Chapter 18: Assessing the Diffusion of Virtual Reality in Local Television News

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Learning Objectives:

1. Understand the impact of virtual reality on local television news.
2. Apply the concept of Diffusion Theory to better understand virtual reality convergence.
3. Identify key takeaways for news media managers to use when creating a virtual reality strategy.

Introduction

Emerging technologies are changing how local television stations gather and disseminate news. One recent technology is virtual reality (VR). It is important that future scholars and practitioners understand the extent to which local TV stations adopt VR as part of their media operations so that new business models can be developed to maximize convergent opportunities.

VR for local news comes in many forms. It can be as simple as a 360 video that does not require special equipment. At the other end of the spectrum is a virtual reality headset paired with haptic response for an enhanced, enveloping experience. An example would be the Oculus Quest device proposed by Facebook founder Mark Zuckerberg in 2018 (Vanian, 2018). Touch controls on Oculus devices add another sense to visual stimulus.

Perhaps the best way to understand how far VR has advanced since the beginning is to look back at early attempts and observations. An editorial, primarily dealing with print media, in *Journalism and Mass Communication Quarterly* argued that technologies such as VR were contributing to "watershed moments" in news (Marron, 2015, p. 351). For example, in November 2015, the *New York Times* inserted Google Cardboard VR viewers into an edition of the paper that was delivered to more than a million of its subscribers (Wohlsen, 2015). The *Des Moines Register* used VR to produce a series of stories about farming (Hoey, 2015). Those uses of VR provide the ability for news audiences to experience news situations and settings (Marron, 2015).

Nonny de la Peña had previously created the first virtual reality journalism stories with her 2012 *Hunger in Los Angeles* that mixed narrative, news values and technology storytelling (Stubbs, 2018). Kurz (2016) has also noted that virtual news sets and augmented reality will be game changers for the future of TV news. Virtual content enables audiences to be participants versus simply observers, and even offer the ability for viewers to choose the path in a story rather than follow linear storytelling (Koski, 2015). Industry forecast reports have revealed growing public acceptance of VR receivers (IDC, 2018; Martin, 2017). When Facebook in 2014 spent $2 billion for the Oculus Rift VR headset, many observers began to take notice (Wood, 2018).

The use of virtual techniques are not solely tools of professional news organizations. The Annenberg School at USC teaches students practical applications of augmented reality and VR, as well as the use of 360 video in journalism (Hur, 2017). Additionally, the Knight Foundation partnered with Google News Lab and the Online News Association to sponsor a competition in the use of virtual reality for news to deliver stories through “immersive storytelling” (Preston & Zenni, 2017, para. 1).

Recent developments in virtual technologies may be setting the stage for different approaches to news, both print and broadcast. Some newspapers remain very active at the close of the decade, e.g., McClatchy operates a New Ventures Lab that demonstrated its digital environment plans at the Capital Region AR VR Accelerator in Sacramento, California in the United States (Anderson, 2019). Before we can ever understand such cutting-edge developments, however, we should take a closer look at how one news outlet has experimented with VR storytelling through 360-degree journalism.

Case Study

The easiest VR format to experience without VR goggles or other equipment is basic 360-degree journalism, similar to Facebook photos that allow the viewer to rotate the view of a still frame. *USA Today* introduced VR storytelling with the following definition: "Virtual reality is a computer-generated experience that can simulate physical presence in real or imagined environments. Quite simply, virtual reality can put you there, wherever there may be" (USA Today, 2016, para. 1). By manipulating a computer mouse and cursor, the viewer can rotate the video in a nearly-endless array of viewpoints. The website (https://www.usatoday.com/vrstories/) gives examples of 360-degree experiences in full motion: inside a race car, inside a fighter jet, through the streets of Havana, and attending a political rally. Words cannot describe the experience; you are encouraged to take a quick look at the website.

Although *USA Today* maintains the website, the documents regarding the "current" state of VR journalism are only as current as 2015. Using the Internet Archive Wayback Machine, we can also experience the early predictions back then (Doyle, 2015). Doyle acknowledges that consumer acceptance would be slow, but opines that traditional media were eager to "avoid repeating their slow adoptions of the Internet and mobile devices" (Doyle, 2015, p. 5). Although his reported

predictions were 10 to 38 million devices by 2018, the number actually sold worldwide by then was much higher. Sony alone sold 50 million headsets worldwide by 2018, not counting the 30 million sold to PlayStation users (Fogden, 2018). Still, technology observers (e.g., Fogden, 2018) were not entirely convinced of a widespread demand.

Television networks and their affiliated stations began taking note of how newspapers were receiving attention for their VR storytelling and thus began to experiment on their own. In particular, ABC News established a website (https://abcnews.go.com/VR) that captured the kind of stories attempted by *USA Today*, but focused on documentary-style news stories with more narration. An example is "Inside the Hermit Kingdom: VR Journey in North Korea" that attracted 17 million 360-degree views in the first 48 hours (McDonald, 2017). The same web address presented 15 additional stories, including a trip to Chernobyl and a California marijuana harvest. Downloading the Jaunt VR app allowed someone to watch the video inside Google Cardboard, a very inexpensive VR device designed to hold a cellphone connected to ordinary earbuds. While only a simulation of "true VR" devices, the experience was arguably better than rotating one's view of a stationary screen, a difference left unanswered by current research. While virtual reality is a new media technology, its emergence and adoption are fairly consistent with other forms of technology. It is important for future practitioners to understand traditional theories.

Something Old

Herz and Rauschnabel (2018) have explored the diffusion of VR devices and concluded that VR-adoption intention is the highest when potential buyers expect to enjoy a strong sense of virtual embodiment (the sensation of being another person) and virtual presence (the sensation of being at another place), while only one of these conditions might have a negative effect. Diffusion has been

studied in many ways, even throughout this handbook, but most theoretical foundations originate with the work of Everett Rogers and Diffusion Theory.

Diffusion Theory

Diffusion is how any innovation is communicated over time among members of a social system (Rogers, 1995). Rogers explained five perceived characteristics of an innovation that influences its adoption: (1) relative advantage, (2) compatibility, (3) complexity, (4) observability, and (5) trialability. All characteristics except complexity are positively related to the adoption. The adoption of VR devices by news organizations require strong participation from media managers.

Relative advantage is often associated with a cost/benefit analysis in which individuals or organizations determine whether it is in their best interest to adopt an innovation (Rogers, 1995). An important aspect of this characteristic is audience size, which is usually a crucial issue for television broadcasters. The number of viewers whom a video platform can attract is typically linked to increased revenue from advertisers or subscribers.

Local TV stations face several concerns when it comes to adopting various types of digital technologies. These include how to create revenue from social media, realizing the potential for mobile technologies, and being more innovative in newscasts (“Local TV news,” 2018). Another tool for TV stations is artificial intelligence (AI). Internally, the use of AI can facilitate faster searches when researching story archives, providing a means of adapting content for different delivery platforms, and analyzing social media (Pallanich, 2019). At the same time, however, stations still must deal with monetizing content and determining whether the advantages of using AI systems are worth the cost of implementation (Pallanich, 2019).

Compatibility is related to the extent to which the innovation is similar to existing objects or practices, i.e., how well it fits "values, past experiences, and need of potential adopters" (Rogers, 1995). A high degree of compatibility tends to reduce the level of uncertainty toward the innovation. Because stations already have experience with posting to their websites, there is an assumed degree of congruence in delivering content via VR. Supplying downloads to dedicated VR devices could be easily accomplished with a television medium that pre-produces its news stories. Despite its technical compatibility, giving viewers a 360-degree experience may create problems related to the central content of a story. Compared to stories produced in 2D, stories that give viewers a 360-degree perspective might take their focus of attention away from what the story producer intends (Bösch, Gensch, & Rath-Wiggins, 2018). Therefore, stations that want to venture into 360-degree storytelling need to determine how to produce content differently to ensure the viewer is directed to the central visual.

Complexity is associated with the level of simplicity or complexity in using the innovation (Rogers, 1995). Television stations interested in implementing VR will need to understand the technological side of news dissemination and gathering. As noted above, complexity is negatively associated with adopting an innovation, so that the higher the perceived complexity of the innovation, the lower the tendency to adopt the innovation. For example, a news director who perceives VR as too complex is less likely to implement the technology. News directors might view the entire process as too much trouble. For example, creating graphics for a virtual set or even a partly virtual environment is only part of the task to create a newscast without a physical set. For WTHR in Indianapolis in the United States, it meant time to reach a comfort level at coordinating the station's robotic cameras with the graphics (Irish, 2018). WRAL's use of virtual reality for its

2018 Winter Olympics program required time for rehearsals to ensure coordination of anchors, cameras and graphics ("WRAL-TV creates," 2018).

Trialability is the ability for a potential adopter to try an innovation before deciding whether or not to adopt it (Rogers, 1995). Additionally, this provides an opportunity to see how the innovation works in the potential adopter's particular situation. However, as Rogers (1995) noted, some innovations are more difficult to try than others. Local television stations might perceive that implementing VR is too difficult to try because it requires additional technology. Audience members who have adopted VR headsets might be ready for local news, but the station must bear the risk of costly cameras and training. Another yet-unanswered question is what it might take for consumers with VR devices for game-playing to wear them for watching the news. One might assume that gamers and news addicts occupy groups with little overlap. Perhaps those who do both activities consider their time spent in entertainment-seeking greatly different than that spent with information-seeking.

Observability relates to how well potential adopters can see an innovation in use (Rogers, 1995). News directors can observe other stations' use of new technology, but without being able to observe results in relation to television audiences. The issue is the extent to which adoption of VR by other stations in a market may influence other news directors' choice to implement new methods for news gathering and dissemination. VR is still fairly rare, mostly adopted by metropolitan daily newspapers (see e.g., Marron, 2015). Judging from the static website for *USA Today*, even major newspapers are not producing much new content. This chicken-or-egg question concerning which comes first is yet unanswered.

In addition to the perceived characteristics of an innovation, organizations also adopt innovations based on three types (Rogers, 1995). Adoption from the optional perspective means the

organization does not sense a need to adopt or is not mandated to do so. Under collective adoption, the decision to implement an innovation is based on consensus. The third type of innovation adoption in an organization is authority-driven. In that instance, a few people who are in authority positions make the decision to adopt. In the case of VR, broadcast television stations that are part of a station group might fall under either collective or authority drive, depending on the amount of participation the local news director has in the decision process.

Now that we understand how an "old" theory of media adoption, Diffusion Theory, can be applied to local television newsrooms' VR adoption, let's turn our attention to new trends in virtual reality literature and practice. Key to the use of VR is the notion of giving audiences an immersive experience. The notion of "immersive" has two components: placing the viewer in a specific environment, and allowing the person to be a part of what they are viewing (Vettehen, Wiltink, Huiskamp, Schaap, & Ketelaar, 2018). Bebwai and Evans (2019) focused their attention on technologies and their uses by foreign correspondents, but their observations are appropriate when understanding local TV station consideration of VR. Bebwai and Evans also stressed the necessity of newsworkers adapting to changing environments, including the type of content and the notion of enhancing the value of what is delivered to audiences. For example, they noted that VR would allow correspondents to be present in a physical location, while virtually being in another place.

Something New

Cost is a crucial issue in station management deciding if adopting VR technology is to their advantage. Equally important is whether implementation of these technologies mean anything to viewers, even if stations can financially handle the acquisition of equipment. One study examined attitudes of viewers about the use of "immersive technologies", in this case 360 video, as compared

to a traditional presentation of news stories (Vettehen, Wiltink, Huiskamp, Schaap, & Ketelaar, 2018, p. 91). The researchers found that viewing 3D stories increased the "sense of presence, enjoyment, and credibility" than viewers had in stories they watched in a 2D format (p. 30). According to these findings, the enhancements may be worth the investment of time and money.

Similarly, an experiment by Kang, O'Brien, Villarreal, Lee and Mahood (2019) examined whether there were differences for study participants who only offered their perspective about news viewing experiences but did not view the stimulus story, compared with a group that viewed the story in a traditional format, a group that viewed the story in VR through a headset, and another group that viewed a 360-degree video on a phone. They found that there were higher levels of telepresence for VR and 360 viewers than the other two groups. The 360 group also perceived the story as more credible than participants in the traditional viewing group. Especially interesting was that viewers had a more immersive experience, even the group that did not use a VR headset to view the story. Findings of this experiment suggest that news organizations do not need to rely on headsets for VR, but that they can provide content for phones to enhance viewer experiences. From this we can surmise that stations will not necessarily need to wait until VR headsets surpass the 50 million mark in the early 2020s (O'Malley, 2019) to continue experimenting with forms of VR that are less device-intensive.

Virtual technologies are only one side of the equation for television stations. Other research has considered immersive journalism from the perspective of the user. Shin and Biocca (2018) found that engagement in a VR story was dependent on an individual's desire to engage with the story. Context of the story also was a factor in the immersive experience. The researchers concluded that the experience from a virtual story was not simply the use of technology, but also included user motivations and level of participation. The story remains the key element. Shin and Biocca (2018)

also noted that the use of VR can enhance the empathy of viewers. Additionally, content should include topics of interest and that have meaning to the individual.

One task of journalists is to connect the news consumer to the story (Reis & Coelho, 2018). Immersive journalism is one means of achieving that goal. At the same time, however, there are concerns about the use of virtual technologies for reporting and storytelling. One concern is ethics regarding how segments of an event are chosen for inclusion within a story, which has long been an issue faced by journalists (Reis & Coelho, 2018). Other concerns include using virtual reality to elicit an emotional response on the part of viewers, and the potential for manipulation of content that gives a sense of reality (Baileson, 2018). For investigative reporting, one question is how placing the viewer in a story affects its content, as well as the experience of the user (Bösch, Gensch, & Rath-Wiggins, 2018). As more TV stations experiment with immersive storytelling, we predict that standards will evolve (especially when professional societies begin to get involved). One example is a collaborative effort between PBS and the Knight Foundation, in which best practices are examined (PBS, 2018).

Television networks and local stations are using VR in a variety of ways to add value for their viewers. The Weather Channel (TWC) anchors and sports personalities used mixed reality technology to virtually transport themselves to a football stadium prior to a game to discuss how various weather conditions affect a game ("The Weather Channel," 2018). The intent of TWC was to use the technology as a mean of teaching viewers about weather. At previous times, TWC used mixed reality to show the effects of tornados, floods, and wildfires. For the flood scenario, TWC helped viewers visualize the impact of Hurricane Florence on objects and people as the level of water increased, virtually, from the beginning of the storm to reaching several feet deep (Feldman,

2019). We imagine that other channels will take note of innovations made by TWC and develop their own enhanced reporting.

On a local level, television stations are using a combination of physical and computer-generated elements to enhance digital effects for viewers. KABC and WFAA are two stations that use virtual reality graphics to give viewers a better picture of weather events (Romano, 2018). WTHR uses both augmented and virtual reality for its newscasts (Irish, 2018). For example, the station creates virtual scenes by chroma keying on an "L-shaped" wall that "adds dimension and depth" to visuals (Irish, 2018, para. 15). One main benefit of this technique is the reduced cost of creating realistic video stories that provide audiences with a more engaging representation of a particular environment. Sending a video crew into a danger zone is not worth the risk to human life.

WRAL in Raleigh, North Carolina, offers viewers a variety of content on multiple platforms, including through a Roku app that features live newscasts and other news content; plus, the station streams sports and news on its website (Morrison & Carlson, 2018). In addition, the station has its own AR/VR production facility that has a dual use. On one hand, the studio enables anchors to appear in distant locations and provides for the insertion of graphics. On the other hand, the studio is used as a means of producing content for outside businesses. During the 2018 Winter Olympics, the station used VR to place the anchors in a snow-covered environment ("WRAL-TV creates," 2018). It's evident that the reduced cost of building physical sets will encourage news managers to use VR in more innovative ways.

Competition between television stations in a given market has historically driven decisions regarding news production and the adoption of innovations. For large market stations, technology is a factor in that competition (Irish, 2018). Stations are increasingly using drones for news, and they are being more intentional with social platforms; although research shows there is less innovation

associated with mobile technologies (Papper, 2018). More research is needed to explore the use of VR technology.

Mark Effron, a broadcast news veteran and journalism teacher, says stations are not sensing an urgency to innovate, which could have negative consequences down the road (Morrison & Carlson, 2018). Former CBS News President, Andrew Heyward, noted in an interview with Nieman Lab that innovating "is not an opportunity, it's a necessity" if stations want to reach new audiences (Schmidt, 2018, para. 29). Beyond the technology itself, stations are realizing the need to produce content for audiences that consume news through a variety of platforms (Irish, 2018). For example, reaching younger audiences has long been the goal of news organizations. Innovative technology is already in their young hands and we predict newer forms of news content should appeal to their sense of (and desire for) novelty. Perhaps linear stories lack something nowadays. Clearly, new technologies are not always beneficial to news organizations. VR is no exception, as it comes with many opportunities and challenges for future media managers.

Opportunities & Challenges

Scholarly research about the implementation of technologies in local television news is largely delineated by four time periods that reflect overall trends in innovation development and the emergence of linear and digital communications in the industry: traditional, online, social, and immersive. Diffusion of journalistic technologies that are commensurate with the traditional phase have largely corresponded with content and the tools used to gather news, while dissemination of news to audiences remained linear. With each new high-tech innovation, however, the chance to innovate is almost imperative. Each provides a "new" opportunity for media managers to innovate to new technologies.

Traditional Opportunities

One traditional means of obtaining news was through satellite-delivered sources and station satellite news gathering (SNG) equipment. A survey of news directors in the late 1980s found that almost three-quarters of stations used satellite sources, but only around 16% had SNG equipment (Lacy, Atwater, & Powers, 1988). Respondents indicated that the technologies made their newscasts better and improved news content.

Another study examined the extent to which television stations used weather reporting technologies as a promotion tactic (Daniels & Loggins, 2010). Radar, satellite maps, and "short-term forecasts" were three of the most featured forms of content on 95% of the stations' weather reports (p. 30). Results also showed that weather branding was most important to the top stations in the markets studied. Stations with 360° cameras mounted on masts to provide a look at the weather would provide a comparative advantage to stations with ordinary cameras.

Another issue is whether emerging technologies affect news content. One study qualitatively examined four decades of TV news packages produced by a local TV station (Cummings, 2014). The analysis showed there was little difference in the organization of stories across time, although the number of edits increased, and the length of edits decreased with the use of digital tools. However, the question remained whether or not technology was the reason for the change versus other factors, such as culture. Not all stories are visual but increased use sometimes helps justify the investment of scarce resources in expensive equipment.

Online

A number of studies examined how television stations were implementing the web and related technologies. For example, Kiernan and Levy (1999) analyzed the content of TV station websites and found that stations were more prone to provide local rather than national and international news. There was some differentiation between affiliates, but only for international and local news, civic information and archived content. They found that competition was not a factor in site differences. Other research noted that TV station websites had a relatively high level of interactivity through clickable objects and links, as well as audio visual content, and opportunities for viewers to post comments (Bucy, 2004).

Another consideration in technology adoption by local television is the role of budgets, such as in use of the Internet (Chan-Olmsted & Ha, 2003). Results of the study showed that "customer relations management" was the highest perceived use of the web (p. 606). Respondents viewed the Internet as a way to enhance station offerings and to find out about viewers, rather than to use the technology in advertising.

An additional factor is the impact of technologies on news workers, particularly given the emergence of mobile platforms. According to research by Reinardy and Bacon (2014), online tools created a sense that news workers were being required to do more, but with less personnel and organizational resources. There also were concerns about quality of stories than with posting the stories online. Respondents who rated their support system as high also had higher "work quality" (p. 141). Other research revealed that television stations were not fully implementing web features. The existence of little interactivity related to stations' newscasts (Gregson, 2008). Sites contained more features that promoted the station than those that promoted the newscast. Only a small percentage of stations highlighted the newscast for a particular day.

A subsequent study analyzed the websites of stations affiliated with ABC, CBS, NBC, and Fox (Cleary & Bloom, 2011). More than two-thirds of the websites provided a way for viewers to share station content. Nearly one-half featured user generated content (UGC), but extent of UGC was not related to ownership, market size and network affiliation. Compared with a study from 2009, stations were still relying on text and photos for web content. Although the web has provided opportunities for audience connections (Bucy, 2004), research discussed above found that this platform remained largely linear with little interactivity tied to newscasts (Gregson, 2008).

Social

Over the last decade, stations have included a variety of social media in their repertoire of communication strategies. Although online and social are both digital and web-based, what differentiates the two technology segments is the inherent characteristic of social platforms as a means of connecting and building relationships with target audiences (Greer & Ferguson, 2011a). One issue for media scholars and practitioners is the effect that social networks have on TV stations and their news operations. An early study of social media and local television examined whether stations were using Twitter as a promotion and branding tool (Greer & Ferguson, 2011b). Findings revealed differences between commercial and public stations. Commercial entities offered more tweets overall, with a predominance of news content, while public stations featured more promotion tweets. However, less than a quarter of stations used the platform for breaking news, and few stations used Twitter to promote their newscasts. Other research similarly showed that few tweets on TV and newspaper Twitter sites contained cross-promotions, interactivity/engagement with followers, or promotional content, although TV stations were more active in "cross-promotion than newspapers" (Meyer & Tang, 2015, p. 249).

Moon and Hadley (2014) examined how much Twitter was used for news sourcing by top TV networks and newspapers. They found that the social network was used as a newsgathering tool, but journalists still relied on traditional sourcing techniques. Television networks were more active in using Twitter for story sources than were newspapers. One might expect networks and their large-market affiliates to invest first in something like virtual reality storytelling.

Given its visual composition, it is not unexpected that TV stations would utilize social networks that consist primarily of that characteristic. For example, an analysis of TV station Pinterest sites found that stations tended to post more pins on lifestyle boards than they did on promotion boards (Ferguson & Greer, 2015). Lifestyle (which represented the highest percentage of boards) and community boards also had more followers than boards that promoted the station. In contrast, a study of TV station Instagram sites found that around a third of the posts consisted of news, followed by station promotion (Greer & Ferguson, 2017). Site visitors interacted more with news posts than they did with content that showed reporters, anchors and other behind-the-scenes visuals of the station.

Immersive

Of course, the foregoing discussion has established VR as the most highly-relevant development among news-related technologies. As already noted in this chapter, some networks and stations are experimenting with the use of virtual reality. This technology is actually divided into three different concepts: Virtual reality (VR), augmented reality (AR), and mixed reality (MR). Virtual reality places individuals in a created environment, typically through the use of goggles, such as Oculus Rift (Jones, 2017; McKalin, 2014). For TV news, VR often consists of giving audiences a 360-degree view of a story versus placing the individual in an "immersive experience" (Watson,

2017, para. 4). The concept of virtual is also being used to denote the use of digital sets in combination with physical objects for newscasts (Kurz, 2015). In contrast, AR combines virtual environments with real objects and settings for user interaction (McKalin, 2014). Mixed reality is using a combination of VR and AR, but with digital content that is superimposed on a viewer's reality, such as virtual objects in a room with which the person may interact (Rivera, 2017).

Based on research about the use of technology in TV news over the four time periods, there are several antecedents that are pertinent to the present media management practice. One is that technology improves the content of news (Lacy, Atwater & Powers, 1988), despite concerns about quality when news personnel works across multiple platforms (Reinardy & Bacon, 2014), and whether technologies affect story organization (Cummings, 2014). Future research and news media practices should examine or experiment organizational structure of news stories with and without VR technology.

Station characteristics also may serve as antecedents to technology adoption. This includes ownership, market size, and network affiliation, which Cleary and Bloom (2011) found were not associated with the presence of user generated content. Kiernan and Levy (1988) also noted that competition was not an issue in TV station websites.

Opportunities present challenges for tradition-bound organizations. We find it compelling evidence that change is coming when the oldest forms of print journalism are leading the way for TV news broadcasters. It is worthwhile to look at these challenges in the next section.

Challenges

The diffusion of emerging technologies continues to change how local television stations gather and disseminate news. Over the past two decades, research has examined how stations have

evolved from relatively simple online distribution points through websites (e.g., Cleary & Bloom, 2011; Gregson, 2008; Kiernan & Levy, 1999) to enhanced connectivity of social media (e.g., Ferguson & Greer, 2015; Greer & Ferguson, 2011; Moon & Hadley, 2014). More recently, academic scholars and industry researchers have turned their attention to issues associated with immersive technologies, such as virtual reality (Koski, 2015). Despite the growing but understated adoption of VR in recent years, few studies have considered the current status of VR implementation in TV newsrooms, and rationale for their use.

One key challenge to future media managers is lack of knowledge about the technology. The extent to which VR is being adopted by local TV station news departments is still not well-examined, largely due to such limited case studies. Examples of VR use in journalism seem primarily to exist in print settings (e.g., Hoey, 2015; Wohlsen, 2015). Indeed, research by Pavlik and Bridges (2013) about the diffusion of AR in news contexts indicated that major newspapers were primary adopters of the technology at the time of their study. When writing this book chapter, a respondent called one of the researchers and volunteered his view that he believes newspapers are more interested in VR. His opinion was that newspapers have a greater need to establish a video presence than television stations. Future research must examine perceived need for such presence.

Additionally, stations that have committed to using VR in news contexts appear to be all-in when it comes to implementing the technology. Future research must focus on adoption of the specific innovation. In particular, the diffusion of VR headsets in viewers' homes will likely lead to more immersive story-telling. By 2023, forecasts predict 54 million devices in the United States alone (O'Malley, 2019). As younger audiences become accustomed to using them to play games, the opportunity may arise for news stations to create content that appeals to aging gamers interested in

current event. We can expect that stations in major markets will be the first to explore this kind of story-telling.

Finally, the overall general concept of VR is problematic, as there are nuances between VR, AR and MR technologies that have not been fully differentiated. It is possible that some stations are using virtual sets, while others are experimenting with more advanced technologies (Kurz, 2016). Case studies would offer more in-depth understanding about how stations are using these tools, especially over time, as these innovations diffuse through local TV stations (Kang, O'Brien, Villareal, Lee, & Mahood, 2018). At this writing, however, none of the nascent technologies related to VR have taken firm root in the news ecosystem, when compared to the diffusion of other new technologies adopted by TV stations, e.g., the use of drones (Ferguson & Greer, 2019).

There is a growing body of scholarly literature dealing with VR and journalism. Future research should track the diffusion of these VR innovations for TV news over time, especially as the techniques begin becoming more commonplace. Also, additional research should examine perceptions and attitudes of TV news audiences regarding whether immersive reporting techniques are enhancing viewers' experiences with stories (Shin & Biocca, 2017). The research process suggests an action plan to reach the desired destination.

Action Plan

1. Take more risks with VR
2. See how other TV stations and newspapers, and even companies other than media organizations, are using VR.
3. Be willing to adapt to a changing audience

Key Takeaways

1. The diffusion process of VR technology in news media outlets is slow but promising.
2. VR shows the most promise in allowing media managers to adopt to resources, reaching specific goals in news, and being used as a part of a station's strategic planning.
3. Traditional, online, social, and immersive media all illustrate unique trends and patterns to maximize VR adoption.
4. Much more academic research on the use of VR in news outlets is needed, especially using VR as a standalone case study and looking at audience perceptions.

Conclusion

This chapter explains how media managers are able to adopt virtual reality in efforts to adopt resources, have specific goals to use VR in news, and VR as a part of the station's strategic planning. The limited case study examples of news stations using VR are intentional in their adoption of the technology, to the extent that they have planned for its use and the types of resources needed to make it happen.

Diffusion Theory helps us to understand the slow adoption process of VR by news organizations. As noted by Rogers (1995), relative advantage, compatibility, trialability and observability are positively associated innovation adoption, while complexity is a negative factor in the process. Given the newness of VR technology for news, slow and careful adoption makes sense. News managers likely want to try out the technology before making an adoption decision, which may be difficult given the fact that VR has not yet been widely used in TV news contexts. In particular, an analysis showed a strong positive correlation between the technology being easy to try

and DMA rank. News managers in smaller market stations were more concerned about the ability to try the technology before making a commitment to adopt.

Challenges to TV stations are not only in the realm of adopting VR from a technological standpoint. There also exists the issue of compatibility when transitioning between traditional and VR story production (Bosch, Gensch, & Rath-Wiggins, 2018). Implementing VR also adds a layer of complexity to story development and newscasts, but stations are using a variety of techniques in their studios (Irish, 2018). Trialability might involve more than one level of adoption decisions by stations, particularly those that are group owned.

The use of VR in local television offers a number of opportunities for stations. An article in *Editor & Publisher* ("A new perception," 2018) suggested that newspapers should examine the use of virtual reality in retail environments. This tactic could also be a good way for local TV stations to become acquainted with virtual uses and then adapt those techniques for news coverage and storytelling. Use of VR in journalism would not be just reporting about an event, but giving viewers a broader perspective of a story. Revenue streams are also a concern of local television. Stations with studio space and virtual equipment might be able to monetize their investment by making their VR studio and qualified staff available for outside productions (Morrison & Carlson, 2018).

Immersive technologies can place the viewer into an environment where they can have a broader perspective of a story (Vettehen, Wiltink, Huiskamp, Schaap, & Ketelaar, 2018). Station management mighty be looking at VR as all or nothing; however, stations should use only as much technology as necessary to begin implementing VR for news. Research shows that 360-degree video on phone enhances a viewer's experience with a story (Kang, O'Brien, Villarreal, Lee, & Mahood, 2019). Stations do not necessarily need to produce news content that requires viewing on VR headsets to achieve a sense of presence for audiences.

Complexity, such as producing content that requires the use of a headset for viewing, is not necessary when first adopting virtual reality. As Vettenhen and colleagues (2019) discovered, using a 360-degree approach is an effective way for audiences to have an immersive experience with news stories. Also, stations should seek ways to break out of traditional techniques by determining how to add technology to newscasts. Stations have long used green screens for graphics. The same physical structure can be repurposed for virtual elements. Remember that technology is a tool to give audiences a better experience with stories. Stations should use as much technology that makes sense and that matches the station's needs and budget (Irish, 2018).

Studies in recent years have shown that television news viewership, even locally, continues to decline. Stations might be able to stem some of that downward trend by incorporating VR stories, but stories that connect with viewers' interest to encourage engagement (Shin & Biocca, 2017). Stations also have an opportunity to add value to newscast elements. These include instructing viewers about weather situations ("The Weather Channel," 2018), and giving users perspective of a distant location (Irish, 2018). This moves news and information programming from simple facts to education; thus, enhancing the viewer's knowledge and understanding of events and situations.

Studies show that local TV news is still a popular information source, despite ongoing declines in viewership (Matsa, 2018). News managers at stations are recognizing the need to adapt to reach a changing news audience, particularly in a digital environment ("Local TV news," 2018; Papper, 2019). One way to make needed changes is to track the platforms viewers are using, which will help stations connect with audiences on their level (Irish, 2018). The challenge is that constant changes require regular assessment of evolving technologies and their users, as well as delivering content that most interests viewers. Stations need to rethink their approaches to news, given an aging

viewership and decreasing numbers of younger ages who are watching live broadcast television (Schmidt, 2018).

Another consideration for stations is offering more variety and options for viewers beyond the decades-old means of delivering news. Stations that want to compete in their market might consider VR as a way to enhance their programming. This involves the use of a wide variety of technologies that range from 360-degree video, to augmented reality that combines real objects and people with digital graphics (Kurz, 2015), to mixed reality that offer viewer interaction (Rivera, 2017). The keys to success for stations adopting VR for local news are understanding the technologies, as well as the station's audience. In the next chapter, this book will talk about podcasting, a technology that brought changes to the traditional radio industry.

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