Module 10

Digitizing 3D Collections for Museums

Technical Workshop 3: Data Applications in Cultural Heritage

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DAN YAEGER:

Hello everyone and welcome to the digital empowerment project, module ten, on Digitizing 3D collections in museums. The digital empowerment project is a nationwide initiative organized by the six U.S. Regional museum associations, dedicated to providing free, self-paced training Resources focused on digital media and technology for small museums. This series of online webinars and tool kits is made possible by funding from the institute of museum and library services. We are delighted to have you with us today.

My name is Dan Yaeger and I am the executive director of the New England Museum Association and your host for this final module of the series. Before we get started, I would like to acknowledge the places in which we gather. In this era of virtual meetings, when digital spaces may substitute our physical sense of place, it is important to reflect on the land we each occupy and honor the Indigenous People who have called it home. I am speaking to you from Swampscott, Massachusetts, North of Boston, the historical homelands of the Massachusetts peoples. Wherever we are, let us acknowledge all indigenous nations as living communities, their elders both past and present, as well as future generations. We, the digital empowerment project team, recognize that our organizations and those of our members were founded within a colonizing society that perpetuated the exclusions and erasures of many Native peoples throughout the United States and beyond. We ask you to reflect on the place where you reside and work, and to respect the diversity of cultures and experiences that form the richness of our world and our profession.

Thank you - and now for just a few housekeeping notes before we introduce today's presenter.

First, I would like to acknowledge today's ASL interpreter who will be on the left side of your screen, and let you know that captioning for today's program is embedded in a box just below the YouTube player on our website with controls to adjust your experience.

Following today's program, we ask that you complete a short survey to give us Feedback. We will drop a link to the survey into the chat stream and will email a link to those of you who pre-registered. We would greatly appreciate it if you'd share your experience with us and help us improve our work.

We encourage you to pose questions to our presenter, which will be addressed at the end of the program after the presentation. Please type your questions in the chat. We will get to as many questions as time allows. However, we may not be able to address all questions during the live session. For this reason, we have set up an online community forum for raising questions, posting answers, and connecting with your fellow museum practitioners on the museum learning hub website - which you can find at museum-hub.org. If you are looking for help between programs, please visit this forum, create a login and post your questions. A member of the community or one of our student technology fellows will get back to you.

Now it's my pleasure to introduce today's speaker for our third module in the tech workshop series Data Applications in Cultural Heritage. Harry Abramson is the director of art services at Direct Dimensions in Owings Mills, Maryland. Harry provides project-specific workflows with 3D imaging, digital modeling, and digital fabrication for sculpture, monuments, historic artifacts, buildings, and antiquities. Over 18 years he has helped 100's of artists, museums, foundries, and institutions from around the world with projects ranging in scale from insects, coins, cuneiforms and jewelry, to colossal sculptures, a complete locomotive, historic buildings, and priceless artwork and national treasures. Harry, you have the distinct honor of hosting the final webinar in our digital learning hub series. No pressure here, but I'm sure we're all looking forward to a great presentation. Harry, over to you!

HARRY ABRAMSON:

Thank you, Dan, and thank you everybody for joining us today. I'm really thrilled and honored to be a part of this. Most likely all of you really enjoy this field and I do too. I would like to start by acknowledging that I am here in Baltimore Maryland the ancestral homeland of the Piscataway people in Baltimore City. We wish to pay our respects to the elders, past and present citizens, of the Cedarville Band of the Piscataway, the Piscataway Indian Nation, and the Piscataway Tribe.

I work for direct dimensions and we are here in Baltimore, but we serve clients all around the world and travel around the country and scan all sorts of things. We've been doing this for 25 years, that's me. We work with a lot of different industries. We've been doing this, it started in aerospace and it developed into art and sculpture quickly because of the need. And we have seen a lot of different industries develop on their own because of the technology developing in different industries adopting it.

There's a lot of different types of scanners, I won't get into that today, I'm more of a liaison between the clients and the technical people. I know how these things kind of work that I don't even touch them, I'm not allowed and I don't know how to turn them on mostly. Except the camera that we see in the middle.

The one thing I do want to say about the equipment is that this little graph says there's different scales, based on different scales there's different resolutions and accuracies required. You have to know what you are trying to scan in order to get the right equipment aligned with the right results. That's a general thing you need to know and we're not going to go into too much detail about that today.

I'll start by telling a story, in 2006 we were called and asked to scan the Genius of Connecticut, it's a 19 foot tall sculpture in the statehouse of Connecticut. They wanted to be scanned because they wanted to make reproductions. This is a plaster. The originals melted down in World War II to make munitions,, 19 feet tall, too fragile to put a mold on it and it is a statehouse, public place, so they couldn't have all that mold material and smelly stuff scanning was the only option.

In 2006 they wanted to reproduce with millimeter accuracy over 19 feet, that's a pretty strong request even today, but back then it was ridiculous. It took months of planning, it took engineers to figure out how to do this. Once we figured out how to do it we took a truckload of equipment. We had five or six people involved and we had probably 20 days on-site to capture this thing.

When it was all said and done it took months to deal with the data, it took engineers to figure out how to do it, a truckload of equipment, 5 or 6 people involved and 20 man days onsite. When it was all said and done it took months to deal with the data, and there's the picture of the data. There's the finished product. That's actually the bronze. We didn't make the bronze, who were responsible for making the phone that made the bronze.

The reason I tell you this story is because if I got this phone call from someone today, tomorrow is Friday, let's say it's a Monday we could put a guy on the plane with some carry-on luggage, they'd be there overnight, back at our place in a couple weeks later we have the data done. That's a big change in time. It has nothing to do with how much better at it may have gotten, it has everything to do with how much better the equipment has become and how everyday the technology options are always improving, so because of that depending on what you're trying to do it might be better to wait than try to force it before it is too soon. It's a great time to look into 3D digitization because of all the possibilities it enables, but remember it's only getting easier.

When I say it's only getting easier it doesn't mean everything is easy. There are still things that are hard and have to be done right or it doesn't work. Many things that were impossible literally 10 years ago, five years ago, are easy now because the technology keeps improving.

I'm asking a question. Why should you pay attention to 3D digitization? I think it offers new ways to solve problems. In some cases empowers you to do things that were previously impossible, and currently we can't even imagine them, but when we have 3D data things can be done with it.

I think it's important to have awareness and familiarity with the technology, the industry and it will inform you as to how it can help your organization achieve and solve problems. What level of work is required and when it's feasible to do it right. We believe if we cannot do it right we shouldn't do it because we can't waste the time.

Some general things to remember. There's a variety of 3D digitization tools and methods all over the place. Different industries, and we use them all. No single approach or tool can do everything. It's all getting better, faster, more affordable and my suggestion is to be objective. Get opinions from different perspectives, with our company we have people that are mechanical engineers, digital artists, architects, archaeologists and we combine all of these mindsets to come up with the right solution to anything we are trying to do.

As Carol Shroer said in last week's presentation, "Don't do anything unless you know exactly who it's for and why you're doing it." That has a lot to do with the differences in how we can scan an object in one way, and deliver one type of data, then scan another way it's a different type of data and we need to align ourselves in those things in order to know you were doing it right.

So, an overview of the applications we will talk about today. Digital archiving, online collections, open-source distribution, which Smithsonian Open Access has started. Exhibits, mounts and crates, digital restoration, comparative analysis, promotion product development, accessibility and immersive AR/VR.

Digital archiving is to obtain a permanent electronic digital record of an object. If something is really important, what if something happens to it? If it's changing we want to record how it was and measure that change. Sometimes it's difficult to experience or present, and sometimes it's all of the above. In all of these cases we have to wonder “how good” does it need to be and it really depends on what the object is.

This is Central Park Bethesda Fountain. It's in New York City. It's part of a whole sandstone ornamentation all around it, it's 150 years old. It's outside.

One of the reasons we scanned this is because, as you can see, it is changing over time. This is the hand on one of the sculptures. This is an 11 foot tall sculpture. This hand is probably 15/16 inches long. The conservator was concerned with how much this pitting was occurring and knew that it's only going to get worse over time. That applies to the whole sculpture, and the whole sandstone environment.

This is an example of something that's outdoors and changing over time. When we scanned it, it was enormous, but we still scanned it well below a millimeter accuracy, which meant it was very difficult and complex. Took a lot of time and effort.

This is an object. This is harder than I thought. This is Rachel WhiteRead Ghost. The National Gallery had a scan of this because it was being put together, it was going to go back into storage and no one knew when it was going to come back, very difficult to assemble. While they headed out in public they wanted to be documented so they could have access to it again.

Now they have a digital record that can be reviewed without having to take it out of storage. A lot of effort. 75 pieces. A life-sized casting of the room.

This is another project where we scanned just because. It's Horatio Greenough's George Washington. That's at the American Museum of Natural History at the Smithsonian. We scan this because it's important. The people that cared about it were worried, what happens if something happens? If it gets destroyed they wanted to be able to have access to it. This digital archive is a really important aspect to scanning in general.

The next thing I want to talk about is the Smithsonian National Air and Space Museum. I want to point out that we did not scan this, but the reason I'm bringing it up is it's a tremendous project that demonstrates so many reasons why digitization is important.

It's a permanent digital record of an object that is changing over time. For conservation it is a thorough record of the existing condition of the model. And the 3D model allows you to compare to the actual thing to see the changes over time and possibly help the conservation to slow the most rapid changes and make repairs where applicable. Also use this for public engagement, education and accessibility.

He was given a way through the creative Commons distribution. Which is the Smithsonian open Access program. It was also used for exhibition promotion to promote their exhibition, they created an augmented reality app and they also need 15 full-scale replicas which were distributed around the country.

No one ever told me they use this data also to help them to plan the exhibit because they had data they could test and do things without actually touching the object. They could position it and plan, and also state specific mounting points.

I'm going to show you a video from the Smithsonian. I'll show you this. This is augmented reality, this is not the actual spacesuit. This is a different spacesuit. You can see here this is an augmented reality application for someone, through their phone, and take 3D data and place it into the environment where they are looking through the phone and then view it through their phone as if it was their right with them.

Through their phone, tablet, any camera enabled AR app.

As I said, Smithsonian's open Access program allows everyone to download this model and do with it as they please. Also, they made 15 life-size, realistic replicas that were distributed around the country to promote the exhibition. We didn't have anything to do with that. We did help them to make the final data that they have media friendly.

Here's another picture of the augmented reality app with the actual Neil Armstrong. This is an example where it was originally scanned because of a digital archive, but then used for conservation, exhibition planning to make an AR app To make physical reproductions, to enable others to have access to this data all because of digitization.

Online collections is another area which we like. This is 3DHOP which is the 3D heritage online presenter and is actually designed just for heritage applications. This is a place we can put your models and know they are secure. That's one of the issues we have with museum objects is sometimes you don't want them to have the data out of your control. This is a trusted partner for that purpose.

We also see a lot of models on Sketchfab. This is something I had nothing to do with. I believe this is in the Louvre.

There's a whole collection of objects that have been put up on Sketchfab, and I will be showing you more things from Sketchfab, so as you can see this is not ours, this is someone else. We have our own. This is a bunch of things from the Louvre that someone has placed upon the Internet.

Also the Smithsonian has its own app, which is the Voyager app. Here's my movie, I will show it to you now. It's out of order, but I think…

(Video plays)

SPEAKER:
And now the Smithsonian is documenting it like it's never been documented before. 3D both inside and out. Kathy Lewis is the spacesuit curator at Smithsonian's National Air and Space Museum. The suit is made of 80 different types of materials. Over time it's begun to deteriorate, so the team decided to do something about it.

SPEAKER:
We have been getting a high level of looking inside and out.

SPEAKER:
The team captured images using high-resolution photo entry, structured light, CT and laser scan. They compile and process through software the full 3D visual model. Capturing details down to the stitching on the suit.

SPEAKER:
We can see the condition, we can see what the materials are doing and we can detect layers.

SPEAKER:
Images can be shared online with researchers and the general public through Voyager, the Smithsonian's online (indiscernible). With this tool people can engage in the technology behind the suit and what allowed Neil Armstrong to walk on the moon.

SPEAKER:
We got a permanent electronic record of the suit that will last forever. It will be sent throughout the world to researchers, historians, and curious children who want to see what the suit looks like. That's the goal of the museum. To show what has been done in the past and inspire people's imagination to go on to the future.

HARRY ABRAMSON:
That was work that was done by the Smithsonian in-house. We did some help with making the media friendly files, but they did all of that scanning. You notice there was four different scanners they used. One was on-based scanner, one was a camera, one was projected like CT. But allows you to scan the inside which is really important.

Online collections, I want to show you a virtual tour. This is a much more elaborate application of the diplomatic reception rooms of the State Department. The United States State Department. They have all these different objects in here. Within that you can pull them up as individuals, and in this case there is a 2D image, but you can also see the 3D image.2

This, again, is through the help of Sketchfab. Now we can see even though you were touring the whole museum can look at a specific object within that tour.

In this case they go ahead and have made a complete walk-through of their entire space. They've handpicked certain objects, again here's another one. These were things that we helped with. We did the 3D scanning, and these are examples of very complicated, high-end work that when you have reflective objects, highly detailed objects it's not so simple, but there are things (indiscernible).

That's part of knowing what the challenges you are facing, and whether it's achievable or not.

One note about online collections. Modern Internet is built to view 3D models, there is limits to bandwidth and processing power, the model that you saw at the Smithsonian made for the conservation and documentation of the spacesuit was very heavy. A lot of data. We too much that you can see over the Internet, so we have to rely on video and CGI technology to make that later in look the same without having all that heavy data transfer across the Internet.

5G will help with mobile applications, and make it so that these AR apps can provide higher and higher resolution. Verizon is working on that with the Smithsonian right now and they have a little virtual Museum as well.

The Metaverse is coming. It's way too soon to know what that really means, but we know it is coming and I think at some point, and I will get to this later, there's going to be things we apply in that universe.

Moving onto another subject matter. One of the things we've done, another application is to make special mounts and crates. This is a single project I'm going to talk about. This is Claes Oldenburg Red Tights with Fragment 9.

Museum needed a great civic ship this to an exhibition that was going to travel. We scanned it. You can see the scanner on the right side. To the left is a model which remain which took the underside of that object and had a perfect fitting interface with spaces so that it conflates the model, the artwork on top and here to the left you can see how it perfectly fits the artwork. Protecting it from bending and breaking in transport. On the right you see it laying on top. And there is in the crate.

Pretty simple understanding of the application, but not an easy thing to undertake.

Digital restoration is another area where we have done a lot of special things. With digital tools you can enable and redesign an object from scratch. When you add to education to the original object you can also modify the original object to repair and restore it in the digital space to a more accurate representation of what it was originally. With the help of digital fabrication scales or life-size reproductions of the restored conditions can be realized. Due to the dimensional accuracy of potential custom fitting you can actually make custom fitting appliances also to perhaps put onto an original and repair damage.

One of the places we did this was the Macedonian monument at the Naval Academy. This was a figurehead, a masthead from the Macedonian ship that was taken from the war of 1812. This is a sculpture of Alexander the great, it was a war prize. The monument had been sitting on the campus for quite a bit. The figurehead had been outside for years and years, and had gotten decayed. There's a long story behind it.

We brought in to make it look like the best documentation that was available. These three pictures were the only documents we had to improve it. And with the help of the national historic trust we were able to redesign it, and they had to approve it digitally. And then we were able to make it again. Meanwhile restore the whole monument. That's the brand-new monument. It was built out of poverty.

Once we had 3D data we could carve it as design and replace buildout of mahogany which was the original material.

Another project we did was Caligula sculpture, which was 2000 years old at the Virginia Museum of fine arts. We scanned it, made a very high resolution model, used scholarly assistance, we are not scholars but we are digital artists. With their direction we were able to design and replace all the missing elements that had broken off of the object over 2000 years.

You can see the different stages. The left is the original condition, the right is we did some work to add all these pieces, then the far right is the finished object.

We 3D printed small versions including the color version. You can see the very high resolution. That was really very long time ago and it was groundbreaking when we did it. We are very proud of that.

Another project which we have done recently was to replace and restore and make replacement of this Assyrian Relief. This was at the Virginia logical seminary in Alexandria. They had because the coliform language or Aramaic language on the sculpture was written in the Bible.

They had this in our library, and basically realized it was too expensive to even in short, and it needed to go someplace to be safe. You can see on the right it has extremely fine resolution details. We scanned it

with multiple tools and also photographed it. On the left you can see the original and you can see it has a scar where it was broken into three pieces. On the right you can see the restored replica, which is actually concrete cast, the original is a gypsum alabaster stone. The one on the right is actually painted concrete, but we were able to restore the missing areas. Again, with the help of their scholars.

The digital data was converted and milled into a negative that served as casting pattern.
You can see here the date of the original scan where has the scar. And you can see here the data where that scar has been, if you go back and forth, you can see we did repair work there.

I think I am in the wrong version of this presentation.

Here's a 3D model, we were able to document this. This is through the Internet. It has been dummy down, it's not the actual data. The dummy down version for the Internet. Even though it does have this dummy down version it is still very high resolution as you can see. This is the underlying data and then here is back with the color on it.

There's the full-scale casting pattern as it was milled. The left is the original, the right is the replica.

And then here, if this works, it's not working. That was supposed to be in animation.

Now is a good time to switch. For the ASL interpreters. I'm going to go into another reproduction. This is a museum exhibit that we made exhibit replica of the Mace of the Republic. As you can see behind the speaker of the house, in this case the president was speaking, but anytime the House of Representatives is in session this mace is there. It's there to represent the power of the government.

They wanted to make an exhibition, so this is an exhibit in the office building of the House of Representatives. It's such a powerful object, so to speak, it can never be seen unless you are actually an active session. We made this replica.

We started by going to the basement of the capital and scanning with this portable scanner arm. You can see it's very shiny, high detail. We were able to capture it in just a couple of hours.

There's the data. We had to do some engineering work to figure out how to make it, but using 3D printing we were able to 3D printed. The one on the left is the original and the right is the reproduction. The reproduction was 3D printed and then Electra formed in copper and nickel to give it this finish.

We could have been plaited in silver, but by design they did not want it to be in silver because silver would tarnish. They wanted this to be put in the exhibit and left for five years without being touched.

They didn't want it tarnish so use nickel.

There's an image of it put together as the finished piece. Let's see if this works.

And again, not only was it useful in making the 3D model, but it's something that can be shared on the Internet so people can see it up close and personal if they want. It's hard to see because of the nature of its shape. The ego is really beautiful and something we are proud to have been able to help with.

And now I just need to find a presentation again.

The next area I will dive into is, this is an online exhibit that was created for the Museum of modern Art, and the Art Institute of Chicago. We used 3D scanning to examine these four Mattisse Backs sculptures. These sculptures were each created inquiry and then cast in plaster and bronze, but they were created over the span of about 25 years, 22 to 25 years. The one on the far left is one, two, three and four. We scanned all of them. With that same portable arm.

We made 3D models of each of them. We were able to compare them in various ways. This is a color map. We overlaid them, and the ones on the right show where they are different. What I want to show you next is the actual online exhibit.

This shows how we enable them to make this online exhibit. This was at least 10 years ago. It still up there. It allows people to study and see the comparisons between the two. What we were able to prove, the first back and the second was the original, the second was a derivative of the first. The third was a derivative of the second and so on.

Here you can see they created, we created this actually. There's the first back, and there's the second back. Here's the third back. Here's the fourth back.

One of the methods we used to prove this for them is we were able to overlay. As you can see, these are cross-sections of the different sculptures, and because they are so precisely matched we have a high level of confidence that they were actually derivatives of one another.

Another project we did with a lot of comparison which was pretty neat was for the national Gallery of Art. Little dancer has a long story. I will have time to tell the whole thing, but the wax sculpture you see here is the only Edgar Davis sculpture ever shown in public. All the other sculptures that exist are posthumous, or else there might have been some plasters that were lifetime plasters, and we did research. We scanned the wax, the plaster, what was known as (unknown term) which would be the master bronze. And then one of the serial bronzes which was reproduction from the master bronze.

Our job was to compare all of these different sculpture representations to determine the strength and growth rates between the plaster and the bronze so they could try and determine what came first. Whether things were original and legitimate.

Here you can see four of the sculptures side-by-sid

in the digital space.

These are converted to point cloud. The lines you see are actually cross-sections, and because the sculptures were all different scales and because they warp, and shrink in growth. We had to figure out ways to really thoroughly analyze them, and the way we did that was by finding like spots, and those like spots were then used to create cross-sections. The three points that were similar on all of the objects were able to be used to create a cross-section.

Those cross-sections were laid out side-by-side on top of each other. With that we were able to do some measuring and analyzing with many, many different data points and get an average shrinkage and growth. That was all used to publish in their sculpture catalog.

Another application is for production of products and promotion. This is an example where a replica bronze series of the young Ben Franklin was made from digitization, 3D printing and lost wax casting. This is for the University of Pennsylvania. Another area is accessibility, interactive tactile art reproductions, we can scan objects and make replicas that are precise out of the same material and different, then you have the ability to have the site and paired to be able to feel and touch them. We were asked to but we didn't get to do it, we were asked to do with Iwo Jima Memorial.

We were asked to use the data to create a small model so the sight impaired could feel the model and also to scale model for example 1 of the soldiers faces. They can feel that as well and get the ability to see and feel, and interpret the scale and also the form of the sculpture.

This is a neat project we did. We scanned Native American Projectile Points. We 3D printed them and then as you see they each all had a QR code attached to them. Those QR codes enabled the sight impaired to use their phones to read the QR phone and then the QR could generate spoken word to describe what they were feeling in the back story.

The last area I want to talk about is the immersive AR/PR. As we mentioned our Internet is built for viewing 3D models. We've already seen some air interpretations. The Metaverse is coming. Another object we're talking about, and I have all later today is to scan a historic objects, I can't tell you anymore, and create an NFT from it. To our knowledge of these done that. I know people are talking about doing it and it's an interesting way, in my opinion, to fund conservation and other cultural heritage efforts. More to come on that.

This on the left is a digitized photogrammetry model of the removed Robert E Lee Memorial from Richmond Virginia with graffiti. On the right is in the Metaverse. I did not have anything to do with creating any of this, I just am aware of it and I think it's very cool because it's the first of its kind as far as we know.

I want to show you this model. This is the model on the Internet. On Sketchfab. This is not Metaverse, just an online model. It's pretty accurate, amazing work and it's documenting a pretty historic moment in time.

The next one I want to show you, if I can get to it, here it is in the Metaverse. What's most important to know about this is the artist, Terry Kilby who created this, he has also created photographic remodels of the Berlin wall. What you see there are sections of the Berlin wall. He has created an online museum, a Metaverse museum where you can go and explore these. If you have an oculus or any sort of 3D immersive experience you can go in and walk around in this museum and see it.

It's the first of its kind as far as I know. Doesn't mean that's the first of its kind, but it's an interesting example of real-world objects being brought into this Metaverse which is kind of a hot topic that no one knows what it's really going to come about.

So, summing up things to remember. There's a variety of digitization tools and methods. No singular approach or tool can do everything. All these tools are getting better, faster, more reliable and more affordable. Sometimes when your challenges might not be ready, you might want to wait. The objective, get opinions from different perspectives. Don't do it unless you know exactly who you're doing for and why.

I would also say it's okay to do it just practice, but understand if you're going to get involved it takes practice and it takes practice to stay in practice and do it well, it cannot hurt to learn a little bit. What we don't like to see is when people take on projects that are really not ever having a chance for success. There's many, many things becoming easy and accessible. Which makes it easy for us to do a lot more for our customers, but still not everything is easy. It really matters what you are trying to accomplish.

Thank you for watching, and I am Harry Abramson from Direct Dimensions.

DAN YAEGER:
Thank you, we appreciate it. On the top of everyone's mind is what drives cost with this kind of thing? What are the costs depending on the size and so forth? And where do you find funding to support this? I think it's directed at smaller museums, but what kinds of things can end should they be doing if it's affordable?

HARRY ABRAMSON:
That's an amazing, great question. I want to go back to referencing what Carla said last week, and what I am saying today. There are ways to do this and the camera is a great place to start because it can do amazing things. It doesn't have $100,000 price tag, and generally all of the museums use a camera. Experimenting with that is an easy way to get started.

We use it all the time and it's very important for doing excellent work but it's also an easy way to start or site work as well. When you say what drives cost, I think the things that drive cost are things like travel expenses and how long does it take to be off-site?

The main thing I think that drives cost is resolution and accuracy requirements. To make a visualization model only that is going to look good on the Internet is generally speaking a lot easier than making a conservation level model which has to have submillimeter accuracy. So when you look back to the Smithsonian's project with the Neil Armstrong spacesuit they raised half $1 million with a kick starter to fund that.

That's all in-house, they had all the tools and the technology to do it, but it still took time, money and effort to do it. It took a lot of time. One of the things I was thinking about this morning as I was preparing for this a good thing to think about this is when you are dealing with millimeters the difference between doing a large object and 2 mm versus 1 mm, it's only twice as good but it might cost five or 10 times as much. Maybe not to the one, but when you get to half millimeters versus quarter millimeter can get expensive. The margin for error is different.

That always dependent on the object itself, complexity of the objects, is it rigid, is it shiny, the cost drivers really are having to do with the purpose. I think that's why this is cautionary tale. Don't spend $20,000 to do something and find out later it needed to be hundred thousand dollars. On the other hand you can do something for next to nothing, meaning literally go out with a camera and software and make amazing models that are very good and can be very effective even for conservation if you know what you're doing.

DAN YAEGER:
You find that there's a threshold that would sort of either in-house versus hiring a vendor like yourself, is it a number of objects you want to digitize so that you got a whole bunch of those it might make sense

to hire staff and equipment to do that versus sending it or bringing you guys and are sending it out to you while? Is there a threshold there or is it just kind of a your case size probably matters, right?

HARRY ABRAMSON:
It's a great question again. We do say for example we are flying to Iowa to scan. We have the tool and it only takes two hours to scan it, why do we spend more stuff and we generally don't charge extra for the scanning.

Scanning usually is about 1/10 to 1/4 of the time in processing. It really depends. There's the modeling time. Modeling often can stretch out over time. If you hire us to give us more time to do it, we're going to charge you less. We can put it off until we have the free time.

Volume matters but really it's a level of effort, and it doesn't change when we have to do more stuff. We still have to do all the work. The main thing for a small museum to consider… I just lost my view there, are you still there?

In-house you are never going to have all the tools. You're never gonna have the ability to invest income over the net via scanner and higher guy into everything we need. It doesn't mean you shouldn't start. Again, the camera is a great place to start, but it takes time to really understand the variables and it's very hard to have someone that's full-time doing it all the time that's good enough to actually do it. Not museum space but in an industrial space it happened so many times when someone will buy an industrial scanner from hundred thousand dollars and then they don't know how to use it, they don't use it enough. And then we come to their facility and scan with their scanner. It's silly, but we are pushing on them. You really have to be goodhearted to be good at it.

The tools are getting better, faster, cheaper. Photogrammetry and other things are a great place to start.

DAN YAEGER:
This question has to do with the materials and types for services. Are some better than others for scanning? Are some impossible to get a good read on, or is pretty much anything fair game?

HARRY ABRAMSON:
And the cultural heritage space we don't like to touch anything. For example, if we are scanning a car and has glass windows we can spray that car with the material that makes it opaque, or we can put tape and see were the glasses. In the museum space we don't like to do that. Glass and things that are translucent are very hard. They are not ideal.

Things that are matte, not complex. I like to say banana isn't complex. A bunch of bananas is kind of complex. A basket of fruit is really complex, so the complexity makes it harder to capture. Surface

texture with photogrammetry in particular if you are scanning anything that's a stone and opaque it is going to work well. Anything with a lot of texture is going to work really well.

On the other hand if you try to scan a white, PVC pipe with photogrammetry it's going to be very hard to tell what you got unless you got other things around it to help define what the pipe is. It depends on the tool, that arm that you saw scans shiny very well. Photogrammetry it's hard to scan shiny.

DAN YAEGER:
Object flow. If I'm in a museum and I've got a couple of objects that I'd like to have scans and you guys come into do it will kinds of things would best be… What do we need to do to get it prepped for you? What kind of management to be need to do?

HARRY ABRAMSON:
The most important thing, and we are dealing with this right now with some projects, he wanted all in one place. Object handlers are important. They are the limiting factor because were not going to touch anything. You have to have the right people set up, everything in the right location. We tend to prefer a dark room, or at least one that has control right so if it has direct sunlight it can mess things up.

Depends on how we are doing it, but if we are using the arm that you saw we have to have a rigid floor. We've done some work where we were doing high-end work and the train would drive by and you could see it in the data. The movement creates blur in the 3D space. Not all scanners have that problem. Generally controlled light, sturdy table, sturdy floor, enough room which depends on the objects, and we don't want to have to do a lot of steps in different places because that adds to time and effort.

DAN YAEGER:
In general terms you want to add stuff pulled out of storage and put into a studio environment? Or can you just go into storage and take care of it?

HARRY ABRAMSON:
You saw the Mace of the Republic, that was brought into a storage area in the basement. It was just a museum storage area that they had. We set it up there and it was perfect. We do scan in situ often. We scanned the dancer in the gallery, George Washington in the gallery. Very often we can scan (indiscernible).

If possible, like when we did the Edgar Dagus stuff we sent in the conservation office.

SPEAKER:
You mentioned NFTs. What is actually digitizing an object due to its value? You got the digital which represents some sort of value and then the original. I guess it has to do, with his any of this possibly monetized by a museum somehow?

HARRY ABRAMSON:
I've been having this conversation a lot lately. I'm not an expert in NFT's and I'm not sure if anyone really is. For example, I like to say NFT's are like baseball cards. Some of us get it in some of the stone. I don't particularly care about baseball cards, but I believe there's a market for it in scarcity makes value. That's generally how I see NFT's. The issue is like you said, is a digital? How do you know my digital scan of the Lincoln Memorial is the digital scan of the Lincoln Memorial. I can't tell you that. Mine might be better in someone else's might not be. Was the authority that defines that it's the one.

As far as changing the value of the original tell you a funny story that's absolutely true. I had a guy call me a long time ago. Had some silk screens that Andy Warhol's that were not anti-Warhol artwork because they were things he made as decorations for parity. He wanted us to scan these to say these are Andy Warhol. But they're not Andy Warhol's because he didn't say they were. It is what it is only because it is.

Secondly, that Assyrian Relief replica may it might be the best replica of its kind, it's worth nowhere near, and never will be, with the original was because the original is 3000 years old and was made by those folks. We made our side of concrete and it will never, ever represent the real thing in value.

When we talk to insurance companies, for example, Shirley can scan it but we can never replace it. You can only replicate it.

DAN YAEGER:
Harry, I'm gonna say to you, I think you just signed up for at least one conference session somewhere along the line in the next couple of years as this technology emerges the ethical issues creep up as well. That's something that we in museums are all about is trying to talk this through.

We are out of time. One last question in terms of housekeeping. Can you share your PowerPoint as part of the materials that's part of the museum learning hub? I think that would be terrific because then people could look at some of the examples and that would be very helpful.

HARRY ABRAMSON:
I will do that. I also will try and put together a little resource page that shows anything I pointed to, and also my information is here. Email away. I didn't put my phone number up there, but I'm just a phone call away and that's my job. My job is not to sell, my job is to help. Call me all the time. We hear what their problems are, we address them, we see if it's feasible and if it is it moves forward. Lots of times we tell people know it's never going to happen.

DAN YAEGER:
Thank you so much. Really appreciate it. Very stimulating, and like I said, I'm sure we will see in the Museum Association conference somewhere in the future. Thank you again, Harry, and thank you all for attending today's webinar. As I mentioned earlier this is our 40th and final installment in the digital

empowerment series we began 10 months ago.

Since then we've had thousands of people attend from around the US and beyond, and we have built a robust community of people who join our form and watched recordings of the webinars@museum-hub.org. If you're not part already I encourage you to join today and be part of the crowd. Many thanks to all of the people of the digital empowerment Project to made this possible including the ASL interpreters, transcribers and the DP technical fellows who have supported the project, and of course to our advisory group of more than a dozen museum professionals from around the country will help us create and review the project.

Thank you to our technical advisor, Nancy Proctor and my dear friend and collaborators at regional museum associations spent countless hours producing webinars, especially our project leader Sheri from the Association of Midwest Museums.

Initial thanks once again to the Institute of Museum and Library Services for their inspiration and funding support for the program. Thanks again everyone. Be well.