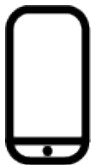# Low-Cost Digital Platforms for Historic Places
An Introductory Guide

About the Guide

This Guide was created by graduate student Michelle Duong (Azrieli School of Architecture & Urbanism, Carleton University, Ottawa, ON) as part of an NSERC CREATE Heritage Engineering Program internship (May - August 2020) on Digital Access to Historic Places hosted by the National Trust for Canada.

While the 2020-21 COVID 19 pandemic has meant closed doors for many of Canada's heritage sites, large and small, these physical closures have also opened up opportunities for sites to rethink and amplify their online presence. This introductory Guide will give you the basics on media, tools, and platforms you can use to launch your heritage place's digital presence, and provide entry level insights on photography and photogrammetry. There are many options and ways to stay relevant through digital access and the key thing is to tell your story the best way you can. We hope some of these tips will help you along the way.

About the Organizations

NSERC CREATE Heritage Engineering Program

NSERC CREATE Heritage Engineering is a research, training and internship program for Ph.D., Masters and undergraduate students and post-doctoral fellows at Carleton University, Université de Montréal, and Université de Québec à Montréal. It provides students with hands-on opportunities to work and learn in the built heritage industry, in addition to their university degree program. The program is funded through the federal government's NSERC CREATE grant program, with additional support from Carleton University. Through the program, students gain sector-specific skills and experience that will benefit Canada's built heritage industry, assist graduates in finding careers in the heritage sector and support the documentation and conservation of our built heritage resources.

National Trust for Canada

Founded in 1973, the National Trust for Canada is a national membership-based charity that works to save and renew Canada's heritage places. We provide game-changing coaching, expertise and funding – and national leadership to change the system. Our advocacy action and public policy efforts seek ways to keep useful older and heritage buildings out of landfill, and support resilient and sustainable communities. We are guided by the Truth & Reconciliation Commission of Canada principles, by the 2030 Agenda for Sustainable Development, and by international charters for the conservation of culture and heritage.

About the Author
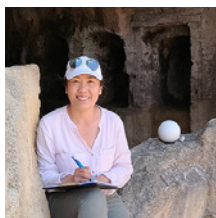
Michelle Duong is a Master of Architecture student at Carleton University and has completed a Graduate Diploma in Architectural Conservation (Carleton). She is a Research Team Lead at the Carleton Immersive Media Studio (CIMS), currently working on an international documentation project. She holds a BA in History and Theory of Architecture (Carleton) and a Bachelor of Architectural Studies (University of Waterloo). She is currently a member of the CIPA Emerging Professionals Working Group and the Core Team Lead of the OurWorldHeritage initiative, Information Technology Theme.

Disclaimer

The products and recommendations in this guide are not endorsed by the National Trust for Canada. They are platforms and tools that I was able to find and research from home during the pandemic as part of my internship with the NTC in the summer and fall of 2020.

Natural Sciences and Engineering
Research Council of Canada

Conseil de recherches en sciences
naturelles et en génie du Canada

Canada

National Trust
for Canada

Fiducie nationale
du Canada

NSERC
CRSNG

Carleton
UNIVERSITY
Canada's Capital University

Digital Media

**digital media**
[dij-i-tl me-dee-uh]

noun
(usually used with a singular verb) video, audio, software, or other content that is created, edited, stored, or accessed in digital form, through numeric encoding and decoding of data
*Dictionary.com*

Listed below are some common media types and some media that is becoming increasingly popular in digital storytelling. Beside each there is a key to show how interactive each medium is for users.

Levels of interactivity from low to high:
●○○○○ low
●●○○○
●●●○○
●●●●○
●●●●● high
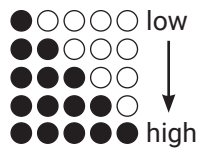
Photographs ●○○○○

Photographs are the most common form of media and, with mobile devices today, they are very easy to capture. The 1:1 aspect ratio (square) has been made popular by Instagram while 16:9 in portrait orientation is common for mobile devices. Get to know the settings on your mobile device in order to enhance your photos with optimal exposure and focus.
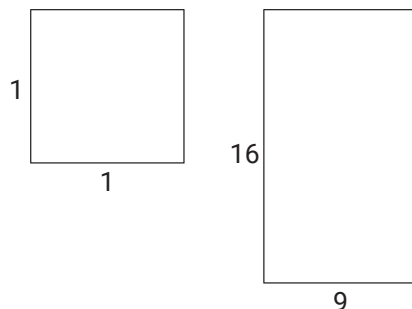
1:1 and 16:9 aspect ratios

This is an example of a high dynamic range (HDR) photo. Multiple photos were taken from the same position with varying exposures, then merged in Photoshop to use the best exposed areas of each photo. This is a useful technique in interior spaces with windows.

Panoramic Images ●●○○○

A panorama is any wide-angle photo that is wider than what can be captured in a typical frame, essentially any photo that is wider than 4:3, 5:7, or 16:9 aspect ratios. The image below is a panorama that covers 360° side to side. It was created using a camera set up on a tripod, on which the camera could rotate at even angles. Overlapping images were stitched together to create one final panorama. Most mobile devices have a panorama mode where you become the centre of rotation and the many images are automatically stitched together on the device.

Panorama of the Main Dairy Barn at the Central Experimental Farm, Ottawa.

360 Photos ●●○○○

The photo below on the left is a 360° spherical photo taken in Fontainebleau, France. What you're seeing is a flattened photo that shows the entire image at once. When a 360 photo is put into a 360 viewer you'll see only what is normally in front of you, in a smaller field of view, like the image below to the right. You can scroll to look around by clicking and dragging the image. On a mobile device with applications like Facebook, you can physically move your phone or swipe the screen to see the rest of the image.

Caption here.

What's the difference between a Panorama and a 360 Photo?

The difference between a panorama and a 360 photo is that the view in a panorama can be as wide as 360 degrees from side to side, but it doesn't have to be. A 360 photo, as it's name suggests, shows a full 360 degree view. It also shows 180 degrees up and down, so you're essentially in a sphere. 360 photos are also called photospheres and they have a 2:1 aspect ratio. Panoramas don't go all the way up and/or down, so essentially you don't see directly above or below you.

Audio ●○○○○

The digital world privileges images and visual cues, often forgetting to consider people with visual impairments. From sound bites to full podcasts, audio content is one way to capture the intangible elements of an historic site while considering issues of accessibility. In addition, recordings of the sounds of footsteps, squeaking floor boards, specialized machinery, animals, doors opening and closing, or other audible experiences can enhance other content such as social media posts or virtual tours.

2

Videos ●●○○○

Videos lend themselves well to digital storytelling since they are structured with a beginning, middle, and end. The combined audio and visual elements increase audience engagement, especially when enhanced with a captivating narrative. Videos can also be used to showcase moving elements at your historic site, such as an historic mill, or to tell the stories of associated persons or historical events.

Use techniques like time lapse (sped up video) to cover a larger amount of information in compressed time, or time warp (slow motion video) to emphasize content. Additionally, short video clips can help promote your site or market items from your gift shop.

Videos can be embedded into a website or shared on social media. See the website of Pimachiowin Aki for a promotional video that encourages potential visitors to discover this UNESCO World Heritage Site: https://pimaki.ca/
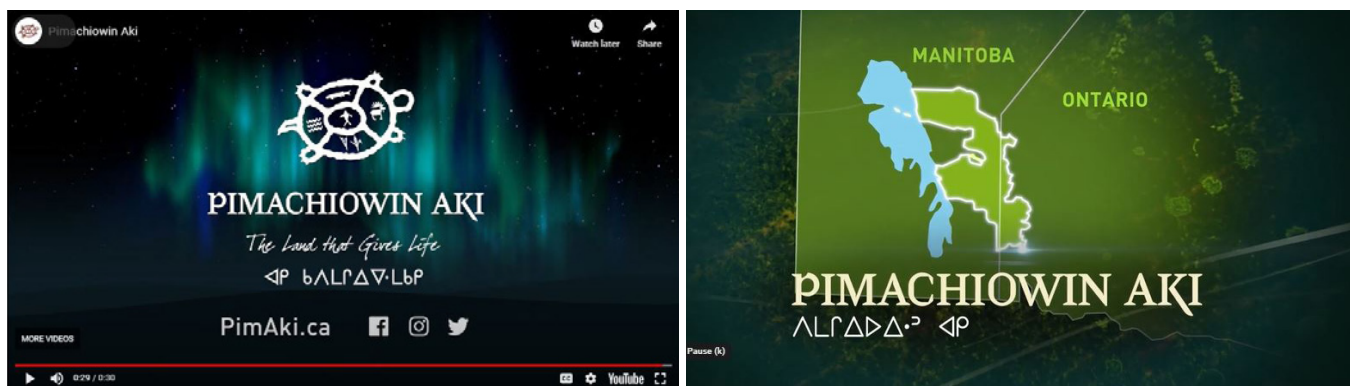
*Promotional video of Pimachiowin Aki UNESCO World Heritage Site, https://youtu.be/pSEz9ekJQsM*

360 Videos ●●●○○

A 360 video has a set duration but while it is playing you can rotate the view, just like with 360 photos. Depending on the device you are using, you can click and drag to rotate the view or physically move around to change the video's point of view. 360 videos are an immersive medium that can also be enjoyed in virtual reality or cardboard headsets.

"Áísínai'pi | Writing on Stone" is an example of a narrative that is told via a 360 video. To watch it on YouTube you can visit this link: https://youtu.be/SoEy0AMxAn0. To experience with an Oculus headset, please see: https://mammothxr.com/writing-on-stone.html.

One possible view from the Áísínai'pi | Writing on Stone 360 video experience on YouTube.
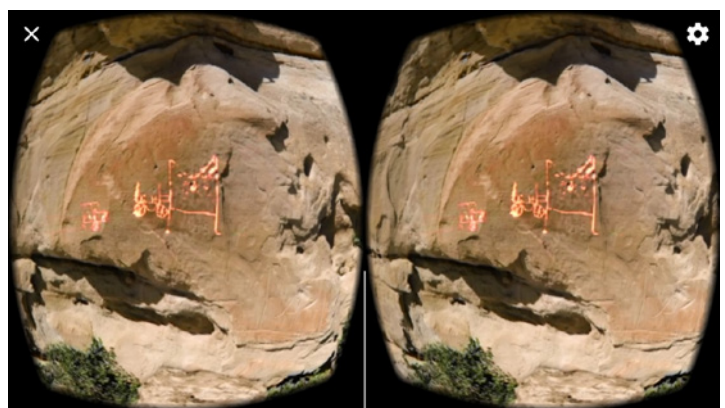
Stereoscopic view from the Áísínai'pi | Writing on Stone 360 video experience on YouTube as seen in a cardboard viewer.

3D Models ●●●○○

One workflow to create 3D models is called photogrammetry. A series of photos are taken in a specific sequence and then processed using software that will produce a 3D model, among other outputs. For museums, it's a nice way to create an interactive and immersive experience that gives users control of viewing a digital object. 3D models can be embedded into website experiences or hosted on exterior platforms. They're are a great way to showcase a collection of tangible heritage. See the Royal Alberta Museum's collections here: https://royalalbertamuseum.ca/blog/Explore-3D

Caption here. Royal Alberta Museum collection on Sketchfab.

Caption here. Royal Alberta Museum collection on Sketchfab.

Digital Media Formats and Assets

Below are some common file formats of the media mentioned above.

A note on image formats: JPG is the most common format for images. When images are taken in a RAW format, they are not yet compressed and carry the most information, and are thus, highly editable. JPGs on the other hand, are compressed, carrying less information and can be limited during the photo editing process. A PNG format is often used when a transparent background is required.

photos	audio	video	panorama	360 photo	360 video	3D model
JPG	MP3	MP4	JPG	JPG	MP4	OBJ
RAW	WAV	AVI	PNG	PNG	MOV	FBX

When digital media are brought together to create a narrative, they need to be hosted on a digital platform. The files are referred to as digital assets.
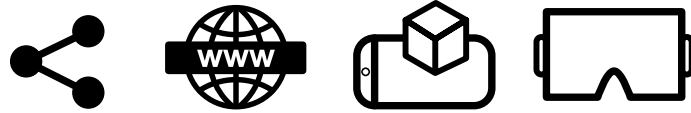
Digital Platforms

digital platform
[dij-i-tl plat-fawrm]

noun
an electronic stage used to publicly communicate digital media

Websites ●○○○○ - ●●●○○

Before social media was widely used, there was the website. It is still the most popular place someone will go to find information about a site before visiting. Websites can host an abundance of information including how to visit, event calendars, online exhibitions, embedded social media updates, and access to other platforms such as virtual tours. The key is to maintain a website that is regularly updated, easy to navigate, well organized, and complies with accessibility standards such as WCAG 2.0.

Google Arts and Culture

Another website option many institutions are looking at is partnering with Google Arts and Culture (GAC). It's one way to widen your network and put yourself out there internationally. It is a free platform that encourages open access to digital media. As a partner with GAC you would provide and own all the digital assets and give permission to Google to publish the assets. They work with you to help curate your narrative. You can upload existing data or make use of Google's streetview camera or high-resolution art camera. The assets you upload will also be available to other partners to help complete their narrative, and existing assets will also be available to you to fill in any gaps of your digital story.
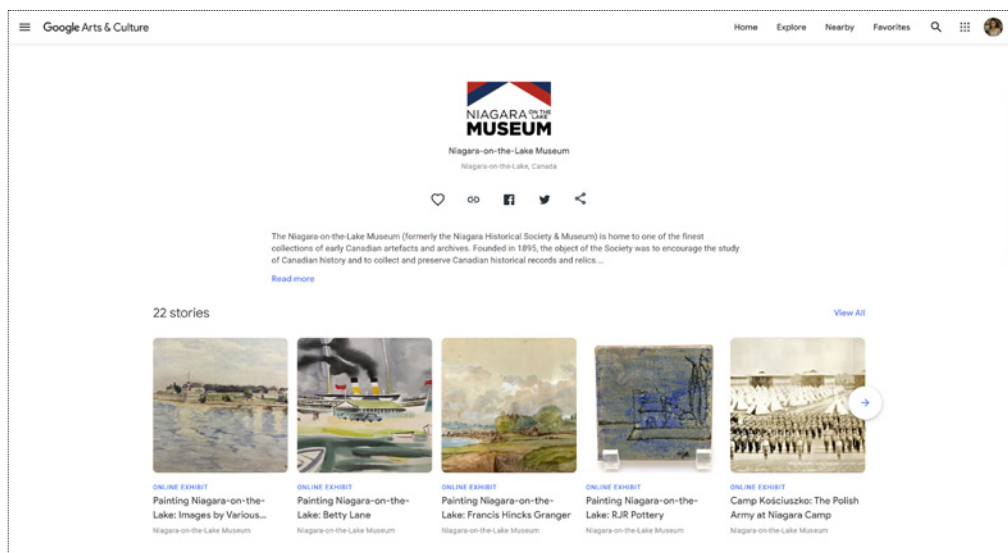
Niagara-on-the-Lake Museum is a partner with GAC. They have created many online exhibitions, or stories, that are highlighted on the partner's page.

All their assets are listed as "Items" below the stories.

https://artsandculture.google.com/partner/niagara-historical-society-museum
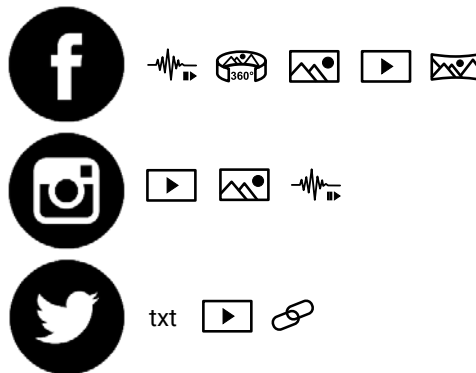
Social Media ●○○○○ - ●●●○○

Facebook, Instagram, and Twitter are three of the top social media platforms used across Canada, each one known to host specific media and target a specific demographic. Instagram is a highly visual platform where you can post images and videos. Regular posts remain on your page while "Stories" stay for a short duration and disappear. Instagram often attracts younger audiences. Twitter is popular for short text-based posts. It is often fast-paced and a go-to platform for current events, providing links to longer articles or websites. Facebook hosts a variety of media, often used by an older demographic, and your site can be listed as a page that provides information on how to visit the site as well as provide regular updates on activities. Facebook can also be linked to Instagram and posts shared across platforms.
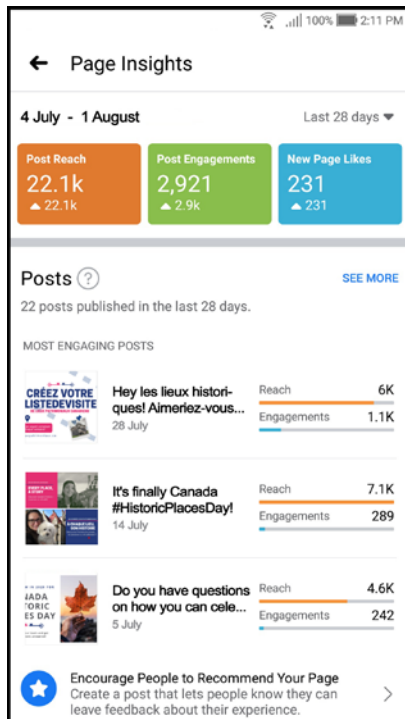
Example of Facebook page insights.

Hashtags are another way to add relevance to posts on social media. Create specific and easy to remember hashtags for your site, event, or campaign. Using them consistently also allows viewers to find your posts easily.

Having a cross-platform presence is beneficial in targeting a larger audiences. Create a scheduled calendar to post regularly and thematically and get to know the analytics offered by each platform to see how far your posts have reached, and which ones garner the most interest. Tools like Hootsuite allow you to plan and schedule posts across platforms. Following and sharing other relevant accounts will also get you noticed.

Social media platforms and common media supported.

Virtual Tours ●●●●○

Virtual Tours are one way you can show your historic site to potential visitors before they arrive on location, or provide online access if they are unable to visit in person. They are usually created using a series of 360 or panoramic photos that are linked to transition from one photo to the next, so that the visitor feels like they are flowing through the spaces. A virtual tour can be a highly immersive experience when viewed in a cardboard viewer but also accessible as a website experience or within a mobile application. Within virtual tours there are often opportunities to include hotspots, which are interactive elements that provide additional information in text, image, or video format, to enhance the narrative of the tour.

Some online software allows tours to be uploaded directly to Google Street View, which helps visitors find you or spark enough interest for them to make the trip.

Depending on your resources, access to tools and cameras, getting started with virtual tours is not as daunting as you might think. Here are some platforms offering free or low-cost virtual tour creation websites or applications:

Theasys *https://www.theasys.io/*
Theasys is an online virtual tour software with a relatively easy to use interface. The free version currently supports the use of five panoramas so you can try it out and decide if it is for you and your site. For unlimited panoramas, Theasys offers an "Essentials" monthly pricing package that is ad-free.

Kuula *https://kuula.co/*
Kuula is also an online virtual tour software. The user interface is a little less intuitive compared to Theasys but has many good features. The free version allows you to test the features before deciding if you want commit to "kuula PRO" at an affordable cost.

Andrex House Virtual Tour of exterior with hotspots showing elevations; created on kuula by Carleton University students Isaac Sanderson, Davis Moore, Braeden Staples, Aidan Bethell; photos taken by Mario Santana Quintero https://kuula.co/share/collection/7Pwlf?fs=1&vr=1&sd=1&init-load=0&thumbs=1&info=0&logo=0

Matterport
This platform started out as a popular tool for real estate companies to showcase properties on the market. It has now become a go-to for heritage sites. The Matterport app to create virtual tours is compatible with iPhones (version 7 and up) and 360 cameras. You could also hire a third party company to use Matterport to create a tour for you. A popular feature within Matterport is the dollhouse, which is a photogrammetric 3D model created by processing all the panoramic images. It is navigable and provides an immersive online experience. Matterport tours are also compatible with cardboard and virtual reality headsets.
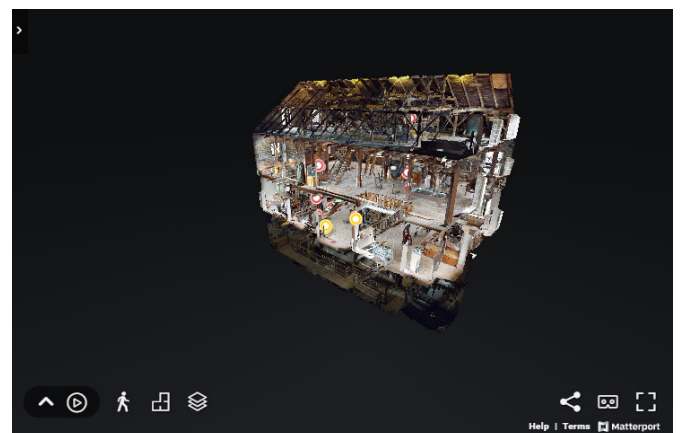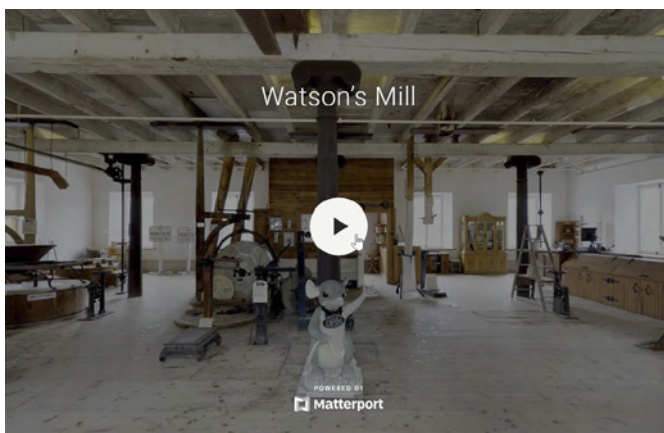

Watson's Mill Virtual Tour interface (left) and Matterport dollhouse (right)

Augmented Reality Applications ●●●●●

A more immersive digital platform is the augmented reality app (AR). AR is an experience where digital information is layered on top of real life. The experience often emerges on a flat surface like a dining room table, living room floor, or a wall, using a device such as a tablet or a mobile phone. AR applications can be created using existing digital assets that a developer can compile into one narrative.

If you want to try to build your own AR application, Apple (https://developer.apple.com/augmented-reality/tools/) and Google (https://developers.google.com/ar/) both offer free basic AR platforms called ARKit and ARCore respectively, but there are companies who will work with you to help develop your experience.

One example is Timelooper (https://www.timelooper.com/museum-virtual-tours). They are providing a service called Timelooper Foundations, and informational webinars about those services, free of charge for the duration of the pandemic. You provide all the digital assets and they compile it into an AR experience, while creating the narrative together. The process takes about two weeks, depending on the assets you're working with. There is a monthly charge to host your app on Android and Apple. They also offer development services for other AR and virtual reality (VR) applications.
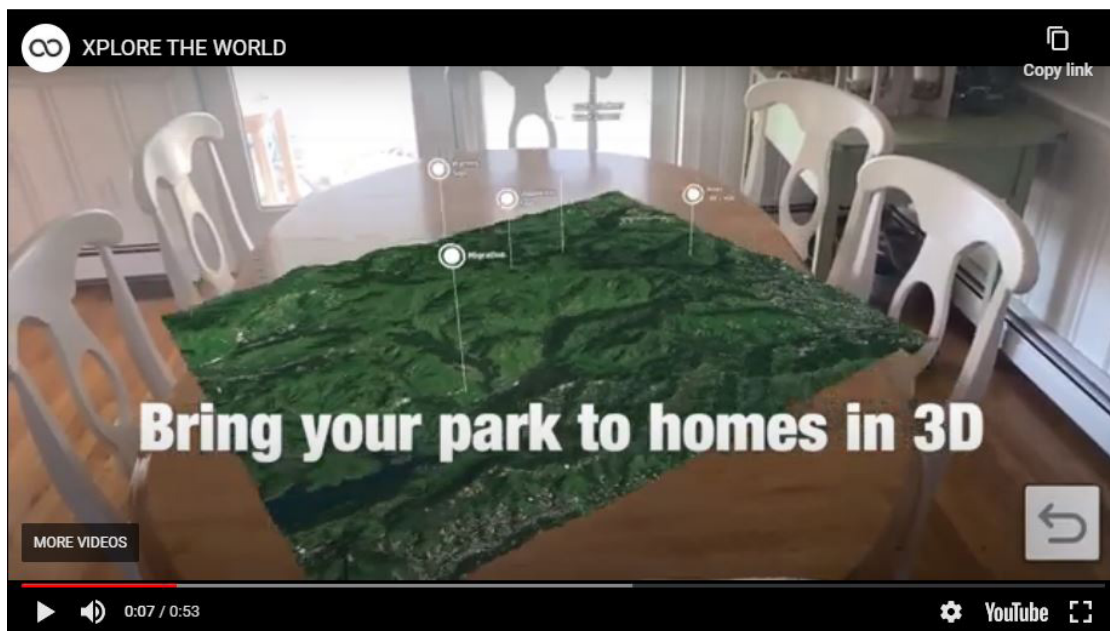
*Watch the Timelooper Foundations AR experience promo video here: https://youtu.be/ycMqD518MIE*

Virtual Reality Applications ●●●●●

Virtual Reality (VR) experiences are among the most immersive where the user is separated from reality and exists in a digital realm. It can be a powerful tool for storytelling. Headsets are required for VR experiences and these applications require more resources to create. There are varying levels of interactivity among VR experiences. Passive VR experiences allow users to be immersed within a 360 video with a set duration. The user stays in the central spot but are able to rotate and view in 360 degrees. The Áísínai'pi Writing on Stone video mentioned above is also available as a passive VR experience and was developed by Mammoth VR Inc. in Alberta and published by Oculus Studios.
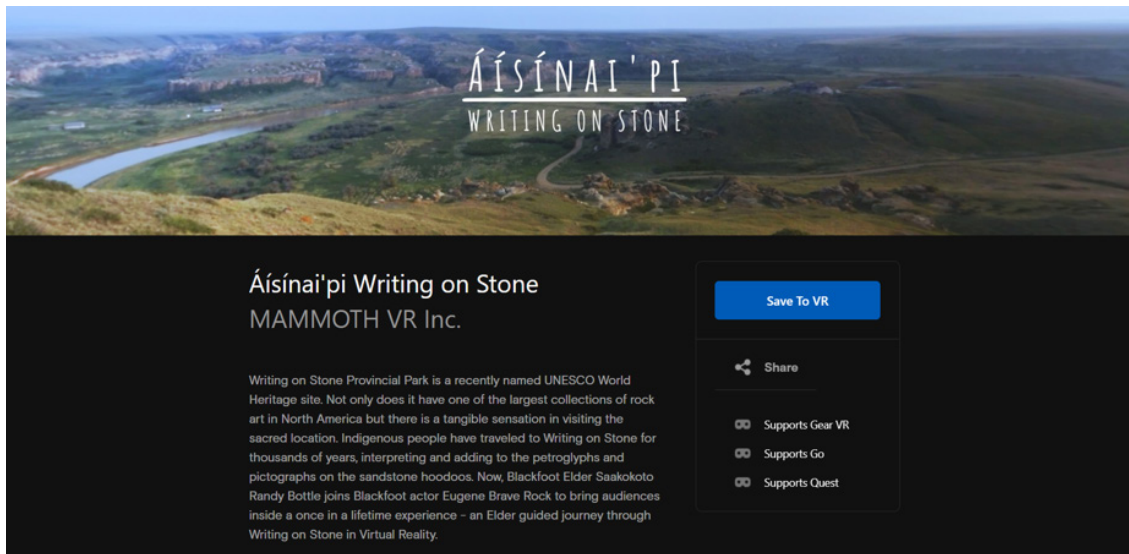
Áísínai'pi Writing on Stone VR experience is compatible with Oculus headsets and can be experienced here: https://www.oculus.com/experiences/media/1755492694779210/3007027589522452/

Active VR experiences allow users to teleport from one virtual space to another or walk around within a limited area, providing a higher degree of interactivity. An example of this is the Anne Frank House VR experience, developed by Force Field, where users can move from one room to another and interact with selected digitized objects. This experience was also published by Oculus Studios and is compatible with specific Oculus headsets. If you are interested in having a VR experience developed, be cognizant of the compatibility of your experience with various headsets, which will define its accessibility.
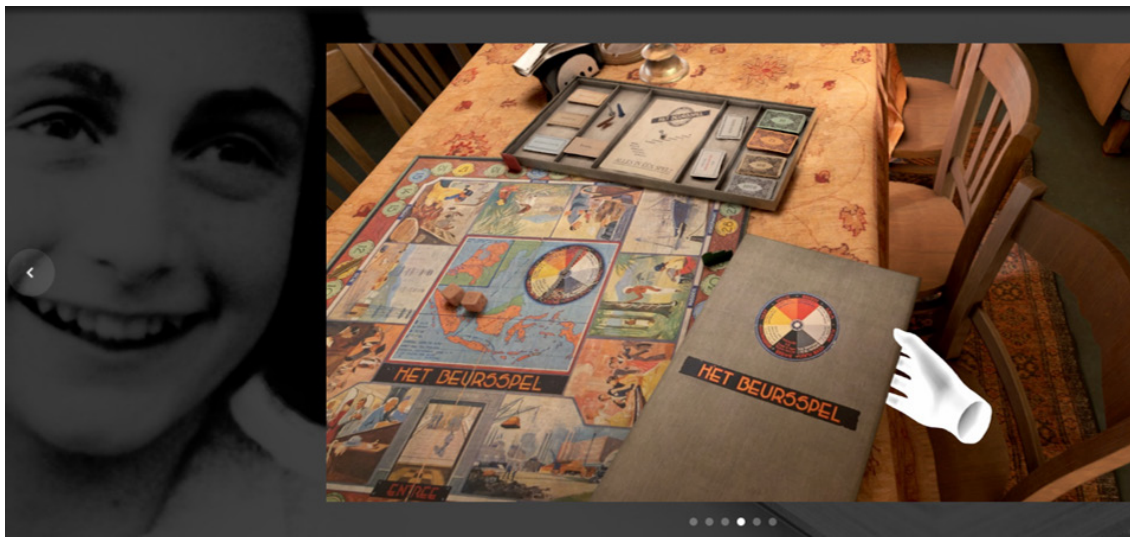
The Anne Frank House VR experience is compatible with Oculus headsets and can be experienced here: https://www.oculus.com/deeplink/?action=view&path=app/1958100334295482&ref=oculus_desktop

Google Cardboard Viewer   *Oculus Go Headset*   *Oculus Quest Headset with controllers*

Tools

To capture the media mentioned in the previous pages, you'll need to use the right tools. The relative costs of the tools below are indicated beside each heading. ⬢◇◇ low / high

Basic Photography - using your own mobile phone ⬢◇◇

If you have access to a mobile phone, many of them now offer a wide range of camera features on both Androids and iPhones. The automatic setting can take a decent photo if you tap on your screen to focus the image, but you will have more control of the output if you familiarize yourself with the manual settings. In the example below, keep in mind that the suggestions given are generally for buildings and artifacts, things that don't move. More consideration needs to be giving to high speed objects and extreme lighting conditions. From top to bottom of the highlighted area:
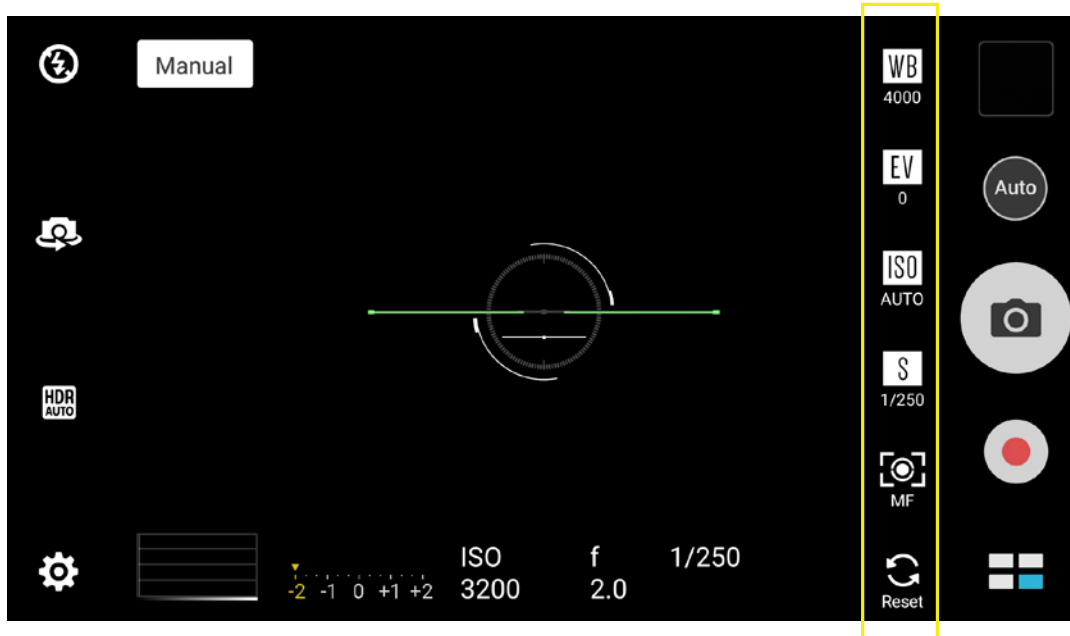
Example of an Android mobile phone's manual camera settings.

WB (white balance): the higher the number, the warmer, or yellower the image. The lower the number, the cooler, or bluer the image.

EV (exposure value): the higher the value, the more light enters the camera lens, giving you a brighter photo; when you adjust the EV, the ISO also adjusts accordingly;

ISO (sensitivity): increasing the ISO brightens your photo and lowering it darkens the photo, but a higher ISO setting will also give you a grainy image, known as noise. Start with ISO 200 as a baseline to minimize noise;

S (shutter speed): the faster your shutter speed, the less light enters your lens and the less blurry the photo. 1/250th of a second, for example, is relatively fast for a building that does not move.

MF (manual focus): this setting controls the aperature of your camera, the opening of the lens, which affects the focal length. It allows you to determine how much of your image is in focus,
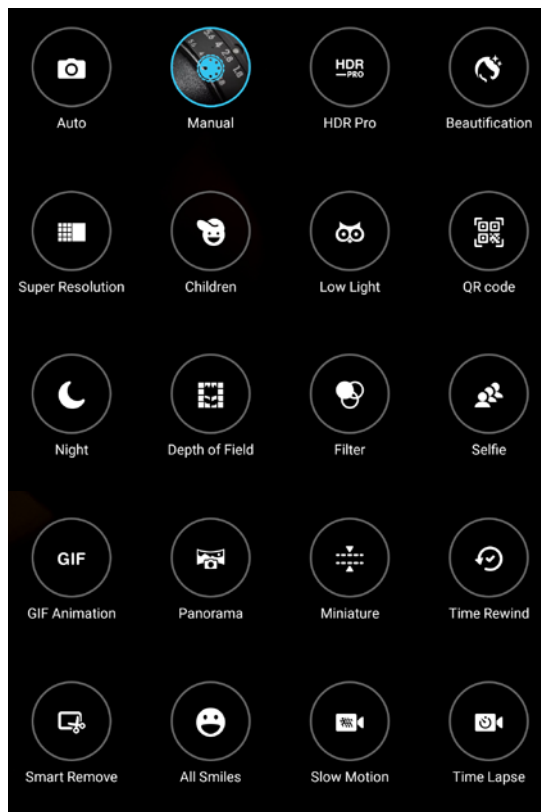
Example of an Android mobile phone's automatic camera settings.

or blurred, by adjusting the size of your aperature to let more or less light in. On some devices this could be shown as a range from f/2.8 to f/16, for example. This f number is also known as f-stop and is expressed as a fraction, so f/16 is a smaller aperature setting than f/2.8.

As an alternative to your manual camera settings, your phone may have many automatic settings to suit your situation, seen in the image to the left.

For example, Low Light and Night settings will adjust exposure and ISO settings to allow more light to enter. Miniature and Depth of Field settings will adjust the focal length and give you varying degress of blur around the main focus of your image. HDR Pro automatically takes several images of varying exposures and stitches them together into one high dynamic range photo. Getting familiar with these automatic settings or your manual settings will maximize what your mobile phone camera can do for you.

Photography Applications ⬡◇◇

If you are using a mobile phone to take panoramas or 360 photos, consider trying an app like Google Street View. The application guides you through where to position your camera, then automatically stitches the photos together to produce a 360 photo. With Google Street View, the photo can be uploaded directly online or downloaded as an asset for virtual tours or social media posts. Watch how to take a 360 photo with Google Street View at Ottawa's Experimental Farm here: https://youtu.be/sYbJ2L9hQ9s

360 photo, known as a photo sphere in the Google Street View App, taken at Ottawa's Central Experimental Farm.

Basic Photography - DSLR camera ◆◆◆

A digital single-lens reflex (DSLR) camera, rather than a mobile phone camera, will give you more options, more control, and higher quality outputs. The concepts of ISO, shutter speed, and aperature are the same with a DSLR as they are with a phone camera, except that there are more parameter settings. For example, a larger range of options with depth of field and ISO settings can give you more control, less noise, and sharpness when dealing in settings with poor lighting, night time shots, or very close up shots.

In addition to the main picture settings, DSLR cameras provide opportunities for the use of wide-angle and other lens, a feature not available with a phone camera or point-and-shoot.

It is higly recommended that you familiarize youself with the user manual as each camera brand will have their own user interface, and even shortforms for functions. Additionally, a decent tripod can be very useful when taking photos with longer exposures, or when doing high-dynamic range (HDR) photography. Patience, planning, and practice will ensure that you enjoy the complexities of your DSLR and maximize the quality of its output.

360 Cameras ◆◆⬡

A 360 camera is built to be able to take 360 photos and videos with just one click. There is a range of qualities available on the market and many of them connect to your mobile device. An app is downloaded onto your phone in order to remotely activate the device, take the photos, edit the images with integrated editing software, and also have the ability to share directly on social media. A few things to keep in mind when using 360 cameras, since it captures an image with one click, you will be in the image unless you are hiding behind something or use the timer function to give yourself time to stage your presence or absence. The Insta360, shown here, has this timer function. When used with the Insta360 Selfie Stick, the stick directly below the camera is automatically erased by the camera's processing algorithms.