Overall mark: 88

General feedback:

Explaining the grade .

You provide an excellent exhibition proposal on the role of technology in science museums. Your proposal is written clearly, makes a distinct case about the importance of such an exhibition, includes objects and wall texts that demonstrate the aims of your exhibition, and is supported by relevant scholarly sources and a great amount of research. Your points about what technology has to offer for science museums, as well as museums in general, by allowing more of their collections to be put on display, and the sharing and preservation of objects and exhibitions digitally is particularly interesting. Your explanation of the display layout is thoughtful and works with the aims of your exhibition.

Feeding forward: how to improve ?

Your use and treatment of the sources is handled well. You provide good context about why technology and interactive exhibits are important to museums by beginning with a discussion about memory and how engaging museums visitors with more tactile displays allows them to build memories of that experience. You also include relevant sources on the role technology has played in museums so far, which supports your claims. To improve, you may want to think about how your ideas are building on or challenging the theories and methods of scholarly sources. This will allow you to better define your own voice and contributions to research.

Memories, Technology, and Experience

Summary

Science museums have forever been at the forefront of technology. Not only do they often display technological progressions, but they rely on it to communicate and curate their collections to visitors of all ages. The use of multimedia has had a notable impact on education, and more specifically, the memories, retention, and success of that education. The *Memories, Technology, and Experience* exhibition will display the history of multimedia usage in science museums, emphasizing the benefits of using multimedia to communicate a collection and establish positive and lasting memories. Not only is multimedia key to the expression of collections, but it also serves a valuable role in science museums' communication with other museums, as well as data storage and collection. As museums compete with other forms of entertainment for the attention of coming generations, this exhibition will also analyze potential uses of technology and virtual reality to establish science museums as a fun, educational, memorable experience for children and generations to come.

Science museums face the pressure of helping the general public, and specifically younger generations, to understand science and how it impacts their lives. Memories are the key. The learning process before, during, and after an educational experience are tied to memories. Technology, when used correctly, has been proven to be positively correlated with memories. This essay will analyze the importance of that correlation. Science museums' use of technology and multimedia has directly contributed to education and memories for visitors, opening up more creative curatorial options. The progression of museums' usage of technology is an essential aspect of the past, current, and future science museum.

As such a cog to the engine of success for science museums, this kind of exhibition is long overdue.

Context and Rationale

We must first understand the importance of memories before analyzing technology. How children interact with science museums is essential to their education.[1] The interactive nature of science museums is why many school field trips choose science museums as destinations.[2] Memories "remain with (children) into adulthood." [3] In a study by Falk and Dierking, college students could "recall three or more specific things linked to a field trip during their first, second, or third grade." [4] I, myself, can recall very little from 2nd grade, but I definitely remember being awed by the dinosaur fossils of the Museum of Natural History in New York City. A positive memorial correlation is essential to effectively communicating with and educating children and students. Science Museums realize this.

An essential aspect of establishing memories is the manner in which an exhibition is presented. When students attend an exhibition for the first time, "exploration and setting-oriented learning" is important to them, more-so than the teacher's plans.[5] Students need time to explore "new and unfamiliar equipment… before they begin to understand them."[6] When it comes to science, interactive multimedia allows students to create these distinct memories. In a study of museum visitors at the Deustches Museum in Munich, one of the world's largest science

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[1] Leonie Rennie and Terence McClafferty, 'Using visits to interactive science and technology centers, museums, aquaria, and zoos to promote learning in science,' in *Journal of Science Teacher Education*, (1995): 2-3.
[2] Stephanie Eva Koester, Belinda Wright and David Bearman, "*Interactive multimedia in American museums*." (Pittsburgh: Archives & Museum Informatics, 1993): 11.
[3] Rennie, "Using," 4
[4] Rennie, "Using," 4
[5] Rennie, "Using," 4
[6] Rennie, "Using," 5

museums, the number one and two impressions specific to science museums acknowledged were "fascination of technology", and the ability to interact with a famous object.[7] In another study, "extent of visitor control" was the most important aspect to a group of visitors in science museums.[8] Allowing tech to give visitors control abolishes the stigma that science is too complicated and time-consuming, and allows users to interact with various technologies *through* technology at their own pace.

Memories are not enough on their own to track the success of science education and retention. Students need to be able to use those memories to think critically; to ponder, solve problems, and make connections.[9] Technology provides detail. In a museum, one may not retain reading a wall text. But an interactive exhibit, one in which multiple senses (i.e. touch, sight, and sound) are triggered, provides more opportunities for memories to be stored and knowledge to later be recalled from them.[10]

If the technology in a museum is lacking, then younger students will lose interest. If interest is lost, the information will not be retained, passions may not be found, and positive memories may not flourish. The most effective technological exhibition interaction occurs when students' "thought processes match those required to understand the exhibit."[11] Without technology, understanding becomes more of a one-size-fits-all experience.

It is clear that technology is correlated with positive memories and associations with science museums. Amongst interviews of employees of art, history, children's, science, and

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[7] Constanze Hampp & Stephan Schwan, "The Role of Authentic Objects in Museums of the History of Science and Technology: Findings from a visitor study," *International Journal of Science Education*, Part B. no. 5 (2014): 173.
[8] Koester, "Interactive," 36
[9] J.H. Falk and L.D. Dierking, "School Field Trips: Assessing Their Long-Term Impact," *The Museum Journal 40,* (1997): 212.
[10] Falk, "School," 213
[11] Rennie, "Using," 7

other museums, science employees reported the highest tally of game-like, activity-based problem-solving exhibitions. It was also the only museum type to record a major presence of "computer-networked, multi-user" exhibits.[12]

Memory is essential to education and positive correlation; technology is a gateway to achieving it. This exhibition will display the use of multimedia in science museum history, with a focus on the research displaying its effectiveness in education. It's an exhibition that will link the past to the present, and the present to the future; later in this paper, a virtual reality futuristic exhibition will be discussed. The exhibition targets two groups: children and adults of all ages. The focus for adults is the opportunity to learn about the use of technology throughout time in science museums, as well as where it can be headed. For children, the focus will be on the interactivity of the exhibition itself, more-so than the data and history behind them.

This exhibition will partner with schools and institutions to fertilize learning, as teachers will be taught on ways to incorporate technology into science learning, similarly to the partnership between the Franklin Institute Science Museum and Lawrence Hall of Science in Berkeley have done.[13] Teachers are continually educated in that partnership, and students introduced to a variety of technology in science museums. Workshops will be held to raise awareness of the importance of technology in museums. The Museum of Museums will hold a Technology Gala throughout this exhibition once a year, in an effort to draw donors and academia together to discuss trends and potential funding opportunities at science museums across the globe. Marketing will target parents, emphasizing a learning-based experience with fun integration of multimedia for children.

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[12] Koester, "Interactive," 57-59

[13] Linda Ramey-Gasset, Herbert J. Walberg and Herbert J. Walberg, "Reexamining connections: Museums as science learning environments," (1994): 352.

How has technology changed museums for the better?

The key for museums has been, and will continue to be, finding the balance between technology and physical display. Computers are used either qualitatively or quantitatively or displayed as artifacts themselves.[14]

The "Busytown" exhibition at the Oregon Museum of Science uses computers to cater to both English and Spanish. The Franklin Institute Science Museum's funnels science current events to all twenty of its permanent exhibitions through computers routinely.[15] The Computer Museum in Boston's "Networked Planet" exhibition utilizes four different computerized "guides" that visitors could choose to have narrate their experience – each one from a different concerned viewpoint.[16] This addresses a common museological critique of only presenting one viewpoint.

Furthermore, computers allow museums to update their exhibitions in the real-time. Without them, once an exhibit, even interactive, is stationed, it's often unchangeable. Computers solve that. Combine the ability to edit with the ability to draw from a country-wide museum database – which will be part of an artifact display - and the impact computers can have on developing exhibitions is clear.

We must keep in mind that media in museums' primary purpose is "educating the user."[17] With so many distractions for children, museums "need to engage them in the ways they need."[18] Multimedia has the "power to juxtapose and visually and aurally connect ideas."[19] It forces users

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[14] Ann Mintz, "Media and Museums: A Museum Perspective," in *Virtual and the Real: Media in the Museum,* ed. Selma Thomas and Ann Mintz (Washington DC: American Association of Museums, 1998): **20.**
[15] Mintz, "Media," 22
[16] Mintz, "Media," 26
[17] Mintz, "Media," 28
[18] Lynn D. Dierking and John H. Falk, "Audience and Accessibility" in *Virtual and the Real: Media in the Museum*, ed. Selma Thomas and Ann Mintz (Washington DC: American Association of Museums, 1998): 59.
[19] Dierking, "Audience," 60

to think, to follow a train of thought. It is a relevant complement to helping younger generations understand physical exhibitions.

Visitors expect to be able to interact with artifacts in museums, and media allows users to take their time in doing so. Technology has given museums flexibility due to their adaptability and low number of moving parts to provide visitors that freedom.[20]

Furthermore, technology has allowed museums to digitalize their exhibitions, adding a longevity that wasn't possible before.[21] With only 6% of the Science Museum's collection on display in London, lots is behind closed doors.[22] But with video and interactive databases, museums can focus on preservation of items, knowing visitors can still access former exhibition artifacts online or through technology at the museum.[23]

Given the correlation between technology and successful education, an exhibition devoted entirely to the history, usage, and future of technology and multimedia in science museums is well-deserved. The timing is perfect – we are on the verge of virtual and artificial reality continuing to make entry into new markets, as the technology behind it improves year after year. Technology leads to more extensive memories, and memories lead to more extensive learning. If our visitors can be guided to this understanding *through* the use of technology, *about* technology in science museums, this exhibition could change the way future generations come to appreciate future exhibitions and usages of tech. The goal will be for visitors to utilize technology to construct their own opinions and memories relative to the exhibit, rather than glossing past multimedia. Media has the ability to make a positive impact on both adults and

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[20] Dierking, "Audience," 67
[21] Paul Conway, "Rationale for Digitization and Preservation," in *Museums in a Digital Age,* ed. Ross Parry (London: Routledge, 2006): 369
[22] Hilary Geoghegan and Alison Hess, "Object-Love at the Science Museum: Cultural Geographies of Museum Storerooms," *Cultural Geographies* 22, no. 3 (07, 2015): 447
[23] Conway, "Rationale," 367

children regarding their museum experiences; now is the time to give them the exhibition they need. There is no better time to show the world that museums will not be left in the dust; that not only will they adapt to the world of entertainment and technology, but science museums will follow up on their legacy; they will be at the forefront once again of using technology to change the way people think about museums.

Introduction

Technology is all around us. We all use it, whether we want to or not. Our lives have been, and will continue to be, scripted by its presence.

Science museums have always been tied to its narrative; understandable, given that technology is grouped under science. Beginning in the 1970s, multimedia began to make its way into museums, and has been a staple ever since.

The question for science museums: how, and why, should they use technology in their exhibitions?

Technology, as you will go on to see in this exhibit, can be used in myriad ways. Its usages have been directly correlated to positive memory development. Memories, in turn, are a key to our deep-rooted learning and passions.

Every artifact in this exhibition utilizes technology. The artifact may be a piece of technology itself, or it may be accompanied by a form of multimedia: video, audio, kinesthetic… even virtual reality.

This exhibition will take you on a ride through technology's past, present, and future in science museums. You will understand *why* technology is so crucially important to the curation

and learning experience. You will see different ways in which science museums have utilized technology, as well as theoretical, futuristic ideas for its usage in decades to come.

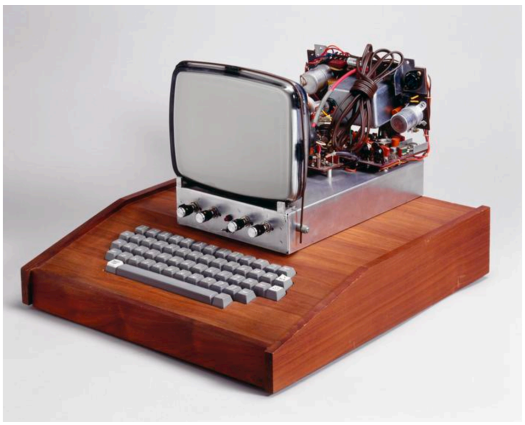
Don't be afraid to throw on a set of Oculus Rift goggles we have waiting for you. Embrace the new; respect the old. Let our differing viewpoints through audio and video challenge your opinions.

In a world where we, as human beings, have more and more ways to spend our time, museums are constantly looking for ways to engage younger audiences. The content of science museums is often marvelous, filled with famous objects and rare exhibits left and right.

Don't be surprised when at the end of it, you have an entirely new appreciation for technology and the benefits it provides, when used the right way.

Objects

The objects on the following pages make up part of the exhibition; they are not the entire exhibition. Rather, they each serve to represent an aspect of technology, past, present, or future, in museums.



Personal Computer, Model Apple I

Gallery: History

1976-1979

Maker: Apple Inc

Present Location: Science Museum London – Making the Modern World

Inventor: Ron Wayne, Steve Jobs, and Steve Wozniak

Medium: Computer

The first computer made by Apple, the Personal Computer laid the foundation for the development of computers, used in both museums and life. It was created in a home garage, utilizing a circuit board accessible to display units and keyboards.[24] Computers have defined the ways in which we operate today; the GPS system to get to this museum, the phones in your pocket, the ticket scanning device on your way in. The headset to your right uses a computer to simulate a visual progression of Apple from this 1977 computer to the 2018 Mac. Give it a try!

[24] Science Museum Group, "Personal Computer, Model Apple I," Science Museum Group

Oculus Rift

Gallery: Futuristic

2014

Maker: Oculus Rift

Inventor: Palmer Luckey

Medium: Prototype

This virtual reality headset was released to the public in 2016, with a new version scheduled for release in 2019. This headset paved the way for modern virtual reality and has dreams to expand. With a 640x800 display resolution, it rivals many high quality cameras. A head tracking sensor notches a user's movements and position. Already being used by pilots to help overcome a phobia of heights, and by scientists to better understand the body, VR is ready to enter the museum space.[25]

[25] Parth Rajesh Desai, "A Review Paper on Oculus Rift - A Virtual Reality Headset," in *International Journal of Engineering Trends and Technology,* (Mumbai: 2014): 175-179

Tandem Artifact Display:

Virtual Museum of Canada

Gallery: History

2001

Maker: Canadian Heritage Information Network (CHIN

Medium: Model

IBM 1401 Mainframe Computer

Gallery: History

1959

Maker: IBM

Medium: Computer

Technology isn't just in London. The Canadian Heritage Information Network (CHIN), formed in 1973, set the groundwork for museum communication. Consisting of more than 100 databases, the network is accessible through terminals and microcomputers. All museums can request information in the databases, and the general public can request information as well. Today it focuses on collection management, digital preservation, and in brainstorming methods of interactive media. The Virtual Museum of Canada was created in 2001, which connects over 600 virtual exhibits and 3,000 museums in an online "museum."[26]Play with a detailed map to see the interconnected museums throughout the country of Canada.

The mainframe computers of the 1960's were the computers of the era when CHIN was formed in 1973. The IBM 1401 is one of the most well-recognized models. Notice the size of this mainframe compared to the mock MacBook display signifying the CHIN Network database of today. Watch the video above to see how computers have transformed from the giant IBM 1401 to the microcomputers and MacBooks we know today.[27], [28]

[26] Computer History Museum, "IBM 1401 Demo Lab," Computer History Museum.
[27] Government of Canada, "Canadian Heritage Information Network," Canada.ca.
[28] Eilean Hooper-Greenhill, "*Museum, media, message*," (London: Routledge, 1999): 87

MeLaβ Interactive Floor

Gallery: Present

2017

Present Location: Frost Science Museum, Miami, Florida, USA

Medium: Floor

Sponsor: Baptist Health

Take a step onto this interactive floor. This artifact uses modern LED lighting and heat sensors to track your feet and show you the energy you're expending.[29] It will show you the modern marvel of technology and how it can be used in museums. What if aquariums used it to give you a "glimpse" into the sea? If an astronomy exhibition used it to allow you to "walk" on the moon and make footprints? The possibilities are endless.

[29] 2019 Phillip and Patricia Frost Museum of Science. "MeLaβ." Frost Science. Accessed March 30, 2019. https://www.frostscience.org/exhibition/melab/.

Display

Memories, Technology, and Experience will be broken down into several rooms.

The exhibition will flow like the Museum of London Docklands, where it's difficult to walk through the entire setup uninhibited. Rather, visitors will be subconsciously encouraged to engage with the variety of technology, taking the time to dabble with virtual reality, the videos, the presentations, and the sound recordings from certain eras. Some artifacts will be preserved behind glass lining the walls; others will be interactive and touchable, in the center of the walkway.

The ***History*** room will focus on multimedia in science museums' past. Items range from computers, radios, and VR headsets to the very wires, high-bandwidth networks, and HDMI cables used to put museum technology together. Each item will be physically present, but as with the entire exhibition, there will be an interactive aspect. Visitors will be able to watch videos of these items in action decades ago in science museums. There will be headsets to listen or watch a narration of item development, progressing from basic A/V cables to modern HDMI and Bluetooth capacities. There will be varied styles of presentations, as well as the MeLaβ interactive floor exhibit, designed for children to walk on, allowing the technology behind the glass to "come to life."

Present: Tech and Memory will be extremely interactive, with physical and virtual memory games lining the walls for kids to partake in. This room will have an interactive exhibit in which kids, and adults, can better understand the processing of memory and thought. For kids, this exhibit will involve videos and an interactive "virtual train," with stops at different parts of the brain, guiding them through the exhibit. The goal of this room is to illuminate why museums are important to fostering learning, while cultivating thought…about thought.

Futuristic Museum will focus on just that: future concepts of technology in museums, emphasizing virtual reality. This room will have portraits of important people in science history lining the walls, with a photo of their work space, or home. An Oculus Rift will accompany each exhibit, and the visitor will be able to step into the work study or office and listen to a virtual "Einstein" or "Wright Brother" detail their respective fields through a pre-recorded voiceover and CGI combination. The user won't be able to converse directly with them, but will get an encompassing 360-degree view of the time period. Designated spaces in the center will allow mobility for usage of the goggles.

Given the Museum of Museums' focus on a variety of museums, it is respectful to include a room relative to other types of museums. An additional aspect of *Futuristic Museum* will have potential uses of virtual reality for exhibitions within other museums. One artifact will be a sized-down replica of a dinosaur fossil in the Natural History Museum, only it will be accompanied by an Oculus Rift that allows the dinosaur to come to life, breaking free from its fossils and running into its wilderness. There will be a reference to the National Portrait Gallery's War General Room. Several portraits will be hanging on the walls, but the goggles will allow visitors to get a look at a Captain's quarters, or "watch" a CGI-developed conversation between a General and his soldiers. These rooms would show how technology can not only help develop science museums' curation, but others as well.

The flow of the exhibition will be chronological – from past, to present, to future. The choice to include interactive displays with every artifact is a tribute to the importance of technology in museum curation.

Virtual reality is already being used in "medicine, education, and cultural heritage." With many museums unable to display their entire collection, VR can be a future solution.[30]

Granted, there have been some critiques of virtual reality usage in museums. VR is expensive, and as technology continually improves, it can become outdated. Furthermore, academics do not want museums to turn into entertainment hubs, with education and preservation losing relevance.[31]

Through our proposed partnership with Oculus Rift, VR will be continually updated. Oculus Rift will be at the forefront of a daring, progressive exhibition, in exchange for a discounted rate. Our exhibits will still have original artifacts, and the interactive displays and floors will be tangible. As such, it will continually be an experience that visitors need to physically be in a museum for. Visitor Education will become more dynamic, and preservation will still be a core value.

The experience is what a visitor makes of it. Artifacts from the past, present, and future of technology in science museums, combined with an understanding of technology's impact on memories and learning, will leave visitors with a renewed sense of interest and passion for science, museums, and technology. Multimedia will accompany every artifact, thus stimulating the senses and generating critical thinking for all ages. Technology is the future. *Memories, Technology, and Experience* will be what opens the door for science museums to be an integral part of it.

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[30] Rafal Wojciechowski, Kyzystof Walczak, Martin White and Wojciech Cellary, "Building Virtual and Augmented Reality museum exhibitions," In *Proceedings of the ninth international conference on 3D Web technology (New York: ACM, 2004:* 135.

[31] "How Can Museums Use Virtual Reality?" Video file, MuseumNext, (2017)

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