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360° VIDEO PRODUCTION - HOW TO AND HOW NOT TO

Minna Kilpeläinen

IN APRIL 2017, MEDIAPOLIS HOSTED AN international Story Jam Workshop on VR production (*Medaia 2017*). At the workshop, students and media entrepreneurs experimented with the methods and technology of 360° storytelling, shooting and editing. The workshop was part of the joint MEDAIA project of Tampere University of Applied Sciences and Metropolia UAS. A VR conference MEDIAPOLIS LIVE with an impressive number of Finnish and international VR pioneers and professionals was also held at Mediapolis during the same week.

The attendees at Story Jam were facilitated by Finnish VR production pioneers Ilmari Huttu-Hiltunen and Pekko Vuorela from Rakka Creative. The workshop was kicked off by VR expert Jannicke Mikkelsen from the UK. Mikkelsen spoke about a 360° video 'VR The Champions' she made with British rock band Queen. She pointed out that VR technology is not actually a new invention. The first elements of virtual reality existed already in the 1860s and the next wave of



development came in the 1950s (*Virtual Reality Association 2017*).

The author of this article participated in organizing and facilitating the 360° Story Jam workshop. This article reflects on different aspects of 360° production. How to do it and how not to? The videos made during the two-and-a-half-day-long Story Jam will serve as examples of just that.

WHY 360-DEGREE VIDEO?

The VR/AR market size is currently at \$5.5 billion, according to Tekes. By 2020, the market is forecast to expand to \$150 billion. ([Nordgren 2017](#)). The 360° videos are widely used in various fields from construction to the entertainment industry, and from teaching materials to remote health care.

Over the last couple of years, media houses have widely included 360-degree videos in their repertoire of news videos and short documentaries. Euronews ([Euronews](#)), The New York Times ([The New York Times](#)) and Frontline ([Frontline](#)) have been among the first to use 360° videos. Fictive 360° movies have also found their way into people's homes. They can be found through several cataloging applications, such as Within ([with.in](#)) and Ryot ([www.ryot.org](#)).

In media studies, 360° video production should not be overlooked.

'That would be like shutting the book on an entire world in the field of media. In my opinion, it's no longer a question of whether I need to know anything about VR. This is not a nine days' wonder,' says VR director and producer, Ilmari Huttu-Hiltunen. He was one of the speakers at the MEDAIA Story Jam workshop.

LEARNING TO BE AN EXPERT IN AN INSTANT

One of the reasons for the popularity of 360° videos is that the cameras and editing software have become simpler to use. 360° video technology may seem complicated but it really doesn't have to be. When the story plays the leading role in the production,



International students and entrepreneurs collaborating at Story Jam.

PICTURE: MINNA KILPILÄINEN

you don't need to pay tens of thousands for cameras or use several GoPro cameras. A simple editing software is all you need to compose 360-degree videos.

360° video production can be learned in just a few days' time. During the MEDAIA Story Jam, fictional 360° videos were made in two and a half days. The students used Samsung Gear 360° equipment and Premiere editing software with a Mettle Skybox extension.

The Story Jam brought together a group of international students and media entrepreneurs. They created five videos at different locations chosen by the organizers. The attendees were assigned to develop a fictional story with a 2-3 minute monologue which was to be used as a voice-over in their 360° video. The production of the videos proved successful as there were 1-2 students in each group who had already made 360° videos in the past. Peer learning and learning by doing were very practical ways of diving into the different aspects of 360° production.

'In the brainstorming phase, we can have tremendous benefits from having team members with different backgrounds,' says MEDAIA Project Manager Leena Mäkelä. She also emphasizes the importance of sufficient level of expertise. More advanced 360-degree videos require special expertise in filming, sound, graphics, and post-production. You need specialists such as Unity developers and 3D designers. ([Watson 2017](#)).

'It is definitely good to start out with simple equipment which don't require any technical know-how. But moving to professional

equipment requires similar experience as using any professional camera,' says Ilmari Huttu-Hiltunen.

THE 360° VIDEO CAMERA IS THE EYES OF THE VIEWER

Multimedia journalist and ICFJ Knight Fellow Ravi Bajpai stresses the importance of the story in 360° videos. Sometimes the problem is picking a wrong story - or no story at all. When choosing a story, one must first consider whether it's best told as a 360° video or whether it would be more suitable for traditional video. The determining factor for choosing a story is the viewer's relation to the events presented. In traditional videos, the viewer is a side follower. In a 360° video the viewer is placed in the middle of an event or a place, inside the story. The camera is the viewer's eyes. ([Bajpai 2017](#)).

Almost all the stories that were made during the Story Jam workshop gave the viewer (i.e. the camera) a clear role. Other characters in the stories talked to the viewer ([Downtimes](#)) or worked closely with them. In some of the videos, the camera is dressed as a specific character ([Masked](#)) or set in a place where the camera is identified as a character of the story ([The World in a Room](#)). In one story, the viewer rapidly changes locations from a balcony of a church to the altar ([Relick](#)). The viewer looks at the main character from different angles with a voice-over of a discussion between two people, a man and a woman. In another story, two friends set a date in an old mall ([Kauppahalli](#)) and chat via text messages. ([Medaia 2017](#)).

The aim of the 360° video is to give the viewer a truly immersive experience. Downtimes is a befitting example of this. 'This ending was ingenious. It really felt as if you were being hanged,' one of the workshop participants said.

The settings and activities displayed in the 360° video always have a meaning in relation to the viewer. The locations and camera level should be easy for the viewer to identify with. For the most natural user experience, the camera should be either standing or sitting at the same level as the human eye.

In videos where the subject (the camera) has a physical character with a body and clothing, the viewer can be easily directed inside the story. On the other hand, the viewer is more limited in interpreting his or her surroundings when put in a specific character.

It can be a bit problematic to place viewers in settings which are unnatural to them, such as at a desk or in a drone. The creators of 360° videos are also often itching to place the camera in fast moving devices - on a skateboard or on a skydiving helmet. (*Neistat 2016*). The viewer experience can be very ferocious. While some do enjoy it, most people experience dizziness or nausea while watching a moving shot in 360° video. If viewers are able to position themselves inside a moving device, such as a roller coaster, the movement seems more natural (*moovr 2015*). But you should not run with a 360° camera.

ELEMENTS OF STORYTELLING

In a 360° video, the setting contains the story. In the assignment of MEDAIA's Story Jam, this

was already taken into account. The teams were given a set of interesting environments where a short story could be easily placed. The setting alone is, however, not yet a story unless something interesting is pointed out for the viewer.

In the Story Jam feedback poll, one participant particularly praised the Masked video: 'They had used the space really well. They used the full potential of that abandoned place. That place alone, in fact, gives you chills.'

The viewer is the ultimate storyteller in a 360° video. In order for the viewer to focus in the direction that the creator of the video had intended, the viewer's attention must be guided. In Story Jam videos, physical activity and conversations worked as clues for where to look. Voice-overs were used to express the thoughts of the main character.

In his feedback, one of the Story Jam participants was left wondering: 'Does the viewer look in the intended direction, and should the viewer's interpretation of the story be kept under strict control or should the viewer be given time to find the story and the clues designed to guide their attention more freely in the entire field of view? Should the entire surface of the 360° video be active during the story?'

'Viewer's point of attention is affected by objects' distance from the camera,' Ilmari Huttu-Hiltunen explains.

'If something is close to you, that is where your eyes first focus on. When different image sizes can't be used as in traditional video, then the

location of the camera must be changed or items must be moved closer to or further away from the camera. This way the cuts of the video will help highlight the desired point of attention.'

You can determine where the viewer focuses their attention at the beginning of each cut.

The 360° story should not include too many equal actions around the viewer. Viewers should not, in principle, be distracted by actions that compete for attention with each other.

In documentary 360° videos, the viewer can be guided by, for example, text, voice-overs and by using a presenter or a guide - usually a reporter ([Woodruff 2015](#), [Razool & Janks 2016](#)). There are different views on whether or not the director and cameraman should be seen in the shot of documentary videos. In Ravi Bajpai's opinion, it is better for the director and the cameraman to stay hidden unless they have a clearly designed story-related role ([Bajpai 2017](#)).

Subtitles work well in 360° videos as long as they are visible in at least two directions - and according to Ilmari Huttu-Hiltunen, the text should preferably follow the viewer's gaze when they turn their head. The video should not, however, be completely filled with text or other graphics. Colour definition and lighting are also good methods for storytelling.

DIFFERENT SENSE OF TIME

According to Austin Mace, creative director, and Ryan Thomas, content manager at SubVRsive, many beginners make either too few or too many cuts on their videos ([Mercurio 2017](#)). Going randomly from one shot to the other can be

quite disturbing - especially if the location also changes ([Neistat 2016](#)). According to Matilda Hanson, editor at Dagens Nyheter, viewers need 30 seconds to orientate to a new location. For the amount of information that takes five minutes to absorb in a traditional video, you need twice as much time in a 360° video. ([Hanson 2017](#)).

On the other hand, long shots that take place in a setting where nothing happens, or that have no relevance to the story are also unnecessary. Especially, if the shot doesn't have any other visual or sound elements besides the video image.

Since 360° videos are not cut in the same sense as traditional videos, the 'cuts' have to be made within the shot. For example, a person speaking to a viewer is in a 'close-up' when they are physically near the camera.

USING 360° CAMERAS

One common mistake made by 360° videographers is to tilt or rotate the camera, thus forcing the viewer to look around or downwards out of sync with the viewer's own head movements ([Krogsgaard 2017](#)). Instead, the viewer alone should decide how to move his or her head while standing or sitting. Not the cameraman.

Because the 360° cameras use wide-angle lenses, important events need to happen close, about one to two meters away from the camera to make them stand out. You can't use the zoom with a 360 camera. Nevertheless,

the cameraman or the director should not be peeking behind the corner because the viewer can easily notice it. There is no place called 'behind the camera' in a 360° shot.

It is also not advisable to place the camera too close to the subject. Objects less than one meter away appear to be in the private space of the viewer. The impression of proximity is more effective when viewed with VR glasses, not so much on the mobile or computer.

If a cameraman or a director is not a part of a video, playing some important role in the story, they must stay behind the scenes and hope that the shot is recorded to the memory card as they want. The advantage of 360° cameras such as the Ricoh Theta and the Samsung 360 Gear is that the activity can be monitored via mobile phone previews.

HOW ABOUT THE SOUND?

In 360° video, sound is one of the strongest ways to draw the viewer's attention. According to Ilmari Huttu-Hiltunen, sound that follows the viewer's head movements is most recommended in 360° videos. Speech is often perceived as a sound inside the head, always coming from the same direction, but the other sound backgrounds should follow the viewer's gaze.

For a long time, 360° videos have been made with stereo sound because spatial sound was originally very time-consuming to post-produce - even though the Ambisonics spherical sound has been around longer than the 360° video. But as the 360° sound software has developed, using spatial sound is now technically easier

than before. Almost all of the most widely used audio software have add-ons that provide the viewer with binaural sound which follows the direction and distance of the sound according to head movements.

There are already cameras available with built-in microphones for recording sound from several directions. The Samsung 360 Gear camera for one has it, and the audio material recorded by it is very good. The audio post-production that would, for example, allow to increase the sound coming from a certain direction, is still not possible with the material recorded by the Samsung 360 Gear. The viewer's attention can only be drawn by bringing the sound source physically closer to the camera, thus of course making it also appear in the picture.

At MEDAIA's Story Jam, the teams used Zoom H2N recorders. Ravi Bajpai recommends Zoom H4N, which can already simulate spatiality ([Bajpai 2017](#)). Ole Krogsgaard, in turn, recommends the iRig Mic Lav, which can be used to attach two button microphones to the camera ([Krogsgaard 2017](#)).

Stereo sound is still widely used in 360° videos, but it does not always serve them well. If true spatiality can not be achieved, mono sound can give a more natural impression.

FIX IN POST?

The 360° video director must be able to rely on his camera and the desired material to be captured on the memory card. 'Fix in post' is not likely to be cheap - or even possible,' said Andrew Baldwin at the MEDIAPOLIS LIVE

conference in April 2017 ([Baldwin 2017](#)). The material shot with the Samsung 360 Gear camera is relatively easy to cut. The camera has two opposing 180° lenses, so there is only one seam that needs to be stitched (attached to one another). Individual shots can be trimmed with a mobile phone and published on YouTube or Facebook. Most patience is required when the shots are stitched by transferring them to a mobile phone via a Bluetooth or a Wi-Fi connection or, for example, to a computer via a memory card reader. Unfortunately, when stitching with the phone, the resolution falls to 2K ([Samsung](#)).

With a computer, the shots can be stitched and edited with Samsung's own editing software Action Director. It can also be used for simple cutting or for adding text to the video. However, Premiere gives you a more professional result, especially in regards to the sound post-production ([Levine 2017](#)). The Mettle Skybox plugin helps as it allows you to do the editing with VR glasses on. The benefit of the plugin is precisely that the raw version does not need to be rendered for preview purposes.

Most of the professional VR creators use Kolor and/or Premiere to edit the material shot by the GoPro-rig ([Ward 2017](#)).

HIGH QUALITY FOR THE USER

As the user is the ultimate director of the story, the most important thing is to think about the whole story and its implementation from the user's point of view. ([Anderson 2017](#), [Newton & Soukup 2016](#)). When making a 360° video, it's also important to think about what kind of a device the viewer will use, and what kind of an

environment they'll view the video in. Although the demand for VR content is currently very high in, for example, the business world, it is still not very common for people to have actually tried VR headsets. 'Very few have held virtual headsets on their heads,' says Ilmari Huttu-Hiltunen. However, the amount of headsets purchased is expanding all the time. 'VR goggles are sold as fast as the supplier is able to produce them.'

Most of the 360° videos are viewed on YouTube or Facebook with mobile phones or even with computer screens. They work as a 'magic window' to the virtual world. ([Watson 2017](#)). The problem is that, depending on the internet connection, the material may be more blurry than it should. With just a mere mobile phone, the video might also look relatively good, but the VR headsets will be quick to expose poor quality.

VR director and speaker at the Story Jam Jannicke Mikkelsen urges VR creators to offer viewers more high-end VR, the best of quality. 'A frustrated viewer may not return to VR videos again any time soon if the quality is bad.' ([Mikkelsen 2017](#)).

So, is it even possible to shoot 360° video footage with lighter equipment in good enough quality to make the viewers buy VR headsets? For example, Euronews relies on more simple 360° cameras and low-end viewing ([Krogsgaard 2017](#)). They make very convincing news videos with them. When viewed with smartphones or browsers, the quality is good enough. However, The Guardian, Sky News and Arte, among others, have put lot of effort into giving viewers high-end VR experiences with VR glasses ([Watson 2017](#)).



PICTURE: MINNA KILPELÄINEN

'News video does not have to be current or on hand for a very long time, so it is essential that it can be made as quickly and lightly as possible. Covering a relevant event is more important than technical quality of the material,' says Ilmari Huttu-Hiltunen.

The Story Jam videos - shot with light 360° equipment - were downloaded in original quality to mobile phones for screening and were viewed with VR glasses. The quality was quite pleasant. When the videos were viewed with glasses over YouTube, the quality was worse.

Jannicke Mikkelsen waits for a time when planetarium-type Dome theatres will become more common. In her opinion, they'll provide the best VR viewing experience. Ilmari Huttu-Hiltunen also predicts that there will be more and more Dome theaters in the future. So those who love going to traditional theatres to watch

movies without any additional equipment will be able to have VR experiences soon, too.

BIG LITTLE TIPS

Euronews's editor in chief Duncan Hooper has listed lifesaving tips for shooting with the Samsung 360 Gear ([Hooper 2017](#)). Immersive journalist Ole Krogsgaard also has some additional advice ([Krogsgaard 2017](#)).

Before:

1. Make sure the lenses are clean: specks of dust and fingerprints can ruin a shot. Wipe the lenses often.
2. Make sure you are shooting video, and NOT pictures, timelapse, nor video loop. The screen should display the video camera icon (if it doesn't, please refer to the manual to change the settings).

3. Check the resolution. And double-check it. Just because a camera can shoot in 4K does not mean that it will. The resolution can change between shots if you're not careful. The resolution should be 3840x1920.
4. Make sure that you are shooting from both lenses (the red LEDs on both sides of the camera should be lit) and that the exposure is fine, too (use the phone preview mode). The camera remembers the latest setting and continues with that unless you make changes.
5. Make sure that the camera is as horizontal as possible; a skewed horizon is hard to fix in post production. The camera should also be stable, so it doesn't vibrate or fall.
6. Put the camera in a place where the lighting is similar on both sides. If there are differences between the material of the two lenses, the stitching line will be visible.
7. Make sure to always avoid any situations with a lot of contrast in lighting, such as being inside with the sun shining hard through a window. Make sure the exposure correction on the camera is fine (via the viewfinder) and not over- or underexposed.

During:

8. If you are doing interviews, make sure that the scene is quiet enough for the camera to record speech properly.
9. If you are doing interviews in a loud environment, make sure you use lav mics for your interviewees, or at the very least, use a smartphone as an additional recording source.
10. Make sure you do not place anything interesting in the blind spots located up to 1.2 meters away from the camera on the sides where the lenses aren't.
11. The camera lenses are sharper in the middle. Place the interlocutors or the most interesting part of the scenery in the center of these lenses.
12. It's best to place the camera at chin level of the persons in the action (assuming they are standing up). If it's lower, they will appear as giants. In a large crowd, however, it makes sense to have the camera higher to see over people's heads.
13. The camera can overheat if it shoots for too long at a high resolution, so it's better to shoot clips of 2 minutes maximum in length. Short clips are also easier to post-process.
14. A spare battery is indispensable. A full battery lasts about 60 minutes.
15. Throw a decent-sized microSD card into the camera and you can shoot for hours. A spare memory card is always good to have, too.

After:

16. If possible, transfer the video clips on to a laptop to have a digital backup version.
17. Do not forget to recharge the battery.



MEDIAIA 360° STORY JAM VIDEOS IN YOUTUBE

Downtimes: <https://youtu.be/E3s8HOGdpUQ>

Kauppahalli: <https://youtu.be/6n-f6eCMgjl>

Masked: <https://youtu.be/hpaDPlkBopc>

Relick: https://youtu.be/_Olv5nNL-bo

The World in a Room: <https://www.youtube.com/watch?v=H1oLRHyI26U>

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