Internet Radio
Radio after the future
What makes radio now, versus what will make radio in the future?

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Original proposal
As on-demand streaming and downloading of digital content become standard features of the Internet, radio of the future may focus on collecting, collating, connecting, contextualizing, and curating fulfilling experiences between participants and content(s). These participants (née "listeners") will seek out trusted sources for radio content, and may engage in its production as well as its consumption. We see aspects of this trend developing in social audio networks like Audioboo, Soundcloud, and Facebook, each evolving toward broadcasting what traditionally has been considered radio content.

The results will surely be varied and interesting. For example, the potential fragmentation of future radio participants may require future broadcast sources to provide context, selection, sense-making, relevance, trust, and value, as well as content. This presentation, based on outcomes of a course to be taught by the presenter, spring semester 2013, entitled "Internet Radio: Theory and Practice," will explore some of the potential opportunities and challenges.

Epigram
Radio as reaction . . .
Audio is like gold (chemical symbol: Au)
        easily shaped, molded, crafted, polished
Radio is like Radium (chemical symbol: Ra)
        active, ephemeral, quickly gone
Together, they produce AuRa, a sound-based chemical reaction . . .

Abstract
Investigates the potential of future radio theory and practice to create and sustain mobile, social audio networks via collaborative production/sharing/consumption of audio content. Focuses on radio drama and radio art, two content genres thought best aligned with this vision of Internet radio as an evolving form of digital media.

Overview
This essay suggests that future radio, with its transmission, contents, and reception digitized and available via Wi-Fi enabled mobile devices, may encourage participants/listeners to converse/collaborate regarding content production, as well as to interrupt/influence/customize the program stream, thus making future radio a many-to-many, mobile,

non-linear, social, and collaborative experience—an audio network providing global reach via the Internet even while its focus remains local. Two content genres—radio drama and radio art—seem especially suited to promote the collecting, collating, connecting, and curating experiences between participants and content(s) associated with this emerging form of radio. This essay investigates evolving theory and practice of Internet radio in this context.

Background
Radio is a 20th century technology (perhaps the most significant) used to transmit signals in the form of invisible electromagnetic waves (commonly called radio waves) wirelessly over distance most commonly through the atmosphere, the ether. This is called radio broadcasting. Information (sounds of speech, for example) in the form of a systematically modulated (changing the amplitude, frequency, phase, or pulse width) electromagnetic signal can be carried by these waves. A receiver (commonly called a radio) can intercept radio waves, extract the information bearing electromagnetic signal, convert it back to its original form using some type of transducer (a device that converts one form of energy into another; in this case, electrical into sound pressure energy), like a speaker. The basic equipment of radio is relatively affordable and allows listeners to tune in one-way broadcasts.

Radio content categories include music, talk, sports, news, and events, all homogenized and rigidly formatted for a perceived, particular audience, and not necessarily connected to the place of its local consumption. It is very much linear, and one-to-many in its nature. Arguably, there are few, if any, opportunities for the listener to influence or contribute to the programming, and diminished opportunities to find that which is new, different, exciting, or thought-provoking.

Given its lengthy and notable history, and its rootedness in practices and cultures that have evolved with and as a result of this medium's growth since the early twentieth century, traditional radio might be better called "legacy radio."

Defining characteristics of legacy radio
As a medium, legacy radio exhibits several definitive / essential characteristics. First, content is transmitted through the ether, generally from a corporate broadcaster via dedicated networks, to listeners, in a one-to-many model. The ability to receive any transmission is limited, however, by its strength, the distance of travel to receivers, the ability of those receivers, and atmospheric conditions.

Legacy radio is a fast, often instant broadcast medium, allowing anyone tuned to a particular broadcast to receive information from distant locations without apparent time delay, or lag.

Legacy radio allows listeners to combine their imaginations and the sounds heard via broadcast in order to make pictures, to "see" events afar, what Frederick Wiebel, Jr. calls "audio mind movies" (Wiebel, Frederick, Jr. "A Not So Brief History of Firesign Theatre." http://old.disinfo.com/archive/pages/article/id2037/pg1/index.html).

Finally, the technology, content, and culture of legacy radio is, primarily, focused on the process of listening and reacting to sound, the listening experience. Sound can be classified in two general categories: vocal and non-vocal. Vocal sounds are, generally, those produced by humans for the purpose of conveying information between a sender and a receiver: generally speech or song. Non-vocal sounds are, generally, those originating from environmental, mechanical, musical, and other sources non-human.

Advantages of legacy radio

Legacy radio has several advantages over other media. For example, compared to other media, it easy to use, needing relatively simple technology and equipment for its infrastructure. As a result, legacy radio is less expensive than other media.

Legacy radio is often the predominant medium in our automobiles, homes, or offices. When we want to engage in activities without the visual distraction of television, radio provides a background (Andrew Crisell. *Understanding Radio*. London: Routledge, 1994).

Legacy radio is a convenient way to get information, especially live, local, community-specific information like traffic, weather, news, and events.

Legacy radio is portable. With advances in technology and manufacturing efficiency, legacy radio receivers have grown smaller, lighter, easier to transport from place to place. With the development of efficient storage batteries, legacy radio can be heard most anywhere, needing no wired electrical power supply.

Finally, legacy radio does not require literacy. One does not have to understand the language of the broadcast to enjoy the broadcast.

Disadvantages of legacy radio
On the other hand, legacy radio does have some disadvantages. For example, legacy radio generally provides only one chance to hear and understand its message, unless a recording is available for playback.

Legacy radio messages are easily forgotten after their initial broadcast unless they are purpose produced to invoke interest and promote memory.

Legacy radio has no visual images, thus belaying the dictum "seeing is believing." (Nokia visual radio seeks to address this disadvantage by adding visual content to radio broadcasts.)[1]

Legacy radio is of no use to people without a sense of hearing, or who suffer from hearing disabilities.

Legacy radio has, arguably, turned away from the primary use of speech, storytelling and narrative, ignoring engagement for programming decisions that seek only to maximize commercial return.

Internet radio
Beginning with the publication of *The Mechanical Bride* in 1951 and continuing to his death in 1984, Canadian communications theorist Marshall McLuhan developed an intricate taxonomy of media and their effects, especially the ways they address and engage our senses. McLuhan was interested in electric media, particularly television and then evolving computer technologies, for their abilities to promote interaction between media and its consumers, creating opportunities for communications with simultaneous global reach and local orientation, what McLuhan called the global village.

Fast forward to 2001 when Lev Manovich posited a "new media revolution" (19) wherein all culture is shifting to computer-mediated forms of production, distribution, and communication. Manovich identified ten media objects as artifacts of this revolution: websites, virtual worlds, virtual reality, multimedia, computer games, interactive installations, computer animation, digital video, digital cinema, and human-computer interface (*The Language of New Media*, MIT Press). Since then, digital media theorists and

practitioners have added three more: digital photography, digital music/sound (including podcasts), and Internet radio.

Again, fast forward, this time to a 2006 statement by the European Broadcasting Union Digital Strategy Group II. "Digital technology makes possible new ways to produce and deliver media, and brings the wider use of ever more sophisticated multimedia, interactivity, the option of multichannel services, on-demand services, and the transition of content provision, to broadcasting and media consumption" (*Public Service Media in the Digital Age*. Digital Strategic Group II Report, Geneva: European Broadcasting Union, 2006: 19). In short, digital technology and culture offers great promise for all media.

As one of Manovich's fourteen digital media objects, Internet radio (also called web radio, net radio, e-radio broadcasting, or streaming radio) provides an interesting context in which to test the statement above.

Internet radio is still evolving, but said to be full of potential and promise. Various futures for Internet radio might be extrapolated from a 1990 book by George Gilder, *Life after Television.* Looking to the future of television, Gilder predicts technological advances will allow individuals using inexpensive and prolific equipment to produce and broadcast their own diversity of programming thus replacing the monopoly of a few television networks to fill hundreds of channels with programming geared to the lowest common denominator broadcast from a few centers to millions of passive receivers (New York: Norton, 1990: 40-41).

Gilder's argument can be extended to Internet radio: transmission of digital audio content via the Internet rather than the ether. Sounds at the transmission source are converted to digital samples (packets of information), transmitted serially and continuously (streamed***[2]) over the Internet (a world-wide network of networked computers), reassembled by a receiver, and converted by a transducer back to the original sound(s).

Beyond the Internet, digital audio broadcasts can be streamed via cable and satellite. Internet radio may be multi-channel, and distributed to multiple devices, notably telephones and tablets. Internet radio is not, however, dependent upon signal strength or transmission through the ether to reach an audience. Internet radio stations can be heard anywhere in the world with access to the Internet, or the ability to download content from the Internet for later playback.

As a result, anyone with a computer, audio software, and a connection to the Internet can stream and/or receive radio content from anywhere in the world. Thousands of Internet radio stations are available for listening today, either streaming from their own websites, or through one-stop aggregators like Live365, ShoutCast, and iTunes. Many duplicate the structured program schedules of legacy radio. Many more provide freeform programming, or genres of music not available on the legacy radio dial. Still others experiment with becoming / offering something new/nous, something different.

Advantages / disadvantages of Internet radio
Where legacy radio has enjoyed a century of development and utilization, the history of Internet radio dates only from 10 November 1994 when the Seattle-based space rock group Sky Cries Mary performed the first live Internet-only broadcast.

Since then, as noted, thousands of Internet radio stations provide a plethora of content, either via constant or on-demand streaming, or podcasting, to a variety of devices no longer tethered to specific locations. Using the Internet, artists/broadcasters are said to be free to experiment outside licensing/commercial constraints, thus potentially increasing options for

creativity, including radio art discussed below. The result is often touted as synergistic, non-linear, interactive, social, on-demand, collaborative, and increasingly mobile. In this context, every listener is capable of creating and consuming content.

It may, however, be too early to discern clear advantages and disadvantages other than the most obvious: that the increase in Internet-capable mobile devices points to a potential increase in Internet radio listeners, or, that Internet radio is still, and always will be, only available to those with Internet access.

A more interesting line of speculation is what might become for Internet radio. On one hand, Internet radio might mirror legacy radio in a digital context. For example, we note that historically, radio is distinguished from other media by being invisible (Lewis, Peter M. and Jerry Booth. *The Invisible Medium*. London: Macmillan Press, 1989). Its disembodied sound sources (voices, words, and music) are rich with representation, but meant to be passively heard rather than seen other than through the deep resources of the listener's imagination. Some forms of Internet radio may do little to change this situation. Click Radio, Last.FM, Pandora, Radio Mongo, Rdio, Rhapsody, SonicNet, Spotify, iHeartRadio, TuneIn and other so called "interactive radio stations" provide, despite the listener's ability to influence the genre or artist played, only a passive radio experience, a one-to-many broadcast, much the same as expected from legacy radio.

On the other hand, where legacy radio was, and to a large degree still is, a solitary one-to-many experience, consumed while engaged in another, primary activities, Internet radio, in forms like streaming, podcasting, and downloading, suggests the potential to provide rich and varied options for the many-to-many distribution and consumption of radio content that more readily incorporates the complex and constantly changing components and culture(s) of radio, sound, and listeners.

The theory of Internet radio
The digitization of radio's essential features--content, transmission, and reception--will certainly provide any number of nudges in many different directions. This could change what we have considered "radio," a one-to-many communication process, into an interactive, social, collaborative yet personalized aural experience capable of connecting people and facilitating their communication over time and distance even while remaining local in its focus. As a result, local Internet radio***5 moves beyond the rigidity of corporate broadcasting and re-validates interaction with everyday residents of neighborhoods and communities (Maria Papadomanolaki. "Radio as the Voice of Community" Locality, Interactivity and Experimentation." *Radio Content in the Digital Age: The Evolution of a Sound Medium*. Eds. Angeliki Gazi, Guy Starkey, and Stanislaw Jedrzejewski. Briston, UK: Intellect, 2011. 73).

At this point, some theoretical framework may be helpful. I have selected three different theoretical approaches to Internet radio based on their abilities to provide a spectrum of opportunities to explore, in both theory into practice, the opportunities and affordances of Internet radio.

At one end of the spectrum, Andrew Dubber argues in his forthcoming book, *Radio in The Digital Age* (Polity Books 2013), that "radio is a term used to refer to very different (though related) phenomena." For example, radio is an institution; an organizational structure; a category of media content with its own characteristics, conventions, and tropes; a series of professional practices and relationships; etc. As a result, radio work, content, technologies, or cultures cannot be considered as single subjects or processes, but rather must be considered as an "ecology," especially within the digital media environment in which "radio" is increasingly situated.

At the other end, media theorist Marshall McLuhan, argues that every medium undergoes a "tetrad," four questions / laws that, he says, can be asked of the medium and its impact:
1) What aspect of society or human life does it enhance or qualify in the culture?
2) What aspect in favor or high prominence before its arrival does the medium question, obsolesce, or push out of prominence?
3) What does it remove from the past, from the realm of the previously obsolesced and put back center stage?
4) What does the medium reverse or flip into when it has run its course or reaches the limits of its fullest potential?

These questions speak to a series of activities / stages / a process each medium undergoes
1) amplification
2) obsolescence
3) retrieval
4) reversal

Following McLuhan's tetrad, radio . . .
1) Amplifies / enhances oral communication across distance
2) Obsolesces aspects of written communication such as newspapers as the leading edge of news delivery
3) Retrieves some of the prominence of oral communication from the pre-literate (pre-writing) times
4) Reverses into broadcasts of sounds and images (television) if we introduce video
(McLuhan, Marshall. "McLuhan's Laws of the Media." *Technology and Culture* January 1975: 74-78; McLuhan, Marshall. "The Laws of Media." *et cetera* 1977 34(2): 173-179; and Marshall and Eric McLuhan. Laws of Media: The New Science. Toronto: University of Toronto Press, 1988).

In between the ends of this spectrum is the idea of remediation posited by Jay David Bolter and Richard Grusin in their book *Remediation: Understanding New Media* (Cambridge, MA: The MIT Press, 2000). Remediation, they say, is the representation of one medium in another, a defining characteristic of new digital media. Digital media, they argue, wants to be transparent, placing the viewer in the same relationship with the remediated digital version as with the original. But, digital media always makes its presence known, in some ways more aggressively than others, attempting either to completely refashion the older medium or media, or absorb them completely. But, the new medium remains dependent on the old, even while trying both to absorb and/or dominate it. Neither can disappear completely, even though new forms or substitutions emerge, like adding multimedia (either video, text, images, text as image) to the sound (audio) of radio. In short, something of the old is always present in the new.

So, whether we consider Internet radio a phenomena, a tetrad, or a remediation, there are many opportunities to discuss and explore the future potential affordances and essential characteristics that may be associated with Internet radio.

The future of Internet radio
Who can know the future, except to say that any observable thing will continue its current trajectory, or, with some sort of nudge, start a new one. In his short story "Burning Chrome," William Gibson speaks presciently to such nudges when he says, about technology, "the street finds its own uses for things" (Gibson, William. "Burning Chrome." *Burning Chrome*. New York: Ace Books, 1986. 186). Surely, this will be the case new combinations of hardware and software imagine and implement new forms of Internet radio.

What are the "things," the essential characteristics, for which Internet radio might find new uses? As noted earlier, new opportunities brought by digital Internet radio might include increased opportunities for mobility, meaningful interaction between participants (née listeners) and content, and social collaboration.

Such potentiality positions Internet radio as a particularly interesting research subject, both in terms of theory and practice. What might be the nature, the future, of Internet radio? Will it replicate the practices and content of legacy radio? Or, will it promote something new and interesting? And what about sound, arguably the essential characteristic of radio, yet a sensory input largely ignored by new (digital) media, or, if used, situated merely as an accompaniment? Might sound, as broadcast via Internet radio, become, once again, a primary sensory input with which we can convey narrative(s), cultural memories and traditions, as well as make sense of our lives in the larger surrounding world?

With such diversity, I propose three areas of interrelated concentration:
1) radio as mobile, interactive, social collaboration
2) radio drama
3) radio / transmission arts

Internet radio as mobile, interactive, social collaboration
Playwright Bertolt Brecht said radio could be "the finest possible communication apparatus in public life," if only it "knew how to receive as well as transmit, how to let the listener speak as well as hear, how to bring him into a relationship instead of isolating him" (Bertolt Brecht. *Brecht on Theatre: The Development of an Aesthetic*. Trans. and edited by John Willet. New York: Hill and Wang, 1964. 51). Radio as a mobile, interactive, social collaboration (social sound) holds interesting opportunities for redefining the culture of radio, and perhaps answering Brecht's challenge.

Mobile
Early listeners of legacy radio tweaked fragile crystal receivers, hoping to tease a signal from the mysterious ether. As radio evolved, programs (content) were broadcast via dedicated terrestrial networks. Families gathered at specific times around large, often ornate receivers, basking in their tube-glow warmth, listening to drama, music, or news. With the invention of transistors and other small-scale electronic components, along with reliable storage batteries, the radio became portable (mobile), able to be anywhere people might gather to listen to distant sounds. This is even more so the case today as radio receivers are miniaturized and built into personal music players and telephones, or replaced entirely by software.

Interactivity
Another popular attribute of the Internet is interactivity, the ability for computer software to accept and respond to input (data or commands) from humans. In order to promote interaction there must be first, the desire to interact. Next, there must be something with which to interact (content) and a way to promote interaction (interface). As a result, users become interactors, "protagonists of information" (Carmen Peñafiel Saiz. "Radio and web 2.0: Direct Feedback." *Radio Content in the Digital Age: The Evolution of a Sound Medium*. Eds. Angeliki Gazi, Guy Starkey, and Stanislaw Jedrzejewski. Briston, UK: Intellect, 2011. 67).

Imagine rather than sitting and listening to a particular program at a particular time, you turn on a program that has you up and out of your flat, walking the streets seeking out treasure, attempting to solve some puzzle, or participating in some event? Perhaps you are collecting materials/clues from the surrounding landscape, or from people met along the

way. Perhaps you create and share content with these same, or other folk. Perhaps you, and others, draw on that content wherever/whenever you/they want.

In this scenario, radio becomes non-linear, social, collaborative---an audio network that can provide global reach even while its focus remains local. Listeners can pull content from any number of creators /providers around the world to create a radio show that addresses their particular needs or wants at that moment. Want world music? News? Sports? Talk? all from someone, someplace different? It should be available and listeners could structure a "program" by linking the desired contents and then having a listen. Conversely, participants can contribute their own content in the form of audio files, podcasts, remixes of content provided by others, online audio conversations and/or conferences. As a result, the listener participates as a parallel broadcaster, with the opportunity to contribute as much or more to the Internet radio programming spectrum as the host station (Saiz, ibid. 67). Internet radio is thus differentiated from legacy radio as it absorbs the contributions and affordances of its context.

Antecedents
There are antecedents from legacy radio that we can consider as inspiration for such future ideas. For example, The Five Mysteries Program <http://en.wikipedia.org/wiki/The_Five_Mysteries_Program> was an audience participation radio program broadcast from 10 August 1947 to 27 March 1950. Each of the 296 30-minute episodes presented five mysteries dramatized by actors, music, and sound effects. A panel of listeners and studio guests suggested solutions.

From 30 October 1969-7 June 1973, KPFA radio's (Berkeley, California) Music Department gave artists from various disciplines any amount of air time to create situations that physically involved the listening audience, making them active participants rather than passive listeners.***[3] On 20 November 1969, dance choreographer and intermedia artist Anna Halprin led the audience in a participatory event (Radio Event No. 3: Furniture, 50:59) where they were to rearrange their home furniture in time with musical selections played during the radio program and then visualize a fantasy that occurred to them during the process. Listeners / participants were encouraged to call the station and share their fantasies, which were included in the program's conclusion. Musical selections included excerpts from Goin' Out of My Head, Live for Life, Don't Fence Me In, and Renaissance vocal, Mozart Symphony No. 35.

During the 1970s, 520 episodes of Ellery Queen's Minute Mysteries began with actor Bill Owen saying, "This is Ellery Queen with the case I call the . . .." Owen then outlined the case in one minute. A radio station announcer encouraged callers to solve the mystery and win a sponsor's prize. Once they had a winner, the station played the solution part of the episode as confirmation.
(Public domain .MP3 files available at: http://archive.org/details/Ellery_Queen_Minute_Mysteries

Many more ideas might be taken from games, locative media, and electronic literature created for use on mobile telephones. In 34 North, 118 West (Jeremy Hight, Jeff Knowlton, and Naomi Spellman; http://34n118w.net/.) a former industrial area in downtown Los Angeles, California, becomes the site for a locative narrative project. Imagine walking through an urban area surrounding the former Freight Depot with a tablet computer equipped with a GPS card and headphones. Physical maps are also available. GPS tracks one's position in the neighborhood and triggers audio-visual narratives when entering hot spots created by Hight, Knowlton, and Spellman. Physical elements /details at each location augment the narrative, providing metaphors and symbols for interaction(s) with the characters and history of this place. By wandering about the area and evoking multiple

narratives, many lost or forgotten, one can uncover the hidden history of this once thriving part of downtown Los Angeles. The streets, the buildings, the ghosts of former residents, all provide fragments that, taken together, provide a deep and rich narrative of this place

The Nokia Games (1995-2005), a series of alternate reality games designed primarily to promote the latest Nokia mobile telephones, involved communication between players through various forms of mass media and featured storylines that changed each year. Each game lasted 3-4 weeks.

The Beast (2001) was an interactive web game designed to promote the film A.I., an unfinished film project of Stanley Kubrick, directed by Steven Spielberg, and released in the United States on 29 June 2001. Elan Lee and Sean Stewart, lead designers, both of Microsoft, seeded the initial clues and puzzles throughout the World Wide Web. A discussion group eventually claiming more than 7,000 members called Cloudmakers formed on 11 April 2001 to solve the puzzles and fill in the details of the game. They solved the game on 24 July 2001.

Uncle Roy All Around You (2003; Blast Theory; http://www.blasttheory.co.uk/bt/work_uncleroy.html), by Blast Theory, is a game played online in a virtual city and on the streets of an actual city. Online and street players collaborate to find Uncle Roy's office before being invited to make a year-long commitment to a total stranger. Building on Can You See Me Now? (2001; Blast Theory; www.blasttheory.co.uk/bt/work_cysmn.html), Uncle Roy investigates some of the social changes brought about by mobile devices, persistent access to a network, and location aware technologies.

I Love Bees (2004; 42 Entertainment; http://www.ilovebees.com) is an alternate reality game created and developed by 42 Entertainment to serve as both material world experience and a viral marketing campaign for the video game Halo 2. First advertised in a subliminal message in the Halo 2 trailer, players who visited the website ilovebees.com found it apparently hacked by a mysterious intelligence. Playing the game involved solving puzzles to reveal the backstory involving an artificial intelligence apparently from a crash-landed military spacecraft and its attempts to repair damages suffered in the crash. Launched in August 2004, over three million people viewed the website and thousands of people around the world played the game during the three months it was active.

Hypercities Project (2009; http://www.hypercities.com) is "a collaborative research and educational platform for traveling back in time to explore the historical layers of city spaces in an interactive, hypermedia environment."

LA Flood Project (2010; Christy Dena, Jeremy Douglass, Juan B. Gutierrez, Jeremy Hight, Marc C. Marino, and Lisa Ann Tao; http://laflood.citychaos.com) positions the audience/user/narrator as the ellipses (. . .) the points between the narrative action: "Voices are being heard on cell phones . . .."

Mowing Lawn (2010; http://artonetwentynine.blogspot.com/2011/02/jeremy-wood-mowing-lawn-2010.html), by GPS artist Jeremy Wood, uses satellite navigation technology to compile a personal cartography of his relation to space and time while mowing his lawn.

[murmur] (2003; http://www.murmurtoronto.ca) is a digital storytelling initiative that began in Toronto, Canada, and has since expanded to eleven cities worldwide, involves people walking neighborhood streets and finding signs with a telephone number and access code. If they dial the number and enter the access code they can listen to an audio narrative regarding the very spot where they are standing.

From these examples, it should be clear that interactive radio implies the ability of listeners to interact with the radio program, thus promoting a two-way connection between broadcaster and audience. If the response is sufficiently complex, the system is said to be conducting social interaction. Additionally, on demand functionalities and full access archives would seem to contribute to a desire for this new form of radio. These requirements prompt consideration of multimedia (text, images, video, audio) as potential content and some device through or with which to receive, manipulate, interact with this content. We can point to potential components across the breadth of digital media (screens of various sizes, handheld or easily manipulated controllers, platforms for sharing information, networks that facilitate collaboration and social knowing) as models for what might be called interactive multimedia radio.***[4]

An evolving definition / conceptualization of interactive multimedia radio might include these levels:
Physical – the hardware platforms of receivers, controllers, servers
Structural – specifically designed software programs and/or operating systems, or the ability to leverage the affordances of the same for a new, specific purpose
Usage – rules and procedures determine what can be shared as the basis for interaction, the form in which it will be shared, and expected responses (from both client and server). Together, these considerations determine what can be created and understood.
Manifestation – the outward appearance of the medial interface with the concurrent agreement that not all appearances are equal and that user responses/experiences are different as well
Sensual embodiment – includes a relation to material and time; technical aspects of the interface will contribute to this. For example, hand held devices may lend themselves to ideas that they contribute to an accelerated sense of space and time.

Social audio network
The Internet and its ability to promote communication (both asynchronous and synchronous) between people since the adaption of email and FTP (File Transfer Protocol) in 1972-1973, has promoted the idea of people connecting with other people for the purpose of sharing information and insights regarding common interests. For example, among the many legends associated with the early Internet is the tale about an early email discussion group comprised of computer professionals, scientists, engineers, and librarians focused on discussing their shared interest in the television program *Star Trek*.

Such use of digital technology, particularly that associated with the Internet, provides unprecedented participation in the process of creating and consuming content (Sherry Turkle. *Life on the Screen*. New York: Touchstone, 1997.) One might suggest a similar desire for shared communication throughout human history. Prehistorical cave paintings were perhaps attempts to understand and/or portray pre-verbal world knowledge. With the advent of spoken language, orality, storytellers, who served as collective memories, organized and communicated the histories of their tribe or society. This reached a pinnacle with the ancient Greek rhetor, arm raised in the agora, signaling a desire to speak. The development of writing technologies affixed the spoken word to some permanent surface, allowing it to transcend temporality, time, and geography. Now, ever-evolving digital technologies allow us to produce increasingly more and more content for publication on the Internet. Social networking technologies increase the opportunity for sharing and discussing this content we produce, thus creating, as Clay Shirkey argues, user generated content for both public and private content / communications. Somehow, the tons of information we create and publish online must be easily accessible to our readers / viewers, who will, through their conversation about this content, often with the creators, determine what is best. To paraphrase Cory Doctorow, "Conversation is king. Content is just something to talk about."

Danah M. Boyd and Nicole B. Ellison differentiate social network sites and their ability to promote communication between people who share an extended social network from social networking sites where people are seeking to meet new people or rekindle old relationships (Boyd, Dana M., & Ellison, Nicole B. "Social Network Sites: Definition, History, and Scholarship." Journal of Computer-Mediated Communication, 13(1), article 11, 2007. http://jcmc.indiana.edu/vol13/issue1/boyd.ellison.html)

Assuming the former suggests social media promotes collaboration/sharing for the purpose of storytelling. As a result, multiple voices of ambient storytellers / journalists can create, shape, and share stories. Diverse participants can collaborate/participate without a central structure. The result: a conversation where the storyteller is one voice in the process of telling the story. Diverse narrators decide how they will shape and use the collaborative spaces afforded by the social network(s). This collective narrative is all around us all the time. It is always being created without our awareness, or even direct participation. This prompts some interesting questions:
How do we make sense of this affordance?
How do we sort through the messages to find the/a story?
How do we search, sort, organize this information?
How do we make sense with the storytelling tools now available?
What stories are going to be told?
How are these stories going to be told?
By whom will these stories be told?

See Cowbird.com <www.cowbird.com> for some answers.

Internet radio as a social audio network provides an interesting alternative to the historical and current producer-consumer model. Following examples provided by woices, audioboo, SoundCloud, MixCloud, and others, we can imagine listeners becoming participants / interactors, and actively creating and sharing content for Internet radio. Such scenarios might include listeners tuning in their favorite genres / eras of music, as well as producers (DJs, bands, etc.). They might seek news from trusted sources, or from those with political bents that match their personal taste(s). Looking for a sense of personalization, listeners will be attracted, increasingly, to what they consider trusted talent / guides in education and entertainment, sources whose powerful one-to-one communication / connections become increasingly more important and valuable. The result will be a truly personalized radio experience, created from a pastiche of audio sources, woven together in response to listeners' particular interests, utilizing trusted yet divergent content sources.

A potential result, noted by Jesse Walker, is that listeners will "withdraw from the thick smoke of mediation and interact more directly, more convivially, with others" (*Rebels on the Air: An Alternative History of Radio in America*. New York: New York University Press, 2001. 11).

Questions for theory, research, practice, and learning
1)   What has comprised mobile, interactive, social radio historically?
2)   How was this work created, transmitted, and received?
3)   What might be done with sounds not possible before digital technology to create and share compelling mobile, interactive, social radio that is both global in scope and local in focus?
4)   Can mobile, interactive, social radio provide a venue for narrative?
5)   Can mobile, interactive, social radio provide a level of interaction beyond simply selecting favorite music genres from extended playlists?

6)   Are there ideas / inspiration pointing to new forms of mobile, interactive, social storytelling?
7)   What stories might be told using mobile, interactive, social radio?
8)   How might these stories be told?
9)   How could these narratives/stories benefit from opportunities for interactivity, collaboration, and social networking among the listeners and between the participants (nee listeners) and the program itself?
10)   How could these efforts help to recenter sound as the primary form of sensory input, even while it is part of a mix of multimedia?
11)   How would we approach the challenge of producing and streaming content for mobile, interactive, social radio?
12)   What might be undertaken in conjunction with such a project (promotional/ educational materials, website, social media, etc.) to increase its effectiveness and opportunities for social engagement?

Radio as drama
Internet Radio (or Radio Nouspace, because of the semantic play on the notion of "nous" = our and sounds like, speaks to, and tries to be "new") can be different. With all aspects of the transmission, contents, reception chain/process/link between creator and consumer digitized we can (re)combine these components however we like, striving for something "nous/new." Additionally, people can listen wherever, either via connection to the Internet, or offline after downloading desired content. Given the interactivity afforded by this context, Internet radio may become increasingly collaborative with its participants (née listeners) becoming both creators and consumers (R. Burnett and P.D. Marshall. *Web Theory: An Introduction*. London: Routledge, 2003) able to interrupt/influence/customize the program stream, all while conversing with each other, thus making radio a many-to-many, non-linear, experience. Additionally, given the increasing use of hand-held, wireless devices, Internet radio may be mobile, non-linear, shared, social, collaborative---an audio network providing global reach even while its focus remains local. Certainly it will not be boring. As Lev Manovich notes, "today we are in the middle of a new media revolution--the shift of all culture to computer-mediated forms of production, distribution, and communication. This new revolution is arguably more profound than the previous ones, and we are just beginning to register its initial effects." (*The Language of New Media*. MIT Press, 2001. 19)

What content might we anticipate from Internet radio? As with the Internet itself, whatever might be of interest to any listener(s), no matter how sharply defined or delineated. With a seemingly endless palate of programming opportunities, I focus on two that seem especially interesting for research and practice associated with the nous/new nature of Internet radio: radio drama and radio art.

As we have learned from Marshall McLuhan, each new media incorporates that/those it replaces/extends. Radio extends speech beyond the transmission circumference of the human voice. Radio drama incorporates and continues the ability of speech to create and share immersive narrative spaces and experiences. Given the historical and cultural prominence for storytelling, what can we do with the technology of speech and sound production to highlight narrative as an engaging, immersive, and participatory experience that can be shared via radio by many listeners? How might radio encourage a return to sound (both spoken voice and other) as the primary sensory input? How can we create and share radio (nous/new) narrative that will encourage participation (some action that promotes/provides a meaningful response) from these same listeners?

Radio drama is interesting because it offers, in the spirit of Gibson's earlier quote, a DIY, open-source, hacker ethic approach to producing and broadcasting engaging narrative that is at once global in scope and local in focus.

McLuhan argues the "content" of any medium is always another medium. The content of radio, he says, is speech. The content of speech is "the actual process of thought, which itself is nonverbal."
(McLuhan, Marshall. Understanding Media: The Extensions of Man. New York: McGraw Hill, 1964. 23-24.)

Following McLuhan's tetrad, radio amplifies / enhances speech / sound across distance through the use of encoding-decoding, transmission-reception technologies, thus facilitating a sonic bridge over the gap of time and distance that frequently separates sender and receiver.

During the so-called Golden Age of Radio (also Old Time Radio), from the early 1920s to the early 1950s until it was replaced by television as the primary home entertainment medium, legacy radio provided outstanding programming in several genres (music, comedy, soap opera, adaptations of comic strips, stage plays, and movies, and drama) to audiences from many cultural, social, political, and economic backgrounds. Common ground through this broad spectrum of radio listeners was their love for a good story. Broadway, the lead character of The Damon Runyon Theater, was always a sucker for a good story, willing to drop everything for an engaging narrative. Each episode was adapted from the work of master storyteller Alfred Damon Runyon (1880-1946), each featuring a humorous or sentimental tale about the colorful characters of New York during the years of Prohibition. Of the many other programs, The Mercury Theatre on the Air and The Campbell Playhouse are often cited as the finest examples of drama during the Golden Age of Radio.

The distinctive mix of formal speech and slang, with never a contraction, and most often delivered in the present tense was a hallmark of The Damon Runyon Theatre. With regard to other drama programs as well, it was speech that formed the basis for audience engagement and sense of immersion. Speech, a technology that utilizes sound to convey abstract information, has been used throughout human history for different rhetorical purposes---to inform, to educate, to entertain, or to persuade. Additionally, speech is the basis for narrative, which in turn provides the foundation for storytelling, and, thus, drama.

Non-verbal sounds have been used historically as compliments to or substitutes for speech. Music of all types is a prime example. Non-verbal, non-musical sounds have also been utilized to supplement and/or add realism to speech-based drama, and as the content of so-called "radio / transmission art" discussed below.

Questions for theory, research, practice, and learning
Golden Age of Radio drama is continually recreated and streamed via Internet radio, and new drama is created (listen, for example, to Dry Smoke & Whispers Holodio Theatre) but . . .
1) What about new concepts, new programs, new narratives that may benefit from opportunities for interactivity, collaboration, and social networking among the listeners and between the participants (nee listeners) and the program itself?
2) What might now be done with the human voice (and other sounds) not possible before digital technology to create and share compelling drama that is both global in scope and local in focus?
3) What stories might be told?
4) How might they be told?

5) How could these efforts help to recenter sound as the primary form of sensory input, even while it is part of a mix of multimedia?
6) How would we approach the challenge of producing and streaming an original drama for Internet radio?
7) What might be undertaken in conjunction with such a project (promotional/educational materials, website, social media, etc.) to increase its effectiveness and opportunities for social engagement?

Radio art

Since its inception, radio has been considered either an art form in its own right, or a medium for which one can create art, most often aural in nature. The radio art artist is one who uses sound to make art. The transmission capabilities of radio are the preferred medium because, as a result of the practice, the radio medium can be used in ways different from its original intention.

In this regard, radio art falls under the larger umbrella of transmission arts, which encompasses performance, video art, theater, sound art, radio art, media installation, networked art, and acoustic ecology in a multiplicity of practices that engage aural and video broadcast media in an intermedia framework where the relationship(s) between artist and audience, transmitter and receiver, can be redefined, along with the telecommunications airwaves as the site for this practice. A fine anthology of artists and their work(s) is provided in *Transmission Arts: Artists & Airwaves* (Galen Joseph-Hunter with Penny Duff and Maria Papadomanolaki. New York: PAJ Publications, 2011).

This overlay of the terms "transmission" and "arts" gives rise to radio art and its focus on the use of radio technologies (transmission, airwaves, reception, etc.) and their ability to create immersive contexts rich with aural and acousmatic narrative opportunities. Radi art presupposes close, attentive listening, or as sound artist Francisco López suggests, "profound listening," to denote listening without constraints in order to explore and affirm all the information inside any sound (Francisco López, "Profound Listening and Environmental Sound Matter," in *Audio Culture: Readings in Modern Music*, ed. Christoph Cox and Daniel Warner New York: Continuum, 2004, 82-83.) Genres of radio art include documentary, drama, sound art, electroacoustic music, sound poetry, spoken word, experimental narrative, sonic geographies (soundscapes), and multimedia performances/installations—all composed for the unique medium of radio and uniquely suited for both its content and form of audio transmission.

Radio art is a collision/collusion between the ancient traditions of oral culture and the instant information access of mass communication systems where sounds from various sources and cultures can create and sustain new narrative strategies and subvert historical media conventions to provide a bridge between art and popular culture. In this context, radio art might include, but is not limited to, documentary, experimental narrative, found sound, field recordings, noise, phonography, sound art, sound poetry, soundscapes (sonic geographies), and spoken word. Given these broad outlines, radio arts considers sound, listening, and hearing as real and concrete participatory practices that may engage digital new media, sampling, remix, appropriation, and purposefully created sounds to promote aural experiences across a wide range of contemporary theory and practice. Radio art then is pretty broad with regard to what it might comprise, and this is interesting.

Radio art within the context of Internet radio provides, it would seem, great opportunities for new forms of content its delivery to listeners / participants in a mobile, collaborative, social media. The results could include the potential to liberate radio from commercial concerns, focusing it more exclusively (or entirely; listen to London's ResonanceFM) on the art of listening.

Questions for theory, research, practice, and learning
Radio / transmission arts seem to offer a great deal of latitude and creative license to artists and content providers, and Internet radio assures a medium for its transmission, but . . .
1)   What has comprised radio art historically?
2)   How was this work created, transmitted, and received?
3)   What might be done with sounds (other than the human voice) not possible before digital technology to create and share compelling radio / transmission arts that is both global in scope and local in focus?
4)   Could radio / transmission arts provide a venue for narrative?
5)   Are there ideas / inspiration to be drawn from Zeega.org, a website purporting to be inventing new forms of interactive and collaborative storytelling using an open-source platform?
6)   What stories might be told using radio / transmission arts?
7)   How might these stories be told?
8)   How could these narratives/stories benefit from opportunities for interactivity, collaboration, and social networking among the listeners and between the participants (nee listeners) and the program itself?
9)   How could these efforts help to recenter sound as the primary form of sensory input, even while it is part of a mix of multimedia?
10)   How would we approach the challenge of producing and streaming an original drama for Internet radio?
11)   What might be undertaken in conjunction with such a project (promotional/ educational materials, website, social media, etc.) to increase its effectiveness and opportunities for social engagement?

Conclusion
We understand from Marshall McLuhan that the artist / creative person is always to be found on the forefront of any new technology, experimenting with and enhancing awareness and participation with its affordances, and thus extending the capabilities and understanding of humankind (*Understanding Media: The Extensions of Man*. Toronto: McGraw-Hill, 1964).

Radio of the future will be about making use of multiple platforms, especially that which is "best available." Often, the best available platform is mobile. With the transmission, content, and reception of radio digitized, the future of radio is, arguably, in the space between the traditional content segments (songs, shows, genres, etc.).

Social audio networks (like Audioboo, Soundcloud, Facebook "We have the most powerful distribution mechanism that has been created in a generation."---Mark Zuckerberg, Facebook) will become broadcasters. The concern will no longer be the "How" but rather the "what." By this I mean context and relevance. Broadcast streams that are and remain relevant will survive / succeed. Fragmentation of listeners will require fragmentation of programming. Selection, relevance, trust, context, sense-making, and value will be what matter, rather than access. As on-demand streaming and downloading become standard features of the Internet, radio of the future we focus on collecting, collating, contextualizing, curating, and connecting the best possible experiences for its participants.

Notes
2. Nokia Visual Radio is technology developed by Nokia to facilitate audience interaction with radio programs. Not radio streaming . . . audio is received via FM analog in phone. Graphics and text synchronized to audio streamed to phone. This interactive visual channel is produced by the radio station. Interactivity options include quizzes, messaging, content

download, commerce, etc. Platform consists of three parts: 1). a visual radio tool (app?) that can be integrated with the station's broadcast system so the visual content can be synchronized with the audio broadcast programming, 2). A visual radio server that handles two-way traffic between producer and audience, and 3). A visual radio client application on the mobile phone that displays the interactive content and provides a portal/channel for the interaction.

1. An Internet radio station is, generally, said to be "streaming" its content, rather than broadcasting, the term applied to legacy radio. Streaming is different from downloading the complete audio file from a server before it can be played and heard. Streaming allows one to listen while the stream is being downloaded. Additionally, the stream can be paused or stopped. Podcasting generally is a radio audio episode, self-contained, sometimes augmented by text or visuals, that can be either streamed or downloaded.

2. See *The Great Radio Audience Participation Shows: Seventeen Programs from the 1940s and 1950s* (Jim Cox. McFarland & Company, 2001).

3. See the "Inter-Media & Visual Arts" pages at the radiom.org website (http://radiom.org/archives.php?et=intermedia&pageID=1) for information and listening opportunities for episodes 1-5, 7-9, 13, 14, 18, 19, 20, and 23.

4. Six Interactive Radio Stations reviewed
http://evolver.fm/2011/05/13/you-have-options-6-interactive-radio-services-reviewed/

Interactive radio system—the revolution of the radio
http://www.interactive-radio-system.com/en/home.htm

Interactive radio instruction (a variant of distance learning)
1 teacher, many students who respond via radio
http://idd.edc.org/our_work/technology/interactive-radio-instruction-iri

5. Rosemary Day ("New Technologies and the Facilitation of Participation in Community Radio Stations." *Radio Content in the Digital Age: The Evolution of a Sound Medium*. Eds. Angeliki Gazi, Guy Starkey, and Stanislaw Jedrzejewski. Briston, UK: Intellect, 2011. 193-205) provides an interesting and informative account of how Irish community radio stations incorporated new social technologies to facilitate participation by members at all levels of their communities.