) confined to desktops, whereas a key feature of radio had been portability. The industry promise of future accessibility through portable devices and cars was a strategy to deny the loss by claiming it was only temporary. Black was documenting the discourses of internet radio in the first part of the 2000s and reminding readers that the claim to radioness could not be taken for granted.

Another, more frequent approach to locating radioness online has been to open up definitions of radio to include the radio-like regardless of the platform, and then to distinguish between those Web radio stations that are radio-like and those that are not, or at least, less so.[18] As mentioned above, it is primarily in confronting automated music channels that theorists of radio have most clearly stated their criteria for radioness, drawing the lines around radio in such a way as to (most often) exclude automated music channels.

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[16] Black, "Internet Radio," 397-408.
[17] ibid., 400.
[18] Examples of the radio-like include London's Resonance FM, in Atton's 2004 study ("Alternative Radio and the Internet"), versus automated music channels as unradio-like, in Priestman's 2004 piece ("Narrowcasting," 77-88).

One of the few writers to include a full-fledged discussion of computerized channels as internet radio offerings is Tim Wall. In his 2004 article "The Political Economy of Internet Music Radio," Wall includes automated music channels and personalized audio streaming services (he refers to them as 'bespoke services') as part of the family of internet music radio services.[19] His piece traces a lineage between traditional radio stations and internet-only services, sketching out, following several other commentators, the differences in business models that might be used by these services as compared to conventional radio. Importantly, his article is based on the assertion of music on the radio as a significant angle of analysis and integrated into a perspective on the public good. As he points out, too many analyses leave out or underestimate the role of music on the radio, attributing the good that comes of music radio to regulatory decisions (such as, in Canada, Canadian content rules and other stipulations made to encourage format diversity within a given market) rather than from the music.

Indeed, many studies of music radio seem to suggest that music itself is the source of the lack of 'conversation' or 'intentionality' (if not sociability) in commercial radio. One indication of this is that criticisms of radio's commercial model are rarely (or differently) levelled at commercial talk radio stations. In fact, even if we go back to earlier studies of radio, such as Crisell's *Understanding Radio*, its musical aspect is consistently considered marginal and secondary to the verbal aspect. This continues on in recent evaluations of internet radio, and, I believe, has affected the ways in which automated music channels have been discussed by scholars in the field of radio studies.

In emerging typologies for radioness, some key themes have been highlighted as crucial to radioness, regardless of the platform. Among them are ideas of liveness, human communication, and intentionality, tests which automated music channels tend to fail in the eyes of several theorists.

[19] Wall, "Political Economy of Internet Music Radio," 27-44.

Liveness

For Chris Priestman, liveness is a key feature of radio which, in assessing web radio becomes a 'make it or break it' factor. Even when accessed as an archived stream, he writes that "it is the integrity of the live experience of listening to the radio that lies at the heart of Web radio," in other words, the feeling of something having been recorded as it happened.[20]

The simulcasts of existing broadcast radio stations have generally been considered internet radio, regardless of the particularities of their programming practices. The addition of text or other interactive features in and of itself has proven insufficient to exclude the category from consideration as radio. Chris Atton, for instance, places such simulcasts in a category of what he calls the 'replica-plus' model. Most other typologies of internet radio distinguish simulcasts from internet-only transmissions. Atton is among those who do consider computerized, format radio a form of internet radio, drawing a direct link between this and computerized format radio in analogue commercial radio.

As Atton's focus is on alternative media, however, he writes critically of the form that "The music is all there is; there is no commentary, no criticism, no progress, no experimentation with the medium."[21] This criticism of an all-music offering as lacking in 'commentary,' 'criticism,' 'progress,' or 'experimentation' can be related again to Wall's observation that there appears to be a lack of critical vocabulary for articulating the role of music on the radio. Music, it seems, is considered in a category apart from the rest of programming, leading some to make the paradoxical remark that all-music radio represents the loss of radio as a form of human communication.

[20] Priestman *Web Radio*, chap. 2. *Pace* Priestman, radio's 'liveness' can be considered something of an illusion even in the context of broadcast, since the delocalisation of radio and the widespread use of automation in analog stations has meant the use of deceptive practices for feigning liveness.
[21] Atton, "Alternative Radio and the Internet," 120.

Human Communication

Chris Priestman describes the emergence of a new category of online music programming he locates at the "periphery" of web radio:

> Somewhere between the online music shop and the DJ presented web radio station, though, yet another offspring of digitalization can be found: the automated web 'jukebox'. This is altogether a more contradictory phenomenon to define in radio terms, since it is quite clearly an extension of music format radio but, in doing away with any form of presenter or news or indeed any kind of radio studio at all, it removes the essential element of broadcast communication: one human person talking directly to another or sharing with them some form of entertainment.[22]

Although Priestman acknowledges the widespread use of automation in terrestrial radio, he ultimately excludes 'web music channels' from his discussion, finding that these forms lack a fundamental quality of traditional radio: human communication:

> I classify the music channel as being on the margins of web radio, overlapping more fully with music sales that radio has done before. This is emphatically not to say it will be marginal in any other sense: the investments of the record companies in web distribution/promotion tell us that much… The question that follows though is: where does the growth of the music channel leave the rest of us–in web radio or indeed an other form of radio–who regard the medium, including music radio, as a form of human communication?[23]

For Priestman, neither the communication present in recorded music, nor the programming of algorithms or other forms of automation, themselves initiated by humans with, arguably, a certain communicative intention, are sufficient to be considered forms of 'human communication' in the sense he uses the term. The difference, it seems, lies in a question of intentionality, which for Priestman is lacking in automated music channels.

[22] Priestman, *Web Radio*, chap. 2. The automated music channels to which Priestman refers are narrowcast pre-programmed channels, not the tailored radio streams I discuss in this thesis.
[23] ibid.

Intentionality

Drawing from Alan Beck and Paddy Scannell, Priestman has identified what he sees as a bifurcation in radio between what he terms 'radio-as-conversation' and 'radio-as-music delivery'.[24] Through this bifurcation, Priestman advances a view of radio as communicative practice defined in such a way as to edge music radio out of the framework in the process. His discussion moves away from discussing radio as connected to any particular receiving apparatus, transmission type, or any particular political or economic model, using, following Scannell, an approach that is attentive to the ways in which radio is built into our everyday lives. Our relationship to radio, in Priestman's take on Scannell, is determined by a certain expectation that it will be authentic, sociable, and display intentionality and sincerity. Radio-as-conversation, for Priestman, is "a less mediated form of public conversation," the definition of which "reaches beyond spoken word to include exchange of cultural information in the broadest sense"—including music.[25] But for Priestman, an automated music channel is not up to par: "the absence of the sociable plus the emphasis on the listener's own music selection that we find on the radio jukebox, is, by even the few measures I have attempted to outline here, obviously [more] un-radio-like [than radio-as-conversation]."[26] Importantly, Priestman is not suggesting that it is automated technology in and of itself that leads to less sociability but it is the lack of intentionality he discerns in the producers of these channels. His discussion in *Web Radio* suggests that his view of intentionality is, however, a function of his perception of radio as 'human communication' where one senses that the voice of an announcer creating the threads between various other broadcast elements becomes key.

What the above discussion shows is that both historically and theoretically, radio is a contested terrain. Rather than creating my own typologies, my approach in this chapter is to document the ways is which the concept of radio has been delineated in order to contrast these with how it is being used in discourses surrounding an emergent media form that stakes a claim on radio. I

[24] Priestman, "Narrowcasting," 77-88.
[25] ibid., 84.
[26] Ibid., 86.

argue that the elements highlighted in these discourses as definitional for radio actually rewrite the terrain around the form. Liveness, human communication, and intentionality are not, in these corporate discourses of personalized online audio, the primary highlighted features of radio. Instead, radio as a visual and textual anchor, as a continuous audio stream, offering musical formats, and music promotion in an ads-based model, and radio as a form in which listeners have little control over their experiences, become the significant categories of radioness. As these characteristics are shared by customized audio streaming services and terrestrial radio, bringing these to the fore in various ways serves to solidify the connection between customized services and radio.

Customized Audio Streaming Services' Remediation of Radio

For Bolter and Grusin, there are a spectrum of ways in which remediation takes place; not all new media or particular examples of new media remediate their predecessors or contemporary forms to the same extent or in the same manner.[27] Similarly, my investigation into online audio streaming reveals that each service relies or draws on radio to a different extent. Here I draw out ways in which the services studied in this thesis have articulated the concept of radio in various contexts, and ways it has been articulated in press coverage and in other commentary relating to them.

Radio as Visual and Textual Anchor

In addition to the more evident nods to radio, such as Last.fm and Radiolibre.ca's very names, personalized services have largely adopted visual and textual references to the historical technologies of over-the-air radio broadcast and reception as a means of organizing the user experience.

[27] Bolter and Grusin, *Remediation,* 44-48.

Pandora, LAUNCHcast, Last.fm and Radiolibre users have access to a personal 'radio' or 'station,' or to several 'radios' or 'stations'. While buffering its audio stream, the LAUNCHcast player window says "Tuning…" and the iconic symbol of a broadcast tower emitting sound waves is used elsewhere on the site to indicate material in Yahoo!'s larger database of music that is available for streaming on the service. Drawing on practices familiar to radio listeners such as 'tuning in' and listening to 'stations' helps to position such services as radio for users, even though one clearly understands that while buffering, the player window is not 'tuning in' to an electromagnetic frequency in the same way that turning a dial or pushing a pre-set button on an electronic radio receiver implies. In addition to the recognizable borrowings, there are several elements on these interfaces that never existed on conventional radio tuners. But the play, stop, pause and skip buttons found on most players are familiar icons from our experiences with music players, devices that have long been integrated with radio receivers in the form of personal stereo systems.[28] Visual and textual icons associated with radio thus act as organizational anchors, creating a known framework within and against which the 'new' can be situated.

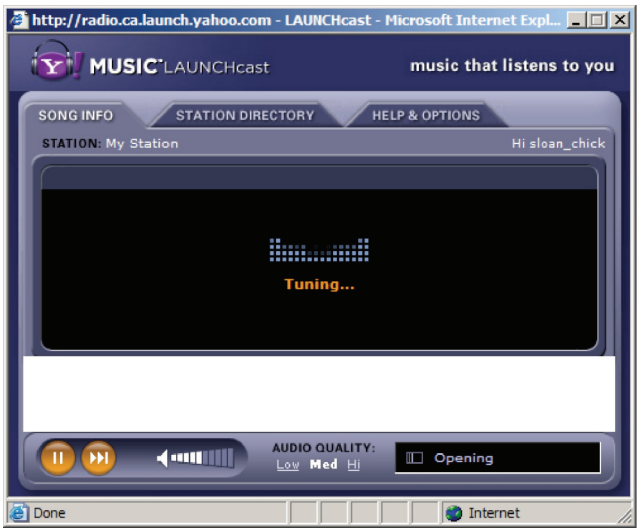

Figure 1.1 Yahoo! LAUNCHcast player, when loading

[28] Other features, such as track and artist rating systems, are novel. See Chapter Two for further discussion of user input mechanisms and the sensation of agency they can invoke.

Radio as Audio Streaming

The majority of the services explored in this thesis offer several types of services on their site, of which audio streaming is only one. The discursive link to radio stations, radio channels, and radio, however, is being used primarily to denote those sections within a website where a user can relatively easily and simply access a stream of uninterrupted music.

Interviewed in *Computerworld* magazine, Pandora's Chief Technology Officer Tom Conrad said of his site's design that,

> We wanted to build an experience that was fundamentally about audio, not about hundreds of thousands of artists' pages and recommendation pages and lots of hyperlinking and this big Web site you come to…. Lots of people have already done that. We wanted to build something that was really, really simple—sort of a one-click radio [station].[29]

Although Pandora later introduced "Backstage," an artist biography area on their site (a branded version of All Music Guide), this quote points to a perception of radio as fundamentally audio-based. We are back, in some sense, to radio as a 'blind' medium. As Bolter and Grusin write, "[a]lthough transparent technologies try to improve on media by erasing them, they are still compelled to define themselves by the standards of the media they are trying to erase."[30] Radio, by this construction, and regardless of its move to the internet, continues to be primarily understood as a form based in audio. As Tim Westergren, co-founder and Chief Strategy Officer for Pandora Media said in a January 2006 interview, "streaming is another word for radio these days."[31]

Similarly, Jonas Woost of Last.fm has said: "We have a radio service on Last.fm… The radio part of Last.fm–we're called Last.fm–we're very passionate about it."[32] Radio is thus conceptualized as a particular feature within a network, the differences between Last.fm and Pandora's approaches residing to some extent in the centrality of the audio 'parts' of their larger service. Last.fm has grown in its over four years of existence to incorporate a vast number of services

[29] Cited in Rosencrance, "Pandora.com Sings," 32.
[30] Bolter and Grusin, *Remediation*, 54.
[31] Westergren, "Pandora and the Future of Music."
[32] Woost, personal interview.

beyond streaming.[33] Users have access to charts, and can engage in social networking, receive personalized concert listings, write journals, upload images and videos, search for music material, and listen to promotional tracks on an on-demand basis. A user could interact with the site often and feel an allegiance toward it without ever listening to a Last.fm 'radio station,' whether a personal one, or any other available stream. As a result, this site less often references itself as a radio service, and increasingly less so.[34] On the other hand, Pandora.com has in recent months increased its reliance on the concept of radio, for reasons I will discuss further below.

Radio as Logical Musical Grouping (Radio as Format-Based)

Related to this conception of radio as an audio streaming function within a larger site, is the idea of radio as a logical grouping of related music; each individual audio stream with its particular set of preferences (based on a 'musical profile') becomes construed as its own radio 'station'. For Tim Westergren, the Music Genome Project, the basis for Pandora.com whereby music's 'DNA' or a series of formal characteristics are catalogued by music experts and these analyses used to generate playlists, was a natural fit for radio. After years of operating as a business-to-business service, they decided to offer a direct-to-consumer service: "[We] were sitting on this enormous collection of music, that we had analysed painstakingly for years and the best use of that turns out to be creating and manipulating playlists. So we said we're going to try to be an online radio service."[35] In this language, playlists, or logical groupings of music, are an ideal basis and framework for radio. Radio would seem to consist of music sequenced or organized in a musically or thematically logical fashion. This concept clearly draws from format radio in asserting that each 'station' has its own unique sound.

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[33] Tim Wall calls this 'metatext radio,' drawing on a term from Timothy Taylor's book *Global Pop*. Wall, "Political Economy of Internet Music Radio," 39.

[34] Instead, the social networking features are increasingly highlighted. See "Last.fm of the international playlists," *The Report* (Music Ally newsletter), 162:8 (March 2007). http://www.musically.com/cgi-bin/dislayPDF.cgi?pdf=070308/MusicAlly_070308.pdf; "CBS Corporation Acquires Last.fm, a Community-Based, Music Discovery Network with a Global Reach," Press Release, May 30, 2007. http://www.cbscorporation.com/news/prdetails.php?id=2263.

[35] Westergren, "Pandora and the Future of Music."

On Last.fm, for example, there are a variety of options for organizing music listening, and these are designated 'radio' so long as they are streams of music. The basis for the grouping of songs can be so-called 'tags,' an artist, neighbour radio, personal radio, or recommended radio. Similarly, on Pandora.com, the 'stations' are labelled by the artist or song used to initiate the stream. For example, starting a stream of music based on the artist Feist or the song "I Feel It All" leads to the creation of a station with the default name "Feist Radio" or "I Feel It All Radio". There is thus a plurality of 'radio' streams as part of the radio service on a particular site. In other words, what personalized audio streaming services claim to remediate, often, is not a single radio station, but the radio spectrum as a whole. From this perspective, each pre-set group of preferences becomes its own station. Thus radio is constructed as a logical group of programming settings, whatever the programming logic may be.

Radio as Ad-Supported, Radio as Open to Competition, Radio as Music Promotion

Numerous discussions of radio pertain to the medium as a particular industrial configuration. Radio is being delineated in discourses in and around customized services as a primarily ads-based industry in which (for the most part) several players can co-exist. Radio as a tool for music promotion also emerges as a highly significant theme.

Although historically several personalized services (Pandora, Radiolibre) started out looking to derive revenues primarily from user subscription fees, the de facto business model which has emerged is for services to offer ad-supported 'free' services. The ad-supported strategy has been discursively aligned with radio. In a recent *Time* article, the business model of Slacker, a customized service not discussed at length in this thesis, was contrasted to that of a pay-per-download service: "Unlike iTunes, music from Slacker is free," it reported.[36] The

[36] Anita Hamilton, "Learning to Love Radio Again," *Time*, May 31, 2007. http://www.time.com/time/magazine/article/0,9171,1627008,00.html.

CEO of that service was quoted in the article as saying, "Most people don't want to pay for radio."[37]

Unlike the Amazon.com retail model where the company seemingly aims to be *the* go-to place for books and more, absorbing and eliminating the competition, some personalized audio streaming services discuss their industry as one in which there is room for many players, as in traditional radio. Tim Westergren, has said: "Right now [Pandora is] the size of one radio in a medium-size market. There's a lot of room for different kinds of radio."[38] There is however, a contradiction in such constructions, when compared against other assertions of personalized audio services. On the one hand, such services construct their brands as analogous to *a* radio station, but they also, as we saw above, set up the individual audio streams they have on offer as *multiple* stations. Some services, like Last.fm, have an Amazon.com-like ambition to offer every song ever recorded for streaming on their service; through their company name and said explicitly in many interviews, Last.fm displays an aim to be 'the last radio station you'll ever need,' replacing all of radio rather than one particular station. There is no equivalent in contemporary over-the-air music radio for this state of affairs, since each station has a certain format, and competes against others with similar or different formats. Here, on the other hand, each Web-based personalized service purports to offer every format of music.

The concept of radio as a promotional tool for the music industry and the role of personalized audio services in offering promotion is key, as Chapter Three and the discussion below will also show. Personalized audio services discuss radio as an intermediary between the music industry and listeners, and as a form with a unique potential for promoting new acts.

Radio as Outside User Control

Radio is described in discourses in and around customized audio services as a model of music listening whereby listeners have limited control over what they

[37] Dennis Mudd, cited in Hamilton, "Learning to Love Radio."
[38] Westergren, "Inside the Net 6."

hear. A positive spin on this idea is the notion of radio as a form of musical surprise. As Martin Stiksel, one of the co-founders of Last.fm, said in an October 2006 interview, "Last.fm always had an emphasis on making you discover new music. On demand is not about discovery… We also find radio attractive because radio keeps you on your toes and you never know what's coming next."[39]

Such an assertion involves a construction of radio as a forum for musical discovery, which, given the limited range of successful formats on terrestrial commercial music radio (Top 40, 'urban', and classic rock, for example), is not necessarily obvious. Additionally, such a view of radio's historical role contradicts personalized audio services' claims elsewhere that commercial radio has failed to be open to new acts and played music in ever-tighter playlists of proven hits, to the detriment of their relationship with the recording industry.[40]

In reality there are very clear policy reasons why these services would want to assert their allegiance to broadcast radio. The Digital Millennium Copyright Act (DMCA), as the only comprehensive document outlining what liberties webcasters can take with the interactivity of their offers, has largely been adopted by personalized audio services as the de facto document for framing user experiences of their services, primarily in the U.S., but also to some extent, internationally.[41] In the United States, the current state of affairs is such that statutory licenses are only available to webcasters that are considered non-interactive. Statutory licenses are desirable because they imply that the streaming service is not required to negotiate deals with individual rights holders, but instead, can participate in a framework whereby royalties are paid to artists whose music has been transmitted based on a standard rate set by the Copyright Board.[42]

For personalized services, asserting their non-interactivity is tricky. On the one hand, interactivity is only vaguely defined in policy texts. What is more

[39] Stiksel, "Last.fm."
[40] See discussion in Chapter Three.
[41] Woost, personal interview; Masse, personal interview. Radiolibre.ca, the Canadian service, classifies itself as semi-interactive, and has negotiated with various labels for access to content, making no claim to 'non-interactivity'.
[42] In practice, many services do negotiate licensing deals with record labels and other content providers, because in addition to their free radio-like services, they also offer subscriptions with added on-demand or less restrictive features or given that they operate in something of a grey area, they prefer to err on the safe side.

explicit, however, is the notion of "on demand" which is a clearly interactive service. As long as they operate in this regime, the value of deferring to radio is to assert its non-predictability as a form, the ways in which it is not 'on demand,' and outside of users' direct control. In an interview with Jonas Woost, Head of Music for Last.fm, I asked about licensing issues with respect to tracks available 'on demand'. Woost emphasized,

> We're not an on-demand streaming service… Labels or artists can make their tracks available if they want to for *promotional* purposes. One has to differentiate. We're not an on-demand service, we're a radio service. Even though there are some tracks available for full-length preview, it is *not* what we do.[43]

Later he acknowledged: "It's been a bit of a struggle for the PPL [Phonographic Performance Limited], the [U.K.] collection society, to exactly establish what is a radio stream and what is an interactive on-demand stream. And we're kind of in the middle."[44]

The DMCA does not set out its criteria for interactivity in stone, but does provide a framework that ensures 'on-demand' music remains more out of reach for many services. Basic functionalities like the ability to pause or the number of skips per hour have been inferred from the text and determined through trial and error.[45] There is not much logic to the difference enshrined between webcasting and analog broadcasting in this respect. Taping off of analog radio used to be common, and the Home Audio Recording Act of 1992 made this practice legal. On the other hand, controlling the knowledge of which tunes are to be played next on internet-based services is written into the DMCA which, in the United States, governs webcasters' ability to legally broadcast. The following table demonstrates the ways in which users' listening experiences are constrained through limitations on those types of control that have not, it is claimed through a rather forgetful discourse, been hallmarks of radio, such as skipping forward and pausing, both of which were possible through taping off radio.

[43] Woost, personal interview.
[44] ibid.
[45] Westergren, telephone interview.

Yahoo! Music LAUNCHcast	Last.fm	Pandora.com	Radiolibre.ca
Skip forward (5 skips/hour); pause (after 30 seconds of a track have elapsed); change audio quality	Skip forward (number of allowable skips per hour unknown)	Skip forward (6 skips per hour); pause	n/a. Only stop and play functions are available.

Table 1.1 Comparison of allowable actions in services studied

Through this tailored take on radio, personalized audio services construct, then adopt the notion of radio as a form of listening where users are subject to certain constraints. The assertion of radio as a model of limited listener control is an important one in the delineation of these services, serving key discursive and even legal functions. Interestingly, these stated limitations on users' control of audio streaming, even 'personalized' ones, are at odds with the promotional discourse of user agency that pervades these sites' encouragements to users to 'create' or 'build' their own stations.[46] Still, for legal purposes as well as for laying claim to radioness it seems that a lack of user control is crucial.

The purpose of this discourse around radio's unpredictability for the listening public is to demonstrate that radio can be an avenue for music promotion. The consensus appears to be that the spirit of the DMCA is to encourage webcasting while ensuring that it does not deter traditional record sales.[47] As Tim Westergren has said, "Radio provides promotion whereas online distribution has no built-in mechanism for that."[48] Personalized audio services are in a position where they need to assert their promotional value for the music industry. More than showing they are 'non-interactive,' they need to show that

[46] See Chapter Two for a critique of this discourse of user agency.
[47] Susan Butler, "Sony BMG Vs. Yahoo, Closing Arguments," *Billboard.biz*. April 30, 2007. http://www.billboard.biz/bbbiz/content_display/industry/e3i449053b206874297dfc11ddcec8ace3f.
[48] Westergren, "Pandora and the Future of Music."

they do not facilitate listeners' ability to make exact copies of particular sound recordings, in other words, that they help, not hinder, the music industry's sales.[49]

LAUNCHcast vs. Sony BMG: A Brief Case Study

The recently concluded SONY BMG copyright infringement suit against Yahoo! LAUNCHcast provides a concrete example through which to analyze the legal and policy discourses arising around radioness and interactivity in the context of personalized audio streaming services (referred to in this literature as 'customer-influenced webcasters'). In 2001, Launch.com, then an independent website, was sued by the Recording Industry of America (RIAA). RIAA charged that Launch.com was not eligible for statutory rates under the DMCA because the service allowed users to influence the music they heard on its audio streams. Within this legal context, comparing Launch's service to that of broadcast radio and practices around it became a crucial argument for the defence. Launch.com and several other services, represented by the Digital Media Association, took the approach of showing the ways in which these services shared characteristics with traditional over-the-air radio.

> Consumer influence in radio has existed for decades pre-dating the Internet. Listeners choose what radio stations they wish to listen to based on the type of music they prefer to hear; and the pre-set station buttons on most radio receivers are emblematic of the fact that listeners frequently change stations to suit their musical tastes. Traditional radio programmers also employ both call-in request mechanisms and computer programs to help create station playlists precisely to be responsive to consumer listening preferences.[50]

A construction of commercial radio as responsive to its listeners and invested in their interests is also a very particular one, somewhat generous with respect to commercial music radio. As Jarl Ahlkvist has argued, there are numerous ways in which program directors at terrestrial music stations make

[49] This fear is reminiscent of the early discourse around home taping. See Kembrew McLeod, "MP3s Are Killing Home Taping," 521-531.
[50] "Complaint for Declaratory Judgment," p. 2, lines 23-28.

decisions about playlists, and only some of these ways involve attentiveness to listeners' tastes; still fewer involve direct research of expressed tastes.[51]

Six years later, the case, by now between Sony BMG (the other members of RIAA had dropped their charges) and Launch (now acquired by Yahoo!) was finally decided, in favour of Yahoo! Reporter Susan Butler described the closing arguments in a piece for *Billboard Online*:

> Michael Elkin, a partner with Winston & Strawn in New York, argued for Yahoo! The service was 'arbitrary, random, unpredictable,' he told the jury…. Using a large screen in the courtoom, Elkin displayed a colorful diagram of a blinking radio transmission while arguing that radio has always been an important promotional tool to sell records – and that record labels don't receive any money for these broadcasts. Elkin argued that five categories of the service operated without any user input. Only three categories permitted the user input to select songs. Even then, the input created more randomness, he argued. To demonstrate this randomness, a depiction appeared on the screen in the courtroom showing a universe of stars. As the user makes more selections, Elkin argued, more data is added (and more stars kept appearing in the universe on the screen).

A particular construction of radio is at play in these legal arguments. The 'randomness' and 'unpredictability' of LAUNCHcast ultimately serve to legitimize the form. Moreover, demonstrating that the programming intentions and effects of LAUNCHcast were not dissimilar from those of broadcast radio—intentions and effects that are posited in a particular fashion—was also key. As Butler continues,

> Elkin also argued that a user's selections are not streamed to the listener immediately; a user who selected a Natalie Imbruglia song and rated it as a favorite didn't hear it again for 3-1/2 hours. And even though a user listening to the service could skip to the next song (i.e., not be forced to listen to every song before hearing more favorites), this was the functional equivalent to a radio broadcast, he argued; it was no different than a radio listener changing stations on a radio.[52]

The discourses of radioness, and in particular, radio as outside of listeners' direct control, present in the closing arguments of the LAUNCHcast court case begin to hint at the very strategic and important uses of drawing on radioness in various fora for those emergent services whose legal status is as yet unclear.

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[51] Ahlkvist, "Programming Repertoires," 339-58. See also Ahlkvist and Faulkner "Are They Playing Our Song?" 155-176.
[52] Butler, "Sony BMG Vs. Yahoo."

Strategic Uses and Effects of Allegiance with Radio

As the first section of this chapter demonstrated, the status of music-only offerings on the internet as radio is not necessarily obvious. Since the concept of radio is the subject of much vigorous debate in the academe, and since it appears to be an increasingly elastic concept, the approach in this chapter has been to discuss the ways in which the concept of radio is mobilized by personalized audio streaming services. What remains to be discussed are the effects of this mobilization. To examine these is not to suggest that personalized audio streaming services are intruders onto radio's domain or to label them 'unradio-like'. Rather, I have been exploring what 'radio' is considered to be in these discourses, believing that its status is being constructed through these discourses. As David Hendy has written, "the critical question is, what sort of radio do we have nowadays. And what role does it play in contemporary society."[53] This thesis looks at a category of music service that has self-described as radio. But what work does the naming and association of these services with traditional radio effect?

Organizing Information for Users

To summarize what we have seen above, one of the principal effects of the visual, textual, and discursive claims surrounding personalized services is that of solidifying the concept of radio as a form that is outside of listener control. We might characterize the nature of the control one has over one's listening experiences in general as that of the power to choose, one the one hand, 'what to hear,' and on the other hand, 'what to hear next'. That is, one can control, to a certain extent, the content, but not the sequencing of music or one can have increased control over both content and order. With traditional Top 40 radio, while one cannot predict nor directly control the exact order of songs, at a given

[53] Hendy, *Radio in the Global Age*, 3.

time, one can expect to hear certain genres, artists, and songs. By interacting with the dial on a radio receiver, that kind of agency is in the hands of listeners. This is different from the kind of experience we get listening to a personal stereo, or music library management software, where I, as a user, control not only 'what to hear' in a more specific way than is possible with conventional radio, but also 'what to hear next'. The practice of home taping made it such that the terms of listening could to some extent be controlled by listeners, despite radio's 'liveness'.

But the ways in which the concept of radio in the discourses of personalized audio services has been deployed serve instead to entrench a particular idea of limited control as that which characterizes the experience of 'radio'. Radio becomes a media form recognizable by this particular relationship to listener control. Since customized services are also characterized by limited control over 'what to hear next' (if allowing one to delimit 'what to hear' in a general sense) then it can reasonably also be construed as radio.[54] Constructing and then claiming radioness is a strategy on the part of personalized streaming services to explain away the restrictiveness of their offerings by slotting them into a 'known' (in reality, rewritten) framework.

Legitimizing a Model of Online Music Distribution

The late 1990s and early 2000s were a time when many dot.com companies sought out ways of legally distributing music over the Web.[55] Although contemporary broadcast radio does not have a perfect relationship with the music industry, and has had its share of clashes (witness the 'home taping' debate in the 1980s, not to mention the 1930s period of marking records 'not licensed for radio broadcast' as we saw above), music radio today is nevertheless a legitimized form with an established relationship with the recording industry. Furthermore, because there is a process, undertaken by the State, to allocate broadcast spectrum

[54] Chapter Two focuses more of the ways in which, despite this important discursive function, in other ways, the control users exercise over their listening experiences is made to appear more direct through a rhetoric of personal agency.
[55] Westergren, "Pandora and the Future of Music."

and regulate the activities of the industries in this sector, it seems fair to state that radio and the business of delivering music on over-the-air radio is an established industry, and viewed by the music industry as legitimate, and even crucial for its own work, as a "shop window"[56] for its wares.

I would argue that one of the functions the reliance on a radio metaphor serves is to legitimize the work that online radio services do. By asserting themselves as radio services, through self-presentations in various arenas, including text on the websites themselves, and in legal arguments such as the ones described above, the allegiance to radio and more conventional webcasters serves to legitimize these services even as their forms are rather unstable and their legal status at times unclear, or at the very least vulnerable at the current moment.

It is interesting to note that as these services move from applications accessed primarily through desktop and laptop computers to mobile applications, the link to traditional radio is more easily and explicitly asserted. A look at Pandora.com's trajectory provides an example of this. At an October 2006 Town Hall meeting, about a year after Pandora launched to the public, Tim Westergren made clear that mobile was on his mind.[57] By April 2007, Pandora had launched its 'Pandora Everywhere' platform, implementing plans to gain a presence throughout the home (thanks to such devices as the Squeezebox[58]), and announced their partnership with Sprint in the United States that would facilitate Pandora listening via mobile phones. At this time, the Pandora main website and user interface, which had seen no substantial changes since the launch of the service in September 2005, was redesigned. Among the most prominent changes was a change in the header of the site: from "Pandora: brought to you by the Music Genome Project" to "Pandora: Radio brought to you by the Music Genome Project". The affirmation of Pandora's radioness came at a time when it was moving off desktops and back into the 'ether'.

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[56] Hendy, *Radio in the Global Age*,168.
[57] Westergren, "Pandora and the Future of Music."
[58] The Squeezebox is a WiFi digital media player that allows users to listen to internet-based streams without having their computers turned on.

Fig. 1.2 Pandora.com main page headers. September 2005 through May 2007; as of May 2007

The change also came at a time when internet webcasters are banding together to lobby the Copyright Board in the United States for fair royalty rates. In Pandora's case it would seem that there were many economic and structural reasons why it could, after two years of conceptualizing itself as a next-generation radio service, more strongly assert this allegiance.

The issue of business models and structures and their relations to discourses around radioness is particularly interesting. Pandora operates as a direct-to-consumer website and is currently independently owned. Because they are not part of a larger company's portfolio as of yet, they are, perhaps, better able to assert a connection to radio. There are counter examples to that of Pandora. For example, Last.fm was recently acquired by CBS Corp., not for its radio division but as an addition to its CBS Interactive group of services. In the press releases and commentary surrounding this purchase, the radio offerings of Last.fm are emphasized much less frequently than its status as a social networking platform used by millions of people in many countries. Similarly, Astral Media, a Canadian media company with many conventional radio, television and advertising properties, launched Radiolibre.ca but backed out of the project only a year later. During its time in the limelight, the links to radio were most often de-emphasized, its managers assuming that those who would go to the Web for music would want something other than the typical offerings. Radiolibre.ca had different staff and a different frame of mind as compared to Astral Media's conventional radio offerings. The service has since been picked up by Lycos.ca, a search engine portal. In contrasting the Radiolibre and the Last.fm example, both involving a traditional media company as an investor, one could ask why one company would abandon a project after so much investment, while the other would pay $280 million in cash to acquire it. The difference here, however,

might be in the stages at which the companies invested in the online services. Astral Media invested in creating Radiolibre.ca from the ground up, albeit by enlisting the services of Double V3, a technology company that already had much of the technology in its hands. On the other hand, CBS Radio has acquired an online property which will continue to be managed by Last.fm as before.

Surpassing Radio

Simultaneous to their construction of, and reliance on radioness, however, customized services must introduce their market differentiation: what makes them special, different and better than conventional radio. Two main arguments have been advanced: firstly, that personalized services provide users with more choice over their listening as compared to traditional radio (while putting forth musical discovery as a significant area of value) and that they are therefore more personally significant to users. Secondly, that personalized streaming as it has been applied through collaborative filtering and content analysis introduces the possibility of a more equal access for artists to relevant audiences, and diminishes the power of institutional gatekeepers such as music directors in the determination of playlists. This chapter has addressed the ways in which customized audio streaming services rely on radio and its codes to construct themselves as comparable and analogous services in particular strategic fashions. The next two chapters examine how customized audio streaming services articulate their worth over traditional music radio.

Chapter Two: The Rhetoric of User Agency and Personalization

While the last chapter showed the various ways in which customized audio streaming services rely on discourses of radioness in order to frame their own activities, this chapter introduces the first of two principal claims through which these same services assert their value over traditional radio: the idea that they provide the user with a more personally relevant musical experience than broadcast ever could. Users, it is suggested, have a more participatory role to play in the determination of their playlists than has been possible in traditional radio. Personalized audio services through their one-to-one audio streaming, particular user interface design, and recommendation engines purport to both *reflect* and *anticipate* users' personal preferences. This claim, together with the second, that services based on music recommenders level the playing field for artists (discussed in Chapter Three), participate in the construction of customized services as emancipatory forms of music listening and distribution.

Such claims would likely come as little surprise to Bolter and Grusin, who in formulating their concept of remediation, noted that new media promote themselves as offering users more immediacy–greater access to 'authenticity' and the 'real'—than their predecessors. Ironically, they note, this sensation of the erasure of mediation is typically achieved through the second main aspect of remediation: hypermediacy.[1] With customized audio streaming services, that claim of immediacy is made through the very aspiration to personalization of the service. Personalized streams are said to reflect a given user's personal tastes and preferences. But mobilizing that attempt at personalization involves the creation of mediating recommendation algorithms, user interfaces incorporating ratings systems, not to mention hardware and music itself; in other words: hypermediation. Furthermore, recommendation systems aim not only, not always, and not primarily, at 'recovery'—or surfacing material a user has already identified as of interest—but at 'discovery'—that is, surfacing material that is

[1] Bolter and Grusin, *Remediation*, 81.

predicted to be of interest to that user. As the concept of personalization operates in recommendation systems, then, it can be understood as having two facets, corresponding more or less to recovery and discovery. The first results from a user's input, and might best be described as 'preference setting,' or from the perspective of a given system, *reflecting* user preferences. Recommendation involves something more, however: *anticipating* user desires based on expressed preferences; whether the prediction is based on other users' input or on content analysis is then a matter of recommendation technique or approach.

If some of the above seems abstract, in what follows I tease out the workings of these two facets of personalization by examining the discourses of agency, the user interface design of music players and, briefly, the underlying recommendation technologies of personalized audio streaming services, analyzed in more depth in Chapter Three. This chapter is divided into three main parts. In the first, I supply evidence of the discursive promises made by personalized audio services as regards user choice, agency, and personalization, contextualizing these within a larger rhetoric about the Internet's personalizing capabilities. Using Tara McPherson's 'Phenomenology of Web Surfing' as an organizing framework, I then consider the user interfaces of several services in order to suggest ways in which, similar to corporate and promotional discourses, these work to structure feelings of agency in the user even as real choice is actively limited in various ways. The last section addresses some of these limitations; despite the sensation of agency that can characterize our interactions with personalized streaming services user input must ultimately be recognized as only one element in a complex of factors (including regulatory, political economic, and technological factors) that impinge upon what is heard on personalized audio streaming services.

Recalling the last section of Chapter One, we might remind ourselves even as we look at the ways personalized services are constructed as superior to traditional radio, of the value for industry players of establishing such services as radio-like: in some sense such an association distracts from other forms of music consumption which involve even more agency, and simultaneously suggests that

complete control of this kind is not desired by users. Personalized audio services are advanced as a hybrid model that surpasses radio by allowing users input into the kinds of music heard on their 'stations'. By comparison to a technology such as the iPod, however, personalized audio services clearly allow users much less agency over what they hear and how they hear it.[2] The analogy to radio therefore serves to maintain the claim of novelty by introducing personalization into radio.

While the distinction between primarily collaborative-filtering based services (such as Yahoo! LAUNCHcast and Last.fm) and primarily content-based services (Pandora.com and Radiolibre.ca are my examples) has not been highlighted thus far, some of their differences are worth commenting upon in this section, and will continue to be of interest in Chapter Three.

Me Radio: Discourses of User Agency and Personalization

A reporter for *Time* magazine recently began her article on personalized audio streaming services in this way:

> Radio's got a problem. Although some 200 million people tune in each week to hear their favorite overcaffeinated DJ or catch those crucial rush-hour traffic updates, it's getting tougher to hold listeners' attention. Facing flat revenues and competition ranging from iPods to music phones, the 87-year-old industry is scrambling to reinvent itself. But not even satellite radio or the new HD format addresses this analog medium's fundamental flaw: it doesn't give people any say in which songs they hear. If you don't like a track or a DJ, your only option is to turn the dial--or turn it off.[3]

The piece goes on to contrast the broadcast model of limited listener control with that of streaming services:

> On websites such as Last.fm, Pandora.com and the new Slacker.com, personalized radio lets you train it to understand your tastes. You can, of course,

[2] Jon van der Veen has discussed the ways in which although theoretically, a user could have unprecedented agency over iPod playlists, in practice iPod users often defer to the Shuffle mode, use 'Smart' playlists, or listen to professional or peer mixes. See van der Veen, "The Playlist Mode."
[3] Hamilton, "Learning to Love Radio."

Fig. 2.1 Poster from Radiolibre.ca ad campaign, 2006

> just listen to the music passively as it plays on your computer. But it's even better when you make it your own, by marking each song as a favorite, skipping past it or banishing it from the station's playlist altogether.[4]

The article posits the possibility for users to have an active relationship with the streaming service, one that, with the right training, can be remade to reflect their personal tastes.

A principal tenet of personalized services involves the contention that musical taste is uniquely personal. In a panel on recommendation engines held in the Fall of 2006 that featured commentators involved with the development of various playlist generators and other technologies that are driven by recommendation engines, one panelist suggested that companies involved in this area of commerce and research are engaged in

> trying to improve the quality of locating each individual uniquely in this hypersphere [of musical taste], this sixty-dimensional manifold or how ever many dimensions we end up saying it is, where you occupy a unique space based on your own history of consumption and preferences and who you are, and yet a space that doesn't limit you to the bubble that you were initially placed in, that allows you to discover new things, and traverse from here to [there in musical] space without having to pass through dangerous territory which is music that's going to annoy or irritate you…. the ultimate gold standard is 'do I like it? It works if it works for me.'[5]

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[4] ibid.

[5] Daniel Levitin, "Recommendation Engines and Music Discovery." Dr. Levitin, a McGill University psychology professor and best-selling author was involved in the development of MoodLogic, one of the first online recommendation engines.

Not only press coverage, but also the promotional rhetoric found on the websites of customized services and in ad campaigns off-line, promotes this conception. These services describe their offerings as "radio that learns what you like and gets better," as Last.fm puts it in one of their banner advertisements. Slogans and taglines such as "You are the DJ" and "Music that Listens to You," encouragements on the sites to 'create your own station' or 'build your own channel,' and the default titles of customized audio streams—"my station," "your station," or "[username]'s station"—discursively invest users with agency and choice over their listening experiences.[6] To recall Bolter and Grusin's terminologies, the claim to immediacy of personalized services takes the form of offering users musical programming that is targeted to their personal tastes, rather than mass prescribed, as in conventional radio. As Tim Westergren, co-founder and Chief Strategy Officer for Pandora.com has commented,

> In the long run I think what the internet has provided is the technology, the infrastructure, that allows you to stream something much more personalized and customized to an individual, and that is just a far more attractive proposition than broadcast... If you have a choice of tuning into a station that's programmed for 10 million people or half a million people, versus a station that you've personalized, I think the choice is pretty obvious.[7]

Contrasting his service to broadcast radio, Martin Stiksel, one of the founders of Last.fm, has similarly remarked that "People want to have a custom station of their own and they can't do this if a DJ is in control. Then the only control you have is to change the channel. But on Last.fm you can configure your own radio station and the more you use it, the better it gets."[8] Both of the

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[6] The taglines quoted are from the websites of Radiolibre.ca and Yahoo! LAUNCHcast, respectively. Interestingly, Slacker, a service not discussed at length here, uses the tagline "kick back and listen," and the service name itself seems to emphasize the non-interactivity of the channel. Although the interface of the service is similar to that of Radiolibre.ca and can be customized, the emphasis in the promotional language is contrary to that of those services studied here. It should also be noted that the enticement to 'create a station' serves a different function than that of creating a 'playlist': a station is like a format, or set of preferences, whereas a playlist describes the particular tracks to be played, and sometimes the order, much like on an iPod. The distinction is most relevant on Last.fm, since the service offers listeners the ability to program such playlists (still within certain parameters); other services only offer the ability to program settings or 'stations'.

[7] Westergren, telephone interview.

[8] Nigel Cassidy, "Will Digital Kill the Radio Star?" *BBC News Online*. February 19, 2007. http://news.bbc.co.uk/2/hi/technology/6376857.stm.

preceding quotes reference the one-to-one audio streaming technologies of internet radio as one source of their improvement over analog radio; Stiskel also likely refers—since they are the means of 'configuring' and 'using' one's stations on Last.fm—to users' explicit ratings of tracks, to audio 'scrobbling' (that is, implicit input of user listening habits via Audioscrobbler, what Last.fm refers to as their 'myware' software application, with a nod to 'spyware,' but implying personal surveillance of one's own habits[9]), and to the collaborative filtering processes that are enabled through these explicit and implicit ratings. In other words, the means of attaining personalization is attributed to the fact that these services are web-based, and, in part, to their recommendation systems.

Audio streaming services based on collaborative filtering, like LAUNCHcast and Last.fm, tend to make strong claims around user agency, because not only do their user interfaces allow for customization, but the very recommendations provided by the service derive from user input. For example, in describing his position at Last.fm, Jonas Woost, Head of Music for the service, described his job as enabling for user agency:

> In the UK we call [Head of Music] the person who sits there with everyone and decides what gets on the A list, on the B list, and what gets playlisted and all that kind of stuff. Now obviously I don't do that at all. What I *do* do though is, I am the middleman between all our users (so they're basically the Head of Music) and the musicians and the labels. So I just facilitate that users can make decisions… that's the idea.[10]

Woost's comment, unlike the more simplistic approach taken in his site's advertising, displays an appreciation of the work of content acquisition as a factor influencing user agency; users' ability to exert agency would not be possible without work on his part to ensure music is available for streaming on the service. Users' relationship to the content they hear on Last.fm's audio streams is nevertheless construed as one involving decision-making, as in Westergren and Stiksel's comments quoted above. This is interesting because personalization in this context implies delegating tasks to an algorithmic system. While the engines

[9] Of course logging one's habits using Audioscrobbler and publicizing them through Last.fm means that one is not alone in gaining access to the information gathered by the program.
[10] Woost, personal interview.

can be said to 'replace' or at least 'displace' users' decision-making processes, nevertheless the rhetoric often stresses the agency users gain through the use of personalized services.

Recall that personalized audio services do not merely or even necessarily stream the particular tracks or even artists desired by a user, but material that may be of interest based on user inputs. This is positioned as an advantage from the point of view of consumer interest in musical discovery. As is highlighted in one of Pandora's patents,

> Although a tailored Internet radio "station" could simply broadcast music selected by the user, a more useful implementation would involve the prediction of the musical taste and/or preferences of the user, in order to provide a stream of musical selections that are unfamiliar to the user… In order for such new musical selections to be correctly chosen and broadcast, the musical taste and preferences of the user must be accurately determined. Otherwise, the user might easily lose interest in the tailored radio "station".[11]

As we will see in Chapter Three, this also serves a key promotional function, since artist 'similarity' functions can serve as kinds of branding tools for other artists. The constraint of licensing agreements (whether statutorily defined or individually negotiated with content providers like record labels or aggregators) also plays a role in how much control a user can legally have over the terms of their listening experiences, as we saw in Chapter One.

Despite the focus on user agency in promotional rhetoric and textual features of the interface, then, the very structures of the services suggest that the endpoint objective of customized services is not user agency *per se*, but rather a larger sense of personalization. The promise that user input will allow for personalization is not so much an assertion of user agency, but a statement regarding a certain confidence in the recommendation engine's ability to surface relevant material on users' behalf, to be accurately reflective of their selfhood.

Some of the more muted claims around listener agency recognize this. Todd Beaupré, Director of Product Management, Personalization for Yahoo! Music, has said,

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[11] Gang and Lehmann, "System and Method for Prediction of Musical Preferences."

> About 15 years ago, there were two modes of consumption for music: there was complete control through physical CDs where you own the music, you can decide exactly what song you want to listen to when, and then there was the other end of the spectrum, which was radio, which gave you very limited control over what you listened to, with a very limited number of channels. Now that we've moved music into the digital world, it's easy to replicate those experiences by pre-programmed Internet radio and digital downloads. But we believe that there's a 'sweet spot,' in between those extremes of on-demand and radio, that will give people the value of discovery that radio brings, but in a much more relevant context to their personal interests, and a better level of control over that discovery.[12]

In a similar vein, Stiksel of Last.fm calls his service an "ideal middle ground between having an intact experience and being in control of what you receive."[13] These discourses, are however, much less prominent than those proclaiming user agency that pervade the online space through which listening actually occurs.

While it is possible to continue forward with a critique of the corporate discourses around agency, and I will engage in such an analysis further on in this chapter and in the next, for now I will take a detour through a different approach in order to address the user interfaces of personalized audio streaming services and consider how they can work to structure a sentiment of user agency into the very interfaces of personalized streaming.

The hype in some quarters over personalized radio and recommendation engines is only one recent instance of internet-based media touting their ability to provide an unprecedented and individualized experience. Tara McPherson has observed that at various industry conferences hosted on the 'Digital Coast' of the U.S. during the late 1990s, the Web was advanced as a 'better' version of television, in part through the mobilization of rhetoric around personalization and empowerment. The Web was described as "software that gets familiar with you," with its niche programming allowing for "deeper, focused, interactive content

[12] Beaupré, "Propelling Music Personalization."
[13] Stiksel, cited in Hamilton, "Learning to Love Radio."

tailored to individual interests, style and taste."[14] This promised capacity of the Web to offer tailored, 'interactive,' and ultimately, personalized experiences, gave it a discursive edge over television with its 'preprogrammed flow' and orientation toward a mass audience.

But while McPherson acknowledges the importance of addressing corporate discourses in understanding new media—and clearly this is one of my principal interests throughout this thesis—her approach in the book chapter from which I draw here moves from delineating corporate rhetoric to addressing the user interfaces and underlying programming of the Web, because, as she notes,

> [w]hat a medium like the Web is or will be, in its very form, is not separate from the discourse which surrounds it and which structures particular conditions of possibility. Yet, if these discourses shape what the Web might become, they are also shaped by the medium and its particular material forms.[15]

This latter stance can be aligned with the SST (Social Studies of Technology) perspective whereby technology is never just a 'thing,' as our everyday usage of the term implies; rather, in the formulation advanced by Jennifer Daryl Slack and J. Macgregor Wise, technological culture can best be understood through the twin ideas of articulation and assemblage. These are, respectively, connections, and a particular constellation of articulations between elements that result in a particular state of affairs that is never necessary and always subject to change).[16] Agency flows through these constellations or arrangements of elements, which can be concepts, institutions, practices, as well as 'things'. In the present case, for instance, I would argue that agency over what is heard on a given personalized audio stream is exerted by policy frameworks, content acquisition practices, the techniques and particular algorithms of recommendation engines, business models, and user input, not to mention assumptions around how people form their musical tastes.[17]

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[14] Rob Tercek, former VP of Digital Media at Columbia's Tristar Television Group, cited in McPherson, "Reload," 199; Pseudo Web site, cited in ibid., 199-200.
[15] McPherson, "Reload," 200.
[16] Slack and Wise, "Articulation and Assemblage," 127.
[17] Crucially, for Slack and Wise, a full analysis would require not just a list of influential elements but an actual mapping of their connections that would acknowledge differences in the amount and kind of agency exerted by each element in the assemblage. Such an analysis is beyond the scope

This conception of articulation and assemblage depends on the notion that it is not only users who have agency in a technological system. Technologies in the more common sense of the term, as 'things,' also have agency. Following Bruno Latour, technologies are mediators, not intermediators, the difference being that "a mediator is active and presumes a transformation."[18] The transformation effected by technologies is referred to by Latour as 'delegation,' and the concomitant changes in our human behaviour are called 'prescription'. Slack and Wise provide the example of a telephone, which becomes one of the factors impinging on a conversation—a cell phone and a home line structuring differing relationships of possibility.

An understanding of these processes underpins McPherson's article, but the value of her particular approach lies in recognizing the sentiment of agency that is invoked not only by corporate rhetoric but also by the design of user interfaces. For McPherson, the rhetoric around 'choice' on the internet at industry conferences, as hyped as it was, had a level of resonance with her experiences surfing the Web. Rather than dismiss the discourses out of hand, then, she looks to the Web itself and its structures, viewing it as a "mediator between human and machine, and as a technology of experience."[19] From this perspective, McPherson formulates a 'phenomenology of Web surfing' that focuses on its ability to frame three sensations she calls 'volitional mobility,' 'the scan-and-search,' and 'transformation'. She conceives of these modalities as related both to the Web's materiality and to its corporate strategies of address. McPherson's main conclusions are that despite the sensations of agency the Web may create, several other factors work to constrain and limit that felt agency, including the very architectures of the Web and the structuring effects of the user interface.

In what follows, I draw on McPherson's frameworks to contextualize the user experiences of customized audio streaming services as Web-based, while

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of the present work, however, a more sustained discussion of these elements is found in Chapter Three. Here I focus on the sensation of agency we find in the user interfaces of personalized audio services, and on the notion of delegation.

[18] Slack and Wise, "Agency," 117.

[19] McPherson, "Reload," 201.

highlighting some particularities of interacting with the user interfaces—the music players—of these services. Indeed, if it is easy to identify corporate rhetoric as flawed in attributing users agency over their audio streams, it is also of interest to address how and why it at times seems plausible. Listening to personalized audio does indeed *feel* different from listening to traditional radio. So how is that sensation structured? My approach here mirrors McPherson's, as I pass through a consideration of the experience of the user interface in order to better approach the emancipatory claims around user agency over musical programming on these services.

Me and the Music Player: A Phenomenology of Customized Audio Streaming on the Web

McPherson was working with the Web as a whole as the point of departure for her reflections, though she used online video upstart Pseudo and MSNBC portals as anchors in this thinking. Her observations of the experience of websurfing are useful for exploring the ways in which we interact with and experience personalized audio streaming services, although there are some differences that I will suggest in what follows. To McPherson's modalities of the Web, I add one more: 'feedback and generation' (explained below) in order to address what I see as a quite salient aspect of the experience of using customized audio streaming services.

Volitional Mobility

Drawing on Jane Feuer's discussion of television's illusion of 'liveness' as central to the medium, McPherson suggests that "[l]iveness remains a key dimension of our experiences on the internet, a medium which also promotes itself as

essentially up-to-the-minute."[20] But this is liveness (or its illusion) *with a difference*, she maintains; it is liveness on demand. The sensation of agency over liveness that one finds in using the Web McPherson calls 'volitional mobility'. This sensation describes the generation of a :

> circuit of meaning not only from a sense of immediacy but through yoking this presentness to a feeling of choice, structuring a mobilized liveness which we come to feel we invoke and impact, in the instant, in the click, reload.[21]

McPherson traces the origins of volitional mobility to one's ability to move a cursor through space while surfing the Web, a kind of causal relation of clicking and impacting which becomes felt as a form of agency. It is, in short, "the experience of choice (or its illusion) within the constraints of Web space and Web time."[22] Such an experience structures users' interactions with personalized audio streaming services as well, and not surprisingly given they are web-based.

One important empirical difference between traditional over-the-air radio and personalized audio services, derives from the basic premise that what is involved is an audio stream, a one-to-one technology as distinguished from the broadcast model where a single and particular 'stream' makes its way to many listeners simultaneously. Thus, radio listening is accompanied by the understanding that other people are listening to the same thing at the same time; listener preferences—if they are taken into account at all—are distilled into a single playlist that everyone listens to. In contrast, personalized services generate millions of individualized streams of audio.

Audio streams on personalized services are typically accessed either through dedicated applications or players (Last.fm) or via Flash applications directly on a Website (Pandora, Last.fm). Some players use a Windows or Real Media-based branded player that opens up in its own browser window (Radiolibre.ca, Yahoo! LAUNCHcast). In addition, personalized audio streams are increasingly available integrated in other settings and applications, such as

[20] McPherson, "Reload," 202.
[21] ibid.
[22] ibid., 203.

Yahoo! Messenger, and Facebook.[23] The sensation of choice in interacting with these interfaces comes in part through the presence of buttons containing iconography familiar from our use of personal stereos. The web-based player offers itself up to my demands with play and stop capabilities, a skip forward button (on virtually all services), and a pause button (on most services).[24] I click, and impact, imposing my will on the audio stream, causing it to buffer, then play, or cease to do so. This sense of choice in turn relates to McPherson's second modality of Web experience, 'the scan-and-search,' as distinct from television's flow, theorized by Raymond Williams.[25]

The Scan-and-Search

Williams described television as a 'planned flow,' and as "the defining characteristic of broadcasting, simultaneously as a technology and as a cultural form."[26] Flow unites various elements of television, establishing a planned sequence more important than individual segments of programming. For McPherson, segmentation on the Web differs from that of TV since the Web's version of segmentation, which she calls 'chunking,' "is spatial as much as temporal; our experience of moving through these chunks may seem akin to our experience of TV's flow, but this is also a *boundlessness* we feel we help create or impact. It structures a different economy of attention than that underwritten by flow."[27] In contrast to the 'glance-or-gaze' modality seen as characteristic of television or film, "[w]ith the Web, we feel we create the sequences rather than being programmed into them."[28] We have the sense of deciding where we want

[23] The streams are also being integrated into mobile experiences via cellular networks, I nevertheless limit the discussion here to the desktop interfaces of these services and more specifically, those found on the services' principal sites and stand-alone players.
[24] As was suggested in Chapter One, the integration of these seemingly simple buttons is highly contentious and is negotiated through licensing agreements and in dialogue with policy structures such as the DMCA in the United States.
[25] Williams, *Television*.
[26] Williams, cited in McPherson, 204.
[27] ibid. Emphasis added.
[28] ibid.

to go by entering URLs and clicking on links. The scan-and-search modality reflects a "heightened sense of choice and mobility through navigable spaces."[29]

On customized music players and elsewhere on the services' sites, I am almost always provided with links to purchase tracks and other bookmarks are handy nearby, inviting me to take further action with the track.[30] These players display contextual images (album art, promotional photographs) and text (song and artist name at minimum; sometimes album title and biography, news, or other information) as each track is played (see Figs. 2.3 and 2.4.). We might say that the invitations to browse artist pages, look up fans of artists in social networking and community-oriented personalized audio service models, reflect the scan-and-search modality. This feels like an active stance, in this case, toward music discovery. In the scan-and-search modality, the music player window is a gateway to a much larger information landscape that can be accessed to learn about artists' biographies, actively seek out recommendations from fellow listeners, and so forth.

For McPherson, because the scanning and searching feels more 'mobile' than it did in television, it also feels more active and filled with agency. But to take both of these ideas and modalities a step further, with personalized audio services, that sense of liveness and agency comes not only from initiating a stream of audio with its associated parade of album cover art shifting as the songs begin and end, but from the ever-present possibility of creating new audio streams, and of interacting, of expressing a rating or preference, of creating new inputs, to which the service will have to react or adapt. I could be listening to my Feist radio on Pandora, hear a song I don't like, skip it, change to another 'station,' pause the stream. But I can also create new stations, using tracks I hear as 'seeds,' and express my like or dislike with a thumbs up or thumbs down. While this may in reality be no different from browsing different webpages, it feels more generative. This constant request for feedback and constant invitation to generate

[29] ibid.
[30] Each service provides links to facilitate the purchase of either single track downloads, albums, or both. However, occasionally an item in the catalogue offered for streaming on a given service is not available from its retail partners.

new streams is implicit to an extent in the volitional mobility and scan-and-search modalities, as well as necessary for the modality of transformation described below, but not drawn out in McPherson's analysis. I see this generative and adaptive feeling, which I call the feedback and generation modality, as crucial to the experience of listening to personalized audio streaming.

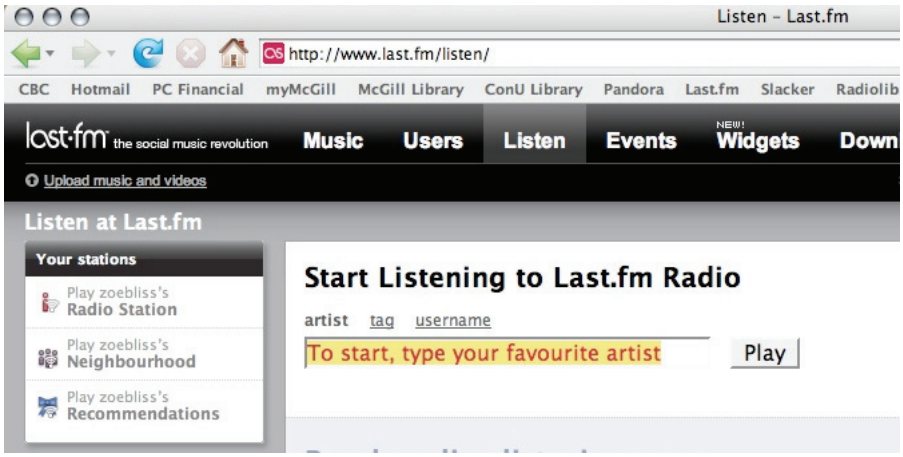

Fig 2.2 Initiating a stream on the Last.fm embedded Flash player

Feedback and Generation

Beyond the recognizable elements on the players such as the pause and skip forward buttons mentioned above, and aside from the invitations to browse artist biographies, buy music, in short, to connect with other content and actions, the music players of customizable services offer the user different entry points for responding to each track as it begins.

As a user of a service, I am constantly being positioned as agent of my musical destiny, asked to respond to each track, in order to teach the software my likes and dislikes so that it can learn my taste over time. Such responses take the form of ratings, whether in gradient form or as an expression of approval or disapproval. There are various actions to be taken in response to a song being played on the system, regardless of whether users actually follow through on these. As Table 2.2 shows, there are a variety of ways in which that sentiment of agency plays out on the music players.

The notion of feedback and generation explicitly recognizes the ways in which entering information on the Web creates a feedback, whether, as in search engines, a one-time response to a query, or as in personalized spaces such as on personalized audio streaming services, where the history of user inputs is maintained in a user profile. In addition to sending feedback in response to already delineated menus as in the scan-and-search, we can also identify the feeling of generating new relational flows or sets of information on the fly as an important experience on the Web, particularly where we feel we are scanning a database. This modality has a generative feel, structuring agency as a kind of contribution ('create your own radio'). This goes a step further than the material in McPherson's description because the user is invited to be involved in the process as well as being interpellated as sole recipient of the transmission. Whether it is filling in forms, checking boxes or inputting data that allows something to be customized, with these actions we feel we contribute something distinct and individual. Out of the services explored in this thesis, Last.fm takes this concept the furthest. Through a system of tags (or 'folksonomies,') users can create categories that become the basis for other audio streams. For example, the 'tag radio' stream pictured in Fig. 2.4 culls together items that users have tagged 'winter music,' clearly a subjective category that is only gathered into a continuous audio stream with a search for it—otherwise the tags merely exist in a field in a database somewhere. Since it is entirely based on collaborative filtering, moreover, user feedback not only affects personal profiles but drives recommendations for others on the system.

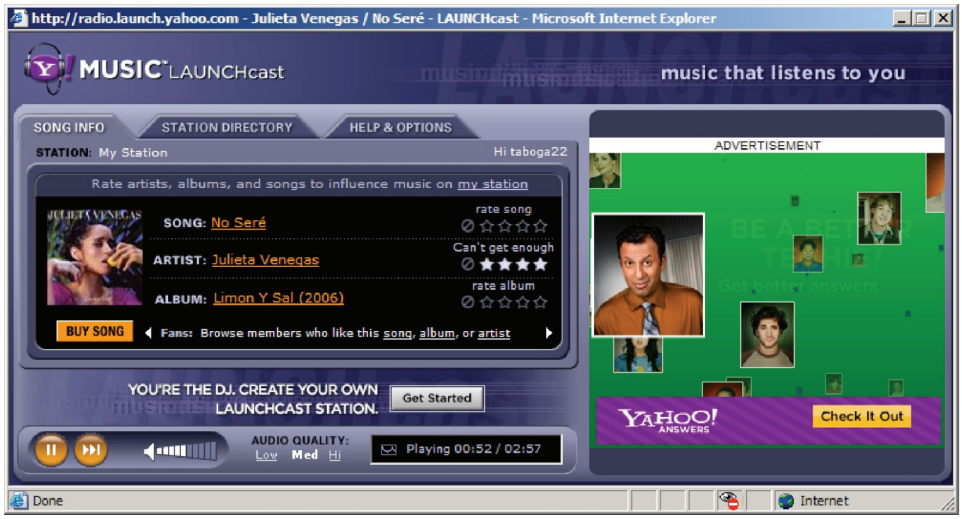

Fig 2.3 Yahoo! LAUNCHcast player window

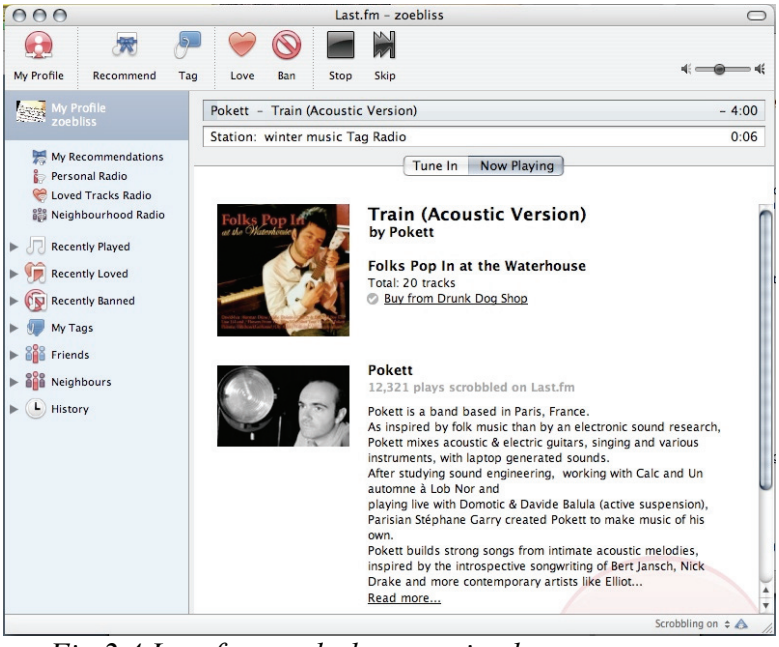

Fig 2.4 Last.fm stand-alone music player

	Yahoo! Music LAUNCHcast	***Last.fm***	***Pandora.com***	***Radiolibre.ca***
One 'station' or various profiles?	*1 personalized station*	*1 personalized station; other customized stations available, e.g. 'recommended radio,' and 'neighbourhood radio'*	*Various customizeable stations; QuickMix feature combines all stations in a profile*	*Various customizeable stations*
Method of initial input of preferences	*Rate genres, artists, songs, albums searched for in Yahoo!'s database*	*Scrobbling; can also love or ban tracks by searching system, but only tracks previously listened to can be tagged, loved or banned.*	*Start with one or several artist or song "seeds"*	*Start with pre-made profile (genre-based), tailor as you listen, or by 'express voting' (expressing preferences on 30-second clips)*
Rating system	*Explicit rating: 1-5 stars, or percentage*	*Implicit rating through scrobbling; explicit rating through Love or Ban features*	*Explicit rating: Thumbs Up/Thumbs Down*	*Explicit rating: Play Always, Often, Sometimes, Occasionally, Proscribe*
Other functionalities	*n/a*	*Tag a track; Recommend a track*	*Bookmark a track*	*n/a*

Table 2.1 Comparative table of rating systems in personalized audio streaming services

Transformation

McPherson describes her final modality of Web experience as an emancipatory promise of transformation, finding it at work even in the most banal of online settings, such as the customizeable homepages of portal sites like Yahoo! These sites

> turn on transformation, as the faceless dataspaces of the Web are made-over via my demands. Personalization holds out the tantalizing lure of transformation, remaking information into a better reflection of the self.[31]

The claim of transformation is the most fundamental in that it is the endpoint of the others. The claim of agency in and of itself is not particularly powerful; rather, it is the idea that agency will lead to a better reflection of the self. Of her modalities this is the key one for me, in terms of the ways it returns us to a discussion of emancipation. Transformation is an equally powerful modality in the use of customized audio streaming services. As Bolter and Grusin have written,

> Computer interfaces–not only in character/avatar based games, but in 'serious' interfaces like desktops and browsers, treat identity as a matter of adjusting parameters. When computer interface designers talk about personalizing the interfaces, they mean adjusting parameters in order to assimilate the interface to the person who uses it. The 'adaptive interface' attempts to refashion itself automatically over a period of time to suit its users' tastes and habits. This characterization 'by the numbers' would have made little cultural sense 100 or even 50 years ago, yet it is how the self is defined today in digital space.[32]

The transformative possibilities of personalized music services lie in the discoveries that are possible if only one rates enough and expresses enough of oneself in interacting with the service.

Some responses to this idea of the self suggest that in fact, this characterization 'by the numbers' is still uncomfortable for many. The mental leap from a user's input of their taste preferences to a recommender system's ability to satisfactorily reflect user selves and desires has been the subject of

[31] McPherson, "Reload," 204-205.
[32] Bolter and Grusin, *Remediation*, 248.

several commentaries and parodies on television and in print media. At issue is the implicit correlation between one's tastes and one's self, that is, what our tastes can imply about our identities and personalities, as well as which tastes are correlated with one another. One of the classic articles appeared in 2002 and instructed readers on how to skew their TiVo personal video recorders' recommendations. An article in spoof newspaper *The Onion* and a *Family Guy* episode have both commented on recommendation engines and identity as well.[33]

More fundamentally, as we saw in the last chapter, and as I have begun to develop in this chapter, there are numerous limitations on the extent to which users can exert control over what they hear on their stations, challenging the discursive assertions of user agency as well as the sensations of choice invoked in the design of user interfaces.

Contesting the Rhetoric and Sensation of User Agency

McPherson pointed to the ways in which the Web enables a feeling of a certain momentum and volition absent in television. But she goes on to highlight that various areas of the user interface work to circumscribe the choice that is otherwise promised, in ways similar to television's programmed flow. While the interfaces suggest users have agency, "the very programming which underwrites them works to guide and impede the user's trajectory."[34] User interface architectures are designed to guide surfers' trajectories in particular ways, encouraging some browsing behaviours and discouraging others. To take an example from customized audio services, all music players provide links to sites where the song currently playing can be purchased as an album or digital download. While most services have agreements with third party retailers like

[33] Jeffrey Zaslow, "If TiVo Thinks Your Gay Here's How to Set It Straight," *Wall Street Journal*, November 26, 2002; "Amazon.com Recommendations Understand Area Woman Better Than Husband," *The Onion*, 43:2 (January 9, 2007). http://www.theonion.com/content/news/amazon_recommendations_understand.; *King of Queens*, "Mammary Lane."
[34] McPherson, "Reload," 206.

iTunes and Amazon, on portal sites such as that of Yahoo!, one is directed to purchase tracks on the Yahoo! Music site itself, keeping users (in the ideal case) within the Yahoo! universe. Of course it is always possible to escape the 'walled garden,' but the encouragement is nevertheless in the direction of engaging only with Yahoo! content.

Another example of the illusory nature of the Web's modalities is found in the idea that through the use of such engines, one is actively surfing the Web. In reality, however, "you remain within a contained database, usually cataloguing less than thirty to forty percent of the Web as a whole, processes which increasingly privilege commercial sites."[35] As customized streaming services draw, at bottom, from particular databases of music, as we will see in more detail in the next chapter, this is an important point for thinking around customized services too. One does not have the agency to choose to listen to content that is not available on the service to begin with.

Finally, McPherson makes the key point that the use that is made of user data, regardless of its couching in a rhetoric of agency, serves neo-Fordist purposes as user information is incorporated into capital, used to collect information, and target advertising. This is most certainly also the case with respect to customized music services, as will also become clearer in Chapter Three. As Greg Elmer has noted, tracing the history of targeted product advertising to the late 1800s, the drive to customize products and information to people on an individual basis necessarily relies on the collection of data about personal preferences and demographics: "[F]eedback techniques are used to cluster like-minded consumers together so that their aggregate purchases—and hence psychographics—can be cross-referenced with production, distribution and sales data," with the objective of better targeting users.[36] User-generated content is also freely provided while the website benefits economically.

Another approach to debunking the myth of user agency lies in the concept of technological agency introduced briefly earlier—the idea that agency, as a process or relationship, can be attributed not only to humans but also to

[35] ibid.
[36] Elmer, "Consumption in the Network Age," 69.

technologies, to which human work is delegated. Recommendation systems can be said to translate the work of sales agents, friends, and so forth in making music recommendations to users based on their expressed tastes. They encode a series of assumptions, just as human sales agents or friends would, in order to predict an individual's musical taste. For instance, collaborative filtering assumes that my taste can be predicted through those of others with similar tastes. Content-based analyses assume that tastes are based on the sound and things that are considered similar. Both systems assume, in the case of implicit inputs such as Last.fm's Audioscrobbler system, that I like what I listen to.

Latour's concept of prescription addresses the behaviours that a particular technology implies in terms of its intended use. Personalized services presuppose that a single person will make ratings within a given musical profile; that two people using the same computer, for instance, will ensure to log out of other users' profiles when expressing preferences on a music profile.

A user's agency is thus only one element in a technological assemblage through which agency flows. With respect to recommendation systems as they are applied in customized audio streaming, I would suggest that some of the 'agents,' by which I mean both human actors and other factors or elements exerting influence on what is heard, are: the listener, the algorithm, as influenced in turn by policy, the music in the database and the particular model of musical taste or particular priorities that are set by the system. For example, the Pandora system privileges instrumentation, among other factors identified as important; the Yahoo! system privileges new releases, and new additions to its database, in addition to giving editorial picks a stronger weighting.

The question of the contents of the database from which the service draws will be discussed at more length in the next chapter; for now it is sufficient to establish that the contents of the database constitute an important limitation on user agency over what is heard. If personalized radio hopes to reflect my listening habits at all, it must be constituted of music that I like that can populate the database. Furthermore, as will also be further highlighted in the next chapter,

the particular recommendation techniques used play a significant role in determining the playlist. In summary, personalized audio streaming services' discourses and their user interfaces have the ability to structure and perhaps invoke a sensation of agency in their users, even as through various means, such agency is limited and controlled. The rhetoric of agency that we find in promoting these services, however, obscures the ways in which other elements in this technological apparatus impinge upon what we hear when we initiate a customized audio stream.

Transformation and Remediation

Given that, as Chapter One showed, personalized streaming services are also compelled to describe their offerings as limited in the area of control (primarily, as we saw, for the purposes of ensuring their eligibility for statutory licenses, at least in the United States), it may be surprising that user agency is a significant theme in the rhetoric surrounding personalized audio. However, it should be noted that the claim of agency is almost exclusively accompanied by an assertion that the form that is being reconfigured and improved upon is radio.

To McPherson's account of the modality of transformation, I would bring in more strongly the ways in which the assertion of transformation depends upon a statement of an emergent form's novelty as compared to established media. As is apparent from the insights of both this chapter and the last, the claim of radioness structures the other two because it creates the point of reference against which they are advanced; few of the claims to personalization and increased agency that we find surrounding personalized audio streaming are possible without a construction of radio as non-interactive, and without the reliance of audio services on radioness as a framework. Without such a framework, one would ask how this was better than iPods (though the services would have an answer, and it would inevitably draw on the historical success and cultural place of radio). The discourses of radioness are important because they structure expectations for the

media form. As I demonstrated in the previous chapter, by setting themselves up as analogous to radio, the claim of personalization becomes a plus. In contrast, a comparison to the iPod experience (which is also used, but under different terms), on the agency front at least, would find personalized radio services curiously lacking.

This chapter has outlined and evaluated some of the discourses surrounding personalized audio streaming services' ability to create user agency and personalization for their users, and the ways in which this is positioned as an improvement upon the conventional radio experience. Chapter Three will describe the claims surrounding ways in which the recommendation engines that drive customized audio services have the potential to level the playing field between artists. To an extent this assertion is a correlate of that of user agency, and of the idea of music as a fundamentally personal experience, where instead of a search for 'good' or 'popular' music (characteristic of traditional taste-making and gate-keeping industries) the ideal is to find the 'right' music for a given user. Thus the claim of user agency examined in this chapter underlies the discourses around the emancipatory possibilities of recommendation services as artist tools, particularly with collaborative filtering based services, where without the user's endorsement of an artist, there can be no promotion.[37]

[37] Unless, of course, promotion is explicitly paid for. On paid performance, see the next chapter.

Of the shit on the radio and MTV
They only play the same thing
No matter where I go
I see Ashanti in the video
I want something more

We are in need of
A musical revolution

—Esthero, "We R in Need of a Musical Revolution"

Chapter Three: The Rhetoric of Industry Opportunity

In 2004, perhaps much later than some of its counterparts, Astral Media, a Canadian media giant with several terrestrial radio stations among its properties, was beginning to question its future livelihood. Ian Greenberg, its president, felt at the time that the broadcast industry would soon be fading away and that the company had to be ready with an online presence. Interestingly, unlike many other radio groups, Astral wasn't looking to merely replicate their over-the-air signals, but rather, hoped to implement an innovative concept on the Web.

Initially, plans were vague. An online portal, something like MSN.com, was envisioned. Astral then enlisted a former Cirque du Soleil organizer to help guide its vision online. He, in turn, sought out Benjamin Masse: musician, president of two Quebec music industry associations, and the founder of Double V3, a Montreal software company. Together, they forged a rather daring project for a 'dinosaur': Radiolibre.ca, an interactive audio streaming site featuring music recommendation and focused on independent local talent. Even a traditional broadcaster, it seems, saw a move to the internet as an opportunity to explore the path not taken; where Astral's terrestrial forte is in Top 40 formats, here they opted to showcase more unknown acts.

According to Masse, "[Astral's] mindset was that people were shifting from the traditional FM stations to go discover music on the Web, so they wanted to have something different on the Web than their usual corporate image." So much so that the marketing firm hired for the project originally suggested it be called "Anti-Radio… But it was probably a too strong statement for Astral, so

they chose Radiolibre instead."[1] Still, the promotional rhetoric surrounding the launch of the service focused on its difference from traditional radio: here was a platform to hear the marginalized voices of Quebec and the world, those excluded from conventional playlists. The TV ad accompanying the launch of the service simulated a listener manifesto demanding musical diversity on the airwaves:

> Donnez nous un DJ qui spinne au gramophone, un Danois au sitar, un concert rock à l'Oratoire. Donnez nous toute la musique. Nous croyons que les goûts ne se dictent pas. Nous croyons au rock, au pop, au country, au jazz, au raï, au klezmer, au reggae. Nous croyons qu'Elvis est toujours vivant. Nous regrettons encore Dédé. Nous croyons que c'est l'auditeur qui est le DJ. Nous voulons une radio à l'image même de la musique. Libre. Radiolibre.ca.[2]

As we will see, Radiolibre.ca is not the only service to have highlighted its potential to bring exposure to unknown artists and niche music genres, and to have put forth the internet and internet radio as uniquely suited to such a task. Since its owner, Astral Media, was a conventional broadcaster placed in the no doubt uncomfortable position of critiquing itself, it is merely one of the more intriguing examples.[3]

In the last chapter, I introduced and challenged the rhetoric of user choice found in promotional language in and around personalized audio services as well as invoked in their user interface design. In this chapter, I address the discourses these same services generate in regard to their value for the music industry, and more specifically, independent artists and labels. I show how personalized streaming, and in particular, the recommendation systems on which they are based, are invested with the capacity to level the playing field for artists by providing access to useful music promotion through targeted airplay and, in some cases, access to information about users' listening behaviour that can be used to improve promotion. Music recommendation systems are also discussed as

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[1] Masse, personal interview.
[2] Radiolibre.ca Television Ad. http://www.grenier.qc.ca/radiolibre.mov.
[3] Only a few months after it launched, the project was dropped by Astral, passed on to Double V3 (who then successfully pitched it to Lycos Canada), Astral feeling it was, after all, perhaps not the best suited to carry it forward. Radiolibre.ca was not an immediate success in terms of take-up or profit, and certainly constituted an economic risk for Astral, a public company that would have to answer to shareholders. Still, that they abandoned the project so soon after investing time, energy, and funds was surprising to many (Masse, personal interview).

emancipatory technologies in that they can help to break down genre barriers that have worked to arbitrarily separate musics in the past. The purported benefits of streaming services based on recommendation systems are often framed in contrast to broadcast radio, as with the rhetoric surrounding listener benefits. We have seen that, according to Bolter and Grusin, new media tend to pose themselves as improved versions of what has come before and that the nature of the improvement is frequently framed as democratic or emancipatory.

I first highlight some examples of the rhetoric of industry and artist opportunity. Then, by revisiting Slack and Wise's concept of articulation and assemblage and through a discussion of the institutional practices emerging in several personalized services' policies and corporate arrangements, I show that while such a potential may well, and I think does, exist, in reality the ability of a service to provide unprecedented opportunities to small artists and labels depends on a complex of factors not reducible to the implementation of a recommendation system alone.

The Promotional Potential of the Internet

The idea that the internet provides a much-needed promotional and distributional forum for independent artists is widespread in certain quarters as a counterargument to the suggestion that Web-based technologies merely encourage music piracy and are generally detrimental to creators.[4] According to such commentary, the internet provides reprieve from the "payola-drenched playlists of corporate radio," facilitating and lowering the cost of generating visibility for and distributing musical product.[5] However, as we saw briefly in Chapter One, proponents of personalized Web radio are among those who emphasize that while websites and P2P are invaluable tools for artists, both lack the simple built-in promotional mechanism of airplay. Radio as a form is viewed as having the

[4] See McLeod, "MP3s Are Killing Home Taping," 521-531; Burkart and McCourt, *Digital Music Wars.*
[5] McLeod, "MP3s Are Killing Home Taping," 521.

capacity to provide invaluable exposure to (in particular, emergent) artists that is not replaceable by or reducible to the availability of their catalogue on the Web.[6]

Since the spring and summer months of 2007, debates have been raging south of the border with respect to the U.S. Copyright Royalty Board's March decision on statutory webcasting rates.[7] Webcasters deem the proposed rates unreasonable and say they will put them out of business, pointing out that such fees are without parallel in either broadcast or satellite radio. The arguments made by participants of the Save Net Radio campaign currently underway in the United States provide evidence of the distinctive value webcasters see themselves as bringing to the music industry, particularly independent or marginalized labels and artists:

> the wonderful diversity of Internet radio is enjoyed by tens of millions of Americans and provides promotional and royalty opportunities to independent labels and artists that are not available to them on broadcast radio... in just the last year Internet radio listening jumped dramatically, from 45 million listeners per month to 72 million listeners each month. Internet radio is already popular and it is already benefiting thousands of artists who are finding new fans online every day.[8]

> Internet radio is one of the best things that has happened to the music industry in the last decade... It's given voice to genres and artists that have never gotten airplay before.[9]

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[6] Westergren, "Pandora and the Future of Music"; Stiskel, "Last.fm". In many cases, this insight has come from the companies' own prior business experiences. For example, Last.fm was initially an online record label. Martin Stiskel has recounted: "We had an online record label, where unsigned artists and bands could upload their music and we got swamped with great music, but we had a problem: nobody knew any of the artists. So we had to develop a system that connects the unknown music with the right ears, to promote the right music to the right people." (Stiskel, "Martin Stiskel of Last.fm").

[7] The full text of the decision is available at http://www.loc.gov/crb/proceedings/2005-1/final-rates-terms2005-1.pdf. The websites of SoundExchange, www.soundexchange.com, Save Net Radio, www.savenetradio.org and the *Radio Internet Newsletter*, www.kurthanson.com list many relevant news items and showcase their own sides of the argument.

[8] "About Us," *SaveNetRadio.org*. Available at: http://www.savenetradio.org/about/index.html. The two U.S.-based personalized audio streaming services studied in this thesis, Yahoo! LAUNCHcast and Pandora.com, are both active participants in this campaign, taking part, for example, in the Day of Silence on June 26, 2007, where webcasters took down their streams for the day in an effort to bring attention to the issue.

[9] Kurt Hanson, cited in Gilbert Cruz, "The Last Stand of Internet Radio?" *Time*, June 30, 2007. http://www.time.com/time/business/article/0,8599,1639084,00.html.

Some artists have joined the chorus of voices speaking out on behalf of internet radio:

> While the royalty rate increases would mean certain bankruptcy for almost every Webcaster, the effect on indie artists would also be disastrous. Losing Internet radio would mean the loss of our biggest promotional resource…Right now, independent artists make up less than 10 percent of what's played on broadcast radio. On Internet radio, we make up about 37 percent. And as much I appreciate royalties as an artist, a bump in royalties means little to indie singer-songwriters if it also means the death of our biggest source of exposure. If Internet radio dies, there won't be any royalties to pay.[10]

In short, internet radio is often spoken of, at least by those invested in the survival of the industry, as a channel for the promotion of independent artists. But why have webcasters been interested in this laudable cause? Drawing on work by Carol Ting and Steven S. Wildman, Tim Wall writes that the technologies and economics of internet radio favour musical diversity in ways that broadcast radio does not, which in theory would bode well for independent artists and often marginalized music genres:

> [F]or over-the-air broadcasters the economic imperative is to produce the smallest number of broadcasts for the largest number of listeners, while for the Internet broadcasters there is little economic advantage in providing one stream to 10,000 listeners, over 10,000 streams to individual listeners.[11]

While the costs of program production could logically be higher than for a single station,

> [i]n Internet radio costs are considerably lowered by computerization, dispensing with human presenters and the transfer of programming costs to amateur programmers…. This is why most Internet radio services are computerized…and why they are based upon particular music genres or music cultures.[12]

Therefore, "[i]n potential terms… the technologies of the Internet offer the encouragement to new broadcasters and could lead to a greater diversity of music

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[10] Sonia, "Independent artists fear the demise of Internet radio," *The Baltimore Sun*, July 4, 2007, http://www.baltimoresun.com/news/opinion/oped/bal-op.radio04jul04,0,1361533.story?coll=bal-oped-headlines.
[11] Wall, "Political Economy of Internet Music Radio," 39.
[12] ibid.

being played, and for innovation."[13] However, Wall moves from this observation to an empirical analysis of internet radio, since looking at technology (and regulation) alone cannot, in his view, fully explain the ways in which the industry is developing. He notes that historical accounts of the ways in which new broadcasting technologies (such as FM transmission) contributed, along with political economic factors, to the birth of alternative music broadcasting styles and music radio itself tend erroneously to attribute change to either technology or regulation, as the case may be.[14] Instead, for Wall, although technology (e.g. one-to-one streaming) and regulation (e.g. the DMCA in the United States) are certainly key facets of internet radio, they are insufficient to understand how it is developing. As mentioned in Chapter One, he feels that the role of music on the radio has been understudied to the extent that we now lack the vocabulary for addressing some of the ways that music radio on the internet is developing. Through an analysis of two snapshots of the state of internet radio, he concludes that despite the potential of internet radio for innovation, the current direction of affairs is such that the nascent internet radio industry may come to resemble the makeup of traditional radio.

I want to suggest, *pace* Wall, that we do have several tools and studies that can help us to understand the contingency of playlists and the various forces, including but not limited to technological and regulatory, that impinge upon the outputs of music radio on the Web. These studies are compatible with Slack and Wise's notion of articulation and assemblage (introduced briefly in Chapter Two), an approach to the study of technological culture that recognizes the relationships in place between concepts, institutions, and practices. I will review these approaches and introduce other studies that further sustain this view in a moment, but first I wish to highlight a few examples of the emancipatory rhetoric deployed by customized audio streaming services as regards the workings of their recommendation systems.

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[13] ibid.
[14] Keith 1997; Rothenbuhler and McCourt 2002, both cited in Wall, "Political Economy of Internet Music Radio," 31.

Recommendation Technology and the Improvement of Artist Promotion

In the past year, what began as an article by Chris Anderson, editor-in-chief of *Wired* magazine, turned into a book, *The Long Tail,* and a widely-cited concept of the same name. The basic idea is that 'hit culture' is dying, and that it makes the most sense for retailers, particularly in the online world, to make the widest variety of material available to their customers because it does not cost them any more to do so as it has in the past when goods for sale were confined to shelf space. Within Anderson's concept, recommendation engines, as filters, are enshrined as 'the New Tastemakers,' important pieces of this emerging puzzle, and necessary tools to drive customer interest down the Tail. The Long Tail is cited at almost every conference and in the course of practically every interview on the subject of recommendation engines as a means to demonstrate the important role they are seen to play, one of surfacing material with an otherwise unlikely chance of being stumbled upon. What is more, this ability is linked to the capacity to change the logic of 'hit culture' into a culture of niches by lowering the costs of promotion, as these two quotes from a recent panel on recommendation engines demonstrate:

> The fellow on the blogging panel today from Rhapsody said, 'We've got this group, they do reviews, we try to get the music in your hands, we try to listen to crap so you don't have to...*But* we can only get to 10 or 12 per cent of the 3 million [tracks] that are [in the database].' Cool, I'm glad he gets to the 10 or 12 per cent. If you're the guy who worked your heart out to get your CD in the 88 per cent that's left, if there's not a mechanism to help you surface, to get above the noise or critically, to find the guy who might like what you sound like, your chances of being heard are lower than they could be, and that's the market space we aim to address.[15]

> [With] these search technologies potentially the money comes from lowering that activation energy. There's going to be fewer big hits, more medium hits and small ones, and you don't need that huge marketing budget to get known and then you find other ways to generate your revenue, which is potentially

[15] Matthew Dunn, "Recommendation Engines and Music Discovery." Dunn is CEO of Music IP.

> selling your album at a lower price or selling other things, so you're not either starving or swimming in champagne in your 50-foot pool out in Beverly Hills.[16]

Although both Yahoo! LAUNCHcast and Pandora.com participate in the same legislative framework as other webcasters involved in the Save Net Radio campaign, because of their basis in recommendation systems, there are several areas in which they would contend their services have even greater emancipatory potential than internet radio with its broadened playlists. The main suggestion is that collaborative filtering, and even more so, content-based approaches to music recommendation, introduce the possibility of a more equal access for artists to audiences by eliminating gatekeepers of taste. The targeting of tracks and artists to those listeners most likely to be interested is another aspect of the improvement in promotion these services offer as compared to broadcast radio. Recommendation engines are sometimes posed as replacements for marketing, even potentially obviating the need for record labels, whose role, in a time of low production and distribution costs, is depicted primarily as that of generating interest and publicity around a given artist.[17] And, since the technologies of music recommendation involve the collection of personal information about listeners and their habits that is of potential interest to record labels or artists, they also promise a better understanding of audiences. Through de-emphasizing genre as an organizing framework for promoting music, new avenues for promotion are also said to be opened up. In summary, by improving independent artists' ability to compete in the market, recommendation is put forth as a means to contribute to significant change, not only in the broadcasting industry but in the music industry as a whole.

The majority of companies studied in this thesis started out long before becoming audio streaming services, with an interest in the promotion of little known artists. Double V3, the software company behind Radiolibre.ca, began its work providing website design for independent musicians and developing web

[16] Darren Jukes, "Recommendation Engines and Music Discovery." Jukes is a Vancouver-based technology consultant whose clients include several music recommendation services.
[17] Westergren, "Pandora and the Future of Music"; Stiksel, "Last.fm."

rings that would allow visitors to the page of one artist to reach the pages of other artists and in this way to increase their exposure. One of the projects of Last.fm 'before it was Last.fm,' was a site where independent artists could post their mp3s, an online record label of sorts. Pandora.com, initially (as Savage Beast Technologies) a business-to-business operation with its sights set on providing tools for music retailers, was similarly invested in the promotion and sales angle of the music industry and specifically of independent acts. Of the services studied, only Launch Media began from an 'outsider' perspective as a CD-ROM magazine dedicated to music discovery for listeners. In all cases, audio streaming (in addition to personalization) was gradually added to the vision as seemingly a key component for introducing an act to a listener. The recommendation system, at the basis of some but not all of the early plans, was also viewed as a key addition for the potential of the services to contribute to artist promotion.

One example is that Sony BMG's recent decision to offer their entire catalogue for streaming on Last.fm is reportedly based on the Audioscrobbler software behind Last.fm that tracks users' tastes in order to make recommendations. According to a Sony BMG representative, "The Last.fm streaming service will give our established artists a platform through which they can reach new audiences, and its unique recommendation system will provide our emerging artists with an important opportunity to build their fan base."[18] While Last.fm's streaming service is described as good for established artists, it is the recommendation system that is primarily credited with the ability to come to the aid of emerging artists.

Tim Westergren of Pandora has been particularly vocal about his interest in improving the lot of independent musicians, perhaps even contributing to the creation of a 'middle class' of musicians, as is evidenced in this excerpt of a *Pitchfork* feature on music recommendation:

> Westergren launched [the Music Genome Project] to help people discover music, and especially, to level the playing field between independent and popular acts. "I was in bands for nine years, and that's the whole reason I started

[18] Thomas Hesse, Sony BMG, cited in "Last.fm strikes Sony music deal," *BBC News Online*, July 9, 2007. http://news.bbc.co.uk/2/hi/technology/6284798.stm.

> it," says Westergren. "Because I saw so many great bands, and I thought, 'Shit, these guys should really be making a living at this.' And they weren't." To Westergren, recommendation tools could boost sales not just for indie labels but across the entire industry. "It's economically rational for labels to promote a small number of artists and bet big on them," he claims. "But people's appetite to buy music is, I think, 10 times [the reality]. There's no other product [with] as big of an unmet need. People graduate from college, get into their twenties and start working, and they resign themselves to music playing this sort of peripheral role. It's not because their love of music goes away, it's because they feel they don't have time. And if you can reverse that, then look out."[19]

The interesting thing about the emphasis placed on recommendation engines' potential is that it obscures some of the possibilities that are inherent in the current economic system for creating more egalitarian status for artists. Its critique of 'hit culture' comes down to a critique of gatekeepers, in a sense. However, hit culture could have other causes. The profit margins that record labels have ensured for themselves, could in theory be redirected toward more equal income distribution. Instituting practices of profit-sharing with their artists, or other techniques could result in a more level-playing field between artists. In other words, it is not only the marketing machine and its orientation that is responsible for the existence of a 'hit' culture, but also a particular profit-maximization framework that has characterized major record labels' business models.

Genre has always been a significant factor working to keep musics institutionally isolated in the music and radio industries.[20] It is occasionally claimed that recommendation engines may help reveal similarities in music across genres. The Music Genome Project has the most legitimate claim to such an ability. Press coverage of Pandora.com routinely emphasizes the qualifications of its expert staff and the intensive training that is required of new staff in order to identify musical attributes. For Tim Westergren,

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[19] Dahlen, "Better Than We Know Ourselves."
[20] Negus, *Music Genres and Corporate Cultures*.

> [Pandora and the Music Genome Project] was a way for you to type in a song or an artist that you know and like and be recommended music that you'd never heard of before. So, it would be a way of giving a chance, an opportunity to musicians who don't already have an audience to be introduced to folks who like music like theirs. And because it's based on musical attributes it doesn't need anything more than that. It doesn't need a purchasing history. The artist doesn't need to be popular. It just has to make sense musically in the context of that better-known artist. And that's how I think the Music Genome can really be an effective tool for surfacing a broad catalogue of music.[21]

By bypassing genre classifications, it is claimed that services like Pandora can further emancipate the industry. The role of genre in the offline universe is to make audiences predictable. Recommendation engines render genre less important as an organizing framework for the promotion and production of music, potentially giving artists freedom to access audiences regardless of the genres they tend to be interested in. To quote Westergren once more,

> We don't define music by genre. Genre is really just a collection of genes to us. And it's fluid, so you flow from rock to acoustic rock to folk seamlessly in Pandora. You can go back and forth between them. So we don't really bucket music that way. I think genre has served a useful purpose because it's a shortcut, it's a semantic shortcut to help you decide which part of the record shop you should go to. But it's a double-edged sword because you've got to make a decision about which bucket you're going to be in. If you're an artist, then as soon as you do that you're excluding yourself from potentially a whole group of people who have chosen an adjacent genre.[22]

The Contingency of Playlists

According to Tim Wall, many studies of music on the radio reduce its role and even the advent of the form to the effect of technological or regulatory conditions. He cites a few scholars like Jody Berland who have cast their net wider, and I would also add to his list the work of Jarl Ahlkvist and his collaborator Robert Faulkner who contribute a significant perspective on the role of music

[21] Westergren, "Creative Generalist Q&A: Tim Westergren."
[22] ibid.

programmers to explain what it is we hear on the radio beyond the effects of policy and technology, both of course also key.[23]

Ahlkvist and Faulkner argue that previous writers have made assumptions about what a station's structural context says about the possibilities for airplay without examining in an empirical fashion the ways in which decision makers like program directors actually perceive the forces at play in their work and make decisions in regards to playlisting. Drawing from Charles Tilly's concept of cultural repertoires, i.e. "a limited set of routines that are learned, shared, and acted out through a relatively deliberate process of choice," they suggest that rather than a single approach, four 'programming repertoires' can be identified, describing the manner in which playlists come together.[24] These repertoires are heuristic constructs, describing differing orientations that programmers may have vis-à-vis listeners (essentially taste-making vs. taste-reflecting) and vis-à-vis the music industry (collaborating with the recording industry's agendas or perceiving themselves as very much independent from these). Ahlkvist and Faulkner further argue that some of these orientations are more prevalent in urban markets versus small markets, and in centralized versus decentralized decision-making contexts. In short, the repertoires are a way of describing the contingency of playlists and the ways in which various factors come to hold a differing weight in the decision-making process about the music that is placed on rotation.

Though not framed in this manner given that a discussion of 'programming repertoires' is essentially a discussion of human agency, such an approach could be related to the concepts introduced in Chapter Two in relation to the distribution of agency within a technological apparatus. As Slack and Wise point out, some versions of Actor-Network theory can be criticized for not attending to the uneven distribution of power within a network. The concept of programming repertoires as advanced in the Ahlkvist & Faulkner piece, on the other hand, considers the interplay between various forms of orientation and the

[23] Berland, "Contradicting Media," 209-217; Ahlkvist, "Programming Philosophies," 339-358; Ahlkvist & Faulkner "Are They Playing Our Song?" 155-176.
[24] Charles Tilly, *Popular contention in Great Britain, 1758-1834*, (Cambridge, MA: Harvard University Press, 1995), cited in Ahlkvist and Faulkner, "Are They Playing Our Song?" 160.

structural and economic contexts of the radio stations studied. While the 'technology' level is not one of the factors placed under consideration, their work nevertheless exemplifies a matrix approach to understanding the differences between radio stations that operate with more of an orientation toward the music industry versus toward the listener; and with a greater concept of catering to the listener or playing 'tastemaker,' taking chances on 'good' music regardless of whether it has yet been proven a hit.

The Slack and Wise and SST conception of technological agency precisely implies understanding the work of technologies as not neutral but shaped, and as having particular effects.[25] Taking the concept of programming philosophies and bringing it to bear on personalized audio services whose output is based on music recommendation systems means taking into account the institutional practices and orientations that lead to the inclusion or exclusion of material from the playlist (or database), but also means attending to the privileging of particular facets of music (or social factors) in generating recommendations. The output of a music recommender system depends not only on user input or feedback, but on the database (which might theoretically consist of user-generated material, although none of the examples examined in this thesis take this approach[26]), the policy structures (limiting number of skips per hour; number of times the same artist may be played in a given time frame), the institutional arrangements, the particular algorithms that drive recommendations (and whether these are in turn impacted by content analysis, collaborative filtering, or a combination of these approaches) and the listener's own inputs (tagging, skipping, searching).

Just as commercial radio playlists have been analyzed as contingent, structuring factors that impinge on the outputs of terrestrial music radio, we can find a similar dynamic with recommendation engines. Whereas with traditional radio, the relevant categories were the effects of policy, profit maximization, and programming repertoires, here the relevant categories are again policy, profit maximization, and the particular design and implementation of recommendation

[25] Slack and Wise, *Culture and Technology: A Primer*, (New York: Peter Lang Publishing, 2005).
[26] That they do not is perhaps indicative that the level of industry self-reform claimed is in fact limited.

systems, made up of its database (and affected by content acquisition practices) and of the algorithmic design. Below I draw out a few of these considerations in more detail.

Policy considerations

How do personalized audio streaming services acquire the content to stream on their services, and, on the flip side, what are the possibilities for independent artists to have their material streamed to listeners? Do such systems reproduce existing hierarchies or truly pose a challenge to the established as they purport to?

At root, the answer to such questions depends on the ability of a service, from a policy or licensing perspective, to stream content of its choosing (in addition to its own orientation and priorities). On U.S.-based services operating under the DMCA's statutory licence, namely Pandora.com and Yahoo! LAUNCHcast (since its April 2007 victory over Sony BMG confirming the service's status as legally 'non-interactive'), any content can be streamed, to U.S. listeners only. Therefore, there is no limitation, on a policy level, on what may be streamed on an eligible online service.

Elsewhere, the situation is more nuanced. In the absence of clear guidelines on how audio streaming services, regardless of the level of 'interactivity,' can legally stream copyrighted material, services in Canada and internationally like Radiolibre.ca and Last.fm have opted to only stream material for which they have directly negotiated streaming rights. Depending on the particular deals involved, this state of affairs suggests that many players may be excluded, but in practice, there exist aggregators of content, such as IODA, the Independent Online Distribution Alliance, through which independent artists can gain access to streaming on such services. Last.fm and Radiolibre.ca are both IODA partners and therefore stream independent material. Radiolibre also broadcasts the catalogue of SOPROQ (a Quebec independent musicians' association) member artists.

The policy dimensions of what gets added to playlists cannot be overemphasized, since, ultimately, the players in the audio streaming business are more likely to play it safe and not stream that for which they have not explicitly gained permission.

Content Acquisition

Music recommendation services build up their catalogues or databases in a number of ways. They purchase records (LAUNCHcast and Pandora), receive promotional materials from record labels (LAUNCHcast and Pandora), process artist submissions (Pandora by mail and Last.fm via internet) or deal with aggregators and labels to obtain access to substantial portions of their catalogue through licensing deals (Last.fm, Radiolibre.ca).[27] The ability of a given artist to be streamed on a recommendation service based on content acquisition practices is therefore highly variable.

Pandora purchases a good portion of its albums but also receives a great number of CDs from record labels as part of their promotional strategies. The service also processes submissions directly from independent artists (who must send physical copies of their CDs, there being no mechanism for digital submission).

> That means everything from majors to people doing stuff in garages. We want it all. We don't discriminate or prioritise because music is on a label or not. We do have to have the mainstream as typically that is what people use to launch a station.[28]

But while theoretically any artist or track could be included in the Music Genome Project, in practice, tracks are selected (principally by Michael Zapruder, buyer and music curator for Pandora Media), likely also a function of the time-intensive coding process of Pandora which is human-based. His selection process and criteria are described in the following excerpt from a feature article:

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[27] See also Appendix B for a full listing of partners for each service.
[28] Westergren, cited in Darren Waters, "Pandora's Never-Ending Jukebox," *BBC News Online,* http://news.bbc.co.uk/1/hi/technology/5264276.stm.

> "If I feel like the music lives up to the promises that it makes to the listener, in whatever genre it's in, then I pass it along," says Zapruder. "I decide on the authenticity of the music. That's all I can really go on...It's very inexact, and I try to err on the side of being inclusive. [But] we need to make sure that everything in here is really good. If stuff starts popping up on your Wilco station and it sounds like mp3.com used to sound"-- meaning, every demo that someone barfed onto a 4-track that week—"that's really not good."[29]

In other words, despite the claim that recommendation engines eliminate gatekeepers of taste, these examples suggest that such a function still plays a role with recommendation systems, albeit one of diminished influence given the comparative breadth of catalogues versus traditional Top 40 radio with its tight playlists.

Unlike Pandora, Last.fm and Yahoo! LAUNCHcast, have the ambition to have the most complete catalogue of music possible available on the service. Last.fm is particularly aggressive about this aim and given that it has a mechanism for including artist-submitted material, almost any track can make its way onto the service.[30]

Recommendation Technique

From the perspective of an artist hoping to gain an audience through personalized audio streaming services, being incorporated into the recommendation engine's database is not the end game. The technologies, here the particular algorithms and emphases of the services, also work to structure the possibilities, conditions, and contexts around being heard.

There appears to be a fair amount of self-reflexivity and in some cases humility on the part of those working on recommendation engines with respect to the effectiveness of their recommendation techniques, at least in conference settings. This awareness means that those working on these systems frequently tweak their algorithms and add new approaches into the mix in an effort to build a

[29] Dahlen, "Better Than We Know Ourselves."
[30] "Last.fm strikes Sony music deal"; Woost, personal interview.

robust engine. The very suggestion that there is such a thing as a 'good' or 'bad' or 'mediocre' recommendation implies that recommendation systems are highly contingent forms that are anything but neutral. Much like search engines, which also involve the design of algorithms influencing the order and type of material surfaced in a text search, the algorithms of recommendation engines similarly work to privilege some connections between songs or artists rather than others. The diversity of music recommendation systems currently available on the Web means that each set of inputs will yield a distinct playlist and set of recommendations, each of which has its own strengths and weaknesses.

Collaborative filtering systems like those of LAUNCHcast and Last.fm are sometimes criticized for recommending items that are obvious to users or for reinforcing the popularity of already mainstream items.[31] Yahoo! and the recommender system community's awareness of the flaws of straight-ahead collaborative filtering leads them to create rules and biases in their algorithms that are designed to prevent such systems from surfacing obvious choices. An example of a way in which services typically bias with a view to improving the quality of recommendations is Yahoo!'s practice of privileging material that has been newly added to their catalogue as well as recently released material.[32] Because their system relies on users' explicit ratings of musical content in order to generate recommendations, this practice is put into place in order to encourage listeners to rate content which otherwise would sit in the catalogue without developing relationships to the older, already rated content. By inserting content that has not yet been rated into listeners' streams, Yahoo! increases the chances that users will listen and rate, and that this information can then be used to usefully target content to other listeners. That these services are interested in driving demand down the "tail" is nevertheless interesting as they could simply have left the 'hit-making' tendencies of collaborative filtering intact. Still,

[31] Ansari et al., "Internet Recommendation Systems," 363-375; "Recommendation Engines and Music Discovery."
[32] Beaupré, "Propelling Music Personalization," Beaupré, telephone interview; Mull, "Characteristics of a High Volume Recommender System."

occasionally these impulses sneak back in; editorial input on the part of Yahoo! staff can also allow some titles to be given priority for streaming on the system.[33]

Content-based services, on the other hand, are frequently criticized for making matches that are too similar and that as a result appear bland:

> One mistake we made early on in our own product development was to index too much information about songs. That sounds sort of funny but we were getting too granular and we were screening out any experimentation around the edges. You'd put in "Beatles – Let It Be" and you'd get these really sincere singer-songwriter tunes... It was sort of a creepy mix that got boring really quickly.[34]

In order to guard against this tendency, designers have used various techniques, including making the defining criteria for a song more general and combining this approach with collaborative filtering. The knowledge that musical taste is not the product of sound alone has also led designers to incorporate other factors in their analyses, still guarding against the perceived flaws of other techniques. Asked about Pandora's incorporation of collaborative filtering as an influential element in the determination of playlists, a few months after its launch, Tim Westergren responded:

> That's what makes the Genome so important, that we don't become a big popularity contest. I actually was the one in the company who argued to never use collaborative filtering... But I have to say it's made the playlists better. But it has to be used carefully because otherwise you become another replica of pop radio in the end. And if you look at collaborative filtering sites, that tends to be what happens, the stuff that gets recommended to you, most of it you already know. It really is, just 'oh yeah, of course they'd recommend that' kind of thing. And it's logical, but I don't think it's interesting. But in conjunction with the Genome, I think it's really powerful.[35]

The 'corrections' that designers build into their systems surely contribute to enhancing the services' effectiveness for users and even in counter-acting the popularizing or unoriginal effects of straight-ahead recommendation. Understanding the intricacies of designing effective recommendation systems

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[33] ibid.
[34] Steve Skrzyniarz, panelist at "Recommendation Engines and Music Discovery." Skrzyniarz is CEO of SoundFlavor, a playlist generator company involved in content-based analyses.
[35] Westergren, telephone interview.

means recognizing the choices that are made at every step of the design process and the way in which these choices can themselves consist of particular assumptions about what a good recommendation is, about which songs go together, and about musical taste more generally.

Benjamin Masse reflected on the original Radiolibre.ca shortly after retooling it in preparation for a revamped relaunch as Lycos Music. In his estimation, the main assumption of the first system, which was based on genre categorizations, contributed to some less-than-stellar recommendations on the service, leading them to redesign the system for the relaunch:

> the algorithm [for Lycos Music] is totally different [than that of the original Radiolibre.ca]… We realized at some point on Radiolibre that there were some premises that were totally false… The theory behind the [Radiolibre] algorithm… is that you could consider some kind of ontology [sic] – so a classification of music- as a standard approach, meaning that everybody believes that Madonna is a pop music artist, which isn't the case, depending on the countries, language, and everything, it always changes. So that was the huge premise behind the algorithm we did use on Radiolibre. And some of the problems we did encounter with wrong recommendations there… the fault was due to the ontology which wasn't good at all.[36]

As with many such systems, their constructedness is most apparent when they are not working as intended.

Recommendation Engines and Monetization

> What we can do in addition to giving a label airplay in a targeted way, [which is] a really good marketing and promotional exercise… is [labels] can go in and get the reaction: how many people skipped [the song], how many people banned it, where they're based, how old they are, what else they are listening to. And it can be very detailed, where we can say, 'Everyone who hated the track is based in Toronto [and] normally listens to Metallica.'
>
> - Jonas Woost, Head of Music, Last.fm[37]

> We will never, ever, play a piece of music because it's paid for. Ever. We will

[36] Masse, personal interview.
[37] Woost, personal interview.

> never include a song in the Genome because we were paid to do it either. There's no way money's going to buy you into the queue, into the Genome or into playlists, and that's an absolutely unquestioned tenet of our business.
> - Tim Westergren, Co-founder and CSO, Pandora.com[38]

With the promotional rhetoric surrounding the opportunities recommendation engines can provide to artists and labels, it may be easy to forget that these are commercial entities rather than solely altruistic enterprises. Although for the time being, many of these companies are indeed operating a partially altrustic service, since they are not profitable, making most of their money through raising venture capital or being purchased by larger entities, they are nevertheless interested in making ends meet, and ideally, in making a profit. However, the business models for recommendation engines have not yet been proven. Three of the four services I study here are interested in generating additional income through charging artists and labels for valuable marketing information and/or additional promotional opportunities. Pandora is the exception, CSO Westergren having stated clearly his disinterest in such a model. Instead, the company has been focusing on advertising as a means to generate revenues, which apparently has been working well for them so far.

Paid Performance

Personalized music services are beginning to be explicitly recognized as promotional tools for record labels and artists, just as radio has been recognized as such for several decades. Nevertheless, there is a difference developing between the ethics of radio and the ethics of online personalized music services. In the former, payola—the practice that record labels had of paying DJs or music directors for songs to be added to a station's playlist—was perceived as a scandalous, not to mention illegal, practice in the industry, even as it had continued in disguise. These were seen as an abuse of the use of precious and

[38] Westergren, "Pandora and the Future of Music."

scarce airwaves that were perceived to be in the public domain.[39] Recommendation engines, on the other hand, are developing an ethics of promotion that is seemingly much closer to the by now established framework for search engine results presentation.

Search engines have two sources of search-specific advertising, namely paid performance and paid inclusion. Paid inclusion is invisible to consumers and ensures that one's website will show up in a keyword search. Paid performance is a payment made to a search engine for the benefit of appearing in a prominent place on the results page of a particular keyword, but which is clearly disclosed to consumers, so that these links appear as "sponsored links" rather than the hits that one would otherwise get with a given keyword search.[40] On a results page, this tends to be manifested with, on Google, results in the middle, and sponsored results marked as such on the right hand side of the page. As Van Couvering reminds us, citing another study, paid performance caused quite a stir initially as it was seen to conflict with the presumed objectivity of search engines.[41]

In his study of commercial compilations and mixes and their use of the mix tape as a trope, Rob Drew critiques the industry appropriation and commodification of a metaphor long associated with consumers' informal and affective practices.[42] He writes that while mix tapes were compilations made from an almost limitless catalogue framed only by the mixer's imagination, commercial mixes (such as the iTunes iMix site, where users can post playlists for others to listen to, but limited by the catalogue available on iTunes) involve restrictions on the titles available.

A similar dynamic is emerging with respect to recommendation engines, and with these emergent technologies and companies, it seems to me important for a streaming service that associates itself with the concept of radio, not to mention with a general idea of recommendation, to ensure access be available to as wide a group as possible, understanding that inclusion in a recommendation

[39] Caves, *Creative Industries*.
[40] Van Couvering, "New Media?" 14.
[41] ibid., 14.
[42] Drew, "Mixed Blessings," 533-51.

engine's database alone, without marketing of other kinds, is not necessarily enough to lead to a 'middle-class' of musicians.

The idea that recommendation engines can act as neutral promotional vehicles for artists obscures the need for such services to be viable. Several people with whom I spoke in the course of research, including Benjamin Masse and Todd Beaupré, indicated their interest in monetizing the information they obtain that can be useful for labels. Some, like Last.fm, already have mechanisms for 'audio ads' or 'PowerPlays'. LAUNCHcast, for example, provides labels with information about listener tastes on a one-off basis, and does not charge for this service.[43] Last.fm has a PowerPlay service that includes both paid placement and a report on responses to the campaign. Radiolibre has indicated an interest in this form of monetization but has not yet implemented it.

Although I would not say that these arrangements are 'bad' in and of themselves, I do think that they undermine the claim that they even the playing field for artists since they take away some advantages for those artists who cannot afford paid placement. As Daniel Levitin recently put it,

> The great thing about the technology we have today, is that it's levelling the playing field, allowing independent bands to compete with the bands that happen to have been lucky enough to attract the attention of big bankrolling, major corporate investors and I think we don't want to lose that levelling of the playing field that we've just finally gotten to because a lot of great music is coming from the independents and it would be too easy for well-financed agendas, well-financed entities to drive the recommendations so that the independents suddenly get lost again.[44]

Even without explicitly driving recommendations through payment, it is not clear that artists without major label backing will necessarily be on par with other artists. Such a view would abstract recommendation systems from the larger media space of which they are a part. Part of the suggestion made by recommendation systems is not that hits will be created through the service but

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[43] Anderson, *Long Tail*, 101; Beaupré, telephone interview. For instance, the Bonnie McKee song, "Someday," was tested out on Yahoo! LAUNCHcast as a means of determining which formats to target for a more traditional radio campaign. The record label was provided with a report of user responses to the track and changed their marketing strategy accordingly.

[44] Levitin, "Recommendation Engines and Music Discovery."

that musicians may have the ability to make a decent living because of some exposure gained in this manner. Hopefully this is true, although in terms of levelling the playing field, those artists with the backing of large marketing budgets will surely be noticed more often by listeners. Hearing a song is no guarantee that a listener will invest in the artist or track, whether immediately or at a later point. As a colleague recently remarked in regards to his use of personalized services, specifically Pandora, hearing the music alone would not necessarily suffice to catch his attention; rather, he said that if an artist came up on the stream that he had heard about elsewhere (magazines, friends, and so forth), he would be more likely to take note.

Lastly, the emancipatory vision of recommendation engines obscures the economics of music production and the reliance for any real change that may be effected by recommendations on a confluence of much larger trends within the music industry. Were it not for independent artists' ability to record cheaply through the rise of home studios, and without affordable means of distribution such as mp3 files and CD burning, recommendation engines would not be in a position to come to independent artists' aid. We cannot dissociate recommendation engines from the music industry—major and independent—on which they depend; neither can we ignore the regulation that also creates certain constraints on what we hear on these streaming services. These considerations affect whatever inherent potential the technology possesses, undermining the position that if one could simply design the right recommendation engine, the lot of independent artists would be greatly improved almost overnight. Just as recommendation engines depend for their emancipatory potential on other changes in the music industry that have allowed greater access to production facilities to independent musicians, they will also not, in and of themselves, be responsible for changing the possibilities for artists, though they can surely contribute to existing trends.

Esthero's call for a "musical revolution" may have involved a desire for new sounds, or perhaps it was a critique of hit culture where the same faces—Ashanti perhaps replaced by now by an Avril or Beyonce—are seemingly

everywhere while others never quite reach our ears. A musical revolution will require more than just the existence of recommendation engines, but will be fed by changes to music production, distribution and consumption as a whole, although recommendation engines may indeed, under the proper conditions, be in a position to play a role in the process

Conclusion

It has been suggested that the advent of customized audio services is due only to the existence of particular policy structures, specifically, in the United States, the Digital Millennium Copyright Act of 1998, which makes fully 'interactive' or 'on-demand' services subject to additional restrictions versus those offering streaming modelled after broadcast radio. In a 2001 article, an industry analyst is quoted as saying that, "Consumer-influenced radio is not the end game... on-demand services are. The only reason this 'hybrid' form with varying degrees of personalization exists, is that it fits under the DMCA."[1] To this commentator, the development of a class of music services like those discussed in this thesis is only an intermediary step in the establishment of the so-called 'Celestial Jukebox'.

The early development of personalized services may indeed have arisen out of these constraints and at least one company invested in the form in the late 1990s-early 2000s ultimately had on-demand in mind.[2] However, there are now several companies offering on-demand streaming and yet radio-like recommendation-based streaming persists and has even begun to flourish. Given the backgrounds of those companies offering customized streaming, an explanation for their continued presence online is their interest in music promotion, rather than solely distribution, and their belief that radio as a form is a powerful marketing tool. Personalization, in turn, is helpful in identifying the tastes of audiences, information that can be sold to interested parties or leveraged in other ways. The restrictions set out in the DMCA have without question helped define many design features of personalized services, even those not based in the United States. What is particularly interesting for our purposes here, however, are the ways in which this form of media distribution, promotion, and consumption has begun to thrive and to in fact market its 'restrictive' features as positive aspects of its enterprise. Today, personalized music services are much

[1] Phil Leigh, formerly Vice President of Digital Media with stock analysts Raymond James & Associates, cited in Whitney, "Interactive Music Under Attack."
[2] Listen.com, according to Leigh.

less likely to suggest their ultimate aim is to provide on-demand streaming. Specifically, as we have seen, these services offer up personally relevant musical discovery and the promotion of little known acts as improvements upon conventional radio. With regards to user control, for instance, a less beneficial formulation could have been to compare streaming services to personal stereos since despite the expanded catalogue, users cannot define the order in which they hear tracks, an established possibility with personal stereo use.

Throughout this thesis, I have avoided referring to these services as 'personalized radio' to draw attention to the constructedness of the connection made between them and broadcast radio, and in so doing, to problematize this relationship. Radio has gained an important cultural place over the years; the act on the part of an emerging industry of leveraging radio's historical connections with its audiences and with the music industry has certain strategic benefits that I hope to have adequately highlighted in the body of this thesis.

Nevertheless, there remains an affinity between recommender systems and the various decision-making processes, some human, some automated, that characterize traditional music radio. The primary utility of recommender systems, from a business perspective, is to facilitate 'word of mouth' and 'discovery'–in other words, promotion, a hallmark function of terrestrial radio. What recommender systems add to radio, then, is the automation of decision-making with respect to playlist formation, which, as Jesse Walker has noted, already existed in the form of Selector, a playlist creation and scheduling software system for the radio industry introduced in 1979. That with personalized services, the number of playlists is scaled to the number of listeners, and that here an attempt is often made to adapt the playlist to listeners' personal tastes, seemingly makes of it a novelty.[3] (Again, a novelty for *radio*. To add to the personal stereo example, the mixtape is another form which has occasionally attempted the creation of a personal, targeted experience of musical discovery.)

[3] Bolter and Grusin attribute at least some of the rhetoric that accompanies the development and launch of new media technologies to the need in our contemporary culture for something to be new in order to be significant. Media define their cultural meaning with reference to established technologies, isolating features and refashioning them in such a way as to enable a claim of novelty (*Remediation*, 270).

The result of a year-long observation of personalized services, this thesis delivers a snapshot of those discourses currently at play in this budding industry. The focus is on the promotional discursive framework surrounding these services, worth attending to because of its salience for users in a still initial moment in these services' mainstream deployment. However, I do not wish to leave the impression that those individuals who represent these services are always pushing their party line. Particularly at industry conferences, where there are opportunities for Q&A and several parties involved in the same industry have the opportunity to discuss their shared concerns and challenges, those involved can sometimes be very self-aware and display a healthy sense of self-criticism, acknowledging the limitations of their technologies (though often these discussions assume that provided the right approach could be found, a technological solution to music recommendation could be found). Still, there is very often an acknowledgement that the technology may not speak to everyone and even that it cannot, in effect, replace traditional radio. Tim Westergren has reflected,

> Pandora's really not a panacea… People like different things out of radio. For some people, radio is company. They want a human voice, they want a DJ they've come to know. And that's what they listen for. Pandora's not for them. There are people who like to hear just the hits—a lot of people. I would argue that that's probably because they've never had something like Pandora before, but it's not going to work for everybody.[4]

More importantly, the individuals participating in shaping these technologies and media experiences as they develop appear open to new methods that might work better to achieve their goals: "[Pandora is] always keeping an eye on the machine listening space… we don't have some kind of religion around the [Music Genome Project]."[5]

[4] Westergren, telephone interview.
[5] ibid.

Some Futurology

Personalized services have been developing and changing over the past eight years or so of their existence. I wish to contribute a few thoughts on where I think these services are heading in the coming months and years.

As appears to be the general trend on the internet, I believe that these applications will make their way into other spheres as music discovery companies open up their data to allow for mashups, and vice versa. Pandora, Last.fm, and LAUNCHcast (only their videos for the time being) have all developed mini-applications for Facebook; Yahoo! is currently working on APIs (application programming interfaces) to allow developers to build applications on top of their data.

The concept of metatext radio introduced by Tim Wall in "The Political Economy of Internet Radio"—the idea of radio as part of a larger, multifunctional site—will, I believe, continue to be important for thinking about personalized streaming services. The financial viability of dedicated radio-style music streaming sites has not been proven, such that they are often folded into portal sites and become increasingly multifunctional.

With respect to the services themselves, much like elsewhere in the internet radio landscape, I think we can expect personalized applications to become available for mobile listening. In terms of content analysis methods, I think more automated analysis will be used to increase the databases, and that more user-submitted content will follow. I also think that rather than services choosing either collaborative-filtering or content-based methods, all services will incorporate all of these methods, while maintaining an emphasis on one or another methodology.

Close attention will have to be paid to the developing situation concerning the determination of statutory webcasting rates in the United States, which are likely to affect the content and type of features found on these services. There is some possibility that in order to avoid legal complications, many services will

negotiate licenses with labels rather than stream material of their own choosing, as is currently possible in the U.S. A statutory licensing framework is not currently in place in Canada. Because of these and similar policy situations, I believe that the availability of certain features and certain kinds of content will become more and more defined by geographic area because of the difference in rights regimes in different territories.

As is key for Bolter and Grusin's notion of remediation, the process of reconfiguration is not only one-way. Therefore, we can expect aspects of personalization and the attempt to level the playing field between artists to make their way as values onto more traditional forms of radio. Expect to see more experiments with user-submitted material, multicasting, and broadcast of little known acts, as has already begun to be the case.[6]

If and when the promotional power of recommendation engines is proven, I believe we can expect to see an increasing commercialization of user data and the emergence of a search-engine like form of income generation for these services. Record labels might pay recommendation services for insertion of their musical acts into the audio streaming such that like search engines, they will begin to feature two kinds of programming, paid and unpaid, most likely with the paid insertions clearly indicated. Search engines, as we know, offer two kinds of results—one paid for and clearly labeled as such in the margins of the results page, and another, the 'real' results, which appear in the main section of the page. As in a search engine, where it becomes valuable for sites to be associated with particular keywords (the basis of Google's Adsense, whereby companies bid on keywords), with recommendation engines there is a similar promotional value in being listed as a 'similar artist' to an already recognized artist 'brand' or simply being played to fans of those artists. Record labels may also pay recommendation services to receive information about how their artists are received and by whom.

[6] Vocalo, a project launched by Chicago Public Radio, admittedly not a commercial player, involves material that is user-submitted via internet that is then broadcast over-the-air. See http://www.vocalo.org.

Future Work

Particularly because of the basis of these services in recommendation systems, I find this to be a very compelling area of research; the technologies and their implementation clearly involve understandings and assumptions about how people form their musical tastes and make purchasing decisions. My hope is that this thesis poses an initial step into the discussion of recommender systems within a communication studies framework. I have concentrated on music recommender systems specifically, and on a particular application (audio streaming) at that. More generally, computerized recommendation systems for film, wine, and other goods, are becoming increasingly ubiquitous on the Web. Future work could look at such systems in a more general context, or examine the particularities of one of these areas of product and service recommendation.

Studying personalized audio services' discourses and claims is clearly only one possible entry point into the phenomenon. I have attempted to weave a political economic interest into the discussion, but certainly such an approach could be made more salient. A focus on the discourses of these services reveals a great deal about the kinds of values that are emerging as positive within in the entertainment industry, in particular in terms of forms of music distribution. The value of a discursive approach is in part its documentary function, since this is still a moment of emergence for personalization in audio streams, which potentially will grow to wider relevance. Like on other areas of the Web, it appears to have become popular to invoke listener agency as well as the democratic benefits for musicians of the existence of these services. Yet there are many aspects of personalized services that remain to be studied; the uses of personalized audio services are also deserving of study in addition to its discourses, forms, and industrial practices. I hope others will pick up where I have left off.

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Appendix A: Research Ethics Clearance Certificate

McGill

Research Ethics Board Office
McGill University
845 Sherbrooke Street West
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Tel: (514) 398-6831
Fax: (514) 398-4644
Ethics website: www.mcgill.ca/researchoffice/compliance/human/

Research Ethics Board I
Certificate of Ethical Acceptability of Research Involving Humans

REB File #: 68-1006

Project Title: Recommendation Engines and Music Discovery: Customized Audio Streaming on the Internet

Principal Investigator: Ariana Moscote Freire **Department:** Art History &Communication Studies

Status: Master's student **Supervisor:** Prof. J. Sterne

Funding Agency and Title: SSHRC- Digital audio and the condition of sound culture (PI-J. Sterne)

This project was reviewed on 27 oct 2006 by

Expedited Review ✓
Full Review ____

Catherine Lu, Ph.D.
Chair, REB I

Approval Period: November 7, 2006 **to** November 6, 2007

This project was reviewed and approved in accordance with the requirements of the McGill University Policy on the Ethical Conduct of Research Involving Human Subjects and with the Tri-Council Policy Statement: Ethical Conduct For Research Involving Humans

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*All research involving human subjects requires review on an annual basis. A Request for Renewal form should be submitted at least one month before the above expiry date.
*If a project has been completed or terminated and ethics approval is no longer required, a Final Report form must be submitted.
*Should any modification or other unanticipated development occur before the next required review, the REB must be informed and any modification can't be initiated until approval is received.

Appendix B: Comparative Table of Featured Services

	Yahoo! LAUNCHcast	Last.fm	Pandora.com	Radiolibre.ca
Country of Operation	United States	United Kingdom	United States	Canada
Ownership (August 2007)	Initially Launch Media; since 2001, Yahoo!	Initially Last.fm; since 2007, CBS Corp.	Pandora Media (formerly known as Savage Beast Technologies)	Initially Astral Media; since 2007, Lycos Canada
Date launched	November 1999; 2001 under Yahoo! ownership	December 2002	October 2005	January 2006; June 2007 under Lycos Canada ownership
Number of Registered Users (most recent data)	30 million worldwide (June 2007)	20 million worldwide (July 2007)	7 million in the U.S. (June 2007)	13,000 at its height (February 2006); current figures unknown
DMCA Statutory License Eligibility	yes, in the U.S.	n/a	yes, in the U.S.	n/a
Size of catalogue	Information not available	Information not available	Over 500,000 songs (August 2006) with approx. 8,000 new songs added per month	Over 500,000 songs of which approx. 100,000 are Quebec artists
Content Licensing Deals	n/a	Warner Music Group, EMI, Sony BMG, ioda, online submission ("Digital Broadcast Agreement")	n/a	Warner, Universal, ioda, SOPROQ
Accept submissions?	no	yes, via digital submission	yes, by post, subject to selection by Pandora	no
Distribution Deals/Partners	USA Networks	Live Nation, Ticketmaster	Billboard, MSN, Earthlink, Sprint, Ticketmaster	n/a
Retail Partners	n/a	cdbaby, iTunes, Amazon, 7digital, individual labels	iTunes, Amazon	iTunes, Amazon, Puretracks, Ticketmaster