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Factors Influencing the Adoption of HD Radio by Local Radio Station Managers

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Abstract

A sample of 114 radio stations measured attitudes toward the adoption of HD Radio and found that stations that have gone digital were motivated the most by two of five identified factors: image enhancement and programming considerations. The lesser factors were competition, revenue and cost. The study also examined the relationship between risk and survival. The data confirmed the importance of managerial attitudes toward disruptive technologies and their relationship to image, programming, and competition.

Factors Influencing the Adoption of HD Radio by Local Radio Station Managers

In 2003, radio stations in the U.S. began broadcasting in HD Radio, a technology that enables stations to transmit a combined digital and analog signal (Haskins, 2007). The event marked one of several recent changes in the broadcast industry that has included satellite radio and podcasting (Green, Lowry, & Jang, 2005) on the content delivery side and computerized automated programming and digital studio production on the programming side (Nellessen & Brady, 2000).

Developed by iBiquity Digital Corporation and trademarked HD Radio (Maxson, 2007), the technology represents what some industry experts have called the first major advancement in radio since the beginning of FM broadcasting (Haskins, 2007). Chief benefits of HD Radio are CD-quality sound for FM stations and FM-quality audio for AM stations (Bray, 2007). Compared with traditional analog broadcasts, stations transmitting an HD Radio signal can send both data and music (Gonsalves, 2007). Stations also can offer more diversity in programming by transmitting multiple HD streams (Bray, 2007). Industry players anticipate that multicasting will be a way to attract listeners and provide a chance for stations to provide alternative programming (Heine, 2005). At the same time, however, FCC Commissioner Michael Copps voiced concern about how multicasting would impact "public interest and media consumption" (Eggerton, 2007, para. 3).

Scholars have analyzed digital audio broadcasting from the perspective of regulation and economics in the US (Ala-Fossi & Stavitsky, 2003), policy in the UK (Lax, 2001), and the transition to this technology in Canada (O'Neill, 2007). Additionally, a number of market research organizations have provided data regarding the interest and potential usage of HD Radio

by the public (e.g., Rose & Lenski, 2007). Academic research focusing on this technology from the standpoint of radio stations in the US, however, is largely absent. It is particularly crucial to garner an understanding of where radio stands today, especially at the formative stage of its digital future. The present study fills that gap in research by examining the factors motivating radio station management to adopt HD Radio. Given the relatively recent development and implementation of HD Radio in the US, this study also offers an important glimpse at these early adopters of digital radio technology.

HD Radio Background

Although the wider implementation of digital radio by broadcasters in the US is a fairly recent occurrence, the technology has been in development for more than a decade. In 1990, the Federal Communications Commission first examined the issue of digital radio broadcasting (FCC, 2007a). At that time, however, the Commission determined that terrestrial digital systems were not adequately developed.

In 1999, the FCC revisited the topic of digital radio and requested comments regarding the In-Band On-Channel (IBOC) system for digital transmissions (FCC, 1999). IBOC enables stations to broadcast both an analog and digital signal on a single channel (FCC Consumer Facts, 2007). Under the system, digital signals are placed beside the station's analog signal (FCC 2002). According to the Commission, this "hybrid" system was selected, in part, because it did not require additional spectrum (FCC, 2007a). Additionally, IBOC allows for digital transmission without interfering with the analog signal (FCC, 1999). In 2002, the Commission adopted the IBOC system and the use of iBiquity Digital Corporation technology for AM and FM broadcasts of digital signals (FCC, 2002). The report and order also permitted stations to start interim digital transmissions.

The IBOC system in the US differs from the Eureka 147 digital system that is used in "Europe, Canada and Asia" (Maxson, 2007, p. 4). A key technological difference is that IBOC uses the same band as AM and FM channels, whereas Eureka 147 requires a different spectrum. Even the technical terms by which the systems are referred are different. Digital audio broadcasting (DAB) is a trademark of the Eureka 147 system. In the US, digital radio broadcasting (DRB) is the name used by the subcommittee of the National Radio Systems Committee (Maxson, 2007).

More recently, the FCC approved multicasting on digital radio without requiring stations to first receive approval from the Commission (Eggerton, 2007). The Commission also has instituted only basic policies in relation to digital radio broadcasting. For example, there is no requirement that stations begin digital transmissions (FCC, 2007a), compared with the mandated transition of television to digital. However, the FCC requires that stations simulcast their analog content on their primary digital channel and that local stations broadcasting in digital must provide a free digital signal (FCC, 2007a).

The FCC's decision to select a specific technology and standard for digital radio broadcasting represents somewhat of a different approach than earlier technological changes in radio. Perhaps the most pertinent regulatory difference came between the implementation of FM stereo and AM stereo. Compared with the three years it took for the "inception to implementation" of FM stereo, AM stereo took five years for an FCC decision, which ultimately left the standard for the technology in the hands of the marketplace (Huff, 1991, p. 488). Klopfenstein and Sedman (1990) suggested that the FCC not establishing a standard for AM stereo might have been a contributing factor to the slowed diffusion of that technology within the industry.

Compared to the marketplace approach allotted to AM stereo standards, the FCC has approved the IBOC hybrid method of transmissions for digital radio and the specific use of technology developed by iBiquity Digital Corporation. At the same time, the two technologies are similar in that neither the use of AM stereo nor the implementation of HD Radio were mandated by the FCC.

Diffusion of Technology in Broadcast Media

Central to the diffusion of digital radio in the US are several factors associated with the adoption of the technology by broadcasters. Especially pertinent to the present study are innovation characteristics and types of adoption decisions within organizations. According to Rogers (1995), key factors in the adoption process are five perceived characteristics of an innovation: relative advantage, compatibility, complexity, trialability, and observability.

Relative advantage is the concept that "an innovation is perceived as being better than the idea it supersedes" (Rogers, 1995, p. 212). In particular, this deals with various benefits such as economics, in which individuals weigh costs and benefits of adopting an innovation. An additional consideration is adoption status, which is the extent to which having the innovation appears to others.

Compatibility is the "degree to which an innovation is perceived as consistent with the existing values, past experiences, and need of potential adopters" (Rogers, 1995, p. 224). Prior studies have shown that a higher degree of compatibility increases the likelihood of adoption. Of particular importance to the adoption of digital radio is compatibility with existing concepts. In this case, broadcasting in HD differs little from a station's current experience.

Complexity is the "degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 1995, p. 242). Central to this concept is the relationship between

the adopter and the degree of complexity or simplicity. Compared with relative advantage and compatibility, complexity is negatively associated with adoption, so that the higher the perceived complexity, the less likely an innovation will be adopted.

The final two innovation characteristics deal with the potential adopter's ability to try or observe the innovation: both of which are positively associated with adoption. With trialability, "an innovation may be experimented with on a limited basis" (Rogers, 1995, p. 243). This allows the potential adopter to assign personal meaning to the innovation. Observability is the notion that "the results of an innovation are visible to others" (p. 244). For HD Radio, it is easy for other station managers to see who has adopted the technology.

Adoption of an innovation within an organization is also connected to three types of decisions: optional, collective and authority (Rogers, 1995). Although these decisions are typically associated with internal adoption of innovations, they also provide some direction when examining radio station implementation of HD Radio. In the optional type of motivation, the choice to adopt is up to the person or entity with no mandate to do so. Under a collective form of adoption, group members together make the decision to adopt. In the third motivation, authority-driven, the decision to adopt (or to not adopt) an innovation is made by a few people. In the case of HD Radio, the adoption of the technology may come under any one of the three types of decisions. For example, the manager of an independently owned radio station might solely decide to implement digital broadcasting. However, that same manager might first consult with station staff to determine if HD Radio is in the station's best interest – a collective decision. An example of authority-driven adoption is when the owner of a group of stations mandates digital audio broadcasting by all the group's stations. Since HD Radio is not mandated by the FCC -- unlike digital television -- there is no external authority-driven motivation for adopting the

digital technology.

Prior research has considered broadcasters' implementation of technology, both internal and external to an organization, and found several contributing factors to adoption. External adoption focuses on audience factors in diffusion, while internal adoption deals primarily with the diffusion of a technology within an organization. For example, Lacy, Atwater, Qin, and Powers (1988) examined reasons for television station use of satellite newsgathering (SNG) technology. They found that cost of equipment kept stations from using SNG. Additionally, they found that there was a relationship between stations having SNG and competitors in a market, although not a strong connection. However, intensity of competition was a factor -- the more competitors, the higher the tendency for stations to use SNG.

Studies also have focused on media adoption of technologies dealing with content distribution, such as the use of the Internet. In their extensive study of radio stations and the Web, Lind and Medoff (1999) found that stations instituted a site due to several factors, including connecting with their audience, wanting to be perceived as "hip", because other stations had a site, to "extend or improve coverage," and "sales opportunities" (p. 211). Chief among Web site benefits cited by respondents were an enhanced image of the station and better communication between the station and its audience. However, the perception that the site brought "commercial or sales benefits" was cited by only a quarter of respondents.

The incorporation of streaming audio by radio stations has also drawn the attention of scholars. Evans and Smethers (2001) examined the use of this form of delivery and found that content was a key to success. They further noted that stations needed to think more broadly regarding revenue opportunities and to use the technology as a means of enhancing the focus of the station. Evans and Smethers also argued that management needed to have a vision for having

a Web site. Additionally, they highlighted the importance of stations positioning their sites, especially in the face of competition from various other online media.

The speed with which an innovation is diffused among a social group is also contingent upon the reduction of uncertainty regarding the outcome of the decision (Rogers, 1995). Inherent in the notion of uncertainty is the existence of chance and potential risk in the outcome following the adopting of the innovation. For example, Owens and Carpentier (2004) examined the extent to which managers and program directors were willing to take risks and to be innovative in programming styles. They found that respondents believed their station to be innovative and recognized the importance of taking programming risks for economic success. Additionally, more than two-thirds of respondents indicated that station owners at least "somewhat" supported taking risks. Although respondents did not see satellite radio as "strong competition" (at that point in time), they did recognize that taking risks would become necessary due to that technology (p. 233).

During the diffusion process, industries are faced with the need to participate in a new technology because of competitive pressure or because of potential opportunities that the innovation might bring (Day & Schoemaker, 2000). A key factor in this process is how companies handle the disruption of traditional patterns of operation. They are termed disruptive because they challenge established standards and ways of doing business (Day & Shoemaker, 2000). Furthermore, disruptive technologies not only “force industries and organizations to continuously adjust to a changing environment” but they may even be a “threat to their very existence” (Saksena & Hollifield, 2002, p. 76). For example, industries have had to confront a variety of emerging technologies such as Internet banking, typesetting, and biotechnology (Day & Shoemaker, 2000). In a recent media study, Saksena and Hollifield (2002) examined

newspaper implementation of Web editions and how that affected the operation of the organizations. They found that more than half of those surveyed saw the Internet as "potentially disruptive" (p. 79). At the same time, publishers who viewed the Internet as a disruptive technology put more thought into online editions and the product itself.

Current Status of HD Radio Adoption

Despite the gradual increase in the number of radio stations that have started broadcasting in HD Radio since 2003, there are several things that have inhibited the rapid diffusion of this technology. For the industry, one challenge is getting car makers to include receivers in vehicles, although more car companies are starting to offer HD Radio as an option (Kite, 2007; Sass, 2007). Cost of implementing the technology is another concern for broadcasters (Quain, 2007). Stations broadcasting in HD Radio also tend to be in larger markets. For example, data from BIA Financial Network showed that 36% of the top 10 market stations were broadcasting HD Radio, while only 3.5% of stations in markets 201 and lower were using the technology (Bridge Ratings, 2007)

In large measure, the success of the technology is dependent upon the use of HD Radio receivers by the public. The industry already faces competition from satellite radio, iPods, and the Internet (Lowry, 2007). One problem with the public's acceptance of the technology is that it does not appear to understand HD Radio (Wilkerson, 2007). People are increasingly hearing about it, but few know what it is. A January 2007 Arbitron/Edison Research poll showed that 26% of Americans had heard or read about HD Radio compared with 14% a year earlier (Rose & Lenski, 2007). However, according to that study, only 6% of respondents indicated that they were very interested in the technology, with 23% indicating that they were somewhat interested.

Acquiring the technology is another issue. The percentage of people desiring to purchase

HD Radio devices is also low (Wilkerson, 2007). According to a 2006 Abitron/Edison Media report, 35% said they would be interested in purchasing an HD Radio if the price were $50, while only 5% would buy a receiver that cost $300 (Rose & Rosin, 2006). Ted Schadler of Forrester Research suggested that the public will gradually replace their radios with HD receivers over time, much like the transition from black and white to color television (Lowry, 2007).

Based on diffusion theory, and given the findings of prior research, the following research questions are posed:

RQ1: What are the primary factors influencing the adoption of HD Radio by station managers?

RQ2: What is the relationship between adoption factors and types of motivations?

RQ3: What is the degree to which market competition plays a part in the adoption of HD Radio?

RQ4: What is the relationship between perceptions of risk and the implementation of HD Radio?

Method

In mid- to late September 2007, a national sample of 1600 radio stations was generated from a list of stations obtained from the Web site of iBiquity Digital Corporation, a leading supplier of HD Radio transmission equipment. Stations that were already broadcasting in digital, as well as stations that indicated they would soon broadcast in digital were included. Students in a communication class generated e-mail addresses for the stations' top managers. The list included stations in the 49 states that had HD Radio stations, plus Washington, D.C. At the time data were gathered, there were no stations in North Dakota using HD Radio. Program directors, promotion directors, and operations managers were substituted if a general manager's e-mail was not available. A cross-check for all radio markets was done by the researchers, using information from Standard Rate & Data (www.srds.com), which confirmed the e-mail addresses and often

found e-mail listings of the general managers themselves. Excluding duplicate addresses, a total of 1045 station email addresses were located.

Using this database, the stations were sent an email in early October 2007 (with a subsequent reminder sent in late October) asking that the station's manager complete an online survey at www.esurveyspro.com. Approximately 13 percent of the addresses bounced back as unknown. Attempts were made to fix the addresses as they bounced back, but the number of stations receiving the initial survey solicitation was estimated at 909. Of those stations, 128 surveys were returned, of which 114 were completed, for a 12.54% response rate.

Demographics

Age of respondents ranged from 24 to 76 years (M = 47.46, SD = 10.08). Ignoring the 18 who did not respond to the gender question, male respondents outnumbered females (89.6 percent, 86 males and 10 females).

Titles included general manager/senior VP/regional manager (63.4 percent), program director/operations manager (30.3 percent), and the remaining groups represented titles that each accounted for less than 3 percent of the total, in descending presence: chief engineer, sales manager/marketing director, public relations, and promotion. The e-mail solicitation requested completion by the general manager, so some lower staff may have been designees of management for the purpose of filling out the survey.

Sixty-four percent of the stations were FM only, 25.4 percent were FM/AM combos, and 8.8 percent were AM only. More than half (55.3%) were group-owned, 14 percent were individual-owned, and 30.7 percent were university-owned. Of the 111 who responded to the question about the adoption of HD Radio, 103 respondents (92.8 percent) reported having HD

Radio at the time of the survey. The length of time with HD Radio (N=99) ranged from 2 to 53 months (M = 15.6, SD = 10.43).

Market Rank

The market rank of the respondents ranged from 1 to 260, with 17.5 percent (N=20) unknown or not answered. Market rank groups put 18.1 percent (N=17) in the top ten markets, 54.3 percent (N=51) in the top 50 markets, and 76.6 percent (N=72) in the top 100 markets. The clearest size division was the 50th rank, creating two roughly-equal groups.

Role of People in the Decision to Adopt HD Radio

Respondents rated the role of key people and constituents in the decision to adopt on a scale of important from 1 to 5. The greatest influence came from the owners (M = 4.08, SD = 1.50), followed by the manager (M = 3.78, SD = 1.67), other staff (M = 2.86, SD = 1.65), colleagues at other stations (M = 2.06, SD = 1.30), corporate consultants (M = 1.77, SD = 1.15 listeners (M = 1.75, SD = 1.10), and friends (M = 1.49, SD = 0.93).

Decision to Implement HD Radio

Items in this section were adapted from diffusion theory, including those associated with perceived characteristics of the innovation (Rogers, 1995). Additional items were derived from prior research, such as market competition (Evans & Smethers, 2001; Lacy et al., 1988), and audience factors, station reach, and station image (Lind & Medoff, 1999).

Respondents (N=94) ranked the importance (1= not at all important, 5= very important) of 18 items regarding factors that influenced each station's decision to adopt HD Radio: to compete

with satellite radio (M = 2.81, SD = 1.37), to improve the station's image with its community (M = 3.61, SD = 1.32), to be one of the first radio stations in the US to have HD Radio (M = 3.04, SD = 1.53), cost of licensing HD Radio (M = 2.66, SD = 1.37), ability to broadcast multiple channels (M = 4.13, SD = 1.26), to distinguish station from other stations in the market (M = 3.44, SD = 1.43), ability to provide more programming options for listeners (M = 4.11, SD = 1.38), other stations in my market are broadcasting HD Radio (M = 2.35, SD = 1.43), quality of HD Radio (M = 3.69, SD = 1.25), to be on the cutting edge of radio broadcasting technology (M = 3.65, SD = 1.31), to provide extra station revenue (M = 2.71, SD = 1.24), to be one of the first radio stations in the market to have HD Radio (M = 3.13, SD = 1.45), to compete with iPods and other MP3 devices (M = 3.02, SD = 1.37), the general survival of radio (M = 3.69, SD = 1.32), to provide enhanced local programming (M = 3.82, SD = 1.28), to provide alternative programming through multicasting (M = 4.05, SD = 1.32), cost of station equipment to transmit a digital signal (M = 2.80, SD = 1.23), and to increase the number of listeners (M = 3.64, SD = 1.26).

We conducted a principal components factor analysis with varimax rotation on those 18 items, applied rules of a minimum eigenvalue of 1.0, and suppressed absolute values less than 0.5. The solution identified 5 components accounting for 73.76 percent of the variance: image, programming, competition, revenue, and cost (see Table 1). Seventeen of the items survived the rotation, but "quality of HD Radio" could not be isolated. Local competition, however, appeared in both the third and fifth components and was eventually omitted from the latter to boost scale reliability. These five components, then, measure the factors sought in RQ1 (image, programming, revenue, cost) and RQ3 (competition).

A scale was constructed from each component, summing the responses to the relevant items. Image ranged from 5.0 to 25.0 (M = 16.93, SD = 5.98, alpha = .90), programming ranged

from 4.0 to 20.0 (M = 16.07, SD = 4.78, alpha = .93), competition ranged from 4.0 to 20.0 (M = 11.91, SD = 4.05, alpha = .72), revenue ranged from 2.0 to 10.0 (M = 6.35, SD = 2.18, alpha = .69), and cost ranged from 3.0 to 14.00 (M = 7.84, SD = 2.82, alpha = .67). The final scale (cost) did not include local competition from the original factor analysis to boost the reliability coefficient.

Table 1 About Here

Perceptions of disruptive technologies

Following research by Saksena and Hollifield (2002), a list of items was constructed to gauge the extent to which HD Radio might be considered a disruptive technology. Respondents were asked 8 items regarding the importance of HD Radio adoption to the station and the radio industry itself, measured on a five-point Likert scale: will dramatically change the way radio does business (M = 3.08, SD = 1.22), is a welcomed technology in the radio industry (M = 3.42, SD = 1.11), is forcing management to adjust station programming strategies (M = 2.88, SD = 1.27), will ultimately replace traditional analog broadcast radio (M = 3.68, SD = 1.19), is essential to the station's immediate future (M = 2.73, SD = 1.42), has created extra stress on station resources (M = 3.08, SD = 1.25), required extra resources and time evaluating before adoption (M = 3.38, SD = 1.10), and required extra time and resources determining how to implement before adoption (M = 3.55, SD = 1.11). All of the items were summed and a reliability check was run (alpha = .69). The "extra stress" item was deleted from the final importance scale to boost Cronbach's alpha to .73 for the remaining 7 items (N=88). The

disruptive technology scale, then, was used to assess motivations for RQ2.

Risk

Drawing on Owens and Carpentier's (2004) study of risk and programming, respondents were asked 6 items regarding the amount of risk involved in adopting HD Radio, measured on a five-point Likert scale: taking risks is essential for the financial well-being of a radio station (M = 3.98, SD = 1.03), radio stations should take more risks with technologies such as HD Radio (M = 3.65, SD = 1.12), the station owner supports taking risks in programming (M = 3.59, SD = 1.26), taking risks is essential for the survival of radio (M = 4.08, SD = 0.97), U.S. radio stations are generally willing to take risks in programming (M = 2.06, SD = 0.93), radio stations in my market are generally willing to take risks in programming (M = 2.10, SD = 0.96). All of the items were summed and a reliability check was run (Cronbach's alpha = .72). These perceptions of risk, then were used with RQ4.

Results

In addition to identifying the components of the adoption decision, RQ1 also considered situation factors like market rank. For example, the absolute market rank correlated significantly with the desire to be among the first in the U.S. to adopt HD Radio ($r = .46$, $p < .001$), the desire to be the first in the market to adopt HD Radio ($r = .47$, $p < .001$), and the desire to be distinctive ($r = .44$, $p < .001$). T-tests conducted between stations inside and outside the top 50 also revealed one significant difference involving the image component of the decision to adopt, but in the opposite direction one might guess. Stations outside the top 50 scored higher (M = 19.00, SD = 5.28) on the image scale than stations inside the top 50 (M = 15.17, SD = 6.13), indicating that image was a significantly larger consideration for smaller markets ($t = 2.88$, $df = 74$, $p <$

.01). The number of months that a station had been broadcasting HD was mostly unrelated to adoption factors, although it was correlated with the survival variable (r = .24, p < .05).

RQ2 was assessed by running correlations among the adoption factors and the stations' assessment of disruptive technologies. The disruptive technology scale was significant correlated with the image scale (r = .38, p < .001), the programming scale (r = .47, p < .001), and revenue scale (r = .34, p < .01). Disruptive technology considerations were related to neither the competition scale nor the cost scale.

To answer RQ3, the competition scale was correlated with the other four adoption factor scales, yielding statistically significant correlations with all four. Competition was thus associated with image (r = .30, p < .01), programming (r = .35, p < .01), revenue (r = .43, p < .001) and cost (r =.38, p < .001). Competition was also correlated with the role of listener considerations in the decision to adopt HD Radio (r = .29, p < .01).

Regarding RQ4, risk correlated with three of the five implementation factors (to adopt): image (r = .43, p < .001), competition (r = .33, p < .01) , and revenue (r = .27, p < .05). Of the 18 original unfactored items, risk was most associated with survival (r = .46, p < .001), desire to be on the cutting edge (r = .43, p < .001), image (r = .37, p < .001) , and distinctiveness (r = .37, p < .001) .

Discussion

Since the first HD Radio broadcast in the US in 2003 (Haskins, 2007), the number of radio stations using this technology has gradually increased. In late November 2007, the FCC had reported that more than 1400 AM and FM stations were authorized to operate in the "hybrid" analog/digital mode (FCC, 2007b). Although there has been some scholarly and market research regarding digital radio, little emphasis has been placed on the factors involved in stations

implementing this technology. Given the relative newness of HD Radio in the US, this study offers an important glimpse at early adopters and their motivations to broadcast in digital. Participants in this study indicated that their station had been broadcasting in HD Radio for an average of 15 months. Length of time with HD Radio was not related to any of the adoption factors. However, it was slightly correlated with survival. Perhaps stations that are earlier adopters see the implementation of digital radio as a pressing need for the future of the industry.

Rogers (1995) noted that adoption of an innovation within an organization is associated with optional, collective and authority-driven decisions. Although Rogers focused primarily on the adoption of an innovation that is used within an organization, the application of these three types of decisions is also appropriate when considering HD Radio. Findings of the present study revealed that the station owner's desire to implement HD Radio was a chief factor in the decision. One explanation might be that more than half of the stations who responded to this survey were group owned. The second highest level of influence was the manager, followed by other staff. In comparison, the level of outside influences, such as friends, consultants, colleagues at other stations, and listeners, was relatively low. This suggests that, at least for the stations represented in this study, owners and management are key players in creating a vision for the digital future of local radio. There was some influence of other station personnel, but the mean for that item was moderate. Since this study did not poll owners, it cannot be assumed that management was not consulted prior to the adoption decision or that staff within the station were not involved at some point. Managers also were not asked about their level of input to owners. However, it is likely that the decision was both collective and authority-driven, especially for group-owned stations.

A factor analysis grouped 18 motivations to adopt HD Radio around five components:

image, programming, revenue, cost, and competition. That image is an essential element in the mix supports Lind and Medoff's (1999) research of radio station implementation of the Web. In their study, having an enhanced image of the station was one aspect of having a Web presence. Similarly in the present study, perception was an important consideration for stations adopting digital radio as a means of improving the station's image within its community, as well as positioning the station as technologically advanced within the market and the US. Particularly interesting was the relationship between image and market rank. Overall, market rank was related to the station's desire to be first in the US to adopt HD Radio, first in the station's market, and to generally be distinctive. However, an interesting finding was that image was a larger consideration for stations in markets smaller than the top 50 than it was for stations within the top 50 markets. Perhaps broadcasting in digital is one way for stations in smaller markets to make a technological statement.

Respondents in this study also viewed programming as a factor in implementing HD Radio. A key element of this technology is the ability to broadcast multiple channels of content. Given the issue of consolidation of radio ownership in the past decade and its affect on programming decisions (Chambers, 2003), multicasting might be one means of enhancing a station's programming diversity. A closely associated factor is competition, which in the present study represents the three-fold challenges of terrestrial competition (other stations), technological competition (MP3 players and satellite radio), and the survival of radio in general. In their study of radio station use of streaming audio, Evans and Smethers (2001) found that online content delivery helped to distinguish a station from its competitors. In a similar manner, by transmitting more than one program stream, a station broadcasting in HD can participate in program competition at multiple levels. For example, a station whose primary programming genre is

country can use one of its digital channels to offer programming not currently available in its market. Regarding technological competition, prior research has already demonstrated the potential impact of technologies such as satellite radio (Book & Grady, 2005) and MP3 players (Ferguson, Greer, & Reardon, 2007) might have on terrestrial radio. Revenue and cost also were factors revealed in this analysis. Specifically, the concern is the cost of implementing digital broadcasting in comparison with opportunities to garner additional revenue for the station and opportunities for increasing audience size.

This study also examined the perceived impact of adopting HD Radio by considering the two issues of disruptive technology and risk. Disruptive technologies are those that challenge an organization's way of doing business (Day & Shoemaker, 2000; Saksena & Hollifield, 2002). There was a significant relationship between the level of perceived disruption and the three motivational components of image, programming and revenue. This suggests that the more station management perceives the technology as presenting challenges, the higher the concern for those three components. Attitudes toward stations taking risks also corresponded with the factors of image and revenue, as well as competition. Additionally, risk was related to four of the 18 unfactored motivations of survival, being on the cutting edge, image, and distinctiveness. However, comparing means of individual risk items showed differences between opinions about risk in general and perceptions of whether stations actually take risks. This suggests that, although managers viewed risk taking as relatively important, they also perceived that stations both within their market and across the US are not willing to take risks.

In summary, this study found that there were several influences motivating stations to implement HD Radio. First, the primary driving force, organizationally, behind the adoption of this technology was the owner, followed by the manager. Second, influences also involved the

five factors of image, programming, competition, revenue and cost. Respondents perceived that HD Radio could distinguish the station from its terrestrial competitors, compete with other digital technologies, and demonstrate that the station is on the cutting edge by being one of the first in the market and in the US to broadcast in HD. A third influence was a concern about the future of radio, specifically as it relates to risk taking. If we consider stations that presently broadcast in HD Radio to be early adopters (Rogers, 1995), they might then be serving as opinion leaders in the "social system" of radio broadcasters, which might explain the correlation of risk with image and competition.

The present study is not without limitations. Foremost is the low response rate. Most likely this is attributable to using email invitations and a Web-based survey rather than sending questionnaires via the mail. Email is a much more expedient and less costly research method. However, recipients who already receive dozens of emails each day might simply find it easier to press the delete button. Although the present study represents a variety of market sizes, the low response rate presents a difficulty in generalizing findings to all stations in the US.

This study also presents a number of opportunities for future research. First, scholars should continue to track the diffusion of HD Radio as it relates to the adoption of this technology by radio stations. Stations included in this study could be considered the early adopters of digital radio. As such, their motivations for implementing HD Radio might differ from stations that adopt the technology in coming years. Given the importance of interpersonal communication and social networks historically in the diffusion of innovations (Rogers, 1995), it would be interesting to see if colleagues and friends of station management play an increasingly important role in implementing HD Radio. Second, research should compare the perceived importance of HD Radio at this point in time with actual future outcomes, including revenue. Another potential

area of investigation involves assessing the relationship between public perception, understanding and involvement in digital radio (i.e., purchasing the devices) and the importance that stations place on programming their primary and alternative digital channels.

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Table 1
Decision to Implement HD Radio: Principle Components Analysis

Likert items (1=SD, 5=SA)	Image	Programming	Competition	Revenue	Cost
Improve the station's image with its community (3.61, 1.32)	0.67				
Be one of the first radio stations in the US (3.04, 1.53)	0.94				
Be one of the first radio stations in my market (3.13, 1.45)	0.91				
Distinguish my station from other stations in this market (3.44, 1.43)	0.76				
Be on the cutting edge of radio broadcasting technology (3.65, 1.31)	0.78				
Ability to broadcast multiple channels (4.13, 1.26)		0.94			
Ability to provide more programming options for listeners (4.11, 1.38)		0.94			
Provide enhanced local programming (3.82, 1.28)		0.59			
Provide alternative programming through multicasting (4.05, 1.32)		0.92			
Compete with satellite radio (2.81, 1.37)			0.85		
Other stations in my market are broadcasting HD Radio (2.35, 1.43)			0.53		*0.52
Compete with iPods and other MP3 devices (3.02, 1.37)			0.79		
General survival of radio (3.69, 1.32)			0.56		
Provide extra revenue for my station (2.71, 1.24)				0.85	
Increase the number of people listening (3.64, 1.26)				0.67	
Cost of licensing HD Radio (2.66, 1.37)					0.81
Cost of station equipment to transmit a digital signal (2.80, 1.23)					0.73
**Quality of HD Radio (3.69, 1.25)					
Sum of Squared Loadings	3.89	3.27	2.42	1.91	1.79
Eigenvalue of unrotated factor	6.40	2.44	1.90	1.51	1.02
Variance explained in rotated solution	21.62	18.11	13.47	10.61	9.96
Mean	16.93	16.07	11.91	6.35	7.84
SD	5.98	4.78	4.05	2.18	2.82
alpha	0.90	0.93	0.72	0.69	0.67

Note: Item means and standard deviations are in parentheses.

* Items excluded from scale.

** Item excluded from further analysis.