THE AGE OF DYNAMIC STORYTELLING

A guide for journalists in a world of immersive 3-D content

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A guide for journalists in a world of immersive 3-D content

By Francesco Marconi and Taylor Nakagawa

AUTHORS NOTE:

This report on the next iteration of immersive media is comprised of two sections. The first part captures some of the major trends and industry use cases surfacing so far. These insights are derived from conversations with dozens of leaders in the field of journalism, technology, academia and entrepreneurship. For the second section, we collaborated with a team of neuroscientists to conduct a scientific study measuring user engagement and brain activity when consuming immersive media content.

The resulting ideas and observations allow us to identify ways that virtual reality and 3-D content may impact the current model of storytelling as well as its future development. We hope to present you with the key insights to make your own informed decisions regarding how newsrooms can navigate the next phase of immersive media.

Prologue

In the spring of 2015, two journalists in the interactive department at the Associated Press received a padded briefcase with a heavy, rectangular-shaped gadget. The object inside was a 3-D camera, a prototype provided by the immersive media technology company Matterport, which combined infrared and high-dynamic-range imaging to create "photo-realistic" virtual spaces.

A couple of months later, the two multimedia producers collaborated with a colleague on the business news desk to embark on a project that would change AP's thought process on visual storytelling.

The trio set an ambitious goal to virtually transport news consumers to places they would not — or could not — normally go, including first-class and executive suites in planes, ocean liners and hotels. The resulting experiences formed "The Suite Life," an interactive experience unlike anything our newsroom had previously produced.

"There are only so many times you can use phrases like 'luxurious' or 'over the top' to describe these posh accommodations," said Scott Mayerowitz, the business journalist who conceptualized the project.

"In fact, none of those words really do these unique spaces justice. But the second people are transported into these virtual suites and can move around on their own, their jaws drop in shock."

Each space in "The Suite Life" was extensively photographed using the 3-D camera and reconstructed for use in virtual reality. Using a VR headset, viewers were able to "walk" through and experience each environment from a variety of angles.

"We've found that the total immersion of VR makes the experience of exploring a newsworthy location more emotionally impactful and ultimately more memorable," explained Matt Bell, a co-founder and the chief strategy officer at Matterport.

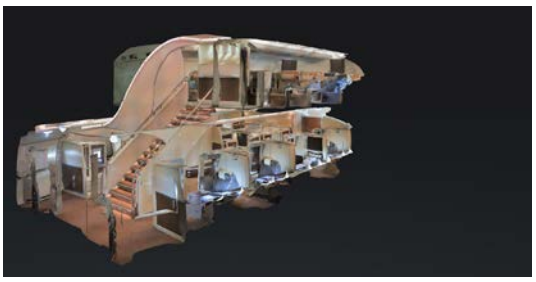
The success of "The Suite Life," helped AP journalists realize that storytelling would soon evolve into a more interactive experience rather than being told from a single, fixed perspective.

We call this new approach to journalism dynamic storytelling.

AP is not alone. Innovators throughout the news industry are collaborating with technology companies and building their own studios to push the envelope in a number of immersive media projects, redefining how stories are planned, produced and distributed.

"VR is not going to replace traditional news formats, but it is an evolution of our desire to want to get closer to the story," said Molly DeWolf Swenson, co-founder of RYOT, a production studio recently acquired by HuffPost.

Matterport's PRO 2 3-D Camera (MC250) is a high-resolution 3-D scanning camera that The Associated Press used to create its first virtual reality story, "The Suite Life."
PHOTO COURTESY OF MATTERPORT



In "The Suite Life," participants had the ability to virtually travel through some of the world's most lavish accommodations. This 3-D model was captured using Matterport's scanning technology and shows the cabin of Singapore Airlines' first-class suites.
AP PHOTOS

As you will see in the following pages of this report, immersive media is much more than 360 videos that provide a peripheral view of a scene. Emerging technologies are on the way that will be capable of producing vibrant 3-D models that give us an even greater sense of depth and texture. A technology called "volumetric capture" will soon enable viewers to not only "walk" through spaces, but also to touch 3-D objects and interact with others in a virtual space.

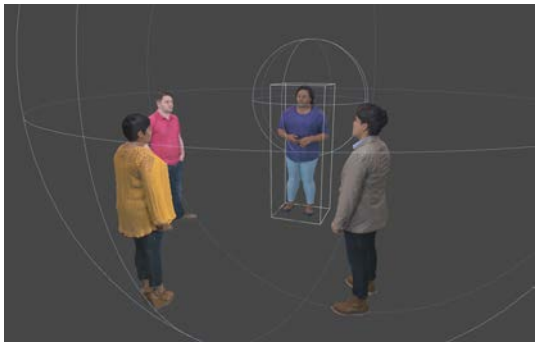
"We experience the world with our whole bodies, so why shouldn't we experience stories with our whole bodies?" asked Nonny De La Peña, founder of Emblematic Group, an immersive journalism studio in Santa Monica, California.

Broadly speaking, volumetric content promises to reap many rewards for journalism in the years to come, including higher engagement with audiences and innovative reporting.

Of course, this wave of technological innovation follows a similar path from others that have come before it. Each new technology reinvents how we experience news, activating each of our senses in a brand new way: The printing press allowed people to read each other's ideas; radio allowed us to hear them; television allowed us to see them and immersive media is now allowing us to feel as if we're actually with others as they speak.

"The flat pane of glass with its two dimensions has been a constraint for content producers for decades," said Justin Hendrix, executive director of the NYC Media Lab. "With virtual and augmented reality technologies, that's about to change. It's hard to imagine the entire extent to which a new dimension will create challenges and opportunities for journalists."

To best leverage volumetric capture and 3-D content in news, the first step is to understand the technology itself. As you read this report, keep in mind that all of the ethical and editorial considerations journalists have today will still apply in the next stage of immersive storytelling. This analysis will both discuss those and hopefully inspire further dialogue about where these new types of media could lead us.



Virtual reality studio Emblematic Group leveraged the volumetric scanning technology of 8i in order to produce "Out of Exile: Daniel's Story," a film that premiered at Sundance Film Festival in 2017.
PHOTO COURTESY OF EMBLEMATIC GROUP

"We experience the world with our whole bodies, so why shouldn't we experience stories with our whole bodies?"

NONNY DE LA PEÑA
FOUNDER
EMBLEMATIC GROUP

3-D scanning adds a layer of depth to the pixels used to produce flat photos and videos and, when captured from all angles, volumetric capture can produce holograms of people and 3-D models of places.
PHOTO COURTESY OF SCATTER STUDIOS

Trends and use cases

From video journalism to volumetric capture

Before we explore the intricacies of dynamic storytelling, let's first talk about the transformational technologies enabling this shift.

First of all, there are some terms to get straight. In one, very basic sense, this is all about the evolution of virtual reality. This new wave of technologies, known collectively as "immersive media," specifically include 360-degree video, augmented reality (AR) and volumetric capture (includes both CGI and 3-D scanning).

These techniques allow journalists to catapult audiences right into the middle of the action, breaking physical and economic barriers by enabling participants to travel to new environments, explore new realities and gain a new perspective of the world around us.

Expanding perspectives

The first stage in immersive media was 360-degree video, or "360 video" for short. This format gave journalists the ability to expand their frame of view and capture spherical images.

"The era of 360-degree video is just beginning, but already we've seen its potential and begun to harness the strength that it offers our storytelling," said Jaime Holguin, AP's manager of news development.

Below are three examples of how news organizations have utilized 360-degree video:

- AP's "House to House: The Battle for Mosul," brought viewers to the frontlines of the battle against ISIS.
- The New York Times' "Life on Mars," chronicled six scientists living in isolation in Hawaii to simulate life on a foreign planet.
- Sports Illustrated and LIFE VR's "Capturing Everest," gave viewers a new perspective on the world's tallest mountain.

In "House to House: The Battle for Mosul," viewers are transported from one location to another as they follow a group of Iraqi insurgents and experience the difficulty of combat in a dense urban environment.

Voice-overs and on-screen text help build context through the translated voices of civilians and soldiers caught in the fray, but for the entire piece, viewers are stuck in a fixed point and, more important, are reliant on the journalist and a video producer to organize the story.

Maya Alleruzzo, the AP's chief photo editor for the Middle East, stands by her 360-degree camera during the filming of "House to House: The Battle for Mosul."
AP PHOTO

The New York Times' six-part series "Life on Mars" chronicled the lives of NASA astronauts living in isolation on Hawaii's Mauna Loa volcano to simulate living on a foreign planet.
PHOTO COURTESY OF THE NEW YORK TIMES

LIFE VR and Sports Illustrated's "Capturing Everest" followed the climb of Jeff Glasbrenner and his crew up Mount Everest in a four-part series of 360 videos. Glasbrenner is the first American amputee to climb Mount Everest.
PHOTO COURTESY OF SPORTS ILLUSTRATED / LIFE VR

"Compared to a still photo assignment, 360 is the ideal medium for combat," said Maya Alleruzzo, the AP journalist who produced "House to House." "The stills were good, but couldn't really capture the scene like the 360 images."

This unique approach of expanding the traditionally fixed frame was an effective entry point to show journalists and audiences the broader possibilities of immersive media.

"360-video was a good introduction to train our journalists how to tell a story in this medium, and it can lead us to approach the future of VR confident in this unique method of storytelling," explained Thomas Seymat, the head of immersive storytelling at Euronews.

Reaching full immersion

The next iteration of immersive media can be found in 3-D content driven by volumetric capture. This technology allows participants to freely move throughout a photo realistic scene and choose how they experience a story, forcing news professionals to rethink how they organize and construct stories. The new approach promises the next revolution in publishing by immersing us deep in a story.

"After the initial wow factor, the first thing people ask me when they get into a 360 story is, 'What can I do?'" said Jesse Damiani, editor-at-large for the virtual reality publication VRScout. "And if the answer is nothing, then the marketability and viability of the experience drops exponentially; to drive engagement, we need more tactile and tangible interactivity."

For example, "Beneath These Restless Skies," a story produced by the journalism studio Empathetic Media highlights the lack of change in Section 8 housing in Harlem, New York. As participants choose their own path and move through a 3-D scanned apartment, they are encouraged to pick up objects such as archival photographs to unlock pieces of the narrative and understand the social climate of the location.

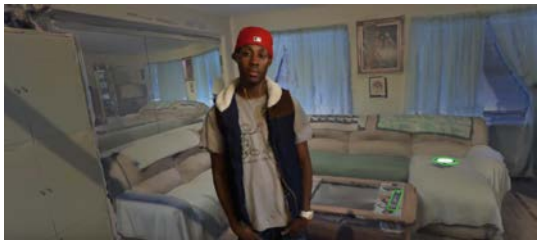
"With 'Beneath These Restless Skies,' the challenge for us was how to chain together these discrete pieces to form a narrative regardless of the order that a user moves through them," said Dan Archer, founder of Empathetic Media.

Note that when journalists give participants more freedom, they are also trading off some of the narrative control.

"As a director of traditional content, you have the control of where the camera is pointed, what is in view, when to transition, when to fade to black. We relinquish much of this control to our viewers in a VR environment," said Dan Kempton an interactive editor at AP.

"Is this a bad thing? Maybe for some, but for those who are up to the challenge, discovering new techniques to solve issues that arise from your audience running amok in your virtual story can be quite rewarding."

Immersive journalist Dan Archer (right) creates a 3-D scan of Trevor, a subject of "Beneath These Restless Skies," an immersive experience on Section 8 housing in Harlem, New York.
PHOTO COURTESY OF HARRIET DEDMAN



An early rendering of Trevor from "Beneath These Restless Skies," a VR story created by Empathetic Media that combines volumetric capture and CGI to allow participants to walk through a Harlem, New York, apartment.
PHOTO COURTESY OF EMPATHETIC MEDIA

Emblematic Group and Frontline's "Greenland Melting" combined the use of stereoscopic 360 video, 3-D scanning and CGI to allow participants to walk throughout a melting glacier.
PHOTO COURTESY OF EMBLEMATIC GROUP

Emblematic Group, explored a similar approach with "Greenland Melting," a story told in partnership with Frontline and PBS. Using a tool called zBrush the journalists were able to add a layer of depth to the 360 video captured on various icebergs. This added dimension allowed participants to move throughout the glaciers, as 3-D models of NASA scientists explained the effects of global warming on the environment.

Putting the viewer in control

Fundamentally, dynamic storytelling is the same as storytelling in its past and current forms — journalists answer questions posed by their readers and viewers. It's just **how** those questions are being answered that's changing.

A text Q&A, for example, is a very linear experience. Question 1 is followed by answer 1, followed by question 2, followed by answer 2, etc.

In virtual reality, when answers are revealed depends on the participants, who can choose when and which questions they want answered through contextual 3-D objects, sound or on-screen text annotations.

"It's all about putting the control in the user's hands and bringing together as many in-depth experiential pieces to them so they can navigate their way through a story," explained Brittany Peterson, an immersive journalist at McClatchy.

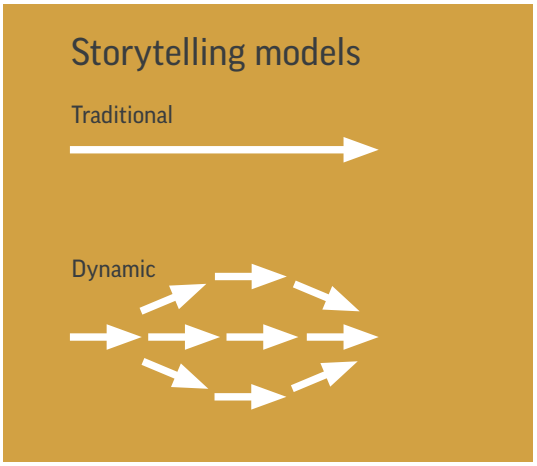
Thinking through multiple perspectives

"When you include more interactivity by impacting someone's senses as well as giving them six degrees of freedom, it means there's a stronger reaction, a stronger commitment and ultimately a stronger memory of the experience," said Gabo Arora, founder of the United Nations' VR unit.

One example of a story using this model is USA Today's "Eisenhower VR," which allows a participant to move through the USS Eisenhower aircraft carrier and experience the daily lives of crew members, ranging from the captain to the cooks through a series of 3-D models, 360-degree videos, animations and graphics.

"Non-linear storytelling is a more natural form of storytelling for this medium," said Niko Chauls, who worked as a director of emerging technology at USA Today. "Much like how an infographic takes a complex set of information and boils it down to its core elements to make it easier to understand, I think this was an approach that accomplished this same effect and allowed users to explore at their own pace."

For Chris Papaleo, the executive director of emerging technologies at Hearst, one of the nation's largest media conglomerates, non-linear storytelling represents a bigger shift than the move from print to digital or from desktop to mobile.



In dynamic storytelling, there is no predefined order to the story. News consumers can choose different paths as they actively explore the experience.

Various scenes from USA Today's "Eisenhower VR." This story combined a 3-D model of the USS Eisenhower with a series of 360-degree videos that a participant would trigger as he or she moved through the 3-D model of the carrier.
PHOTOS COURTESY OF USA TODAY

"It's not as simple as transposing existing content to a new screen — it requires us to learn new skills and use new tools," explained Papaleo.

"The quality of the experience a viewer gets from VR is impossible to match, VR allows a viewer to feel closer to the subject."

Connecting technologies and platforms

This new model isn't just about creating a single story. It instead benefits from constructing story packages that can be experienced across multiple platforms and, in some cases, with multiple technologies in play.

"Remaining innovative will involve pursuing the incredible and profound new storytelling opportunities afforded by this rapidly changing technology landscape," said Graham Roberts, director of immersive platforms storytelling at The New York Times. "It will also mean connecting the VR work we produce to other immersive technologies along a spectrum of storytelling."

Beyond virtual reality, journalists are starting to explore augmented reality, or AR, which entails projecting digital 3-D models onto a physical space using a mobile phone's camera.

The Washington Post, for example, partnered with Empathetic Media to conceptualize an AR extension of the Post's coverage on of the death of Freddie Gray in Baltimore. Readers of the print edition could use a smartphone app to scan the Post's logo to uncover a 3-D recreation of the event.

"Experimenting with new forms of immersive media is critical because news organizations won't be able to accurately predict which forms will be most widely embraced by the news consuming public,"explained Jeremy Gilbert, The Washington Post's director of strategic initiatives.

"We have to try things and know what stories and techniques work best in any form of immersive media so we're ready when certain forms of media win out."

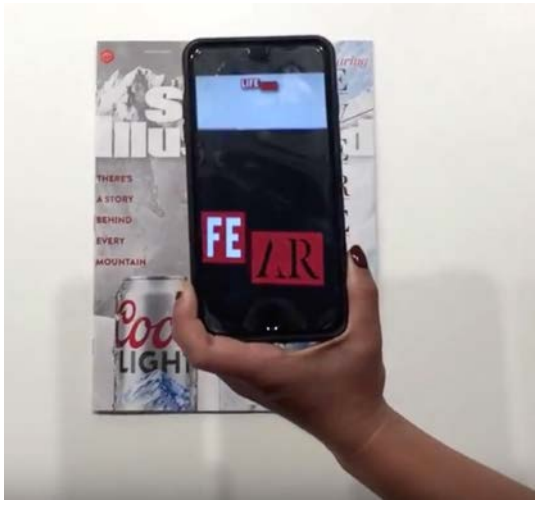
Elsewhere in the industry, Sports Illustrated and LIFE VR's "Capturing Everest" used an augmented reality plug-in to connect their long-form text story to a series of 360-degree videos that chronicled three climbers ascending up Mount Everest.

"AR really closed the loop with what we were doing in print and what we were doing with 360 content and allowed us to create a full-circle approach in presenting a package with immersive media," said Mia Tramz, managing editor at LIFE VR, Time Inc.'s new VR unit.

"Context is such an important part of what journalists have to bring to the table, and AR puts things in context through a real-world environment."

In fact, AR may provide an entry point for more viewers because the technology may reach consumers quicker than other existing platforms.

Empathetic Media partnered with the Washington Post to combine court documents, eye witness testimony and 3-D imagery into this AR experience on the death of Freddie Grey in Baltimore. To access this story, participants had to download the custom-made ARC application and scan a Washington Post logo.
PHOTO COURTESY OF EMPATHETIC MEDIA



LIFE VR used augmented reality to connect a long-form text story text story on Jeff Glasbrenner, the first American amputee to climb Mount Everest, to a series of 360-degree videos on the same subject. To access the videos, a participant scans the cover of the Sports Illustrated issue with a mobile phone and the 360-degree videos automatically start playing.
PHOTO COURTESY OF LIFE VR

Carol Chainon, an entrepreneur and VR producer for the Global Editors Network,the world's largest association of news executives, explained that in next few years we will start to see consumer products and features that will allow for information to be gathered from the natural world through our mobile devices. AR lays the groundwork for this to be possible.

"If we look at the spectrum of immersive technologies, AR and mixed reality will likely be of most immediate use to a mass audience, because they will very soon become ubiquitously available on our smartphones, thanks to Apple's ARKit, Google Tango and Facebook's AR platform," said Chainon.

The Apple, Google and Facebook platforms are new tools that enable a streamlined development of augmented reality.

Rethinking audience participation

During the Summer of 2017, NBC News broadcasted a series of virtual sit-downs with science icons like Bill Nye live on the social VR platform AltSpace. Paul Cheung, director of digital news at NBC, said these talks have challenged his newsroom to think about VR strategically and examine what it NBC's experiment is a great example of how newsrooms can combine social aspects found in communication platforms such as Skype, Google Hangouts and Facetime with the entertainment and educational value of a talk show or the nightly newscast.

NBC's "Bill Nye in VR" event was one of the first attempts for a media company to connect with its audience using social VR platforms like AltSpace. During the event, participants could ask questions comment with emojis in real time.
PHOTO COURTESY OF NBC

"Social VR can help us reimagine what it means to have a live audience," said Cheung. "In VR, you can reach a global audience and allow them to interact with each other — you and your virtual environment can be very powerful."

Early adopters might be skeptical of social VR due to the clunky avatars that are commonly employed, but what's most important is to reflect on the potential for this format moving forward.

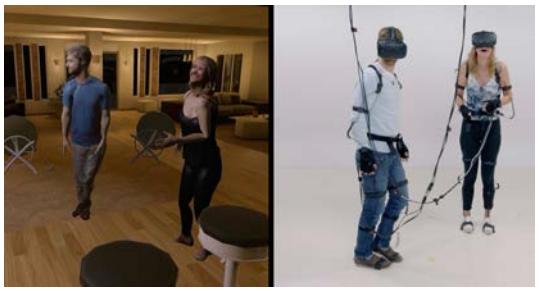
"There's this uncanny moment that we see when people react, saying, 'Oh, my God, I'm part of the story,'" said Igal Nassima, founder of Superbright, a creative studio in New York City that developed the technology for one of the first reality shows in VR commissioned by Condé Nast.

"As storytellers and content creators, we need to continue to experiment with that level of interaction to see where it can take us."

In the future, participants will be able to replace rudimentary avatars with 3-D scans of themselves, resulting in a more authentic feel to social VR.

"3-D scanning has greater implications behind the scenes, and I believe it will become part of standardized broadcast techniques without audiences truly needing to understand what it is nor how it is being used," said Kevin Joyce, editor-in-chief of VR Focus, a publication covering the VR industry.

The ability to truly interact with a global audience promises to reinvent the



Condé Nast recently partnered with the New York City technology studio Superbright to create the first-ever dating show in virtual reality. Participants first had to be 3-D scanned to create their own virtual avatars before meeting their blind date in VR.
PHOTO COURTESY OF SUPERBRIGHT

current formats of talks shows, political debates and even town hall meetings by bringing the news to participants in virtual spaces.

"The continuation of these technologies will be less focused on presence and more focused on moving along a continuum of being present," said Shawn Cheng, a New York City-based venture capitalist focused on immersive media investments.

Key challenges and concerns

Despite the enthusiasm that surrounds these new technologies, there are several challenges standing in the way of solidifying the dynamic storytelling approach across newsrooms.

"A great story told well is a great story, no matter what the format. With VR, lots of perennial questions have reemerged, as they do with all new frontiers — for example, around journalism ethics and standards, about newsroom workflows, technology, skills and user adoption," explained Shazna Nessa, global head of visuals at The Wall Street Journal.

Maintaining journalistic standards

As journalists experiment with these new technologies, they are also upholding certain editorial standards throughout the entire process.

"New technology brings wonderful opportunities for reinventing storytelling," said Lisa Gibbs, AP's director of news partnerships.

"But just because we have the capability to do something doesn't mean we should. Applying the same editorial, ethical standards to our innovations as we would any traditional coverage initiative is critical to our journalistic mission."

Let's say a few years down the road a reporter wants to volumetrically scan a group of protestors marching down a crowded street. While he or she could accurately capture the surrounding buildings and the street itself, the individuals could become blurred and distorted. How should the news professional handle this natural distortion from an ethical perspective?

"Journalists should present their editorial options, but should never make assumptions," said Scott Mayerowitz, an editor on AP's business desk. "Just because the storytelling format is unique, it doesn't mean that we throw away all long-standing reporting methods."

If a newsroom takes it upon itself to alter or recreate a scene without any prior reference, it could be overstepping its bounds. One possible solution is to include a disclosure stating that distortions were left in place because the editorial team couldn't determine the accuracy of a certain footage.

"Just because the storytelling format is unique, it doesn't mean that we throw away all long-standing reporting methods."

SCOTT MAYEROWITZ
BUSINESS EDITOR
ASSOCIATED PRESS

Tips for journalists exploring dynamic storytelling

Put the audience at the center of the process. User choice can drive higher levels of impact and participation. Stories can be structured with the audience in mind to allow a participant to uncover virtual elements while piecing together the narrative.

Create an experience that lives across platforms. Including elements such as interactive graphics, flat or 360 videos and photos that can distributed through traditional channels can promote and drive more traffic to the immersive story package as a whole.

Leverage the expertise of everyone in the newsroom. Early adopters will become experts on this new storytelling model, but it doesn't mean that knowledge should be confined to only a small group. Share dynamic storytelling best practices with your peers and collaborate to expand editorial innovation.

Test and iterate throughout the process. Since dynamic storytelling doesn't follow a structured formula, feedback is needed from story conception, through design and execution.

In industries like film and video game production, where 3-D modeling is widely used, such distortions or inaccuracies are merely seen by the consumer as poor production value that many people write-off because it's a work of fiction.

Journalism isn't afforded that luxury. News organizations are starting to set standards to uphold truth telling from the start, which is contributing to the progress immersive journalists have made thus far.

"We're at a stage now where neglecting ethics could be extremely disruptive to our ability to do this kind of work," warned Saleem Khan, founder of JoVRalism, a Toronto-based publication covering the intersection of journalism and immersive media.

"This technology is still in its infancy, and if people decide they can't trust it, then what does it mean for the future? These doubts could create an environment where people call everything they're experiencing into question."

Beyond the ethical implications in producing volumetric content, newsrooms are also paying attention to how they present it.

For example, how should a reporter present the aftermath of a terrorist attack or the chaos seen in a war zone? Inducing post-traumatic stress isn't something for which a newsroom would want to be responsible.

"The more realistic that we make these immersive experiences the more we have to consider what we are putting people into because the impact will be multiplied," added Khan.

Including disclaimers before a story is a helpful strategy to warn participants they are about to engage with disturbing environments. However, these shouldn't be used as a sanitizer to protect a news organization. The question to consider moving forward is how much is too much when dealing with potentially sensitive images?

"Because VR impacts physiology in unique ways, immersive storytellers have to be extra careful with their content," alerted Sarah Hill, founder of the immersive journalism studio StoryUp. "These challenges, when well-managed, also present unique opportunities for storytellers to create impactful content beyond just information and entertainment."

Al Thompkins, a senior faculty member at Poynter, encouraged newsrooms who are entering this field to set their own, non-negotiable standards before seeking external technology partners.

"The technology always moves faster than the ethics do," Thompkins observed. "We have to ask ourselves 'Before we had VR, what were our standards for truth telling? Now that we have new technologies, do those standards change? If so, why and how can I explain that to the public?'"

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AL THOMPKINS
SENIOR FACULTY MEMBER
POYNTER INSTITUTE

A look at the equipment AP provides its immersive journalists shooting 360-degree video around the world.
AP PHOTO

New skills, tools and workflows

Dynamic storytelling requires new skills beyond traditional reporting. These are capabilities more likely to be associated with graphic artists, game developers and motion designers.

"VR reporters need to be fluent in 3-D animation, motion graphics, video editing and technical rendering in order to produce stories in this emerging medium," observed Darrell Allen, an interactive journalism editor with AP.

Gaming programs such as Unity, Unreal and the 3-D modeling software Maya LT provide a foundation for how stories using volumetric content are produced. These programs enable media organizations to build 3-D recreations of news events, to increase the interactivity level of their graphics and to create AR extensions of text stories.

"For news publishers, the immersive nature offers a unique degree of focus from its users. But news publishers are also challenged to provide an experience that is interactive like a video game. That's a difficult combination," said The Washington Post's Gilbert.

James George, a founder of the volumetric scanning tool DepthKit, said this emerging technology is becoming a new genre in of itself and requires skills traditionally considered less important to news companies.

"The future of volumetric is to take the subject matter, themes and approach of the current 360-video world and expand on that format to make it more experiential, magical and explorable in a way that VR animation content is right now," George said.

Cross-disciplinary collaboration is also important to the success of these projects. AP has worked with a game developer and visual effects artist who had worked, among other organizations, at the gaming giant Electronic Arts. Leveraging these skills, we produced a series of experiences generated through computer graphics (CGI) that included an immersive look at the effects of global warming and a virtual museum of the most dangerous invasive species in the U.S.

Another AP immersive experience using CGI examined the causes of Alzheimer's disease from inside the brain and allowed participants to see first-hand how the condition spreads.

"The use of computer-generated imagery for "Alzheimer's Disease: Exploring the Brain" offers the participant a perspective they wouldn't be able to see; in this case, it was a microscopic view inside the brain. CGI also gave us the ability to better tell the story by allowing us to show events that would normally need expensive scientific equipment," said Panagiotis Mouzakis, an AP multimedia animation producer based in London.

The 3-D scanning tool DepthKit combines the capabilities of DSLR camera with the Microsoft Kinect for depth sensing to create 3-D avatars of real people. PHOTO COURTESY OF DEPTHKIT

Developing 3-D models and virtual environments follows three steps

1. Conduct thorough journalistic research, find sources and visual references for the story.
2. Build 3-D models of characters, buildings, vehicles and trees that make up the news event. These elements can also be volumetrically captured and processed through CGI.
3. Program the behaviors of these elements, such as individuals' facial expressions and how people move through a virtual environment. This entire process requires graphical knowledge and skills that were traditionally exclusively found in game development.

Collaborating with individuals with non-traditional editorial skills can enable newsrooms to accelerate their move into dynamic storytelling.

"Journalism is a fairly new entrant into the VR space, whereas game designers and others have been embracing this new technology for years," said Laura Hertzfeld, program director at Journalism 360, a collaborative initiative by the Knight Foundation, the Google News Lab and the Newseum to accelerate immersive storytelling in journalism.

"Right now, the community experimenting in this new space is relatively small — both within journalism and beyond — so people who are passionate about the technology are eager to share their knowledge, and that can only be a good thing."

While this kind of storytelling is still in its infancy, exploration of new technology is key.

"There's no how-to guide for immersive storytelling and I think there's still a sense of mystery around it — we're trying to demystify it by testing different camera setups and techniques, integrating 360 video players in our mobile apps and sites, learning new development and design environments like Unity and Apple's ARKit, and charting new production workflows," explained Heart's Chris Papaleo.

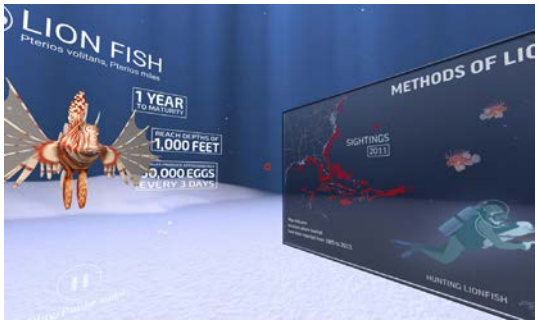
Al Jazeera's Contrast VR unit is another example of knowledge sharing throughout the newsroom. In addition to being a production unit for the Al Jazeera network, Contrast also harbors the responsibility for training other journalists around the world. This approach is giving journalists at Contrast, like Zahra Rasool, the opportunity to beta-test some of the experiences her unit is working on.

"Al Jazeera is a company that's spread around the world and some of the people that we work with haven't been exposed to this kind of storytelling as compared to someone from the United States," explained Rasool, who recently held a training session at the Al Jazeera bureau in Uganda.

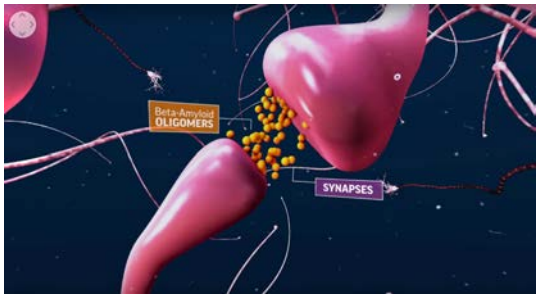
"We hold regular training sessions for other journalists and take their feedback to constantly iterate on our stories so that we can create the best stories possible, even for those who have never experienced VR before."

An important takeaway is to provide the space for dynamic storytelling experimentation by building institutional expertise that can be shared throughout the newsroom.

"The challenge for us, and for everyone right now, is creating the bridge between what we can publish now through these quickly evolving, but still relatively nascent platforms and technologies, to what we will be able to do in the future — a future that will probably arrive sooner than we expect," acknowledged Roberts of The New York Times.



AP partnered with a game designer to producer a series of CGI-driven stories, including this story that highlights some of the United States' most invasive species.
AP PHOTO



"Alzheimer's Disease: Exploring the Brain" is an example of story that isn't possible without the capabilities of computer-generated imagery (CGI). With the help of a game designer, journalists at AP were able to produce an unprecedented look at how this disease spreads throughout the brain.
AP PHOTO

"Global Warming: Signs & Effects" simulates how the "greenhouse effect" works and highlights some associated climate trends and their influence on global warming.
AP PHOTO

Navigating technology costs and constraints

One of the primary challenges in producing volumetric content centers around the extensive production time and cost it takes to scan and combine the people, places and objects that make up a 3-D environment. This new content creation process results in copious amounts of data and large file sizes, making it difficult to produce directly from the field.

To overcome the challenge of managing these gigantic data files, AP partnered with AMD, a technology company that specializes in image processing and graphics, to develop more realistic immersive media experiences. AMD provided journalists at AP with powerful computers capable of significantly increasing the speed of processing and producing 3-D content.

Deniz Ergürel, head of the VR publication Haptical explained that volumetric capture technology enables newsrooms to serve their audience's needs in an entirely new fashion.

"The goal here isn't to show off a new and shiny form of technology, but the question newsrooms should be asking themselves is 'what can this technology bring to storytelling that others can't?'" explained Ergürel.

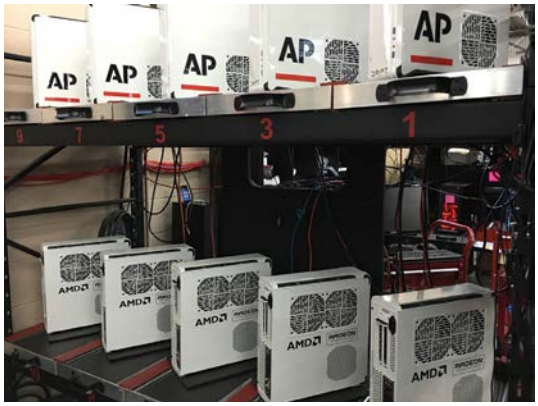
Not all newsrooms will have the same level of resources and access to new technology. However, media initiatives like Journalism 360 can provide funding and share best practices. During the summer of 2017, Journalism 360 awarded $285,000 in grants to 11 projects around the world to encourage the growth of immersive storytelling in journalism.

"Experimentation is key to the future," explained Erica Anderson of the Google News Lab, a Journalism 360 partner.

Beyond technical newsroom capabilities, access and user adoption present itself as one of the final technical challenges for immersive journalism.

"VR will inherently be more expensive as it moves into mainstream media," said Jonathan Albright, research director at the Tow Center for Digital Journalism at Columbia University.

"This will unfortunately create a digital 'format divide' for the people who can't afford the expensive devices and high-bandwidth data plans required to access the content."



In 2015 AP partnered with AMD, a technology company specializing in high-end image processing and graphics, to jumpstart their VR production. PHOTO COURTESY OF AMD

Tips on how to experiment with immersive media in the newsroom

CREATE a small challenge fund and let teams compete with proposals to experiment with immersive projects that will spark new internal thinking, whether or not they're good enough to make public.

PLAN one-day bootcamps where participants start from scratch and end up with a group project. They'll get a taste for the state of the art and increased awareness of the medium's limitations and potential.

ADD highlight links to internal newsletters noting VR experimentation done by other news organizations to spread awareness of the medium's strengths and limitations.

Tips provided by Jeremy Caplan, director of education at CUNY Graduate School of Journalism.

Dynamic vs. traditional storytelling

As dynamic storytelling breaks away from the traditional approach, here are some important distinctions to keep in mind.

DYNAMIC	branched	active	participant
TRADITIONAL	linear	passive	viewer

HOW IS THE STORY CONSTRUCTED?

Linear vs. branched story structure

LINEAR The order in which a story is presented is vital for it to be understood. More important, linear storytelling requires there to be a "giver" of information — traditionally journalists — and a "receiver" — the public.

BRANCHED There is no predefined order to a story. Stories are created as interactive experiences, where news consumers can choose different paths. Audiences actively explore stories, rather than passively viewing them.

HOW WILL A PARTICIPANT CONSUME THIS EXPERIENCE?

Passive vs. active consumption

PASSIVE Observers have limited control over how a story progresses. A journalist guides them through the narrative and packages the information in a fixed order.

ACTIVE Participants have the ability to affect how their experience evolves. They have the freedom to dictate how they consume information, whether that's through movement, interaction or story structure.

WHO IS THE AUDIENCE?

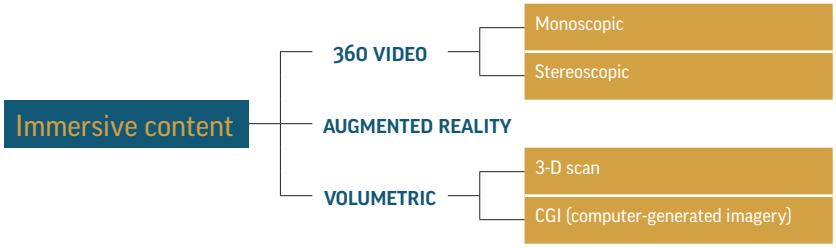
Observing vs. participating audience

OBSERVER The producer of the story is in complete control, guiding an observant user in specific ways to transmit certain information.

PARTICIPANT Users command how they move through an environment and digest information, with the freedom to participate, touch and interact with the people, places and events that are presented.

Understanding the technology involved

Immersive media has many facets, and there are many ways it can be implemented in a newsroom, but just like any other technology, the more you know about a tool, the more effectively you can use it.



360-DEGREE VIDEO — MONOSCOPIC The majority of 360-degree video is captured with a single camera or camera rig. While the spherical image provides a sense of immersion, clarity decreases at the edges of this sphere.

Example: AP's "Trapped in Myanmar: Life inside a Rohingya camp"

360-DEGREE VIDEO — STEREOSCOPIC A pair of 360-degree camera lens are placed side by side to add depth between the foreground and background for a heightened sense of immersion.

Example: NextVR's coverage of the NBA Finals

AUGMENTED / MIXED REALITY 3-D models are projected onto physical surfaces using depth sensors built into the cameras of mobile devices.

Example: Empathetic Media and The Washington Post coverage of Freddie Grey's death

VOLUMETRIC — 3-D SCAN Real people, places and objects are scanned with depth sensors to create elements that, when combined, form a 3-D environment.

Example: Emblematic Group's "Out of Exile"

VOLUMETRIC — CGI (COMPUTER-GENERATED IMAGERY) 3-D models and environments are recreated based upon photo and video references through gaming software.

Many times, volumetric scans and CGI models are combined to create a more cohesive presentation.

Example: AP's "Alzheimer's Disease: Exploring the Brain"

Scientific study on VR user engagement

Measuring media immersion: AP and Multimer study

Although news consumers may not consciously realize it, experiencing immersive media activates thousands of physical and physiological stimuli. These changes can result in participants becoming so engaged that they hardly notice their surroundings.

To measure the psychological effects of immersive storytelling, we teamed up with neuroscientists at Multimer, a New York City-based company born out of the MIT Media Lab that has developed mobile biosensors used to measure a person's mental state as they performed different activities.

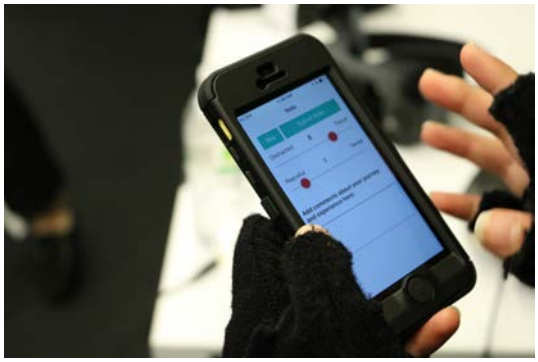
The study was conducted at New York University's VR Lab MAGNET (Media and Game Network), a facility dedicated to studying the intersection of emerging technology and culture. MAGNET's Black Box Theater provided us with state-of-the-art equipment, including a motion-tracking system and room-scale VR headsets that allow participants to move through a virtual scene.

The immersive experiences presented included three 360-degree video stories as well as a CGI room-scale experience. These stories featured the fight against ISIS in Iraq, a cultural parade in New Orleans, an exploration of the ivory trade in Thailand and an underwater experience exploring biodiversity and marine species.

Twelve study participants were paired with a Multimer staff member, who helped them put on motion-capture suits, an EEG brainwave sensors and heart-rate monitors. Staffers also calibrated each participant's sensor readings and monitored their movement through a motion-tracking system.

While study participants experienced each story in VR across multiple viewing devices, our team recorded their brain activities, heart rates and body motions. In addition, individuals filled out surveys in the Multimer data app asking how each story impacted them emotionally and whether there were particular moments in each story that sparked their feelings.

A detailed methodology for this study is outlined on Page 24 of this report.



A participant fills out a survey on the Multimer mobile app after watching a virtual story at AP's VR study at the NYC Media Lab on August 12, 2017. The participants were asked to explain what emotions were associated with each story and a specific moment in each story that stood out to them.
AP PHOTO

Motion tracking sensors were placed on individuals who participated in The Associated Press' virtual reality study at the NYC Media Lab on August 12, 2017. The motion tracking data showed that stories dynamic in nature resulted in more movement by each participant.
AP PHOTO

Measuring and interpreting physiological metrics

In order to understand the effects of VR on the brain, Multimer's research scientists first had to identify the core physiological metrics that can be broken down, parsed and compared with the study participants' qualitative feedback.

These core metrics include two key "ingredients": a participant's overall attention to a particular story, and their overall relaxation associated to that same experience.

Quantifying levels of attention and relaxation involves examining the alpha and theta brain waves that were collected throughout the study via Multimer's mobile app. In general, prior research indicates that brainwave alpha frequency in the broad range of about 6.5–10.5 Hz is associated with a significant level of attention. An increase in theta waves (4–7.75 Hz) is associated with relaxation.

These baseline readings provide a framework that can be further analyzed to uncover more specific states of mind using the contextual information of a story, the device that an individual was using as well as the participant's own feedback.

Multimer's data scientists hypothesized the presence of key sentiments by looking for specific balances of the brain waves associated with attention and relaxation, as well as analyzing them against heart rate and verbal feedback. This was done using custom algorithms based on prior Multimer research and the study participants' verbal comments.

Note that these categories are meant to be suggestive rather than prescriptive or fully descriptive; to be fully confirmed, they would require robust statistical analysis and repeated data collection in the context of VR technology.

These sentiments include:

OPEN-MINDEDNESS Associated with an individual being attracted to a topic, but not alarmed. For this metric, a participant exhibits less than 44 percent of the overall range of attention, less than 53 percent of the overall range for relaxation and an average of 77 heartbeats per minute.

FASCINATION Associated with a relaxed interest in a topic. For this metric, a participant exhibits less than 57 percent of the overall range of attention, greater than 53 percent of the overall range for relaxation and an average of 82 heartbeats per minute.

STIMULATION Associated with an individual being more attentive than they are relaxed. For this metric, a participant exhibits greater than 50 percent of the overall range of attention, less than 53 percent of the overall range for relaxation and an average of 82 heartbeats per minute.

Arlene Ducao, founder of Multimer, and NYU research assistant Alexis Trevizo observe participants of AP's virtual reality study at the NYC Media Lab on August 12, 2017. Ducao and Trevizo were responsible for running the motion-capture system throughout the study.
AP PHOTO

Participants watch the AP's "House to House: The Battle for Mosul" on a VR cardboard as part of a virtual reality study at the New York City Media Lab on August 12, 2017. The participants were hooked up to brainwave sensors, heart rate monitors and a motion tracking system in order to test how various VR stories affected their psychological state.
AP PHOTO

POWER / INTENSITY Associated with the lasting impact of the experience. For this metric, a participant exhibits greater than 44 percent of the overall range of attention, greater than 54 percent of the overall range for relaxation, and an average of 84 heartbeats per minute.

	Heart rate	Attention	Relaxation
OPEN-MINDEDNESS	77 BPM	44%	53%
FASCINATION	82 BPM	57%	53%
STIMULATION	82 BPM	50%	50%
POWER / INTENSITY	84 BPM	44%	54%

Study findings

The results allowed us to derive the following observations related to device and story type.

HANDS-FREE HEADSETS DRIVE HIGHER LEVELS OF ENGAGEMENT.

	Cardboard	VR headset	Room-scale VR
OPEN-MINDEDNESS	2	3	1
FASCINATION	2	3	1
STIMULATION	1	2	3
POWER / INTENSITY	2	1	3

Note: We ranked each device by sentiment on a scale of 1–3, with 1 being the highest.

We found participants had the highest levels of open-mindedness — being attracted to a topic, but not alarmed — on the room-scale VR headset, while the cardboard elicited the highest level of stimulation, which is associated with individuals being more attentive than they are relaxed. Based on participants' comments, this may be connected to the higher levels of image quality on a room-scale experience and the ability to freely move around the room.

The high levels of stimulation for the cardboard device may sound counterintuitive, but this heightened sensory reading is associated with low image quality and the struggle to comprehend a blurred image. In addition, the requirement for cardboard users to hold the device to their face also could contribute to this result.

The VR headsets, which only enable a participant to watch a story from a fixed space, as opposed to move through the scene, elicited the highest overall power / intensity. This is associated with the lasting impact of the experience and may be a result of combining relatively intense stories with a more "immersive" device.

War zone immersive reporting drives participant stimulation, while science and environment stories build open-mindedness.

A study participant watches the Associated Press' "Thai Elephants: Surviving the 21st Century" on the Samsung Gear VR headset while wearing Multimer's biosensor. The biosensor clips onto an individual's earlobe while another sensor rests on their forehead.
AP PHOTO

WAR ZONE IMMERSIVE REPORTING DRIVES PARTICIPANT STIMULATION, WHILE SCIENCE AND ENVIRONMENT STORIES BUILD OPEN-MINDEDNESS.

	Conflict "House to House"	Culture and lifestyle "The Second Line"	Beat reporting "Thai Elephants"	Science and environment "The Blu"
OPEN-MINDEDNESS	4	3	2	1
FASCINATION	4	1	2	3
STIMULATION	1	3	2	4
POWER / INTENSITY	1	2	3	4

Note: We ranked each experience by sentiment on a scale of 1–4, with 1 again being the highest.

All physiological metrics were lowest for "The Blu," an experience exploring marine biodiversity, which was the single experience tested on a room-scale level. This may suggest a higher level of engaged open-mindedness (being attracted by a topic). However, more scientific testing is needed to determine if this sentiment is caused by the story, the device or another factor entirely.

Metrics associated with stimulation and power / intensity — related to the lasting impact of the experience — were highest for "The battle for Mosul," a story documenting the fight against ISIS in a major city in northern Iraq. Across those metrics, this particular experiences measured 4 to 6 percent higher than other experience. The scenes shot in the Iraqi city of Mosul also elicited the most participant comments related to strife and fear.

Metrics associated with fascination — eliciting higher levels of attentiveness than relaxation — were highest for "The Second Line," a story that celebrates multiculturalism in New Orleans. Those metrics were 5 to 7 percent higher than other stories. It also garnered the most comments describing the experience as "pleasant."

The more dynamic an experience, the higher the engagement

The initial results of our study surfaced that immersive experiences, allowing participants to freely move through a virtual environment, drove the highest levels of open-mindedness and fascination. These findings demonstrate that while study participants were playing close attention to the content, they did so in a state of relaxation — speaking to the overall sense of being present and immersed in the scene. For story topics specifically, our study also found that VR experiences related to science and discovery, presented in a room-scale environment, drove the highest levels of open-mindedness and fascination.

On the other hand, the analysis revealed that experiences in a VR headset resulted in heightened levels of stimulation and intensity. Stimulation and intensity both involve an elevated heart rate and levels of attention.

A study participant watches "The Blu," a room-scale virtual reality story, on the HTC Vive during AP's VR study at the NYC Media Lab on August 12, 2017. AP PHOTO

A study participant watches the Associated Press' "The Second Line: A parade against violence" on the Samsung Gear VR headset while being connected to Multimer's biosensor and a motion tracking system. AP PHOTO

We noted that presenting war and conflict stories such as "House to House: The battle for Mosul" in a VR headset can drive higher levels of engagement when compared to the cardboard.

Experiences such as "The Second Line: A parade against violence," featuring culture and lifestyle topics, aligned most closely with a sense of fascination. Based on our results showing that room-scale VR had the highest level of fascination, this content could be optimized if distributed in a room-scale environment.

Extrapolating how audiences implicitly react to different forms of stories across media environments can help newsrooms meet consumers' needs and improve upon the overall impact of their reporting.

"Creating a new media type requires storytellers to suspend some of their own preconceived notions or biases," said Ken Romano, a product director with AP.

"Immersive experiences are ultimately being built for their users. Involving them in the process and monitoring their behavior is going to uncover incredibly valuable information that can be used to refine future story approaches."

Takeaways to retain

Journalists working in this area of immersive media might drive the following conclusions.

- While the cardboard enabled the entry point for immersive media experiences, our data showed there was a significant struggle viewing stories with that device.
- Room-scale VR drove the highest level of engagement, allowing participants to not only pay attention to the experience, but they did so in a state of relaxation.
- Stories that cover war zones, riots and other forms of conflict drive higher engagement when consumed in VR headsets as opposed to the cardboard.
- News topics covering science, nature and exploration benefit from room-scale VR presentation.

Conclusions

It's difficult to fathom that just two decades ago the internet barely existed and print media was still as central to society as it was 100 years before.

"We take for granted the immediacy and rich visuals afforded to us by sharing stories through pocket-sized rectangles of glass we seemingly can't live without," said The New York Times' Roberts. "But as amazing as the mobile revolution has been, the current method of storytelling, distribution and consumption shouldn't be viewed as the final form factor for storytelling."

Much sooner than we may realize, 3-D content will become commonplace. As the technology continues to advance and become more accessible, the current notion of reporting may evolve into something entirely new.

"Companies like Intel and Qualcomm are making technology that allows us to capture objects and process them into 3-D models very quickly with our cell phones," said Emblematic Group's Nonny De La Peña. "This will continue to challenge journalists on how they want to capture the world."

"The push for the future will be to continue to break that fixed frame by thinking about how our body is placed in a space and what the space is like."

Immersive media will bring stories to life

360-degree video allowed journalists to expand their frame of view by making stories experiential. Volumetric capture and 3-D content will likely take this approach to an entirely new level.

Highly immersive stories will be gathered using the same journalistic methods of contextualization and verification, but will be presented in a manner that's explorable.

"One can easily imagine smells being added into virtual reality experiences along with the wind or the feel of a hot sun," said the AP's Scott Mayerowitz. "Whatever it is, the approach will remain the same — bringing people an unbiased approach to newsgathering and taking them to places they would otherwise not be able to visit."

Journalists and consumers will have to relearn how to produce and consume 3-D content

Volumetric broadcasting is vulnerable to the errors found in traditional media.

In fact, the risk of creating a biased report increases when a newsroom is able to fully control, model and replicate an environment. It's up to journalists to set editorial standards and ethics as more of this technology enters the mainstream of the news business.

Highly immersive stories will be gathered using the same journalistic methods of contextualization and verification, but will be presented in a manner that's explorable.

AP Multimedia Video Graphics Manager Darrell Allen (left) and former AP interactives editor Nathan Griffiths use a Matterport camera to 3-D scan the penthouse suite at the Four Seasons in New York for "The Suite Life," one of the AP's first stories told in virtual reality.
AP PHOTO

"One of the biggest challenges newsrooms face is handling the uncertainty associated with investments in VR equipment, training, production and distribution," said Jeremy Caplan, the director of education at the Tow-Knight Center for Entrepreneurial Journalism. "Being a first mover is costly and risky when standards, tools and platforms are evolving so quickly."

There is still a great learning curve for the audience, too. Most participants continue to view dynamic storytelling projects on smartphones or desktop computers. Training them on how to interact with the stories in virtual reality will take time and a concerted effort from news organizations.

Feasibility, profitability and distribution still remain a challenge

As with other nascent technologies, there are significant hurdles to staff training, costs and profitability of the final products.

Producing immersive media requires specialized training for the journalists, but it also takes longer explaining to sources what the requirements and the vision for the project are.

Despite the rapid growth in VR headset sales, immersive media consumers are still a small percentage of overall viewers. Distribution of immersive content remains a challenge, and many small news organizations are not set up to distribute this type of content.

Much of the initial funding is coming from device manufacturers and platforms wishing to drive user consumption. As our study suggests, participants' attention levels are higher with immersive stories. That type of engagement will ultimately make these formats more attractive to advertisers. As 3-D content becomes prevalent, we can expect new monetization opportunities to emerge.

Immersive media relies on building a culture of experimentation

In the short term, the cost of implementation may be a barrier to entry for many news organizations. But as the technology matures and user adoption rises, journalists will rely on experimentation in order to develop best practices.

"The insights gained from testing are extremely valuable, but the economics of early-phase innovation requires that we be focused and disciplined when it comes to product development and creative when it comes to partnerships and deal-making," said Hearst's Papaleo.

At its core, dynamic storytelling challenges us to rethink how we conceive, construct and distribute stories to the public. The technology gives us a wider range of possibilities, but also raises new questions.

"Technology enhances the storytelling, but at the end of the day, the story is what matters most," said Contrast VR's Rasool.

"Technology enhances the storytelling, but at the end of the day, the story is what matters most."

ZAHRA RASOOL
JOURNALIST
CONTRAST VR, AL JAZEERA

Associated Press staffers, from left, Michael Rubin, Bernat Armangue, Dennis Passa, Tassanee Vejponsa and Koji Ueda discuss their team project during AP's Virtual Reality Boot Camp in Bangkok
AP PHOTO / CHARLES DHARAPAK

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Molly DeWolf Swenson (RYOT)
Niko Chauls (formally USA Today)
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Igal Nassima (Superbright)
Alexy Furman (Aftermath VR)
Al Tompkins (Poynter)
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Paul Cheung (NBC News)
Eric Shamlin (Secret Location)
Dan Archer (Empathetic Media)
Shawn Cheng (Venture Capitalist)
Justin Hendrix (NYC Media Lab)
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Chris Papaleo (Hearst)
Graham Roberts (The New York Times)
Carol Chainon (Global Editors Network)

Laura Hertzfeld (Journalism 360)
Nonny De La Peña (Emblematic Group)
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Sasa Marinkovic (AMD)
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Multimer is an New York City-based MIT spinoff, that offers a unique, quantitative way to build empathy by measuring a population's sentiment and experience. Its products include MindRider, a location-aware biosensor system, and a data analytics platform that integrates biosensor and geographic data. We are a proud member of Matter.vc and an awardee of the National Science Foundation SBIR program.

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AP and Multimer research methodology

This study measured heart-rate (beats per minute), EEG brainwaves (alpha, beta, delta, gamma, theta frequency bands) from a single electrode device, and recorded participant comments. The sample size was 12, and simple percentages were used to compare outcomes; further statistical analysis is required to determine correlation and statistical significance. The process of this study followed these steps:

12 participants were scheduled over three 2.5-hour sessions. There were four participants in each session. Each participant was compensated with an AP gift bag, snacks, and refreshments.

When participants arrived, they first signed waiver forms acknowledging they understood how data would be recorded.

Participants were paired with a Multimer staff member, who helped participants to outfit themselves in a motion-capture suit, an EEG sensor, and a heart-rate monitor. The Multimer staff member also helped to calibrate each participant's sensor readings and monitor their movement through a motion-tracking system.

An AP staff member paired participants with VR technologies in this manner

Over the course of the session, AP staff members helped participants to rotate between three stations, with the following VR technologies and stories:

Cardboard (New Orleans, Mosul, Elephants)

VR headset (New Orleans, Mosul, Elephants)

Room-scale VR (The Blu)

After a participant finished watching each story, a Multimer staff member facilitated the participant to fill out a short survey outlining the emotions sparked by it and a specific moment in the story that stood out to their.

The three datasets (EEG, heart rate and motion) were then cleaned, parsed, and analyzed using several Python analysis libraries. Machine learning was not used for this initial analysis, but it can be used as part of a deeper analysis with this data.

Relevant research and academic resources

MIT MEDIA LAB is an interdisciplinary research laboratory at the Massachusetts Institute of Technology that devotes itself to projects at the convergence of technology, multimedia, sciences, art and design, as well as to groups such as the Laboratory of Social Machines and Civic Media that work to develop technologies and solutions for the journalism community.

NIEMAN FOUNDATION at Harvard University works to promote and elevate the standards of journalism, while it's affiliate, Nieman Lab, publishes insights and industry updates on the latest innovations in the news media industry.

NYC MEDIA LAB connects digital media and technology companies with universities and research centers to explore and develop new technologies, including artificial intelligence.

REYNOLDS JOURNALISM INSTITUTE is a center affiliated with the Missouri School of Journalism that focuses on researching and testing new models of journalism in this era of technological advances.

TOW CENTER FOR DIGITAL JOURNALISM is a research center at the Columbia Journalism School that explores the intersection between technology and journalism, focusing particularly on the ways technology can improve journalistic practices and consumption.

NYU MAGNET NYU's media and games network is a center for the faculty and students across the NYU network who are interested in the intersection of culture and technology.

Stay informed

AP INSIGHTS introduces readers to emerging technologies while presenting industry insights regarding their implications.

COLUMBIA JOURNALISM REVIEW is a bimonthly publication of the Columbia University Graduate School of Journalism that explores news and media industry trends, often as they relate to new technologies.

JOURNALISM.CO.UK is a website that covers the intersection of technology and journalism.

MEDIASHIFT provides industry insights regarding journalism-based technologies.

NIEMAN LAB publishes insights and industry updates on the latest innovations in the news media industry.

THE NYC MEDIA LAB newsletter is a weekly digital newsletter that details the most recent advances in artificial intelligence, virtual reality, augmented reality and data science.

STORYBENCH covers the world of digital storytelling and media innovation.

THE TOW CENTER blog explores the most recent information regarding the intersection of journalism and technology.

JOURNALISM 360 is a collaboration among the Google New Lab, the Newseum and the Online News Association dedicated to accelerating immersive storytelling in news.

The definitive source for journalism innovation

Working on projects related to dynamic storytelling?
Get in touch with us: fmarconi@ap.org