

Experiential Media and Transforming Storytelling: A Theoretical Analysis

John V. Pavlik, Rutgers University

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Abstract

Journalism and media content rests on a foundation of storytelling. Shaping this storytelling is the quality of the medium of content delivery and the nature of public engagement. With the development of digital, networked media, the audience's role is transforming to be more of an active user who experiences stories as a participant rather than as a passive receiver of content.

This article proposes a new model of experiential media based on six primary qualities of the digital environment. These qualities are 1) interactivity, 2) immersion, 3) multi-sensory presentation, 4) algorithmic and data-driven, 5) first-person perspective, and 6) a natural user interface. Augmented reality and virtual reality are among the most-widely discussed experiential media forms, but others include, for instance, advanced ultra-high-definition video. Experiential media bring implications for the nature, production, impact and the future of mediated storytelling.



John V. Pavlik is Professor of Journalism and Media Studies in the School of Communication and Information at Rutgers, the State University of New Jersey. He has written widely on the impact of new technology on journalism, media and society.

Introduction

Media of communication have evolved substantially over time, with certain technological changes portending significant shifts in the nature, production and impact of mediated storytelling (Carey, 1989). Moving from writing on stone tablets to papyrus, the advent of the printing press with movable type, the invention of photography and motion pictures, the discovery of wireless communication, and the invention of television are among the most notable milestones in the historical development of modern communication media (McLuhan, 1964). The invention and rise of the Internet and digital, or computerized media, have ushered in a sea-change in mediated communication. Moreover, the advent of ubiquitous, networked, multi-functional mobile and wearable digital media have enabled the development of what this paper calls experiential media. These emerging media forms have the potential to shape society, perhaps even “democratize culture and art,” as Flew and Faustino stated with regard to earlier media transformations (2018: 9).

This paper examines how experiential media forms such as augmented and virtual reality can enable content creators to design stories for users as participants in immersive, multi-sensory and interactive first-person narratives (Pavlik, 2017a). This is in contrast to traditional media environments in which audience members tend to more often passively watch, listen or read the narrative from a third-person’s perspective.

A Historical Context of Mediated Storytelling

Telling of stories is fundamental to media and journalism. These stories can take many forms, depending on the nature of the medium of communication and its level of audience engagement. As the digital age of media advances, the shape of storytelling is shifting dramatically, and the audience is becoming more akin to a user of or participant in the story rather than a passive recipient of the narrative.

To frame this analysis, it is useful to briefly provide some historical context as to the nature of storytelling in traditional, pre-computerized analogue media, such as newspapers, books, magazines, radio, television and motion pictures. Stories are among the most common form of media content, although there is a substantial amount of media content that is not necessarily in a narrative form, such as most of the recorded music.

Figure 1 presents a basic model of analogue media storytelling. It is somewhat of an oversimplification of the nature of mediated storytelling in the traditional, analogue media, but it captures many of its essential elements. In general, analogue media stories tend to feature linear narrative structures (Pinault, 1992). That is, they have a beginning, middle and an end, and audiences usually engage with them in that order. These stories typically feature one or two modalities, sight and sound. Stories tend to be fixed; they are

produced, recorded, published, distributed, and do not change subsequently, although sometimes news media will publish corrections when errors are detected. Analogue media stories are often episodic in nature; in other words, they tend to revolve around an event or a set of related events (Mittel, 2015). This is especially the case with journalism (Harcup, 2009). Perspective is an important element in a story, and in analogue media, the perspective or point of view usually comes from a third person, again especially in journalism. That is, a narrative tells the story from the point of view of a central character, a news source or subject, or a protagonist, but is typically reviewed by a third party. Reporters, for instance, tell stories about what public figures, such as an elected official, do or say, or what happened to someone caught in a natural disaster such as a flood, an earthquake or a hurricane. As such, audiences engage with stories in a relatively passive form (McQuail, Blumler, and Brown, 1972). They receive or consume stories published or made available. They read, watch or listen to the story.

Figure 1:
Model of Analog Media Storytelling

- Linear structure (beginning, middle, end)
- Single/dual modality (sight, sound)
- Static (fixed)
- Episodic (event-centered)
- 3rd-person perspective: telling and showing
- Passive audience

The Development of Experiential Media

Technological change has facilitated a transformation in the nature and impact of mediated communication and storytelling. Traditional mass media have given way to an interactive network of increasingly mobile, global and immersive media (Pool, 1983). Increasingly ubiquitous, multi-sensory and wearable digital media have contributed to what this paper describes as the experiential media.

Experiential media forms enable the user to experience stories as a participant in a first-person narrative, rather than merely watch, listen or read the story from a third-person voyeuristic vantage point. 1st or 2nd person perspectives are possible in analogue media, and has been used (e.g., radio plays of the 1930s, '40s and '50s often used this approach), but it has not been a typical creative choice of media storytellers.

Immersive platforms such as 360-degree video, virtual reality (VR) and augmented reality (AR) are among the most familiar forms of experiential media. Such experiential media fall along the virtuality continuum theorized by Milgram, Takemura, Utsumi and Kishino (1994). On one end is AR which blends users' real-world and virtual experiences, and on the other end are completely synthetic experiences or computerized experiences that replace users' direct contact with the physical world. These immersive, participatory formats are especially amenable to a 1st-person perspective. Together, some are describing the combined forms as extended reality (XR) (Gownder, Voce, Mai, and Lynch, 2016).

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This paper defines experience in terms of making practical contact with and directly observing objects, facts, or events. In other words, it is something to do and observe for oneself. There is a substantial body of research on user experience (UX) (Hassenzahl, 2013). This research suggests that compelling user experiences are increasingly possible through well-designed technological interfaces (Marcus, 2015). In terms of experiential media, this conceptualization refers to the degree of doing something while engaging one or more of the senses via a digital communication platform. This conceptual framework is reflected in the work of Jeremy Bailenson (2018) at Stanford’s Virtual Reality (VR) laboratory. Bailenson describes VR as “experience on demand” (2018:1).

Experience is not the exclusive capacity of experiential media; other media can, for example, let audiences experience an emotional state such as fear or joy. All media to a certain degree involve users doing something, however, limited in complexity. But analogue media cannot generally allow audiences to do something beyond the use of a medium, such as to turn a page of a book, read words on that page or change a TV channel.

Experiential media enable users not just to experience the medium, but also to participate or engage in a story or content itself. Users do not merely imagine. A helpful example is Edgar Allan Poe’s classic tale from 1839, *The Fall of the House of Usher*. In the story, Roderick Usher relates how he acquired a morbid acuteness of senses or hyperesthesia. Colours, sounds, scents and taste are intense beyond tolerance. It is one thing to imagine such acuteness, as might readers of a story or listeners to a radio play retelling the tale or even viewers of a movie depicting the story through sight and sound. It is other to gain practical insight through an immersive, interactive, and multisensory VR experience based on the tale in which a user enters the character of Master Usher.

Another historical example is the 19th century Lumiere brothers’ motion picture, *Demolition of a Wall*, which illustrates the nature of the development of experiential media. The Lumiere brothers’ 1896 film #40 showed this simple real-life story through moving pictures. 20th-century movie productions with synchronized audio could include the sounds of the demolition. The 21st-century experiential media could let users swing the hammer virtually and partake in the demolition of the wall; a haptic interface could even let users feel the impact of each blow (Parisi, Paterson and Archer, 2015). The relative advantages, disadvantages and consequences of engaging only users’ imagination versus engaging their entire being have yet to be fully investigated but it could make for valuable research.

AR and VR and other experiential media forms have emerged as significant parts of the global media marketplace in the early 21st century. But in fact, their development

has been underway for more than a century. However, one does not suggest that this development is either a linear progression or a technologically determined process. Instead, a confluence of factors, including commercial interests, government policies and cultural factors has shaped the prospects and problems coincident with the emergence of experiential media in the creative and cultural industries.

Yet, we can point to several notable milestones in the development of more experiential media forms. In 1901, L. Frank Baum, famous as the author of *The Wizard of Oz*, imagined an electronic “character marker”, which arguably signals the first conceptualization of augmented reality. In 1935, Stanley G. Weinbaum published a short story, *Pygmalion’s Spectacles*, in which he described electronic goggles that immerse the wearer in a virtual world featuring holographic displays with smell and touch. In 1949, science fiction writer Ray Bradbury envisioned an electronic, multi-sensory and interactive nursery for a short story titled *The Veldt*. Children in the nursery control the experience simply through thought. If they imagine the African veldt, the nursery becomes that veldt, complete with lions. Not surprisingly, things go awry in the story and bring dire consequences.

In 1957, Martin Heilig invented the “Sensorama”, the analogue machine that allowed up to four people to simultaneously experience “the illusion of reality using a 3D motion picture with smell, stereo sound, vibrations of the seat, and wind in the hair to create the illusion” (Heilig, 2017). In 1968, Ivan Sutherland developed the first head-worn display. In 1987, Jaron Lanier coined the phrase “virtual reality”, and designed the first commercial VR headset (Virtual Reality Society, 2017). In 1989,

Steve Mann developed the first functional and networked wearable computer (Mann, 2017). In 1990, aerospace engineer Thomas P. Caudell coined the term “augmented reality” (AR) (Lee, 2012). AR has a natural application to journalism and media, in which the news and other media have historically functioned to augment the public’s experience with reality.

These imaginings and inventions long preceded the 21st-century launch of consumer-oriented VR headsets such as the Oculus Rift, or AR platforms such as the iPhone X and the Samsung Galaxy S9. AR can augment user views of reality. Readers might imagine standing in front of New York City’s Flatiron building, Manhattan’s original skyscraper. By pointing a mobile device at the building, an AR app could overlay information telling the user about the building or facilitating social media engagement. In contrast, VR could allow a user to enter into the building virtually, becoming immersed in a narrative about the building’s history and story. Named the Fuller Building when built in 1902, the Flatiron building once featured stories projected onto its exterior via a magic lantern, an early image projector (Alexiou, 2010; Vermeir, 2005).

With the rise of experiential media, the creative and cultural industries are on the verge of the third stage of mediated storytelling. For most of media history, the first stage of mediated stories featured telling of tales using words, especially in a written form (Schramm, 1988). Written narratives in printed media, including newspapers, magazines and books, provided a major platform for primarily textual storytelling.



The 20th century saw the rise of the second stage of mediated storytelling, the one that involved showing and hearing stories in media via photography, moving images and over the air on radio or the wireless. These stories tended to follow largely the same basic narrative approach as printed media but added more audio and visual elements to the storytelling. Many scholars have explored aspects of the evolution of mediated storytelling throughout these first two stages (Spiegel, 2017). Jenkins (2010) and others articulated the development of transmedia storytelling as content narratives that have been adapted to and designed for multiple mediated environments. Murray (2017) conceptualized a storytelling transformation in an online environment in which users can interact and engage in virtual narratives.

By 2018, the creative and cultural industries have reached the beginning of the third stage of mediated stories, the one characterized by story experiencing

rather than storytelling. These experiential stories operate on networked, digital platforms, including augmented reality (AR) and virtual reality (VR). Experiential stories signal a potential transformation of the creative and cultural media industries on several levels, including content, practice and industry structures, especially in terms of public engagement. Experiential stories are developed in nonfiction and fiction media realms, including journalism, cinema, games and art.

Importantly, although newer media forms keep emerging, they do not necessarily supplant earlier forms; in many cases, they complement or extend the capacity of storytelling in new directions. The newer forms can become increasingly dominant, but not necessarily to the exclusion of earlier forms. When radio emerged in the early 20th century, for example, it became the dominant platform (at least in terms of audience and revenues for much of the world) for storytelling in the form of the theatre of the air (Pavlik, 2017b).

But newspapers, magazines, motion pictures and books continued to play an important role. Television eventually came to largely displace radio as the dominant storytelling medium. Experiential media are likely to grow in importance as a story-experiencing environment, but other media will continue to play a significant role in public storytelling. These opportunities will be shaped and constrained by economic, cultural and political forces that surround and form the basis for the global media system (Adorno, 1991).

Contemporary Experiential Media

Experiential media allow users to actively engage, navigate and to a large degree control immersive narratives or stories, at least within the content framework and parameters provided within the platform. AR layers digital content onto users' real-world experiences via mobile or wearable devices. For example, a smartphone user running an AR app might point his/her device at a nearby building and see or hear a geo-located narrative linked to that building, perhaps about a current or past event or a person associated with the location. In more immersive fashion, users wearing smart-glasses might look at that building and see or hear AR overlays that blend seamlessly into the location. Sometimes AR is anchored as interactive 3D objects in the user's immediate physical environment. Some describe this form of AR as Mixed Reality or MR.

In 2018, *The New York Times* launched an AR, or MR, news reporting initiative. Coinciding with the 2018 Winter Olympics in Seoul, South Korea, the AR-enabled

news experience allowed a user to see an Olympic figure skater in 3D photorealistic form appear before her or him via a smartphone, and anchored to the floor, or another flat surface, such as a table. iPhone users could interact with a life-size 3D version of U.S. figure skater Nathan Chen, who appears virtually before them. "From this view, you can see Chen's arms and legs are tight to his axis of rotation, which helps him spin faster than 400 r.p.m.," the report states (Branch, 2018).

In September 2017, *The Washington Post* introduced geo-located AR stories through its app, enabling users to access locative stories about iconic buildings. The *Post's* first AR story explores the National Museum of African American History and Culture in Washington, D.C. This use of AR is somewhat akin to audio guides or tours in museums or other venues, but story-oriented and multi-media in format.

VR headsets supplant users' direct world experience with computer-mediated content or stories. Enveloping 360-degree images, video, animation and the like fill the user's entire field of view. Geospatial, high-fidelity audio enriches the user's immersive experience in the narrative. Next-generation systems may deliver such mediated experiences via volumetric displays that no longer require the user to don a headset or hold and look at a mobile device. Rather, AR and VR narratives will be projected into a 3D space or volume, bringing to digital life Heilig's half-century-old multi-user Sensorama but in a disintermediated form. Ultra-high-definition (UHD) video platforms including 8K UHD delivered at 240 frames per second may envelop users in lifelike high-fidelity, 3D audio and visual displays.

Qualities of Experiential Media

Experiential media feature six primary qualities of relevance to mediated stories. These qualities emerge from the capabilities inherent in contemporary digital, networked media platforms. These qualities are interaction, immersion, multi-sensory presentation, algorithmic and data-driven, first-person perspective, and natural user interface.

Interaction

Interaction refers to the exchange that occurs between or among users and content or mediated stories. In experiential media, interaction takes two main forms. First is interaction via a computer or communications network between and among public and media storytellers. Second is the interaction that can occur between a user and content or the story itself.

Social-networks increasingly feature experiential formats. Snapchat, for example, uses geo-located augmented reality to facilitate user interaction. Users create their own stories via Snapchat and can overlay geo-filters, or geographically located augments, to situate their stories or to creatively manipulate images and videos of human or animal story subjects and then share them (e.g., an AR-enhanced selfie).

Content interaction allows users to access embedded content or navigate layered story elements. In experiential media, such content interaction becomes the essence of the story experience and the user interface. *The Times's* Olympics AR report illustrates this aspect of interaction.

Interactive documentaries (I-Docs) emerged in the early 21st century as an international standard in journalism storytelling in the experiential media realm (Pavlik and Pavlik, 2016). Among the award-winning examples of such I-Docs is *Inside Haiti*, an interactive, online non-fiction simulation that allows users to virtually travel to Haiti and experience the aftermath of the earthquake that devastated the island nation in 2010. Users can journey interactively through the narrative in the first-person as an earthquake survivor, an aid worker, or a journalist on assignment. In each role, a user faces decision points, and then experiences (through sight and sound) the consequences of those choices.

Immersion

The second primary quality of experiential media stories is immersion. Experiential media envelop the user within a story (Carter, 2015). This is the essence of immersion. Users are surrounded by spherical, 360-degree imagery, video and computer-generated imagery and sound. Immersion can also mean enveloping the user in a real-world, physical space using augmented or mixed reality on a handheld or wearable device, even including haptic interfaces (e.g., wearable digital bodysuit).

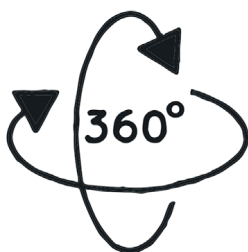
Höllerer, Feiner, and Pavlik (1999) developed an early prototype immersive storytelling format. They dubbed their immersive format "The Situated Documentary". Situated Documentaries were developed and experienced using a wearable computer system, the research team called the Mobile Journalist Workstation (MJW). Storytellers used MJW to embed non-fiction, documentary stories

in real-world locations. The MJW included a head-worn display with graphics and video display and audio playback, wireless Internet connectivity or Wi-Fi, geolocation via the Global Position Satellite system (GPS), a 360-degree video camera (developed by Columbia Computer Science Professor Shree Nayar), and a handheld interactive display.

Situated Documentaries feature a variety of media types to deliver story experiences, including 360-degree video (a precursor to VR) and AR, layering digital content tagged onto real-world objects and seen through and interacted with wearable or handheld platforms. Users navigate through stories or content via gaze approximation, allowing hands-free operation. The system tracks where users look, and if they gaze at an object, real or digital, for a half second, it is automatically selected via an algorithm – much as a cursor pointed at the object and a mouse click might do.

Students using the MJW reported or produced several Situated Documentaries, including one of the 1968 Columbia student revolt or strike, Enrico Fermi’s nuclear pile (a precursor to his work on the Manhattan project), and the Bloomingdale Asylum (for the insane in the 19th century), which was located on the Columbia campus before it was a college campus; one asylum building remains to this day.

Users stand on the campus, looking around the College Walk area. Overlaid onto the real-world scene and displayed on the head-worn system are immersive bits of 2D and 3D AR content. These include photos and videos from the past and 3D digital visualizations of buildings that once occupied a space which today contains another building, geographically synchronized onto the actual locations where they once existed or where past events once occurred. For instance, users experiencing the 1968 student revolt story see a photo of Mark Rudd, a student leader of a revolutionary group of the day called Students for a Democratic Society (SDS) overlaid onto the location of the University’s President’s former office, and then hear an actuality (audio recording of his voice) of Rudd speaking. He explains what he found in the Columbia President’s office: “his girly magazines and letters about moving out the Blacks and the Puerto Ricans” who were in the way of the University’s plans to turn nearby Morningside Park into a new gymnasium or exercise facility. This Situated Documentary format is somewhat analogous to a virtual time-traveling platform. The student producers even developed an applet that enables users to move back or forward through time by tapping the display and selecting the desired year.



By 2016, immersive 360-degree video stories had become a mainstream media storytelling feature. Among the leading venues for such storytelling in journalism are *The New York Times*, the Associated Press, *USA Today*, the *Wall Street Journal*, NBC and many others around the world such as *The Guardian* and the BBC. *The New York Times* introduced its 360-degree video storytelling on Nov. 5, 2016, with a story called "The Displaced." *The Times* also distributed to one million of its subscribers a low-cost headset called Google Cardboard. Users inserted their smartphone into the Cardboard viewer and running *The Times'* VR app could experience "The Displaced" story, journeying virtually to three refugee camps in Syria, Ukraine and Sudan, and experiencing life there from the point of view of a child refugee.

Research has shown that virtual environments can enhance a user's sense of presence in a virtual, mediated space (Witmer and Singer, 1998; Zahoric and Jenison, 1998). Studies have shown how immersive content, including on high-resolution television, can increase the user's sense of presence and produce other cognitive and affective outcomes as well (Kim and Biocca, 1997). At the Pennsylvania State University's Media Effects Research Laboratory research has shown that immersive stories, especially experienced from the point of view of a single protagonist, are especially likely to generate for the user a sense of presence at the site depicted in the narrative and for her or him to experience heightened empathy with the protagonist (Sundar, Kang and Oprean, 2017). Research at the Tow Center for Digital Journalism at Columbia University has confirmed these findings (Archer and Finger, 2018).

The New York Times' 2017 immersive "Antarctica" series merits a special note. The four-part series of 360-degree video stories invite the user on a journey to Antarctica, a location few may ever get a chance to visit in real life. But the story of Antarctica is one of central importance in contemporary global affairs. Whether due to climate change or geopolitics, Antarctica is vital to the world's environment and may serve as far more than just an early warning system for the effects of global warming. *The Times'* immersive undersea journey is a powerful experience that can help build public understanding of the state of the endangered, remote continent.

Although the 360-degree format offers storytelling immersion, it lacks some of the essential qualities that would constitute full VR. Among them is what is known as six degrees of freedom (DOF). DOF refers to "the ways an object (or person) can move within a space. There are a total of six degrees of freedom in a three-dimensional space. The six DOF can be divided into two categories, rotational movements and translational movements. Each category has three DOF. Both orientation tracking (rotation) and positional tracking (translation) are required to have a truly immersive VR experience" (XinReality, 2018). These DOFs in full-scale VR essentially allow the user to not only look about in all directions but also to move about in a three-dimensional virtual space or volume.

In 2018, full-scale six DOF VR experiences are very expensive to produce and are available mainly in the VR game environment. Some six DOF cinematic VR experiences are being developed, but journalism stories that offer full immersion with six DOF are still primarily on the horizon, although VR journalism pioneer Nonny de la Peña has been leading the development of some exam-

ples. De la Peña is the founder and CEO of the Emblematic Group, a VR and AR company headquartered in Los Angeles, CA. She is known for her work in creating 360-degree video and VR journalism stories. De la Peña says VR is an empathy machine and that VR journalism can transform the user into a new kind of eye-witness to events. Her VR stories include *Greenland Melting* (De la Peña, 2017a), produced with PBS Frontline, taking users to Greenland's melting glaciers, and *After Solitary*, produced with PBS Frontline, enabling users to enter a solitary confinement cell in a Maine (U.S.) State Prison (De la Peña, 2017b).

De la Peña is not only creating powerful experiential narratives. She is also shaping the contours and grammar of a new story medium. Among de la Peña's most important early VR works is 'Hunger in Los Angeles', a non-fiction VR experience premiered at the 2012 Sundance Film Festival. She followed that narrative experience with *Out of Exile: Daniel's Story*. Users experience the story of a young gay man coming out to his homophobic family. This VR film was named one of the best of the Sundance festival in 2017.

AR is increasingly a part of a wide spectrum of objects in the physical world, from objects of art to the news. To illustrate, the author and his doctoral student, Frank Bridges, embedded AR into elements of a monograph on AR in storytelling (Pavlik and Bridges, 2013). They augmented an image of a Chinese handscroll "Heaven and Earth", created in 1964 and on loan to the Metropolitan Museum of Art from the Nanjing Museum in China. With permission, the co-authors added a short video of a curator from the Met explaining the meaning and significance of the hand scroll. They also created an original video shot with an iPhone to an image of Mr.

Pete Seeger's unique banjo signature. A legendary American folk singer, the late Mr. Seeger was also a civil rights activist, environmentalist and storyteller. Seeger explained to the author how he developed his signature and the author recorded a short video and embedded it as an augment into a copy of his signature.

The tools for creating and experiencing AR are developing and expanding rapidly. Some of the AR apps news media have used in their story content include HP Reveal (formerly Aurasma), which the author and Bridges used in their monograph. *Prosthetic Reality*, an art book, features the EyeJack AR app and illustrates the potential to embed animation, audio and interaction in visual art.

2017 saw the development of advanced AR technologies in television newsrooms around the world to aid in storytelling. CBS News, for instance, a TV news network headquartered in New York City, in August 2017 employed AR to tell viewers a story about an unusual upcoming astronomical event: a total solar eclipse that would pass over most of the U.S. for the first time in nearly a century. The story featured an animated, digital version of the solar system, including the Sun, Earth and Moon, which rotated as the news operation's chief meteorologist walked about the studio and explained what viewers soon could expect to experience. The AR was of high resolution and three-dimensional quality appeared to the naked eye as though the mini-solar system was, in fact, present in the CBS news studio.

“Experiential media are also likely to offer users engagement beyond the five human senses soon. Neuro-reality is a working prototype format (...)”

Multi-Sensory Presentation

Stories offered via experiential media can engage all five human senses. Lifelike sight and sound are common, and tactile or haptic experience is increasingly available, even expected, and can facilitate user memory or emotion (Kappers, Van Erp, Bergmann Tiest, Van Der Helm, 2012). Eidetic memory, or memory stored or recalled as distinct images, might be especially likely to be enhanced by compelling visual and haptic VR experiences. Haptic user experience can be with virtual or physical objects and can be generated via devices of many forms connected to the Internet. The Internet of Things (IoT) already includes an estimated 50 billion objects worldwide ranging in format from multispectral sensors to drones and robots; IoT can serve as an almost limitless resource for the generation of data-driven, multi-sensory experiential content (Pepper, 2015).

Experiential media are also likely to offer users engagement beyond the five human senses soon. Neuro-reality is a working prototype format for games and persons with a disability (Houser, 2017). Neuro-reality allows users to engage experiential platforms via thought or mind control, sometimes even via a wireless interface. More than simply a means of content navigation, neuro-reality may enable new forms of human senses. There are several commercial and research initiatives underway to advance neuro-reality, including EyeMynd, NeuroLink (Elon Musk is the founder) and Kernel, a company seeking to develop a neuroprosthesis (Lant, 2017). A research project based on neuro-reality is developing a system to create a new human sense, the one that would allow a user's mind to engage directly with data,

such as the stock exchange. This project may signal a step in the human evolution toward the so-called singularity (Eden, Moor, Soraker, and Steinhart, 2012).

VR may also enable the expansion of human experience. In the VR system called Birdly, users experience the dream of human flight (Hynes, 2015). Developed in 2014 by Max Rheiner at his media lab in Switzerland, Birdly allows users to virtually fly bird-like over the city of San Francisco.

Algorithmic and Data-Driven Media

Experiential media and the stories they enable are increasingly data-driven for geo-location and other dynamic customization of content or stories, including reactive or responsive displays that can track and respond to the tracking of users' eye movements or respiration. Data about users' location, preferences or digital behaviours and physiological responses, for instance, enable stories to automatically adapt to that location or users' presentation preferences or more. For instance, a story might adapt to the time of day, users' background or interests or emotions, or previous choices in an earlier part of the narrative.

As a part of this process of story adaptation, experiential media utilize algorithm-enabled features to adjust the narrative or its presentation (e.g., with or without sound). Such algorithms are a pre-cursor to full artificial intelligence (AI), machine learning and neural networks, which could deliver real-time, automatic user customization and user interaction. Increasingly, experiential media can engage automated content interaction via algorithm, or AI, and data.

Illustrating the role of AI in an interactive, shared, public experiential media setting is an interactive billboard placed in London's Canary Wharf in observance of International Women's Day on 5 March 2015 (Wallwork, 2015). The billboard featured a story of domestic violence. With an embedded AI-enabled camera watching the faces of those passing by, each time a person looked at the billboard the sign's image of a battered woman's face healed ever so slightly. Once enough people looked at the face, helping it to heal, the message shifted to read, "Don't turn a blind eye to domestic violence." Then the system would reset for another public interactive experience.

AI plays a potentially significant role in most experiential media stories. Thousands of AI-generated stories are already being produced each year by organizations such as the Associated Press (AP). Likewise, a software robot called QuakeBot illustrates the potential of AI and data for storytelling. Designed by a human reporter, the algorithmic robot "Quakebot" automatically captures in real-time the data feed on the U.S. Geological Survey (Slate, 2014). When an earthquake of 4.2 magnitude occurred in Southern California in early 2014, Quakebot automatically dove into the data stream to gather the needed information about the magnitude, epicentre and time of the seismic event. Quakebot then wrote the story and sent an electronic alert to its human editor, notifying him of the breaking news. The human editor quickly double checked to confirm the occurrence of the earthquake, and then forwarded the story for publication on LATimes.com. Future news bots may be capable of producing immersive, interactive, and multi-sensory stories generated algorithmically from IoT data and more.

AI is integral in the production of high-resolution 360-degree or VR live action video. Google's Jump video compiler automatically seams together 16 streams of ultra-high definition video shot on the advanced Google omnidirectional VR camera rig to create a compelling omnidirectional video. High-speed data processing, including that enabled by advanced AI and ultra-fast data processing, eliminates an immersive media problem known as the latency effect (Mastin, 2017). The latency effect refers to any perceptible delay the user experiences between taking an action, such as clicking on a digital object and getting a response from the system. Perceived latency interferes with users' sense of reality or presence in the game or narrative. Eliminating or minimizing the latency effect helps to heighten the users' sense of reality and presence in the narrative.

Certainly, the potential for AI-enabled systems to generate errors or to invade human privacy is substantial. The reduction of this potential will require the development of significant and powerful mechanisms to detect and minimize possible problems. Acclaimed science fiction writer Isaac Asimov once proposed three laws of robotics that he designed to "eliminate" the potential for AI-enabled machines to harm humans or generate other negative consequences" (Asimov, 1950). A similar approach may be central to the development of AI in experiential media. In the future, a design that frames AI as an augmentation to human performance rather than as a replacement is likely to become essential.

First-Person Perspective

In experiential media, stories increasingly engage users into a first-person perspective, letting them experience narratives as the protagonist or a central character of the story. By being placed inside the story, users become participants in an “I” or “we” (collaborative, multi-user) format, pursuing a narrative alone or with others.

Identity in such stories can become fluid. A curious 2017 example is the immersive simulation called *Everything* (O’Reilly, 2017). *Everything* lets users become virtually anything in the universe, animate or inanimate, and follow the story from the point of view of an atom, a plant, a bear or a star. Users can create their own universe. There are no right or wrong choices. It is a simulation of exploration. Users can repeat an experience or live it virtually from multiple points of view.

Natural User Interface

Natural user interface (NUI) design is of critical importance to stories in an experiential media environment. When people engage with the real world, they do so in a highly intuitive manner. People look at things, touch, smell, and hear them. To get information, people simply ask questions using their voice or other means of communication (e.g., a gesture) they have in common with others. In traditional computing environments, users need to first master a variety of skills, beginning with language, and then specialized skills such as using a computer keyboard, to interact with others or with computer content or data. If experiential media are to offer the user a sense of actual experience, then it is

essential that users can navigate or interact in an intuitive manner as much as they do in the physical world.

Increasingly, immersive media platforms support such natural user interface (NUI) design. Among the most widely experienced in 2018 are interactive, Internet-connected 360-degree audio platforms that allow voice interaction. Popular platforms include Amazon Echo with Alexa and Google Home. With the Echo, the user speaks to the device, first saying the activation word, Alexa. Then the user follows with a statement, command or a question such as “Alexa, good morning”, “Alexa, play Spotify”, “Alexa, what’s the news”, or “Alexa, raise the volume”. Alexa responds accordingly, assuming it understands the user’s statement. Amazon is developing Alexa to be integrated into a wide variety of devices and platforms, from automobiles to dishwashers. Likewise, Amazon is reportedly developing smartglasses that will support Alexa and likely will feature a high definition camera, AR, and two-way audio and video. Interactive, voice-based games have been designed for the Echo, with Alexa acting as the user’s assistant. One is called The Wayne Investigation. Modelled after a 1940s-style radio play, the Investigation challenges the user to solve the double-murder of Bruce Wayne’s parents. Wayne is better known to comic book fans as Batman. Users hear Alexa provide an audio scene setting, and then proceed to try to solve the murder by asking Alexa questions and hearing her describe the evidence. Audio effects help advance the narrative engagement as well.

Gesture navigation is a similarly increasingly important feature of NUI design. Users can control or navigate experiential content simply by looking at an object or waving a hand or finger or nodding a head or blinking an eye.

Thought control through a brain-machine interface (BMI) and neuro-reality are fast approaching as well. Already in use for persons with disabilities and in prototype form for VR games, users will be able to control or navigate through an experiential narrative simply by thinking a command, a choice or a communication. This may be the real advent of Bradbury's *The Veldt* from 1949.

Also on the horizon are implantable chips that will further advance AR and VR impact via BMI. Implantable radio-frequency identification (RFID) chips are already in growing use for various applications including medicine, disability treatment, and the workplace, and may soon enable interactive media experiences that fuse directly with the human mind.

For many, wearing a headset, or implanting a digital chip, is unthinkable. It's far too much an encumbrance or an invasive threat to privacy. Consequently, many are skeptical about the potential for fully immersive, interactive, multi-sensory experiential stories. But others are embracing these new immersive media forms and using them to create arts and other experiences (Zolfagharifard, 2013).

Diverse Platforms

There are many media platforms for experiential media, and they offer varying degrees of capacity with regard to the six qualities identified in this paper. These platforms are rapidly evolving and reaching a growing installed base around the world. The platforms include Samsung Gear VR and Google Daydream View for limited immersion; Oculus Rift and HTC Vive for richer immersion, interaction and multisensory experiences.

VR usage worldwide is growing. A GlobalWebIndex (2017) study of 350,000 US households with Internet access indicates 8% have a VR headset. About 90% of U.S. households have Internet access, so this 8% translates into some 7.5 million households with a VR headset. The same study suggests VR headset ownership is rising rapidly, having almost doubled from just 5% in June 2017. Those surveyed indicate they want more and better content or experiential stories designed for an immersive experience.

Other research indicates that the worldwide installed VR headset base totalled 24 million in 2017 and is expected to reach 77 million by 2021. As a percentage of the world's total population, this is still small, but it is not insignificant in terms of an emerging platform for delivering experiential stories. Moreover, VR headsets represent only a small portion of the total experiential media landscape, which is much closer to 50% when the adoption of smartphones and UHD video systems is considered. Smartphones are a primary platform for AR and MR.

On the experiential horizon is what is known as three-dimensional volumetric displays. These platforms project 3D virtual objects into space or volume, without users needing head-worn displays. The images, video and animations are lifelike in appearance, apparently solid, 3D objects. They are geo-located AR/MR (mixed reality). Volumetric projections can be animated, interactive, and photo-realistic. The approaches to creating volumetric displays are varied, including lasers and retinal displays, as well as fast moving light emitting diodes (LEDs) and holography.



Ultra-high definition (UD) video and high fidelity spatial audio also can enable the delivery of stories that create highly lifelike user experiences. With 8K resolution and spatial audio, persons watching, and hearing video and video delivered via slightly curved OLED screens can, like those wearing a VR headset, gain a sense of immersion in the narrative or scene (Seel, 2016). Ultra-high definition (UHD) holographic projections such as those at the Theoriz Visual Studio in France illustrate the potential for blending the physical with the virtual in an interactive UHD narrative environment (Theoriz editors, 2018).

One of the most vexing problems associated with the expansion of experiential media and the platforms needed to create and engage them is their high cost, both in terms of production as well as user access. A digital divide between those with access and those without will persist and possibly widen (Castells, 2002). Solving problems of inequality of access to the tools of production, distribution and access in these experiential creative and cultural industries is essential but not easily addressed.

Experiential Media Story Model

Figure 2 provides a summary of the experiential story model, drawing upon a synthesis of prior research on each of the six primary qualities it articulates.

Figure 2: Experiential Story Model

- Immersion, including 6 DOF (de la Peña, Weil, Llobera, Giannopoulos, Pomés, Spanlang, Friedman, Sanchez-Vives, and Slater, 2010).
- Interaction, including non-linear narrative structure (Bostan and Marsh, 2012).
- Multi-Sensory presentation (Shams and Seitz, 2008).
- Algorithmic, data-driven and dynamic, featuring contextualization and real-time customization (Lindén, 2017).
- First-person perspective (*Oxford Reference*, 2018).
- Natural User Interface Design (Mann, 2003).

In contrast to the analogue media storytelling model presented in Figure 1, the experiential story model is far more complex. All the capacities of analogue media are still available in the story production palette. Yet, some are modified and enhanced, and new capabilities are introduced. Experiential stories feature structures that are increasingly non-linear. They are immersive, interactive and multi-sensory. Such stories can be dynamic, algorithm- and data-driven, even featuring AI. Stories can be contextualized or linked to other online content. Contextualization is especially likely in journalistic stories featuring 360-degree images and video in which the user can look about and see the events in a wider field of view. Perspective is shifting away from the somewhat detached third-person perspective and toward the highly engaged first-person viewpoint. In fully immersive VR, users can move about freely with six degrees of freedom. A natural user interface design not only makes user engagement and navigation intuitive, but it makes the story experience increasingly lifelike and seemingly real for the user, especially with a rich blend of multi-sensory presentation including sight, sound and haptics.

Concluding Reflections: What Experiential Stories May Bring

Experiential media bring the possibility of a transformation of media content from storytelling to story experiencing. This transformation offers users and society potentially positive, beneficial outcomes. Research indicates experiential stories can increase user engagement. Experiential stories can produce a greater sense of user

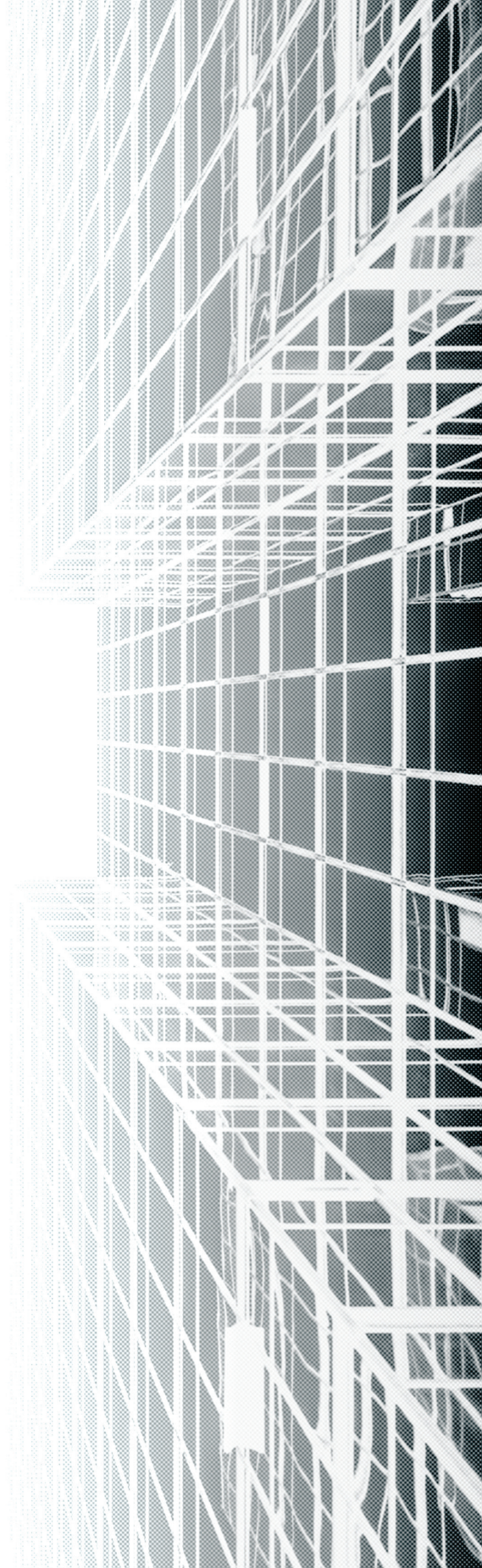
presence in a narrative. Experiential stories can generate greater empathy among users. Ultimately, users may transform from passive audience members to active participants in a story, seeing, hearing, touching or otherwise experiencing events and issues for themselves.

All of these outcomes may be especially important in journalism and other story forms where topics of importance are explored or presented in narrative form. Increasing user engagement, empathy and understanding can facilitate the development of a public better informed and able to participate in the public sphere. Yet there are also significant risks that may accompany experiential media stories. Ethical concerns abound. Potential invasions of privacy, threats to security, commercial exploitation, harmful health effects, and misinformation may be part of both the intended and unintended consequences of an experiential future.

Experiential media stories may blur the boundary between the real and the artificial. Users may develop false memories that seem totally real. Experiential stories may create the illusion of choice, when in fact the actual choice is highly constrained within the presented virtual world; the options are simply far more complex. One day, disintermediated multi-sensory story experiences may be delivered via volumetric displays featuring 3D, photorealistic and interactive animation and live action. Such stories may become virtually indistinguishable from reality. The fake news of 2018 may morph into the artificial reality of 2028. Synthetic may be an even better way to think of this digitally driven realm, which may increasingly imitate reality. The implications of the process of public discourse and democratic governance are profound.

User engagement via neuro-reality may deliver experiential stories directly into the human brain. Unobtrusive, ubiquitous and persistent experiential stories may be more than powerful tools of propaganda. They may become an irresistible means of thought control and bring profound psychological or neurological consequences. Story creators may hold the key to the development of a culturally and politically beneficial experiential media environment. By using emerging experiential media ethically, story creators can help to ensure that interactive, immersive and multi-sensory narratives are a powerful source of insight and inspiration for future generations, and not just a Pandora's box of digital disasters and algorithm-driven social control.

Users, or those who consume or experience those narratives, also will play a crucial role in ensuring that the future of experiential media is a positive one. Users will need to engage in experiential media with a critical lens and be on guard for experiential news narratives that are deliberately false, deceptive or otherwise potentially harmful. Experiential media literacy will be an important subject for life in the digital age. Yet, a commitment to freedom of expression among both story creators and users will be vital as well. Only through a robust and open environment can experiential media yield stories that are creative, diverse and continually advance public engagement and insight.





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