THE DIGITAL STAGE

Horizon Scan
Future Context of Performing Arts

**PREPARED FOR CANADIAN OPERA COMPANY,
NATIONAL BALLET OF CANADA, SCREEN INDUSTRIES RESEARCH
AND TRAINING CENTRE (SIRT) AT SHERIDAN COLLEGE**

Project Mandate
It is the responsibility of our combined organizations to provide technology leadership within the greater arts community and to collectively facilitate a collaborative learning environment that benefits everyone. We fully intend to use our institutional influence to create connections with the technology sector and provide access to smaller organizations and individual artists.
From Digital Stage Project Mandate

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Image Patterns by KerrSmith Design
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Foreword

The following document is intended to give you a wider contextual under-standing of potential external changes that may have an impact on Canadi-an society, and the evolution of digital technology and its intersection with the performing arts in this country as we attempted to answer this research question:

"How might the Digital Stage evolve and what will be the impact on Performing Arts in Canada?"

We identified seven major Drivers of Change and organized this document under the themes of :
• Creating Performing Arts
• Presenting Performing Arts
• Receiving Performing Arts
• EcoSystem of the Performing arts

This information was distilled from a broad and structured literature review. We appreciate you taking the time to read through this dossier and welcome your comments and elaborations.

Helen Kerr
President, KerrSmith
Project Lead

Introduction

INTRODUCTION

Setting the Stage:
Seven Major Drivers of Change

Before looking at signals of change on the horizon of our current practices, it is important to understand what is underpinning those changes. Drivers of Change are the slow moving and deep forces that shape the direction of change in our world. Because they are at play over long periods and across wide areas of concern, there is less uncertainty about their existence and potential impact. The implications of these factors may unfold in many ways and across multiple domains. They are as relevant for the future of transportation or electoral reform as they are to emerging notions of the performing arts and form the contextual basis of this study.

1. Demographic Changes
Seniors are projected to become more numerous than children in Canada by 2017—a milestone in the country's history. The proportion of seniors within the population has been steadily growing since 1960, increasing from 8% at that time to 14% in 2009. According to all population projection scenarios, seniors are expected to comprise around 23% to 25% of the population by 2036, and around 24% to 28% in 2061. In 1971, the median age of the population was 26.2 years—it was 39.5 years in 2009. The population's median age is projected to continue rising to between 42 and 45 years by 2036, and then to between 42 and 47 years by 2061.

2. Multicultural Canada
In recent times, the contribution of natural increase to population growth has waned as the Canadian population aged and fertility rates declined. Today, natural increase accounts for less than one-third of Canada's population growth and has ceased to be the major player in the equation. Meanwhile, migratory increase plays an increasing role in Canada's population growth. Migratory increase currently accounts for about two-thirds of Canada's population growth. Statistics Canada projects that immigration will not only continue to be a key driver of population growth in the coming years— without it, Canada's population growth could be close to zero in 20 years, as the population continues to age and fertility rates projected to remain below the replacement level of 2.1 children per woman.

3. Reconciliation

The cumulative impact of residential schools is a legacy of unresolved trauma passed from generation to generation and has had a profound effect on the relationship between Aboriginal peoples and other Canadians.

Collective efforts from all peoples are necessary to revitalize the relationship between Aboriginal peoples and Canadian society – reconciliation is the goal. It is a goal that will take the commitment of multiple generations but when it is achieved, when we have reconciliation - it will make for a better, stronger Canada.

4. Urbanization

Today, 55% of the world's population lives in urban areas, a proportion that is expected to increase to 68% by 2050. Projections show that urbanization, the gradual shift in residence of the human population from rural to urban areas, combined with the overall growth of the world's population could add another 2.5 billion people to urban areas by 2050, with close to 90% of this increase taking place in Asia and Africa, according to a new United Nations data set launched today.

5. Rapid Tech Advancement

The unprecedented speed of change, as well as the breadth and the depth of many radical changes unleashed by new digital, robotic and 3D technologies, is having major impacts on what we produce and do, how and where we do it and indeed how we earn a living. And while the transformation will proceed differently in advanced and developing parts of the world, no country or market will be spared from the tidal wave of change.

Artificial Intelligence in particular will make a mark. "The McKinsey Global Institute separates AI into five broad categories: computer vision, natural language, virtual assistants, robotic process automation, and advanced machine learning. The research institute predicts that by 2030, 70 percent of companies might have adopted at least one type of the AI technologies listed above."

6. Automation

We know that robots are taking over thousands of routine tasks and will eliminate many low-skill jobs in advanced economies and developing countries. At the same time, technology is creating opportunities, paving the way for new and altered jobs, increasing productivity, and improving the delivery of public services. When we consider the scope of the challenge to prepare for the future of work, it is important to understand that many children currently in primary school will work in jobs as adults that do not even exist today.

7. Climate Crisis

Climate change is a long-term shift in the average weather conditions of a region, such as its typical temperature, rainfall, and windiness. Climate change means that the range of conditions expected in many regions will change over the coming decades. This means that there will also be changes in extreme conditions.

  ...Climate change is already causing impacts on human and natural systems in Canada and around the world. Further changes are inevitable, with larger changes projected for higher emission scenarios. Depending on the region, changes projected for Canada include: higher temperatures, shifts in precipitation patterns, more frequent and intense heat waves, fewer cold snaps, rising sea level.

  More frequent and severe extreme events, such as floods, droughts and wildfire are also a risk.

Digging Deeper
Signals of Change and Shifts

Our Methodology

We used the research question "How might the Digital Stage evolve and what will be the impact on Performing Arts in Canada?" as a frame to gather evidence in the form of weak Signals of Change and emergent data from a broad range of sources, both scholarly and popular. Our methodology was coherent with Foresight approaches. We framed our scan by the generalized but encompassing categories of change in Society, Technology, Economy, Ecology, Politics, law and Values (STEEPV). As we moved through the process, we made every effort to eliminate bias. We used filters and questions to see whether any given Signal was validated or negated compared to our original information capture. We expanded our decision-making in terms of Signals from the original STEEPV categories to clusters of concepts related to patterns of emerging directional Shifts we observed. We described those directional currents within a set of four major clusters each with four strong examples that we believe are important to the future, specific to the performing arts and more generally to society at large.

In order for information to be included in our summation, it had to fulfill three criteria:

1. Was it resonating at different scales? (globally, nationally, locally, organizationally)

This allowed us to confirm that the issue identified was of importance to the primary research question.

2. Did it resonate in different sectors?

This let us understand the scope of impact.

3. Did it transcend cultures/societies/demographics?

This ensured that we were not simply confirming our own biases.

Here follows the research overview organized according to the major Shift categories we observed.
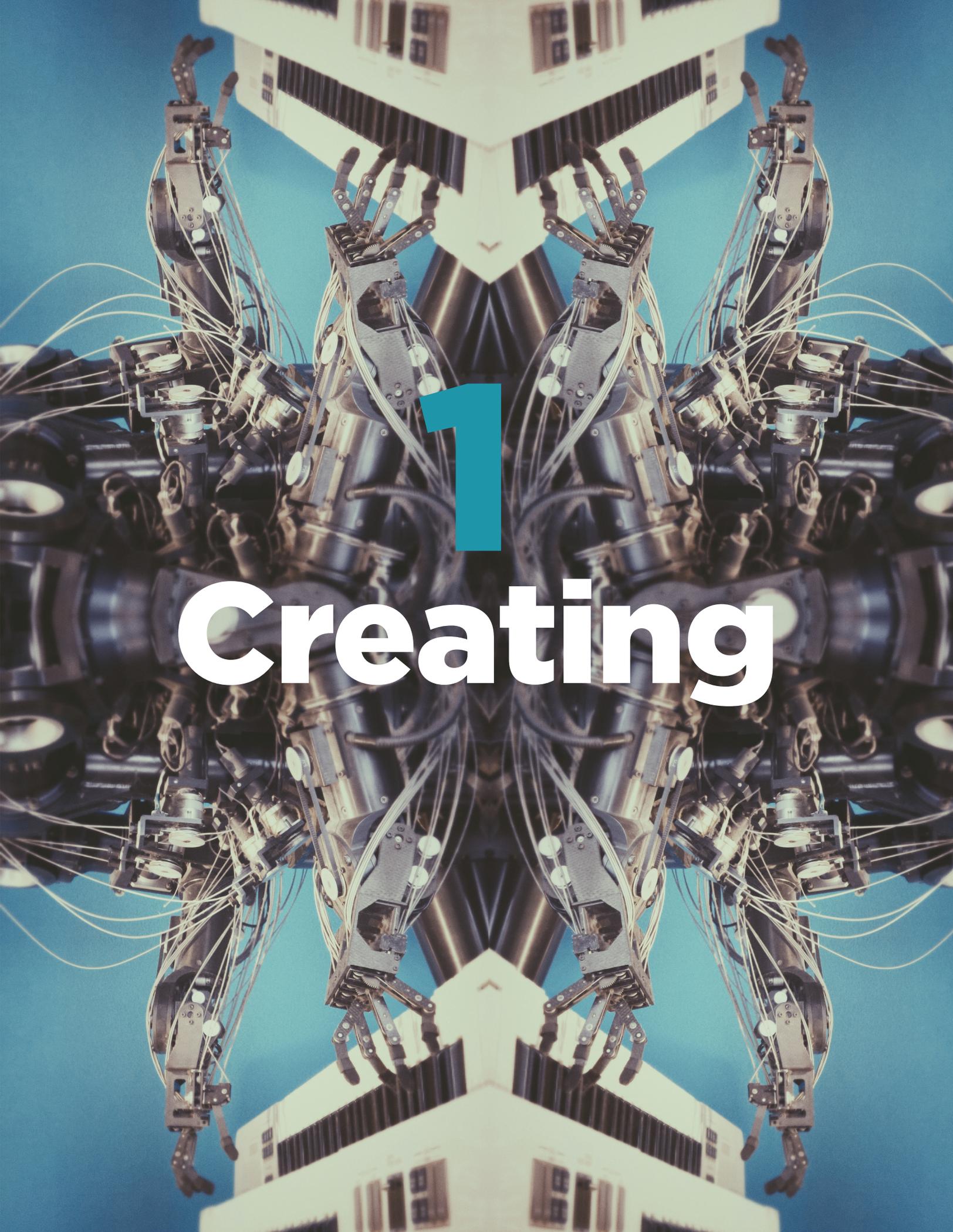
1
Creating

1

Creating Performing Arts

Radical changes to our understanding of human creativity and the limits of physical performance will alter music, theatre, dance and vocal expression. Identity becomes more complex, especially as artificial manifestations are more common-place.

1.1 Humans Plus

Using both genetic enhancement and wearable augmentation, humans are able to reinvent their physical capacities in ways previously unimaginable, even a decade ago. Outperforming their innate abilities may be a significant motivation for those who wish to reach a pinnacle within their field. Better bodies may improve our ability to project vocally, to attune pitch, to leap higher, to perform longer, to see more clearly and to sense space with greater refinement.

Continuous monitoring of well-being is also possible with internal tracking at a cellular level that allows ongoing intervention. We will live longer active lives enhanced by supportive medical intervention and devices such as integrated exoskeletal robotics that assist our abilities to move, lift and complete precision tasks.

Ethical questions will arise as procedures and enhancements become available only to those with the financial means to access them, or as competitive circumstances push adoption of potentially dangerous treatments for those who feel the need to excel. As we confirm that many talents have a genetic basis, there will be incentive to modify our DNA to meet our ideals.

Implication for performing arts

- Physical abilities are optimized for those able to afford it
- Extended careers for those who are enhanced and opportunities for those who might not have previously qualified.

1 CREATING PERFORMING ARTS

1.1 Humans Plus: Evidence

"Wearable interactive technology is an essential component in enabling human augmentation. It offers a seamless integration with the physical and digital world around us. It can empower the user with non-invasive and easy to use extensions to interact with smart objects and augmented information of the hybrid physical-virtual world of the future. Human augmentation will serve the user by providing essential, timely information for current tasks and filtering out unnecessary information.

… A recent survey (Whitman, 2018) on attitudes towards human enhancement technologies positioned different technologies along a 5-step continuum of use: 1) therapeutic use to restore ability, 2) prevention when there is a known risk or relevant family history, 3) prevention when no known risk or family history is apparent, 4) enhancement beyond the ability one would normally have, and 5) enhancement greatly beyond normal. The results showed that 95% of respondents supported physical restorative applications. Technological aids for individuals with lower capacities due to age or illness would serve as a critical support mechanism ensuring that the deterioration of senses does not limit the ability to function in the society. The Western, Japanese and Chinese populations are aging fast. As disability rates increase with age, there is an urgent need to find new ways to cope with and fight against age-related disabilities. The proposed human augmentation can potentially push the retirement age further and enable better and longer independent living. It should be noted that technological augmentation does not solve all problems; people still need to take care of their physical and psychological wellbeing by eating well, exercising and resting.

… Human beings have always been striving to improve their natural abilities. This need to evolve has shaped human development and what it means to be human. However, gradual natural evolution may soon take a backseat as human beings take control of their own future. We as a species are now more capable of altering and enhancing ourselves than ever before. The need to be stronger, faster, and smarter has contributed to a vast number of scientific developments. A large number of technologies from gene therapy to exoskeleton attachments and from brain-computer interfaces to having the entire global repository of information at one's fingertips can soon enhance and alter our abilities. Some of these technologies are still in their infancy and need to mature over time. However, many technologies can already be integrated to augment core human abilities.

At the moment, most of these technologies are used independently with little to no fusion. As demonstrated in this paper, creating an integrated, intelligent wearable system is the next essential step in the progression of augmenting human abilities. The once diversified technologies with variable use cases are now coalescing into a robust framework that lays the foundation for the Augmented Human of the future. This advancement will revolutionize the meaning of being human. However, due to ethical issues related to such augmentation, regulation as well as international standards and guidelines are essential for ensuring privacy, universal access, etc. to such technologies. Augmentation technology should not only enhance the well-being and quality of life of an individual but also have positive effects on the community and society.

Raisamo, R., Rakkolainen, I., Majaranta, P., Salminen, K., Rantala, J., & Farooq, A. (2019). *Human augmentation: Past, present and future. International Journal Of Human-Computer Studies*, 131, 131-143. https://doi.org/10.1016/j.ijhcs.2019.05.008

"CRISPR is a revolutionary tool that enables scientists to edit genetic sequences with extreme precision. It works as a two-part machine: a molecular address (the CRISPR "guide") and a scissor-like protein (Cas9) that, when delivered into a cell, searches the genome for a unique DNA sequence. Once found, the CRISPR machinery makes cuts and nicks in the DNA that permanently alter the cell's genetic makeup. This ability, combined with our ever-increasing understanding of how DNA determines who we are, has seemingly unlimited potential.

As demonstrated by its success in animals, CRISPR will be a godsend for those with genetic conditions. Reversing deafness, curing genetic blindness, relieving symptoms of sickle cell anemia: the results in mice have been extraordinary. With human trials already underway in China, and several slated to start in Europe and the US this year, researchers from around the world are now tackling diseases long-thought to be incurable.

1 CREATING PERFORMING ARTS

1.1 Humans Plus: Evidence (Cont')

But like other great scientific advances before it, there are people who wish to take CRISPR out of the clinic and use it to make themselves better in some way. Many belong to a community of biohackers, and they have a reputation for using technology in new and unconventional ways.

"Borrowing from the traditional hacking ethos, biohackers often ignore established safety measures and scientific mores while advocating for the democratization of science. The movement ranges from the innocuous DIY biologist of Brooklyn, performing modest experiments to promote science literacy, to the more extreme cyberpunks and grinders that advocate using technology to improve natural human capabilities.

A proponent of using biotechnology to improve oneself, Josiah Zayner is the CEO-founder of The Odin, a company that sells DIY CRISPR kits online. Having obtained his Ph.D. from the University of Chicago in biophysics, he is certainly no scientific outsider. Yet his attitude toward science is steadfastly that of a biohacker, stating on his blog, "I am sure many people will try and dismiss this as unscientific or how clinical trials will need to be run. The problem is that old world is dead."

And while it's tempting to dismiss him, there is increasing evidence that he is not the only one that thinks this way. In the past couple years, two other biotech CEOs, Liz Parrish and Brian Hanley, have made news by receiving gene-based anti-aging therapy, paving the way for further self-experimentation using CRISPR.

…While there are many hurdles to using CRISPR on humans (for any purpose), those issues will likely be resolved one day, which would present serious ethical dilemmas (Figure 2). Should it be legal to edit your own genome? Moreover, is it moral? And what if the ability to edit oneself is prohibitively expensive (à la plastic surgery)? It is easy to imagine a world where only the rich can alter their genomes or those of their children. Do you want to be especially smart, strong, or good-looking? Pay up."

Griffin, P. (2019). *Edit Thyself: Biohacking in the age of CRISPR – Science in the News. S*cience in the News. Retrieved from http://sitn.hms.harvard.edu/flash/2018/edit-thyself-biohacking-age-crispr/.

"Similar to general musical talent, it has long been described that AP (absolute pitch) runs in families, and there are several groups (Ashkenazi Jewish, for example) with much higher rates of AP than the general population. For instance, in 2001 Gregersen et al. found that Chinese, Korean, and Japanese music students had a significantly higher incidence of AP (47.5%) compared to Caucasian students (9%). But again, these associations lack for controlled studies of how and when AP develops, so whether this trend is indicative of inheritance is speculative.

…Another study found a genetic link between AP and synesthesia in a cohort of 768 subjects with self-documented AP. Synesthesia is a rare cognitive trait in which the stimulation of one sensory pathway leads to the involuntary stimulation of a second sensory pathway. The most common form links sound and color, although sound and taste are also described. Like AP, synesthesia runs in families. Gregersen et al. found 20% of their AP cohort also experienced synesthesia, which is significantly enriched compared to the general population (estimated at $0.2 - 0.005\%$). Here, the researchers linked the presence of both traits to a region on chromosome 6q that encodes 73 genes, including several with roles in neurodevelopment. However, more fine-grained analysis is needed to determine if any of these genes significantly impact either trait."

Cassidy, S. (2018). *The complex genetics of musical talent.* The Jackson Laboratory. Retrieved from https://www.jax.org/news-and-insights/jax-blog/2018/may/complex-genetics-of-musical-talent.

"Cutting-edge biomedical technologies that could push the boundaries of human abilities may soon be available, making people's minds sharper and their bodies stronger and healthier than ever before. But a new Pew Research Center survey of U.S. adults shows that majorities greet the possibility of these breakthroughs with more wariness and worry than enthusiasm and hope…Majorities of U.S. adults say they would be "very" or "somewhat" worried about gene editing (68%), brain chips (69%) and synthetic blood (63%), while no more than half say they would be enthusiastic about each of these developments."

Funk, C., Kennedy, B., & Podrebarac Sciupac, E. (2016, July 26). U.S. Public Wary About Use of Biomedical Technology for Human Enhancement. Retrieved from http://www.pewinternet.org/2016/07/26/u-s-public-wary-ofbiomedical-technologies-to-enhance-human-abilities/

1 CREATING PERFORMING ARTS

1.1 Humans Plus: Evidence (Cont')

"Over the past few years, Profusa Inc has been developing tiny biosensors that get injected under the skin, and then provide the user with health information via their smartphone. The technology was recently approved for marketing in Europe, with US approval possibly following soon.

Each sensor is smaller than a grain of rice, has a scaffold-like structure, and is made of a hydrogel based on a polymer commonly used for soft contact lenses. That polymer is festooned with dye molecules.

Due to their small size, high flexibility, and the fact that they lack any unnatural flat surfaces, the sensors aren't recognized by the immune system as foreign objects. As a result, they don't get covered in inflammatory cells or scar tissue, which would isolate them and keep them from detecting chemical changes in the body. Instead, cells and capillaries actually grow into the sensors' scaffolding, incorporating them into the surrounding tissue.

The sensors subsequently remain active for a period of months to years – in fact, the first sensors implanted in human test subjects are still functioning after over four years.

To "read" them, users utilize a handheld detector or an adhesive electronic patch, which shines near-infrared light through the skin. This causes the dye molecules to fluoresce. The degree to which they fluoresce is determined by relative concentrations of certain biochemicals within the body – different types of dye molecules react to different chemicals, such as oxygen, carbon dioxide, glucose or lactate.

…In Europe, the sensors are already being used to monitor tissue oxygen levels in patients being treated for peripheral artery disease, which can lead to amputations if left unchecked. The technology is also being tested in a clinical trial at the University of California, San Francisco, tracking oxygen levels in patients with chronic foot wounds.

The sensors could additionally be used to monitor oxygen levels around muscles to assess peoples' fitness levels, and to help athletes train more effectively. They may also find use with US Army, which has expressed an interest in using the technology to remotely monitor the well-being of soldiers, and to help in the triage process on battlefields."

Coxworth, B. (2018). *Health-monitoring implants edge closer to common use*. New Atlas. Retrieved from https://newatlas.com/profusa-health-monitoring-biosensors/53870/.

"Scientists at Princeton University have designed a bionic ear that can hear better than human ears. And get this: It was printed using an off-the-shelf 3D printer.

We've heard of 3D printers someday building human organs before, but what's noteworthy about this project is this printed ear intertwines embedded electronics. These Princeton researchers basically 3D-printed cells and nanoparticles, and then combined a small coil antenna with cartilage to create this "bionic" ear, according to the university.

The result was a fully-functional organ that can hear radio frequencies a million times higher than our human ears, lead researcher Michael McAlpine told Mashable.

"The way that our ear hears now is we pick up acoustic signals and then we convert those into electrical signals that go to our brain," said McAlpine, who is an assistant professor of mechanical and aerospace engineering at Princeton. "What this ear does is it has this electronic coil on it and it picks up electronic signals directly." McAlpine said he and his research team basically wanted to ask the question of whether they could grow an organ in a petri dish, with the electronics intertwined into the organ as it grew. Their successful project used a $1,000 3D printer to print the cells with the electronics (see video below). The "ear" was then put in a dish so the cells could culture for 10 weeks into cartilage tissue.

Creating this bionic ear was not really intended for those who are deaf or don't have ears, McAlpine said, but rather: "The idea of this was: can you take a normal, healthy, average human and give them superpower that they wouldn't normally have?"

Ramachandran, V. (2013). *3D-Printed 'Bionic' Ear Can Hear Beyond Human Ability. Mashable.* Retrieved from https://mashable.com/2013/05/24/3d-printed-ear-princeton/.

1 CREATING PERFORMING ARTS

1.1 Humans Plus: Evidence (Cont')

"Medical innovations have already saved the lives of millions of people. My working lifetime saw the introduction of CT and other imaging, non-invasive surgery, and endoscopy made possible by fibreoptics and cameras on microchips. In the UK more than 300,000 cataract replacements are performed each year inserting an artificial lens into the eye. The near future will probably see the wide application of smart health monitors, brain stimulators, replacement organs grown in the laboratory or in donor animals, artificial intelligence to diagnose and treat disease, and nanomedibots in the bloodstream programmed to search out and destroy harmful viruses and cancers."

Goldhill, D. (2018). *The first person to live to be 1,000 years old is alive today – this is how.* The Independent. Retrieved from https://www.independent.co.uk/news/long_reads/live-longer-longevity-stem-cells-ageing-a8332701.html.

1.2 Unreal (Feels Real)

What began as efforts to craft more realistic animated gaming characters is evolving into synthetic human avatars able to interface convincingly while adapting to function with proficient computer aided capacity using machine learning. As creators access all digital technology available to them, the lure of performers that can look, sound and physically act exactly as proscribed may prove irresistible. Control over the presentation of one's storytelling vision may be more comprehensive than ever before.

At a minimum, digital guidance as a learning approach that can be endlessly repeated has the potential to deliver high quality mentoring and coaching service to anyone with a smartphone. Previsualization may include more detailed components as artificial humans are inserted into a run through to comprehensively represent the action of the event. Special effects are now synthetically created using the analytic capacity of machine learning to filter from a wide array of inputs. Costs and time for production are dramatically reduced.

Beyond "deep fakes" that tamper with reality, NEON are computationally created virtual human beings that look and behave like real people, with the ability to show emotions and intelligence. While still in the development phase, these personas created by Samsung subsidiary STARlabs, are expected to take on real world service jobs involving interaction with human customers or performative roles such as information sharing. In an effort to encourage deep interpersonal connection online, Facebook has been developing convincingly realistic portrayals of user's facial animation through machine learning and advanced sensing technology.

While early adoption of these approaches has been in film, TV and the online world, the ecosystem of performing arts is not immune to the incorporation of artificial humans. There will be ethical implications beyond job loss or ownership of scanned personal likenesses when the activities of computationally constructed entities are indistinguishable from real people.

Implication for performing arts
- Potential for non-human roles in performance, professional training with digital "masters"
- Service provision at venues such as ticketing, marketing and promotions without days off
- Multiple productions on tour simultaneously in multiple languages

1.2 Unreal (Feel Real) : Evidence

"Thanks to funding from the UK government's Audience of the Future programme, Maze Theory will be leading development on a virtual reality game based on the BBC show Peaky Blinders. As CEO Ian Hambleton explains, the use of "AI narrative characters" promises a brand new experience. "For example, if you get really aggressive and in the face of a character, they will react; and they will change not only what they're saying, but their body language, their facial expressions," he says. An AI "black box" will ultimately drive the performances.

Could we one day see aesthetically convincing digital humans combined with the AI-driven virtual humans to produce entirely artificial actors? That, theoretically, could lead to performances without the need for human actors at all. Yuri Lowenthal, an actor whose work includes the title role in PS4 game Spider-Man, wonders: "Your everyday person is not in the business of voluntarily having their data captured on a large-scale like I am. When people record all the data from my performances, and details of my face and my voice, what does the future look like? How long will it be before you could create a performance out of nothing?"

Kemp, L. (2019). *In the age of deepfakes, could virtual actors put humans out of business?*. the Guardian. Retrieved from https://www.theguardian.com/film/2019/jul/03/in-the-age-of-deepfakes-could-virtual-actors-put-humans-out-of-business.

"With an AI based learning system that has already started creating its own expressions and conversations beyond what was originally recorded, NEON is clearly demonstrating the potential for dramatic and dynamic human representations. Want to simulate an angry co-worker or scared patient in real-time with hyper realistic features and independent thoughts? NEON suggests that one day we can!

Each Neon avatar is "computationally generated" and will hold conversations with users while displaying "emotions and intelligence," says the company. Their likenesses are modeled after real humans, but have newly generated "expressions, dialogs, and emotion." Each avatar (known individually as "NEONs") can be customized for different tasks, and is able to respond to queries "with latency of less than a few milliseconds."

They're not intended to be just visual skins for AI assistants, but put to more varying uses instead: "In the near future, one will be able to license or subscribe to a NEON as a service representative, a financial advisor, a healthcare provider, or a concierge. Over time, NEONs will work as TV anchors, spokespeople, or movie actors; or they can simply be companions and friends."

Baily, L. (2020). *CES Showcases Future Technologies Which Will Impact Clinical Simulation | HealthySimulation.com.* HealthySimulation.com. Retrieved from https://www.healthysimulation.com/22210/ces-medical-simulation/.

"…And thanks to advances in artificial intelligence and processing power, technology companies now say they are at the point where they can create photo-realistic imitations of human beings that can move, talk and smile with such authenticity that it is impossible to tell they are computer-generated.

…But while deepfakes involve taking a video and altering it, often for sinister reasons, synthetic humans represent a new type of challenge, because they are completely artificially generated.

Oren Aharon, the chief executive of Hour One, a company that generates synthetic avatars for use in advertising and ecommerce, says neither humans nor deepfake detection technology can discern its videos from the real thing.

A subject's likeness is captured in a studio in a process taking 20 minutes and, from there, AI can generate new videos of the person realistically speaking, laughing and making facial expressions, merely by feeding it text and configuring a personality. The company says it eventually wants the process to take two minutes using a consumer smartphone.

"We think it's already past the Turing Test," says Aharon, referring to the challenge posed by Alan Turing of fooling an observer into thinking a robot was human.

Titcomb, J., Field, M., & Hoggins, T. (2020). *The age of the virtual human is here – are we prepared?*. The Telegraph. Retrieved from https://www.telegraph.co.uk/technology/2020/01/07/age-virtual-human-prepared/.

1 CREATING PERFORMING ARTS

1.2 Unreal (Feel Real) : Evidence (Cont')

"Facebook Reality Labs has created a system capable of animating virtual avatars in real-time with unprecedented fidelity from compact hardware. From just three standard cameras inside the headset, which capture the user's eyes and mouth, the system is able to represent the nuances of a specific individual's complex face gestures more accurately than previous methods."

Lang, B. (2019). *Facebook Publishes New Research on Hyper-realistic Virtual Avatars. Road to VR.* Retrieved from https://www.roadtovr.com/facebook-expands-on-hyper-realistic-virtual-avatar-research/.

"To start, we're working to enable an even deeper sense of connection in VR than today's 2D technologies provide. Our goal is to make virtual interactions feel as natural as in-person interactions. We call this "social presence." It's the 3D-enabled feeling that you're physically sharing the same space with someone else, even though you may be miles apart — and that you can communicate your ideas and emotions seamlessly and effortlessly. To accomplish that in VR, you need lifelike avatars — virtual stand-ins that faithfully reproduce your facial expressions, gestures, and your voice.

Introducing full-body Codec Avatars

Earlier this year, we shared our research on Codec Avatars — incredibly lifelike digital representations of the heads of real people. These avatars can be animated in real time, opening the way for effortless, live, unscripted interaction in VR. The ability for two people to communicate via their photorealistic avatars in VR as naturally as they would if they were in the same physical room is a first.

In this video, sensors in Technical Program Manager Danielle Belko's and Research Science Director Yaser Sheikh's headsets measure their facial expressions. These measurements are then translated in real-time into audio and visual signals they perceive as a picture-perfect representation of the other person's likeness, movements, and voice.

However, enabling true social presence requires more than just heads. Body language is critical to our ability to communicate. That's why today we're introducing full-body Codec Avatars. While you won't find this technology in a consumer product anytime soon, we imagine a future where people will be able to create ultra-realistic avatars of themselves with just a few quick snaps of their phone cameras and animate them via their headsets. And that future will usher in a new wave of fully immersive VR."

Inside Facebook Reality Labs: Research updates and the future of social connection. Facebook Technology. (2019). Retrieved from https://tech.fb.com/inside-facebook-reality-labs-research-updates-and-the-future-of-social-connection/.

"One of the most exciting ways A.I. is changing film production involves computer-generated imagery, or CGI. While the motion-capture suit has long been Hollywood's favorite tool for creating CGI characters that mirror the movements of real actors, motion-capture technology provides VFX artists only with basic visual reference points. At Los Angeles-based production company Digital Domain, co-founded by Titanic director James Cameron in 1993, VFX artists are using proprietary A.I. to incorporate humans into the design of their CGI characters much more efficiently.

"We can actually take actors' performances--and especially facial performances--and exactly transfer them to digital characters," says Darren Hendler, director of Digital Domain's appropriately titled Digital Human Group, a division the company created just last year. "In the past, doing that would have required building a full CG version of the actor's head and getting it to look photo-real.""

Winfrey, G. (2018). *4 Fascinating Technologies Remaking Hollywood Behind the Scenes.* Inc.com. Retrieved from https://www.inc.com/graham-winfrey/4-fascinating-technologies-remaking-hollywood-artificial-intelligence.html.

1 CREATING PERFORMING ARTS

1.2 Unreal (Feel Real) : Evidence (Cont')

"With traditional software systems, there is an implicit expectation that the user interface and behavior of a system is the same every time one uses the system (any changes via update or upgrade are usually known in advance). However, this expectation could change when the user interface is an artificial person. Would we not expect an agent, such as Nadia, to remember us, learn about us and over time adjust her behavior between interactions in ways that we would expect from a real person? In other words, the question arises, if, and under what circumstances, a VCA (visual cognitive agent) should accommodate building relationships with users over time, rather than merely engaging in a series of isolated, transactional interactions as if they were starting over each time.

… As we contemplate the implications of visual cognitive agents becoming widely available in everyday contexts, we argue that we will have to engage with questions about the effects such agents will have for our own self-understanding. We suggest that the creation of artificial human entities will raise quite profound ethical and existential questions.

…As such, we will be able to ask questions about the being of a VCA, such as Nadia, when relationally involved with particular users, whereby the VCA might become different things to different people, such as a useful advisor, a trusted companion, or a mere nuisance, depending on "her" involvement in a particular user world. Equally, we suggest that interaction with such artificial humans might also change or challenge us in quite existential ways, in that previously stable professional and personal identities become renegotiated. For example, we might have to ask, does it matter how we treat our agents? Will this reflect badly on us? What does it say about us if we choose one kind of agent as a personal assistant over another? Will there be new social conventions or norms that organize our collective lives with visual cognitive agents once they become ever-present on our mobile devices? And what happens if we go to a friend's house who maintains a relationship with the same agent, will he/she recognize us, and should they? Will there be a sociality of agents? Moreover, will it be appropriate to "own" these agents in conventional ways? Will a corporation that provides a VCA be allowed to change his/her appearance at will, or even decommission agents when they have already become integral parts of peoples' lives in quite existential ways? Will users rebel? Will there be a new ethics covering the "lives" of VCAs? Similarly, will advanced VCAs be recognized as a legal entity with certain rights and liabilities when carrying out certain tasks autonomously?"

Seymour, M., Riemer, K., & Kay, J. (2020). *Actors, Avatars and Agents: Potentials and Implications of Natural Face Technology for the Creation of Realistic Visual Presence.* AIS Electronic Library (AISeL). Retrieved from https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1832&context=jais.

1.3 AI Artists

Despite "future of work" assurances that creative and cultural content development is resistant to mechanization, we are rapidly programming those capabilities into devices. Sometimes we cannot detect their presence at all.

Beyond assistance from smart computers, technology has been trained to perform creative acts previously deemed impossible and unimaginable. In earlier versions, output was novel but not remarkably artistic. However, the latest versions of machine learning enabled technology have achieved levels of sophistication that surpass many human skills. Current examples are in visual arts and written content with some nascent musical works, in part because the underlying rules of grammar and style for writing, and perspective and colour parameters for visual works are more clearly determined. It is unlikely that this trajectory will slow down, especially because we like the results, if not the implications for our jobs.

It is now possible to imagine a competent and compelling work of art authored by AI, given creative characteristics by AI, performed using AI and, ultimately, efficiently distributed using AI. Where does this leave us as human creators? Perhaps machine-human, collaboration is part our next reality.

Implication for performing arts

- Across the board intersection of creation with machine learning
- Ownership of copyright is murky
- Does audience push back against machine generated art?

Artificial Intelligence (AI)

"Artificial intelligence (AI) is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using rules to reach approximate or definite conclusions) and self-correction." *

*Rouse, M. What is AI (artificial intelligence)? (n.d.) In *WhatIs.com.*

1.3 AI Artists: Evidence

"The images are huge and square and harrowing: a form, reminiscent of a face, engulfed in fiery red-and-yellow currents; a head emerging from a cape collared with glitchy feathers, from which a shape suggestive of a hand protrudes; a heap of gold and scarlet mottles, convincing as fabric, propping up a face with grievous, angular features. These are part of "Faceless Portraits Transcending Time," an exhibition of prints recently shown at the HG Contemporary gallery in Chelsea, the epicenter of New York's contemporary-art world. All of them were created by a computer.

Metz, R. (2019). *This AI is so good at writing that its creators won't let you use it.* CNN. Retrieved from https://www.cnn.com/2019/02/18/tech/dangerous-ai-text-generator/index.html.

The catalog calls the show a "collaboration between an artificial intelligence named AICAN and its creator, Dr. Ahmed Elgammal," a move meant to spotlight, and anthropomorphize, the machine-learning algorithm that did most of the work. According to HG Contemporary, it's the first solo gallery exhibit devoted to an AI artist.

… Bystanders in and out of the art world were shocked. The print had never been shown in galleries or exhibitions before coming to market at auction, a channel usually reserved for established work. The winning bid was made anonymously by telephone, raising some eyebrows; art auctions can invite price manipulation. It was created by a computer program that generates new images based on patterns in a body of existing work, whose features the AI "learns." What's more, the artists who trained and generated the work, the French collective Obvious, hadn't even written the algorithm or the training set. They just downloaded them, made some tweaks, and sent the results to market.

"We gave the machine images of art, labeled by style—Renaissance, Baroque, realism, impressionism, and so on—and the machine figured out the chronology," Elgammal said. It's a remarkable accomplishment that could upend the belief that artistic progress depends on human reason alone. "

Bogost, I. (2019). *The AI-Art Gold Rush Is Here.* The Atlantic. Retrieved from https://www.theatlantic.com/technology/archive/2019/03/ai-created-art-invades-chelsea-gallery-scene/584134/.

"To meet the demands of consumers in a new way, some brands are using algorithms in the research and development process to sift through data and determine the solutions that will be the most pleasing to a group of consumers. Within the realm of food, some of the best examples of this include pretzel snacks with unique ingredient combinations, plant-based burgers and other dairy-free alternatives that are meant to be as realistic to their dairy counterparts as possible.

Artificial intelligence is also being used to assemble poetry, commercials, music videos, travel recommendations and fairy tales, putting a fresh new perspective on the familiar."

McQuarrie, L. (2019). *25 Artificial Intelligence Creations.* TrendHunter.com. Retrieved from https://www.trendhunter.com/slideshow/artificial-intelligence-creation.

"In 2016, IBM used A.I. to create an alternate movie trailer for 20th Century Fox's science-fiction movie Morgan, which follows an artificially created humanoid. To teach the company's supercomputer Watson what scenes make for a good trailer, IBM researchers had Watson "watch" 100 movies and their corresponding trailers. After identifying patterns in the visuals and sounds of the 100 trailers, Watson then watched Morgan and quickly suggested 10 scenes to include in the trailer. A film editor used nine of them, turning out the new trailer in a single day, much faster than the typical process for cutting a trailer.

"Where IBM has made advances is in developing improved capabilities for computers to understand things like vision and speech and language," says John R. Smith, IBM Research's head of A.I. Tech at the company's T. J. Watson Research Center. "Over time, the computer will be able to get deeper and deeper information out of that content."

Last year, IBM worked with Disney to teach Watson how to identify the 10 most emotional moments featuring the robot character C-3PO from Star Wars. Because C-3PO can't move his face, however, Watson wasn't able to derive any information from facial expressions. "We had to look at a lot of information including body gestures, signals of agitation in voice inflection, and other sounds in the scene that could be indicators that is was an emotional moment," says Smith. "A.I. has the potential for helping us understand content better."

Winfrey, G. (2018). *4 Fascinating Technologies Remaking Hollywood Behind the Scenes.* Inc.com. Retrieved from https://www.inc.com/graham-winfrey/4-fascinating-technologies-remaking-hollywood-artificial-intelligence.html.

1 CREATING PERFORMING ARTS

1.3 AI Artists: Evidence (Cont')

"The days of debating if artificial intelligence (AI) will impact the music industry are over. Artificial intelligence is already used in many ways. Now it's time to consider how much it will influence how we create and consume music. Just as it does for other industries, in the music industry, AI automates services, discovers patterns and insights in enormous data sets, and helps create efficiencies. Companies in the music industry need to accept and prepare for how AI can transform business; those that won't will be left behind.

… Tech companies are investing in a future where AI creates or assists musicians in creating music. Google's Magenta project, an open-source platform, produced songs written and performed by AI and Sony developed Flow Machines, an AI system that's already released "Daddy's Car," a song created by AI.

Musicians and professionals in the music industry will need to acquire tech skills in order to leverage the power of AI tools that will help them do their jobs even better. Other AI services such as Jukedeck and Amper Music help amateur musicians to develop their own musical pieces with the assistance of AI.

The listening experience is optimized for any device in a process called audio mastering. AI-based mastering services such as LANDR provide musicians with a more affordable alternative to human-based mastering, and so far more than 2 million musicians have used it to master more than 10 million songs. While there is still a creative component involved in audio mastering and some prefer to rely on humans to do this work, AI makes the services accessible to artists who wouldn't be able to master their songs otherwise."

Marr, B. *The Amazing Ways Artificial Intelligence Is Transforming The Music Industry.* Forbes.com. Retrieved from https://www.forbes.com/sites/bernardmarr/2019/07/05/the-amazing-ways-artificial-intelligence-is-transforming-the-music-industry/#37c6e9150721.

Multimedia editing and transcription provider Descript is today announcing a redesigned version of its audio editing software that's geared toward podcast producers. The product, officially called Descript Podcast Studio, features a lot of the forward-thinking approaches to audio editing the company, created by Groupon founder and former CEO Andrew Mason, was founded on.

Most prominently, that includes the ability to easily edit an artificial intelligence-generated transcription of your audio file as if you were editing a word document. Essentially, Descript turns your audio into text, broken up by who's speaking, and it then lets you manipulate those audio files as if you were editing on a text version of the script in a word processor. Delete a sentence or two, and Descript will automatically shorten the file to make the recording sound smooth and natural. With Descript Podcast Studio, the company's software now supports simultaneous and collaborative multitrack editing in the style of Google Docs, with changes synced in real time to the cloud. Descript can also just be used as a transcription service, with the company providing pro-grade transcription that includes both AI and human-aided audio-to-text services at 15 cents a minute for free users and 7 cents a minute for those who subscribe to its $10-a-month plan. But Descript's new podcast product will also come with an all-new unique AI tool that Mason says can completely overhaul the editing process. It's called Overdub, and it will allow you to create what Descript is calling an AI voice double that can be used to overdub flubbed words or phrases and can even generate entirely new sentences all on its own — in your voice. It relies on technology developed by a Montreal-based AI startup called Lyrebird, which Descript says it has acquired and transformed into its AI research division.

Statt, N. (2019). *Descript's new podcast editor includes an AI voice double for dubbing over mistakes.* The Verge. Retrieved from https://www.theverge.com/2019/9/18/20871613/descript-podcast-studio-launch-editor-overdub-ai-features-pricing-release-date.

"OpenAI typically releases its research projects publicly. But in a blog post about the text generator, the researchers said they would not make it publicly available due to "concerns about malicious applications of the technology." Instead, the company released a technical paper and a smaller AI model — essentially a less capable version of the same text generator — that other researchers can use."

"Artificially intelligent systems are slowly taking over tasks previously done by humans, and many processes involving repetitive, simple movements have already been fully automated. In

1 CREATING PERFORMING ARTS

1.3 AI Artists: Evidence (Cont')

the meantime, humans continue to be superior when it comes to abstract and creative tasks. However, it seems like even when it comes to creativity, we're now being challenged by our own creations.

In the last few years, we've seen the emergence of hundreds of "AI artists". These complex algorithms are creating unique (and sometimes eerie) works of art. They're generating stunning visuals, profound poetry, transcendent music, and even realistic movie scripts. The works of these AI artists are raising questions about the nature of art and the role of human creativity in future societies."

Bidshahri, R. (2019). *The Rise of AI Art—and What It Means for Human Creativity. Singularity Hub.* Retrieved from https://singularityhub.com/2019/06/17/the-rise-of-ai-art-and-what-it-means-for-human-creativity/.

"In November, the musician Grimes made a bold prediction. "I feel like we're in the end of art, human art," she said on Sean Carroll's Mindscape podcast. "Once there's actually AGI (Artificial General Intelligence), they're gonna be so much better at making art than us."

...Of course, creating simple ditties or glorified white noise is far different from creating great music. This is one of the main concerns that many have about AI in music: that it could flatten music into functional and generic sounds until every song sounds more or less the same. What if major labels use AI and algorithms to cram simplistic earworms down our aural cavities from now until the end of time?

But musician Claire Evans of the Los Angeles-based electropop band YACHT says that sort of craven optimization already sits at the heart of the music industry: "That algorithm exists and it's called Dr. Luke," she says, referring to the once omnipresent producer who creates pop hits through specific formulas. It's the job of forward-thinking musicians, then, to wield the technology for the exact opposite purpose: to push against standardization and explore uncharted territory they could not have conjured on their own.

For their most recent album Chain Tripping, YACHT trained a machine learning system on their entire catalog of music. After the machine spit out hours of melodies and lyrics based on what it had learned, the band culled through its output and spliced together the most intriguing bits into coherent songs. The result was a jumpy and meandering interpretation of dance pop that was strange to listen to and even stranger to play.

"I think often musicians underestimate how much the way we play is based on our physical experiences and habits," Evans says. She says it took the band many excruciating hours to learn the new music, because many riffs or chord changes would deviate just slightly from the ones they had relied on for decades. "AI forced us to come up against patterns that have no relationship to comfort. It gave us the skills to break out of our own habits," she says. The project resulted in the first Grammy nomination of YACHT's two-decade career, for best immersive audio album.

Chow, A. (2020). *Musicians Are Using AI to Create Otherwise Impossible New Songs. Time.* Retrieved from https://time.com/5774723/ai-music/.

"IoT (Internet of things) could have a huge impact on generative music and algorithmic composition due to the large amount of data that IoT devices can share. Whether it is traffic information, weather data, or a persons health statistics, all this data could potentially be shared and accessed via the Internet and then used by music software as an input for control, mapping different data to musical parameters. For example, real-time environmental data of a city could be fed into a generative music application, mapping temperate to musical scale type, wind speed to tempo, pollution level to chord density, and so on. In an era where musicians and producers are constantly on the lookout for new ways to make music in order to stand out above the rest, using IoT alongside generative music and algorithmic composition could be a way of doing so."

Music and The Internet of Things. Loopmasters.com. Retrieved from https://www.loopmasters.com/articles/3500-Music-and-The-Internet-of-Things.

1.4 Who am I?

Our understanding of ourselves in the digital age – the way we recognize our individuality and express our identity – has added more layers of complexity than in previous times. As we navigate between media platforms, our constructed personas can be altered and our affiliation to groups can shift. Intersectionality recognizes the overlapping distinctions that may be expressed based on physical, cultural and social uniqueness. Fluid gender identification, racial, religious and class constructs, and values-based alliances accumulate to describe us in more nuanced ways, more like a collage. While we may connect with our "tribe" by clicking a cursor, finding representative storytelling might not be so easy.

We are also constructing online identities through our continuous digital footprint; the trail we carve through our use of computerized devices. Reputation, preferences, and behaviours accumulate to create a snapshot of who we are that is reinforced through predictive feeds of information tailored to our aggregate conduct. Such information is valuable to organizations that wish to target audiences or monetize interactions. Establishing social credit, where all financial and social behaviours are given a cumulative score to establish creditworthiness, is not only the purview of totalitarian states. Our online transactions with others we know only in the digital realm require some level of authentication and credible reviews to be trusted.

Are we the same as our data based replicants? Some performers are proactively scanning themselves to ensure that they are able to extend their ability to exploit their likeness into the future. Owning your online persona becomes as important as maintaining your physical autonomy.

Implication for performing arts

- Creators could expand the representativeness of works
- Performers may have extended and wider careers through their avatars
- Different identities can be marketed to different audiences

1.4 Who am I? : Evidence

"The biggest triumph of the digital age is the transference of our relationships to the digital space. This is not merely a mental transition but our bodies are online too with our pictures, voices and locations all present through an interconnected set of social platforms. So we construct our relationships based on the rules of the digital space, which places a cultural premium on broadcasting our lives. This trend of sharing is very linear, missing out on all the nuances present in real world relations and tending towards an 'ideal representation' of our lives. It gives us the illusion of companionship without the demands of a real relationship.

This has fundamentally impacted our pattern of thinking because instead of experiencing a moment in our real life we think about how 'ideally' we can showcase it for our social networks. Our dopamine kick is not coming from the real world experience but from the likes, comments and the virtual attention we get. We constantly watch each other, curating responses that match up or outdo those of our virtual friends.

Strength of our real world social connections has weakened, since a peripheral awareness of someone's virtual life is increasingly considered as sufficient emotional investment. On the other hand, this peripheral awareness has allowed us to extend the reach of our digital identities to a point where many of us have 'friends' on our social lists but whose relevance or connection to our lives is negligent. This has fostered a feeling of loneliness despite our hyper connected lives.

Comfort of navigating our digital identity through the screen, has resulted in a world where intrusion is far more accepted. We are emboldened by being behind a screen, anonymous to a certain extent and are far more opinionated, assertive and confrontational. The rise in online hostility, shaming and scapegoating is proof of this sense of security given by the screen."

Mallela, S. (2018). *Identity in the digital age: our transitioning sense of self.* Medium. Retrieved from https://medium.com/@culture-aroundus/identity-in-the-digital-age-our-transitioning-sense-of-self-6dcbb27a2e63.

"Virtuality and digital technologies have added innumerable nuances to the nature of our identity. European researchers are working hard to keep pace with the new identity paradigm. What is identity? In the digital age, this has become one of the big questions. The multiplication of online personas, the numerous and increasing contexts where identity plays a role, and the perennial problem of establishing reliable, secure identity in cyberspace make this one of the bigger challenges that the information society faces."

What is the identity of identity in the digital age?. ScienceDaily. (2020). Retrieved from https://www.sciencedaily.com/releases/2010/02/100224134029.htm.

"Every day, whether we want to or not, most of us contribute to a growing portrait of who we are online; a portrait that is probably more public than we assume. This portrait helps companies target content at specific markets and consumers, helps employers look into your background, and helps advertisers track your movements across multiple websites. Whatever you do online, you might be leaving digital footprints behind."

Your Digital Footprint Matters | Internet Society. Internet Society. Retrieved from https://www.internetsociety.org/tutorials/your-digital-footprint-matters/.

"Maude Bonenfant (MB), digital media specialist who researches new technologies: games, social media, etc. from a social point of view, shared her findings on what the virtual world means for the digital natives (gamers, advanced tech and social media users) especially, and for us, the regular users as well. Contrary to the common belief, her key point is that the virtual world is not a parallel one and what we call the virtual reality is an extension of the offline one: as real as the real world is. She has reached this conclusion through interviewing members of various digital communities, interviews through which several conclusions can be drawn, for example the fact that online harassment and bullying hurts one's feelings for real, or, on the positive side, that friendships that gamers have established online are regarded as real friendships no matter if they've never met each other personally offline. "The virtual world is only an extension of life", MB says.

1 CREATING PERFORMING ARTS

1.4 Who am I? : Evidence (Cont')

A common misunderstanding towards the Internet today is that we are anonymous on the web. It has become a standard practice now to use one and the same ID account for various Internet services (for ex. to log on a website with a Facebook profile) so our virtual self is being gradually consolidated in an extension of our real world personality. We are not anonymous anymore. We create our digital identity the way we create our real life social image. It takes a lot of efforts to stay anonymous on the web and furthermore, due to a certain transparency injunction, if you are trying not to share something you are assumed to hide something bad/ you tend to seem suspicious.

For digital natives, it is not an intrusion in one's personal life to let others know where they have been today or when was the last time they have logged in on a certain website. The borders between private and public activities are shifting and the definition of private life changes. A new way of living together has evolved from the way we choose what to share with others online."

Shishkova, V. (2014). *Digital space: Performing Arts and the Digital Shift* [Ebook]. https://www.ietm.org/en/system/files/publications/digital_space2_report_vsh-05_11.pdf.

"Personal computing has come to be defined first by an individual's unique social access to the internet, and then by the device they use. It follows that, ten years from now, personal computing devices won't be singular and personal. They'll be more distributed as points of access: screens, sensors, data, processes and platforms. It will not be the watch on your wrist or the phone in your pocket. Your 'device' will be your digital identity, used like a key to enter the system from any number of screens and actions."

Volpicelli, G. (2015). *What will personal computers look like in 20 years' time?*. Wired.co.uk. Retrieved from https://www.wired.co.uk/article/future-of-personal-computers.

"The boundarylessness of the internet has enabled all kinds of connections; a lot of stories now start online. Back in Web 1.0 when I was growing up and the idea of a worldwide connective tissue was still strange and new, there was the idea of stranger danger: that you'd be hurt more by a stranger from the internet than by the people closer to you. Making internet friends then felt like a fraught endeavor because what if they weren't the person they said they were online? Of course, many of them were, and many fears were misplaced.

…Online friendships only really work if someone's presence carries some degree of the real person within it. We're not strangers anymore. Partially, that's because of online dating, which is where the idea of meeting a random person you only knew about based on what they put online was normalized. The fear of being alone, as it turns out, is more powerful than most of the others. Partially, we just live online now.

That it's now mundane to have and meet internet friends suggests something deeper has changed in American life, something related to how we befriend people now in the first place. A common refrain about getting older is that, as you grow up, it becomes harder to make friends. There are simply fewer spaces where speaking with a new person is sanctioned, and sometimes life can be too busy already to allow people in. Although the internet can be isolating, it has also allowed people of all ages to bond over their shared interests without the burden of having to be in the same place at the same time. It's a tectonic shift from the old narratives of lifelong friends being neighbors or those college or high school people you've kept up with. It's liberated friendship from the nuclear family narrative.

As you grow up, it beomes harder to make friends. Sometimes the process works backward with those proximity friends from the past who go from friend to acquaintance to Facebook contact you don't interact with. The assumptions about what friendship is have changed. It's persistent, it's performed online, it's sometimes passive. It's hard to lose track of people."

Stephen, B. (2019). *To all the internet friends I've loved before.* The Verge. Retrieved from https://www.theverge.com/2019/4/27/18516737/mutual-internet-friends-followers-instagram-facebook-friendship-relationship.

1 CREATING PERFORMING ARTS

1.4 Who am I? : Evidence (Cont')

"The identity politics seen in art around the #MeToo and Black Lives Matter movements will grow as environmentalism, border politics and migration come even more sharply into focus. Art will become increasingly diverse and might not 'look like art' as we expect. In the future, once we've become weary of our lives being visible online for all to see and our privacy has been all but lost, anonymity may be more desirable than fame. Instead of thousands, or millions, of likes and followers, we will be starved for authenticity and connection. Art could, in turn, become more collective and experiential, rather than individual."

Maldonado, D. (2019). *What will art look like in 20 years?*. BBC.com. Retrieved from http://www.bbc.com/culture/story/20190418-what-will-art-look-like-in-20-years.

"Modern technology is a marvelous thing – it can increase accuracy and efficiency, perform tedious and redundant tasks, improve the decision-making process, and in general, make life and work a lot easier. And if that's not enough, technology can also help to advance gender equality. When speaking of the ubiquitousness of the internet, it's important to remember that access still remains a problem in rural areas and even urban low-income areas. But for the most part, internet access, automation, and other digital tools have helped to remove some of the barriers keeping women from pursuing educational opportunities, participating in the workplace, and having their voices heard.

Given the importance of technology, it's no surprise that jobs in the tech field are in high demand and pay well above the national average. Software engineering roles are still some of the hottest technology jobs in the country – if not the world. But as we know, most of these professionals and students are men.

Holberton School of Software Engineering is trying to change these statistics by ensuring that its admissions process does not discriminate against women applicants. "Diversity and inclusion are at the heart of our mission, and as a result, it seemed logical to think of an application that was blind and unbiased," says Julien Barbier, co-founder and CEO of Holberton School. Barbier says he realized that if the application process was not blind, all of the students would look like him – and the school wouldn't be moving the needle.

"The admission process is fully automated and has been built and tested with mentors from different backgrounds," Barbier explains. "It has been built for complete beginners so that anyone can apply, and focuses only on motivation." Applicants are not asked about background, ethnicity, GPA, zip code, etcetera. "It is also based on the Holberton Education: it's a project, and you have to collaborate with other candidates.""

Williams, T. (2019). *How Technology is Helping to Advance Gender Equality. Women 2.0.* Retrieved from https://women2.com/2019/03/20/technology-removing-gender-barriers/.

"From Carrie Fisher in Rogue One: A Star Wars Story to Paul Walker in the Fast & Furious movies, dead and magically "de-aged" actors are appearing more frequently on movie screens. Sometimes they even appear on stage: next year, an Amy Winehouse hologram will be going on tour to raise money for a charity established in the late singer's memory. Some actors and movie studios are buckling down and preparing for an inevitable future when using scanning technology to preserve 3-D digital replicas of performers is routine. Just because your star is inconveniently dead doesn't mean your generation-spanning blockbuster franchise can't continue to rake in the dough. Get the tech right and you can cash in on superstars and iconic characters forever."

Winick, E. (2018). *Actors are digitally preserving themselves to continue their careers beyond the grave.* MIT Technology Review. Retrieved from https://www.technologyreview.com/s/612291/actors-are-digitally-preserving-themselves-to-continue-their-careers-beyond-the-grave/.

1 CREATING PERFORMING ARTS

1.4 Who am I? : Evidence (Cont')

""Facial scanning is inevitable, and retailers will use it to their advantage. Euromonitor predicts that a personal profile made by you and shared with the store — or a private file made about you by the store — could be used to tailor your shopping experience. If a shoe store knows you're a runner that needs ankle support, the salesman will already have a selection of high-top sneakers on hand."

… Unless lawmakers curtail the use of facial recognition in public, can you envision a future where police don't use that technology on city streets? Facial recognition, which is already in widespread use in China, will allow police and government entities to track where you are in public. The FBI and ICE are already searching through millions of American faces via their state-issued driver's licenses to look for criminal suspects for crimes as low as petty theft, the Washington Post reported.

… At 2012 Coachella, the resurrection of Tupac as a hologram for two songs was an interesting, albeit weird, novelty. In the future, they'll be a mainstay. In America, BASE Hologram is a company touring the holographic likes of Buddy Holly and plans to produce a Whitney Houston hologram as well. But those concerts aren't 100-percent virtual; they use real people and real props as well. Meanwhile, full-fledged hologram concerts are popular in South Korea, where cheap tickets and consistently running shows draw teens to holographic K-pop concerts (with holographs of bands that are still alive and touring).

In the future, attending "live" concerts at whatever venue has the technology to project images of dead and still-living celebrities on stage will be more than just a novelty."

Donofrio, C. (2019). *27 New Ways We'll Live, Work and Play in 20 Years.* Workandmoney.com. Retrieved from https://www.workandmoney.com/s/future-predictions-20-years-2040-bfbd-d5366ab54955.
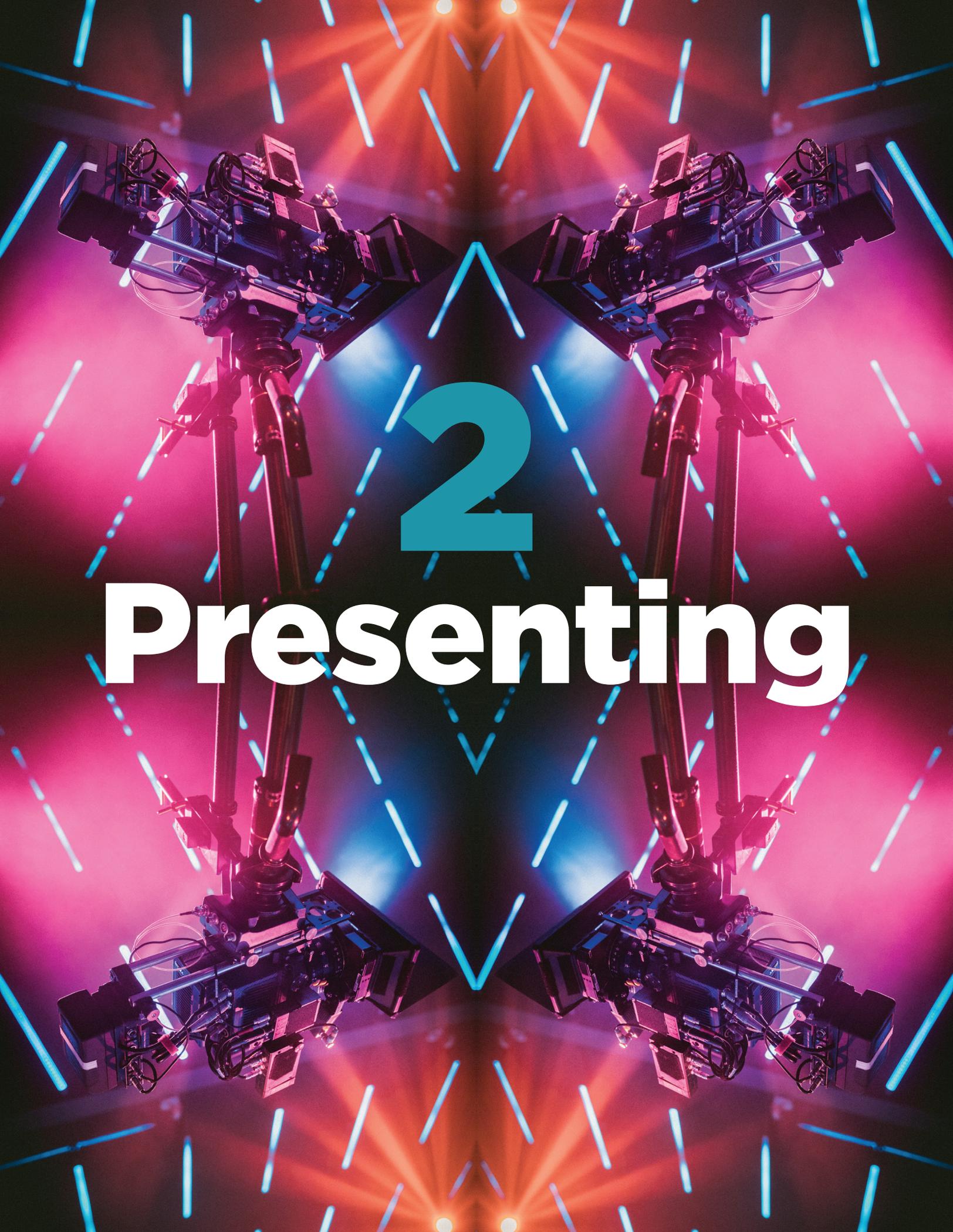
2 Presenting

2

Presenting Performing Arts

The venues, producers, and stagehands responsible for delivery of performances and the performers who sing, dance and play music will see increasing levels of disruption into the future. New competitors, new platforms, new purpose and new levels of continuous observation change how performance is offered.

2 PRESENTING PERFORMING ARTS

2.1 Tomorrowland

Amusement parks and film theaters begin to encroach into the presentation of "live" performances with increasing levels of complex multi-sensorial experiences becoming the norm. Animated screen based 3D effects combined with animatronic movement and atmospheric intrusions are compiled to create a full body immersion. Smoke, wind, fire and rain, moving flight simulator powered platforms and surround sound contribute to the experience as a shared event where roles for audience members are emphasized.

Advances in visual capture and display technologies are likely to be incorporated into more conventional physical stages as digital and real life blend seamlessly to create more emphatic environments. Immersive 3D effects use holographic LED screens or paper-thin flexible digital displays to give backgrounds hyper-realistic dimensionality. Volumetric 4D cameras record moving elements to be displayed so as to fool the senses completely. Sony recently introduced the Atom View that "manipulates and changes the perspective of a previously scanned 3D environment no matter where the camera is moved" that provides more cost effective methods of transforming simple spaces into simulated location recreations.

Massive budgets are deployed at theme parks to create these fully immersive experiences with pre- and post-event transitions also staged in order to extend the visitor's suspension of disbelief. This emphasis on immersion meets the preferences of consumers, especially younger ones, who have high expectations of agency in terms of participation and a more porous understanding of culture and entertainment.

Implication for performing arts
- Digital stage environments could be enhanced
- Reduced materiality of the stage
- Change in skill sets are required
- Competition for entertainment dollars are increased
- Insurance waivers may be necessary for safety and security

2 PRESENTING PERFORMING ARTS

2.1 Tomorrowland : Evidence

"Traditionally, theme parks and other OOH (Out of Home) entertainment business build their on-site experiences around main attractions. In the case of theme parks, it's usually the roller-coaster rides and ferris wheels. For zoos and museums, it's the special exhibitions and performances. Customers line up for those attractions and wait for their turns, which means that wait time is a big factor shaping the customer experience for OOH entertainment businesses. This also perpetuates a paradoxical feedback loop — the more amazing an attraction is, the longer the line for it would be, thus diminishing the overall visitor experience. In addition, peripheral services such as dining and shopping are built to support the customer experience, but rarely incorporated as part of the experience itself.

Recently, however, this attraction-based model is slowly giving way to one that prioritizes immersive storytelling over standalone rides. Borrowing elements from video games and interactive theater, innovators in the theme park business are starting to push the envelope on what an out-of-home entertainment experience could be, and how it could be scaled. The more interesting and immersive this kind of world-building can achieve, the less of a nuisance waiting in lines would be, as any wait time would be simply time to soak up the surroundings and appreciate the details of the fictional world.

There's no doubt that the state of the art in the theme park business today is what Disney is getting at with the newly opened Star Wars: Galaxy's Edge area. Entering the village of Black Spire Outpost, visitors will have a chance to fully immerse themselves in the fantastical environment and feel like a character in the Star Wars universe. Surrounded by the sights, sounds, and populace of the Star Wars universe, you can ride the Millennium Falcon with your friends, build your own lightsaber, and soon, partake in an epic battle between the First Order and the Resistance. The area also features themed shops, restaurants, and entertainment offerings, and Disney is also building a fully immersive resort hotel to make lodging part of the experience as well.

…All these examples point to an industry moving towards more LARPing-like (live Action Role Play) immersion, likely based on popular entertainment IP or fantasy genres for a built-in audience, with themed dining and retail options incorporated as part of the overall immersive experience, and foregoing of live "shows" on stages for actors that either freely interacts with visitors or act out a scripted narrative in the park. This is the current state of the art, and it's working, so it's logical to assume there will be greater investment in this direction. Like successful interactive theater productions such as Sleep No More and Accomplice, the key to creating a great immersive theme park experience lies in giving the audience the freedom to explore the set, interact with the characters along with the illusion of control over a scripted narrative, lest everything comes to an end with no satisfying pay-off. Almost all narrative entertainment requires a willing suspension of disbelief, and nothing is more engaging than thinking that you have control over the outcome, however false and make-believe that may be."

Yao, R. (2019). The Future of Out-Of-Home Entertainment. Medium. Retrieved from https://medium.com/ipg-media-lab/the-future-of-out-of-home-entertainment-82905989d751.

"Although originating from the act of physical submersion, the term immersion has developed to describe the act of becoming engulfed by a place or a thing, encapsulating the sensorium of the visitor transporting them to a time, a place, or even another world.
More recently, the term Immersion has become synonymous with eXtended Reality XR including Virtual Reality, Augmented Reality and Mixed Reality. These virtual worlds are accessed through the use of head-mounted displays, CAVEs and dome projection. However, beyond the sterile digital world of the bit and the byte, immersive spaces can be found in art installations, theme parks and even in manicured country estates.

These immersive physical spaces enable designers to create worlds which encapsulate and overwhelm the senses placing the visitor at the mercy of the designer's story world. Through the sensory stimulation of the visitor, an unquestionable reality is constructed, whether real or synthetic, suspending their disbelief and enabling true immersion.

2 PRESENTING PERFORMING ARTS

2.1 Tomorrowland : Evidence (Cont')

…Central to the success of long-form narrative content inside the immersive media space is the creation and maintenance of presence in the virtual world. The prominent starting place for adaptive storytelling is to build upon the games engines as they operate in the same 3D world and encounter some of the same challenges. However, a new language for this medium is needed as the tropes and techniques of directing players are incompatible with the requirements of presence."

The field of computational narratives has been the preserve of computer scientists since the early 1970s, seeing significant improvements in recent years with the increasing availability of suitably powerful desktop computer hardware and readily available of cloud computing services. The objective of computational narratives is to gain a greater conceptual understanding of narratives, imbuing computers with a narrative intelligence to enable better human-computer interaction. Humans are naturally creatures of narrative, passing information on through stories, tales and limericks, computers do not yet possess this ability to express information in a consistent narrative. Computational Narrative research is divided into two distinct areas, that of narrative analysis which seeks to extract the narrative from the text and build a model of understanding and Generative Narrative systems which create new stories based on human-generated narrative models. Although combining these areas is being investigated, there Is currently no end to end solution which can analyse a series of texts and then generate a new text that is unidentifiable from the style of the original.

To create congruent story worlds which maintain presence and immersion regardless of the action of the player computational narratives will become central to the generation of adaptive story worlds – allowing for the combined Agency of decision making with effective reaction from the story world.

Tree, D. (2019). *Adaptive storytelling for immersive spaces* [Ebook]. https://www.researchgate.net/publication/335443067_Adaptive_storytelling_for_immersive_spaces.

"In March, 2013, Disneyland opened the Royal Theatre, condensing Disney films like Beauty and the Beast, Tangled, and Frozen into 22-minute stage adaptations. The decor of the theatre, the language of the characters, and the costuming of the performers all work together to evoke a nostalgic and loose sense of history that calls on guests to interact with the story in the style of an "old-time melodrama," booing, hissing, cheering, and singing along to the story. …Maria Patrice Amon argues that tourists are taught how to perform as actors and given a new hybrid identity as both performer and audience that extends to the parks as a whole. The essay explores the theatrical genre of melodrama and asserts that the Royal Theatre's use of this genre gives the audience a way to exceed their assumed passivity and interact with the performers as actors themselves."

Amon, M. (2019). The Royal Theatre Presents: Echoes of in the Magic. *Performance And The Disney Theme Park Experience*, 193-210. https://doi.org/10.1007/978-3-030-29322-2_10

"Based on observation of the trends and on their own analysis, the authors show that contemporary museumgoers seek an experience that is shared, user-friendly and interactive (in terms of other visitors, staff, exhibits, etc.). The pursuit of sensory and emotional stimulation is also a factor. Visitors thus have an expectation of a co-produced experience that will enable them to play an active and relational role within an exhibition that combines playful and educational elements (De Barnier and Lagier, 2012). The acknowledgement of this new reality by some museum professionals has led them to place greater emphasis on edutainment by promoting a blend of entertaining and educational aspects. Other professionals and stakeholders in the museum sector, however, continue to believe that to accommodate the more experience centered expectations of their audience would be to compromise their offerings (Mencarelli, Pulh and Marteaux, 2007).In his essay on virtual reality, Rheingold (1992) points out that new communication technologies greatly increase the potential for convergence of education and entertainment. Multimedia applications can be used to present the content of an exhibition within a virtual environment such that it is an actual re-creation of the exhibition."

Balloffet, P., François H., C., & Lagier, J. (2014). *From Museum to Amusement Park: The Opportunities and Risks of Edutainment* [Ebook]. https://www.researchgate.net/profile/Joelle_Lagier/publication/281158815_From_Museum_to_Amusement_Park_The_Opportunities_and_Risks_of_Edutainment/links/5671414d08ae0d8b0cc2e667/From-Museum-to-Amusement-Park-The-Opportunities-and-Risks-of-Edutainment.pdf.

2 PRESENTING PERFORMING ARTS

2.1 Tomorrowland : Evidence (Cont')

"…Sony Innovation Studios has acquired Nurulize, a startup whose software lets users edit, color and enhance volumetrically captured images in a real-time collaborative environment.

…Nurulize's Atom View software "enables us to integrate the highest-quality volumetric data capture with traditional workflows for film, television, and gaming, ushering a new method of content creation — the blending of the digital and the real — in truly innovative ways," said Glenn Gainor, president of Sony Innovation Studios and head of physical production for Screen Gems."

Spangler, T. (2019). *Sony Pictures Buys Nurulize, a Virtual Production Software Startup (EXCLUSIVE).* Variety. Retrieved from https://variety.com/2019/digital/news/sony-innovation-studios-nurulize-acquisition-1203261061/.

"For the 2018 fiscal year, Walt Disney Parks and Resorts had an operating profit of $4.5 billion, an increase of more than 100 percent from five years earlier. For comparison, Disney Media Networks, home to ESPN and ABC, had a profit of $6.6 billion, a 3 percent decline.

Each of Disney's six theme park resorts around the world is undergoing major expansion, along with Disney Cruise Line. Michael Nathanson, a longtime media analyst, estimates that Disney will spend $24 billion on new attractions, hotels and ships over the next five years. That's more than Disney paid for Pixar, Marvel and Lucasfilm combined.

"It can't just be special — it has to be spectacular," Bob Chapek, Disney's theme park chairman.

… Disney faces an enviable challenge: Even with steady price increases for peak periods — single-day peak tickets at Disneyland in California now run $135 — visitor interest often exceeds capacity at some properties. "You can only let so many people in a park before you start to impede on satisfaction level," Mr. Chapek said.

The hotel reflects a push by Disney to provide more immersive and personalized experiences. Now even your hotel stay becomes an attraction that is "unique to Disney, that you cannot get down the street," Mr. Chapek said.

…For his part, Mr. Chapek talks about "relentless innovation" across the board, using technology to make attractions more relevant wherever possible.

"We want to be the disruptor, not the disruptee," he said."

Barnes, B. (2020). *Disney Is Spending More on Theme Parks Than It Did on Pixar, Marvel and Lucasfilm Combined.* Nytimes.com. Retrieved from https://www.nytimes.com/interactive/2018/11/16/business/media/disney-invests-billions-in-theme-parks.html?mtrref=undefined&gwh=3582894E08BB7D3A127E-78BAF-90CC6&gwt=pay&assetType=PAYWALL.

2.2 All the World's a Stage

Where else will we look to consume our next choice of performing arts? Cars, eyeglasses, mobile platforms and even textiles are all examples of evolving settings for presentation of storytelling. As digital technology morphs into less conventional formats, our understanding of how to "stage" an event transforms along with who is in charge of the composition.

The Internet of Things promises the ability to bring performance into the world outside standard venues, even beyond those currently on the fringe. Using sensors to gather and process data, trigger dramatic elements or connect aspects of performance in unexpected ways suggests new forms of art may emerge. The line between spectators and artists will be increasingly blurry as actions of the crowd influence the flow of performances in uncontrolled ways.

Implication for performing arts
- Any surface and any space has the potential to be a performance vector
- Guerilla marketing
- Co-creative elements of performance are accentuated

2 PRESENTING PERFORMING ARTS

2.2 All the World's a Stage: Evidence

"The Internet of Things (IoT) is an emerging paradigm that enables the communication between electronic devices and sensors through the internet in order to facilitate our lives. IoT use smart devices and internet to provide innovative solutions to various challenges and issues related to various business, governmental and public/private industries across the world. IoT is progressively becoming an important aspect of our life that can be sensed everywhere around us. In whole, IoT is an innovation that puts together extensive variety of smart systems, frameworks and intelligent devices and sensors. Moreover, it takes advantage of quantum and nanotechnology in terms of storage, sensing and processing speed which were not conceivable beforehand. Extensive research studies have been done and available in terms of scientific articles, press reports both on internet and in the form of printed materials to illustrate the potential effectiveness and applicability of IoT transformations. It could be utilized as a preparatory work before making novel innovative business plans while considering the security, assurance and interoperability."

Kumar, S., Tiwari, P., & Zymbler, M. (2019). Internet of Things is a revolutionary approach for future technology enhancement: a review. *Journal Of Big Data*, 6(1). https://doi.org/10.1186/s40537-019-0268-2

"The rapid shift of the auto industry toward self-driving and connected vehicles has pulled players like Google, Apple, and Amazon into the car business, mostly with regard to infotainment systems. General Motors plans to use Android software in its future vehicles; Amazon just landed Lamborghini as the latest user of its embedded Alexa system. Sony already has a place in the auto industry. It provides speaker systems to a variety of automakers. Toyota and its luxury arm, Lexus, use Sony's CMOS image sensors in some models to underpin automatic emergency-braking features. But now the company is looking to ramp up its offerings. "We will accelerate our efforts to contribute to the future of mobility," president and CEO Kenichiro Yoshida said at a press conference in Las Vegas. "This prototype embodies our contribution." So it's no surprise to see that the Vision-S plays up two Sony strengths: consumer entertainment and sensors.

The first is the easier to see here. The Vision-S features a bevy of screens, including one that stretches the length of the dashboard, like that in the upcoming Byton M-Byte SUV. These, of course, offer access to the music, games, and movies in the company's vast library. (The latter two are for when, as Sony says, you are "relieved from car operations.") "We believe that the evolution of mobility will also redefine cars as a new entertainment space," Yoshida said.

A 5G connection will ensure everything comes through with nary a moment of buffering. The two backseat passengers each get their own headrest-mounted screen. With speakers all around the car, including one in each seat, everyone can enjoy Sony's immersive "360 Reality Audio" system, which debuted at CES 2019.

Davies, A. (2020). *Sony's Concept Car Puts Entertainment in the Driver's Seat*. Wired. Retrieved from https://www.wired.com/story/sony-concept-car-puts-entertainment-drivers-seat/?itm_campaign=BottomRelatedStories_CES.

"An alternate reality is preparing to leapfrog the need for total immersion VR. It promises to enhance what we see in the real world, instead of shutting us off from it. Rather than transporting us to another reality, it will deliver information, entertainment and new experiences within the context of our daily lives.

More than five years on from Google Glass, augmented reality is re-emerging rapidly. Snap Spectacles are offering fun and quirky experiences at an affordable price, while startups like North and Vuzix are focusing on bringing non-invasive information to more fashionable prescription glasses.

Magic Leap and Microsoft are building those bleeding edge 'wow' experiences; promising seamless blends of the real and unreal, but at a prohibitive cost.

… Augmented reality may have a clearer path to mainstream adoption than VR: for starters, the far lower instances of motion sickness when in augmented reality environments compared to their virtual counterparts. For some, VR was just a non-starter.

2 PRESENTING PERFORMING ARTS

2.2 All the World's a Stage: Evidence (Cont')

Although research is still limited, an Oxford University study in 2018 found: "Microsoft HoloLens causes across all participants only negligible symptoms of simulator sickness. Most consumers who use it will face no symptoms while only few experience minimal discomfort in the training environments we tested it in."

Augmented Reality glasses in their current form do require continued shifting of focus in order to clarify the information in the heads-up display, but in the main, it's a more tolerable experience for all."

Smith, C. (2019). *Future of AR smartglasses: How they will become the way we view the world.* Wareable. Retrieved from https://www.wareable.com/ar/future-of-ar-smartglasses-7677.

"Now, theatres are changing once more. Shaped by local social contexts, greater ecological awareness and the mixing of different art forms, performance spaces are becoming increasingly diverse. Modern theatres are much more connected with their surroundings – and so too are the performances they stage.

…The visually striking mobile concert platform Soundforms (from the UK) brings the acoustic qualities of an indoor concert hall to outdoor public spaces. Soundforms is shaped like a large white shell lined with rows of acoustic panels. It differs from other outdoor concert platforms – like California's iconic Hollywood Bowl – because it can be moved to different places and musicians don't need to rely on electric amplification to be heard clearly."

Filmer, A. (2019). *Theatres are evolving to reconnect us to each other and the environment.* The Conversation. Retrieved from https://theconversation.com/theatres-are-evolving-to-reconnect-us-to-each-other-and-the-environment-118735.

" Google is experimenting with smart textile design, weaving conductive threads into clothes to create touch-sensitive panels that work like smartphone screens.

…The structure of textiles is the same as the structure of touchscreens that we use every day on mobile devices and tablets," said project founder Ivan Poupyrev. "That means that if you replace some of the threads in textiles with conductive threads, you should be able to weave a textile which can recognise a variety of simple touch gestures."

By swiping the portion of a textiles embedded with the conductive fibres, users could unlock their phone, answer calls or scroll through articles.

"If you can hide or weave interactivity and input devices into the materials, that will be the first step towards integrating computers into clothing," Poupyrev said.

The yarn is created by replacing strands of thread with thin metal wires or conductive polymers. According to the team, their yarn is highly conductive as well as scalable, so it can be used in industrial weaving machines around the world."

Howarth, D. (2015). *Google weaves smartphone interfaces into clothes.* Dezeen. Retrieved from https://www.dezeen.com/2015/06/03/google-smartphone-interfaces-conductive-threads-clothes-textiles-project-jacquard/.

"Eve 2050 by Van Grimde Corps Secrets imagines how, in the near future, the frontier of the body and its identities could be redefined through the story of Eve, a symbolic figure with many faces that embodies the humanity of tomorrow. It engages the spectator in an artistic, esthetic and ethical reflection on what will become of the human being and human body in the digital era, with biomedical enhancements and artificial intelligence. Combining dance, video, music, plastic and digital art, Eve 2050 shape shifts to inhabit theatres, public spaces and the Internet in a fascinating integration of live performance and technology.

The work will unfold in three parts , each building a different relationship with the audience: an interactive five-episode webseries; an interactive installation with choreographed performances; and a staged work."

Eve 2050 | National Creation Fund. Nac-cna.ca. Retrieved from https://nac-cna.ca/en/creationfund/project/eve-2050.

"In Western tradition, cultural space has been defined by a social hierarchy and rendered visible through buildings — theatres, museums, music halls, and galleries. But what if a "cultural space" could be anywhere? What if anyone could define a cultural space? Could your home be a cultural space? Could your phone become a cultural space? How does that differ from an entertainment space? Or does it? Could we use your floorboards? Your tables, your walls, or your memories for those immersive experiences? Maybe you'd welcome me and Judi Dench into your home?

2 PRESENTING PERFORMING ARTS

2.2 All the World's a Stage: Evidence (Cont')

If it were no longer defined by a social hierarchy, could cultural space be defined by us together?

…Technologies are now regularly helping us discuss story, character and also re-imagine cultural spaces and experiences, whether that's a volumetrically captured performance on your table-top shown through a mixed-reality device or converging our virtual and physical worlds. Institutions are exploring the many ways we can create those immersive experiences in their own space but also for you, with you and on your stages. It's different from the broadcast model we have seen thrive in the 20th century. This content is circulated and distributed and unique to the platform it's experienced on. It can be amplified, built on and experienced together in real-time.

Our challenges are myriad. We wait for the technology to keep up with our imaginations, so we can dive into a story or a space that we aren't physically at and when we do attend them — use the technology — AI, data and connectivity to create a more personalised, immersed set of experiences that take those floorboards further.

But. Arguably the focus in recent years has been thinking with a "technology first" brain, often missing an audience-first perspective. Start with your hands and what you hold. Start with what you can see and who you're with. Then bring the story into that space and use the tools that are necessary to help make that happen. Make the rituals you need to define and enliven the space to go to where new communities congregate and converge.

Build on what we know. We assume that in conventional theatre we are not interactive or immersed. However, every cough, sigh, laugh, silence, and tear is a connection; we don't need to look at each other to be present together. Our presence is felt by the actor and audience. We experience this, and create worlds in time and space. Those real-time experiences can now happen across multiple spaces and stages through new technologies. Let's take the volumetrically captured performance further, give the audience agency and enable them to use their senses within the piece — touch, smell — become more meaningfully immersed."

Ellis, S. (2019). *How Are Cultural Spaces Thinking About the Audience of the Future?*. Medium. Retrieved from https://immerse.news/how-are-cultural-spaces-thinking-about-the-audience-of-the-future-8294d3474051.

"The 20th Century witnessed radical experimentation in theatre design. Such eminent theatre directors as Tyrone Guthrie and Zelda Fichlander, for example, rejected the simplistic picture-frame stage, taking inspiration instead from the in-the-round and thrust stages – the latter projecting, jetty-like, into the auditorium – of ancient Greece and Rome.

…"There's a reaction against the black box's neutrality, which I see as analogous to the white-cube gallery in the art world," says Jeff Day, a founding principal of US architecture firm Min | Day, which redesigned the Bluebarn Theatre in Omaha, Nebraska. "In the theatre world, reasons for the waning interest in it include its ubiquity, with audiences tiring of its austerity, and directors no longer feeling the need for pure neutrality. Another reason, perhaps, is a postmodern rejection of modern theatre as an abstract space divorced from its social context. As designers, we're motivated by a desire for warmth and a welcoming atmosphere."

…Storyhouse embodies another development, too: the relatively static black-box concept is being replaced by multidisciplinary arts centres that require flexible spaces for use by all genres of performance. Many of these boast theatres that can be subdivided into smaller ones or whose seating and staging can be thoroughly reconfigured. Storyhouse has an 800-seat proscenium that can be converted into a 500-seat thrust stage. "Directors and designers now are interested in far more flexibility and adaptability, in being able to radically reconfigure an auditorium," says Green."

Lutyens, D. (2018). *A brave new world of theatre design. Bbc.com*. Retrieved from http://www.bbc.com/culture/story/20180122-how-theatre-design-has-become-flamboyant-and-flexible.

"This future is already here, in its nascent form with Live Nation's NextVR. Right now, it's an app that works with VR headsets that syncs with a live feed to view sporting events and concerts. The cameras are still rather static — for example, for boxing, the cameras are on the ring posts, or positioned on the stage during a concert.
But in 20 years, will advances in VR technology allow us to virtually dribble with the Raptors, or dance with the Rolling Stones? (We assume they'll still be touring)."

Donofrio, C. (2019). *27 New Ways We'll Live, Work and Play in 20 Years*. Workandmoney.com. Retrieved from https://www.workandmoney.com/s/future-predictions-20-years-2040-bfbd-d5366ab54955.

2 PRESENTING PERFORMING ARTS

2.2 All the World's a Stage: Evidence (Cont')

"A digital poetry walk around Hampstead Heath encouraging visitors to slow down and discover more about London's urban trees opens this week.

It will use stories about 15 'veteran' trees to create digitally generated poems.

These trees, aged between 40 and 500 years, provide important habitats for wildlife and help to maintain the biodiversity of the heath.

Visitors will see keywords etched on roundels of wood beside trees in Golders Hill Park and Sandy Heath and will be encouraged to send a message online or on their phones to unlock lines of poetry relating to the history of park and the tree.

The Listening Wood has been created by artists and computer scientists from University College London's Centre for Advanced Spatial Analysis (CASA) in collaboration with the City of London Corporation.

Leah Lovett, Artist and Research Fellow at UCL said: "It has been such a privilege to work with the City of London arborists to develop this project. Some of the team have been managing these trees over thirty years and more – they're like old friends. To have a chance to meet each tree, to really get to know them through the team has helped me to see trees differently, as actors that share and often shape our cities.

"In creating the Listening Wood, we have tried to capture the unique character of each tree to give a glimpse of these actors playing out their dramas in slow time, in tree time."

Bayley, S. (2019). *Digital poetry walk encourages love of trees. Evening Standard.* Retrieved from https://www.standard.co.uk/futurelondon/culturecity/hampstead-heath-golders-hill-park-sandy-heath-leah-lovettgolders-hill-park-refreshment-house-a4127071.html.

2.3 We're Watching You

We live in a world of both systemic and voluntary surveillance. Our cities are strewn with closed circuit cameras. Sensors embedded in smart public spaces track our movements. We install Ring video doorbells as smart security devices and Alexa as our voice activated assistant that listens for our requests. Rapid advancements in technologies that have the potential to override our privacy concerns are outpacing our regulatory landscape's ability to guard against inappropriate use.

Facial recognition, motion detection and eye tracking are combined with data scraping from voluntary information provision across social media and internet tracing through "cookies". Tech providers may flag whether collected information will be de-identified before use but there are few opportunities to reject collection altogether. Although it will be hugely beneficial to access data for all manner of predictive activities, limits to use and requirements for transparency are not clearly defined. For example, using digital tools to manage crowds is a sophisticated endeavour connected to security concerns, especially at unbounded venues, but doing so can restrict privacy rights.

Implication for performing arts

- Transparent and accountable use of data is a requirement
- Use of predictive data for event management may be restricted or require notice to audiences

2 PRESENTING PERFORMING ARTS

2.3 We're Watching You: Evidence

"As privacy laws continue to roll out in Europe, California and other regions, privacy and security experts disagree over how technologies including facial recognition, artificial intelligence and 5G should be regulated.

Some proposals to ban these tools or place strict restrictions on them could have undesirable repercussions, said Ruby Zefo, chief privacy officer at Uber Technologies Inc. She was speaking Tuesday on a panel at a cybersecurity event hosted by Nasdaq Inc. and the National Cyber Security Alliance, a nonprofit that works with the public and private sectors.
For example, she said, efforts to ban the use of facial-recognition technology could inhibit the development of tools designed to promote consumer safety.

… Lawmakers and privacy advocates have pushed back against the use of facial-recognition tools. In May, San Francisco banned the use of facial-recognition technology by city agencies, and Democratic presidential candidate Sen. Bernie Sanders (I., Vt.) has said he supports a federal ban on police use of the tools.

Another panelist—Ben Voce-Gardner, director of cybersecurity and threat mitigation policy at New York state's Division of Homeland Security and Emergency Services—agreed that efforts to safeguard privacy should be weighed against the benefits brought by certain uses of the technology. Facial recognition and similar tools allow government agencies to spot and monitor potential terrorists, for example.

"Facial recognition, if used properly, allows us to react faster to a potentially dangerous situation," he said.

But he said the technology should be limited, and agencies should be transparent in how they use it. "It's critical for the government to make the argument for why [facial recognition] is necessary," he said.

Similar privacy debates are being fought over emerging technologies including AI and 5G. New York City passed a law in 2017 to make algorithms more accountable, though city officials said earlier this year that progress has been slow, the Verge reported. In April, Sens. Cory Booker (D., N.J.) and Ron Wyden (D., Ore.) proposed the Algorithmic Accountability Act, which would require companies to assess automated systems for accuracy, bias and privacy."

Janofsky, A. (2019). *Emerging Technologies Hit a Barrier In Privacy Laws*. WSJ. Retrieved from https://www.wsj.com/articles/emerging-technologies-hit-a-barrier-in-privacy-laws-11570573878.

"What is clear from the past 12 months is that people want to know who is using their personal data and why. As more people become aware of the increased value of their data and the additional or strengthened rights they have to control the way their data is collected, used and shared, we expect demand for our services to continue. We accept we have entered the new normal. But organisations need to accept and respond to this too.

We may be one year on, but the work is not over. Organisations have plenty of work to do and this is not the time to switch off. As we said last year, this is a journey not a destination. People are increasingly demanding to be shown how their data is being used and looked after and they are holding organisations to account.

And it's not all about data breaches. They may attract the headlines, but over half the complaints we receive relate to the way subject access requests have been handled.

… Whilst the number of people impacted by some of the cases is staggering (for example the millions impacted by the Uber and Facebook cases), it is clear that regulators are prepared to take action even if the infringement impacts only one individual as was seen in cases in Colombia, Cyprus, Hungary and New Zealand.

Privacy is an issue across public and private sectors alike as is evidenced by the fact that the regulators in Hungary, the Netherlands, New Zealand, Norway, Portugal, Russia and the UK all took action against Public sector bodies.
The failure of businesses to appoint a DPO(data protection officer) has been picked up in Sweden as well as in the UK and is likely to be a focus for the other 24 jurisdictions that require details of the data protection officer or primary privacy contact to be notified to the regulator."

PricewaterhouseCoopers LLP. (2018). *Privacy and Security Enforcement Tracker* [Ebook]. https://www.pwc.co.uk/data-protection/Enforcement_tracker_2018.pdf.

2 PRESENTING PERFORMING ARTS

2.3 We're Watching You: Evidence

"We please ask that you turn your cellphones on."

That's the unusual instruction audience members receive at James Graham's "Privacy," which begins performances at the Public Theater on Saturday, July 2. Part comedy, part documentary, part lecture-demonstration and part fourth-wall smasher, "Privacy," which had an earlier run at London's Donmar Warehouse, explores the contemporary surveillance society and the personal trade-offs each one of us makes among freedom, comfort and security. It also asks spectators to adapt their Androids and iPhones for dramatic purpose.

(An assurance for those allergic to audience participation: All of these interactions are voluntary and many are as anodyne as a simple Google search or direction in how to take the perfect selfie.)

… To help the piece to resonate with New Yorkers, they've now interviewed some two-dozen United States experts. Ms. Rourke noted that, "Generally, the British are unconcerned about the state having their data but reluctant to share their personal histories." In America it's been the opposite. The number of audience interactions have been increased and there is a more graceful emphasis on the connections between the personal choices each individual makes (what to reveal to another person, what to disseminate online) and larger political trade-offs between liberty and security."

Soloski, A. (2016). *Is Nothing Secret? Daniel Radcliffe and the Art of 'Privacy'*. Nytimes.com. Retrieved from https://www.nytimes.com/2016/06/26/theater/daniel-radcliffe-privacy.html.

"Smile! You're on camera — or you were at some point in the past few years — and now your face is public domain.

Facial recognition technology is everywhere, and only becoming more pervasive. It's marketed as a security feature by companies like Apple and Google to prevent strangers from unlocking your iPhone or front door.

It's also used by government agencies like police departments. More than half of adult Americans' faces are logged in police databases, according to a study by Georgetown researchers. Facial recognition technology is used by governments across the globe to identify and track dissidents, and has been deployed by police against Hong Kong protesters.

To push back, privacy-focused designers, academics, and activists have designed wearable accessories and clothes meant to thwart facial recognition tech.

Facial recognition software uses artificial intelligence to detect faces or human figures in real-time. But that software is fallible — clothing can "dazzle" the software with misleading shapes that stop the AI from knowing what it's looking at. Other designs confuse AI with images of decoy faces, preventing it from making the right identification.
These designs are still niche, and have mostly only appeared as art installations or academic projects. But as facial recognition becomes more widespread, they may catch on as the next trend in functional fashion."

Holmes, A. (2020). *These clothes use outlandish designs to trick facial recognition software into thinking you're not human*. Business Insider. Retrieved from https://www.businessinsider.com/clothes-accessories-that-outsmart-facial-recognition-tech-2019-10.

"And it's not just government surveillance that has changed over the years — we ourselves are inviting devices into our homes and lives that could fundamentally alter what we can expect when it comes to privacy. If you choose to put an Alexa or Google Home in your house—a device that listens to everything you say, waiting with baited digital breath for its magic wake word—you could be fundamentally altering the answer to the question of reasonable expectation. "There is a fair argument that if I have installed these kinds of listening devices in my home, I don't have a reasonable expectation of non-interception," says Lee Tien, a senior staff attorney at the Electronic Frontier Foundation. And that might even apply to guests. If I visit a friend with a home assistant, do I no longer have a reasonable expectation of not being recorded at their house? Or what about dorm rooms — St. Louis University in Missouri recently announced a plan to install 2,300 Echo Dots in dorms room across campus. Do those students now no longer have a reasonable expectation of privacy in their rooms?

2 PRESENTING PERFORMING ARTS

2.3 We're Watching You: Evidence

These aren't just hypothetical questions, they're ones we answer with our actions. "The way that the law thinks about whether or not you should or should not have a complaint against being recorded depends on social context and norms," says Tien, "And those are things that could conceivably change depending on how technology is applied." This is why our rejection of Google Glass was more than just a fashion decision. It was a decision about reasonable expectation: It should be reasonable, that bar in Seattle said, to go get a drink and not be recorded. We should be able to expect that. And the only way to protect that expectation is by setting boundaries with our technology."

Eveleth, R. (2018). *Google Glass Wasn't a Failure. It Raised Crucial Concerns.* Wired. Retrieved from https://www.wired.com/story/google-glass-reasonable-expectation-of-privacy/.

"Some crowded events attract people from hundreds of different cultural and linguistic backgrounds, which create significant communication challenges for management to deal with. Large crowds would also witness medical and other life-threatening emergencies. As expected, some participants in large crowds go missing for different reasons. Tracking their way back through a dense crowd, especially in a foreign land, with significant communication and transportation problems, could be a very daunting task for them. It is the responsibility of the crowd administration to manage these kinds of emergencies and issues.

Many parts of the globe are now facing the menace of terrorism [11]. Crowded places have greater likelihood of being subjected to terrorist attacks as observed by the history of previous attacks. Possibilities of terrorist strikes must be taken into consideration seriously and the management should have adequate plans and measures to minimize this threat and deal with the aftermath in case the terrorists do succeed.

… Management of regular events might seem easier but the reality is quite opposite as most of the stampedes have occurred during Hajj and Kumbh Mela. However, technologies like RFID, WSNs, Cloud, and Fog can be used to manage a regular crowd, which may not be feasible in cases of irregular and spontaneous crowds.

…The framework within the CCHMS (Crowd Control and Health Management System) takes into account the nature of crowding and has built-in mechanisms to deal with them with the help of sensor and mobile technology. When applying CCHMS in real crowds, it is expected that the system would require some minor operational changes and adjustments. We believe that CCHMS can be adapted to manage crowded events around the globe. Analysis of stampedes in the last fifteen years reveals that the crowds in some of those events were neither contained nor controlled. Personal experience of the authors of this article affirms that participants generally lack education and training of the usage of facilities and proper performance of various functions of the event. It is suggested that event participants must be provided with adequate education and training with simulations. Out of bounds crowds are very difficult to manage and hence it is the responsibility of the relevant authorities to limit the size of the crowd. Providing adequate facilities for managing crowded events would be very helpful in reducing the chances of disasters."

Yamin, M., Basahel, A., & Abi Sen, A. (2018). *Managing Crowds with Wireless and Mobile Technologies. Wireless Communications And Mobile Computing,* 2018, 1-15. https://doi.org/10.1155/2018/7361597

With the development of IoT, several real life problems are solved but it has also given rise to critical ethical and legal challenges [50]. Data security, privacy protection, trust and safety, data usability are some of those challenges. It has also been observed that majority of IoT users are supporting government norms and regulations with respect to data protection, privacy and safety due to the lack of trust in IoT devices. Therefore, this issue must be taken into consideration to maintain and improve the trust among people for the use of IoT devices and systems.

Kumar, S., Tiwari, P., & Zymbler, M. (2019). Internet of Things is a revolutionary approach for future technology enhancement: a review. *Journal Of Big Data*, 6(1). https://doi.org/10.1186/s40537-019-0268-2

2.4 Performance as Protest

Artists have expressed the social and political mood of the moment throughout history, but with increasing political polarization globally, the stakes are now higher. In 2019 civil unrest around the world raged to levels not seen in sixty years and is expected to surge more in this coming year as mechanisms for voicing opposition are constrained. Protest performances staged on the street are often designed for maximum impact, complete with costumes, lighting, music and choreographed movement, by organizers with awareness of how they will play out on digital streams. Umbrellas, Gilets Jaunes, Pussy Hats and full Handmaid's Tale costumes are some of the effective tools used in recent times to elaborate on protest messaging. Use of social media as a distribution channel is immediate and crosses jurisdictional boundaries, helping to build support both locally and especially within a migrant diaspora.

In many jurisdictions, arts and culture are particularly under threat either through austerity that starves production or restrictions on freedoms that prevent expression. Increasingly sophisticated and defiant protesters have the ability to disrupt economic activity as has been seen in Hong Kong, France and most recently in Canada.

Implication for performing arts

- Co-opting performance or for protest may have legal implications
- New role for creators designers and performers

2.4 Performance as Protest: Evidence

"Contemporary activism in both its "live" and online deployments exposes the intertwined relationship between aesthetics and politics. Though historically there have been numerous examples of tactical uses of embodied behavior within so-called civil disobedience events—for example, Gandhi's peaceful sit-ins, Rosa Parks' refusal to comply with segregationist rules, and the rounds of the mothers of the disappeared in Argentina and beyond—contemporary protests rely heavily on symbolic elements and uses of the body to communicate claims across borders and languages. Anchored in the society of the spectacle, demonstrators put in practice a variety of communicative styles and mobilizing techniques that include strategic uses of non-linguistic, embodied actions as statement. These practices, such as pots and pans protests (cacerolazos) and impromptu assemblies or consultas, which originated in Latin America, are appropriated by progressive and conservative movements alike, locally and globally. In some cases, such as within the Occupy Movement or in diasporic contexts, the fact of citing a specific protest tactic creates historical continuity and ideological affinity across borders.

This "performatic literacy" demonstrates how contemporary protestors are building on and expanding previous repertoires of protest. More and more we witness and participate in local and global acts of protest and solidarity that entail visual, aural, and behavioral figurations evaluated by demonstrators as effective ways of making claims, reclaiming spaces, and denouncing abusive conditions. For example, in 2011 in Chile, students danced Michael Jackson's "Thriller" (now a classic Flash Mob choreography) to oppose the Chilean state's policies of defunding public education. Jackson's zombies clearly conveyed the protestors' understanding of the embodied effect (drawing vital energy from otherwise youthful beings) of the government's neoliberal turn regarding education. Similarly, in Canada, students appropriated the tactic of banging pots and pans that emerged in the 70s in Chile to reject impending tuition hikes. Both groups of students, Chilean and Canadian, considered these choreographed actions to be effective tools to get national and international attention and to put pressure on the government towards a favorable result. Both performances, the flash mob choreography and the pots and pans protests, are methods of amplifying the reach and tone of the local protests, and both carry the potential of being replicated in other parts of the world, creating networks of empathy and nodes within a larger social movement against neoliberalism and neoconservatism."

Fuentes, M. *What is Performance Studies?: Performance, Politics, and Protest. What is Performance Studies?*. Retrieved from http://scalar.usc.edu/nehvectors/wips/performance-politics-and-protest.

"Late last year the Spanish government passed a law that set extreme fines for protesters convening outside of government buildings.

In response to the controversial Citizen Safety Law, which will take effect on July 1, Spanish activists have staged the world's first ever virtual political demonstration.

After months of massive flesh-and-blood protests against the so-called 'gag law', thousands of holograms last night marched in front of the Spanish parliament in Madrid.

Organised by the group Holograms for Freedom, ghost-like figures holding placards took aim at the imminent draconian measures, arguing that holographic people are now afforded greater freedoms than their real-life counterparts."

Boren, Z. (2015). *The first hologram protest in history has just taken place.* The Independent. Retrieved from https://www.independent.co.uk/news/world/europe/spains-hologram-protest-thousands-join-virtual-march-in-madrid-against-new-gag-law-10170650.html.

"Street art and graphic design are defining features of the pro-democracy demonstrations that have roiled the semiautonomous Chinese territory since June. Artists often work quickly and anonymously, and present their oeuvres either in Reddit-like internet forums or public places with heavy foot traffic.

Much of the art channels pop-cultural aesthetics taken from Marvel Comics and Japanese anime. And in a financial hub where legions of young people are glued to Instagram, even the street art seems designed to go viral online.

Some protest artworks depict the movement's heroes — including Lady Liberty Hong Kong

2 PRESENTING PERFORMING ARTS

2.4 Performance as Protest: Evidence (Cont')

and a demonstrator in a yellow raincoat who fell from a building in June — in somber, reverential terms. Others are whimsical sendups of Chinese officials, including Carrie Lam, the city's embattled leader.

These pop art-style posters of Mrs. Lam, below, were designed to be stepped on as pedestrians cross a bridge leading to a train station in the city's Tsing Yi district."

Ives, M. (2019). A*t Hong Kong Protests, Art That Imitates Life.* Nytimes.com. Retrieved from https://www.nytimes.com/2019/10/11/world/asia/hong-kong-protest-art.html.

"Protesters in Hong Kong use masks, umbrellas and top-to-bottom black outfits not only protect themselves from physical threats such as the riot police's teargas and rubber bullets, but also from the invisible dangers of government identification and tracking. By obscuring their faces, individuals melt into a sea of plastic canopies, anonymous and united in a shared distrust of the authorities."

Portraits of Hong Kong's masked protesters – in pictures. the Guardian. (2019). Retrieved from https://www.theguardian.com/world/2019/nov/13/portraits-of-hong-kongs-masked-protesters-in-pictures.

"After the show, I talked to the cast. A graduate of the Hong Kong Academy for Performing Arts mentioned that work on the play had started in the summer, not long after the beginning of the current wave of protests. She found herself thinking how odd it was to be inside rehearsing a play about protests when you could just go outside and join a real one. Many of the actors were involved in the street demonstrations, and some rehearsals had been rescheduled to accommodate particularly significant rallies. Taking off their stage costumes at the end of a show, they donned others: the all-black clothing, gas masks, and helmets that have become the de-facto uniform of the uprising.

…Meanwhile, creativity expressed itself everywhere: performances, graffiti art, songs, slogans, memes. And in this artistic impulse one could see Hong Kongers striving to establish an independent sense of identity, and to insulate it against mainland influence. Wu, the director, described the Hong Kong of his youth as "a cultural desert." In a territory geared toward making money, most art that flourished was wholly commercial, like Cantopop and popcorn cinema, and was tailored for consumption across Asia rather than for a domestic audience. Wu's approach was proudly local. "How we narrate this city's past has meaning, and the meaning is political, because art is political," he said. "Not least because, in Hong Kong, the past is literally a different country."

The cast of "2047" thought constantly about the relationship between self-expression and political action. "When and how does news become art?" an actor in his late twenties asked. "We artists are always rehearsing in the privacy of our studios, but we need to move our performance to the public. Society should be our stage."

Fan, J. (2019). *Hong Kong's Protest Movement and the Fight for the City's Soul.* The New Yorker. Retrieved from https://www.newyorker.com/magazine/2019/12/16/hong-kongs-protest-movement-and-the-fight-for-the-citys-soul.

"In contemporary societies, the clear-cut separation of the public sphere and the state (as well as the economy) does not exist. Instead, we find ourselves confronted with a conglomerate of interests and agents that can be clearly separated from each other…Because activist performances take place in spaces in which the public sphere of citizens, corporate and commodified spaces, and spaces determined by mass media are inextricably connected and at times even indistinguishable…

…Although the actor-citizen of activist performances use the public sphere to call attention to their political agendas, they do not discuss and debate these agendas in public, but draw attention to specific political circumstances, suppressions or inequalities, in short, political issues they feel are not adequately discussed in governmental or party politics. Thus, for the analysis of activist performance it is necessary to perceive the public sphere as a battleground of competing publics that struggle for public attention. Before certain political issues become subject of political discussion and debate, these matters must be uttered and made visible in public. For this reason, activist performers as actor-citizens often make use of symbolic political acts in order to make their agendas visible to a wider public. In other words, they create a space for public discourse by means of performance.

Wiegmink, P. (2011). *Performance and Politics in the Public Sphere.* Escholarship.org. Retrieved from https://escholarship.org/uc/item/5rb855rp.

2 PRESENTING PERFORMING ARTS

2.4 Performance as Protest: Evidence (Cont')

"When the Extinction Rebellion (XR) protests took place all over London, with occupations at Oxford Circus and Waterloo Bridge, the pictures published in the media were particularly striking because they featured white-faced figures clad in scarlet robes.

Over the course of the protests in locations all over the city, these figures – choreographed by a Bristol street arts company called Invisible Circus – popped up with silent, ritualised performances which entertained protestors and onlookers. But with their ghostly pale faces, they also kept minds focussed on the fact that failure to avert climate catastrophe will be the death of the human race.

Invisible Circus's contribution to the XR protests is a reminder that theatre and activism have long gone hand in hand. From Pussy Riot's Punk Prayer performed in Moscow's Cathedral of the Christ of the Saviour in the week before the 2012 Russian presidential elections to Belarus Free Theatre's underground performances in opposition to the country's dictatorship, the performing arts have often been closely involved in protest.

When XR performed a 'die-in' at the Natural History Museum, it echoed the die-ins of 1980s New York, organised by Act-Up and designed to raise awareness about the AIDs crisis. One of Act-Up's organisers was Larry Kramer, who went on to write The Normal Heart. The artistic interventions around XR also recall the arts activism that sprung up around Occupy Broadway in 2011.

Theatre as a form of activism – and activism as a form of theatre – has long been with us, from the activities and the performances of the Actresses' Franchise League, which supported the women's suffrage movement, through the protest theatre of 1960s and 1970s with companies such as San Francisco Mime Troupe, Bread & Puppet, and Julian Beck and Judith Malina's The Living Theatre. In the 1980s, the Guerrilla Girls protested the lack of female artists in New York galleries.

More recently, protests against the Royal Shakespeare Company and the Tate's willingness to accept sponsorship from oil companies has attracted impromptu and eye-catching performances both on the RSC's stages and in the Turbine Hall of the Tate Modern. Performance is a particularly good way of grabbing attention, not just because it attracts media coverage but also because, as Judy Chicago once observed, "performance can be fuelled by rage in a way a painting or a sculpture cannot."

Unlike its counterpart Political Theatre, activist-led performance tends to take place out on the streets and often within local communities. Brecht's theatre was designed to make audiences think about issues and societal problems in a different way. Polish theatre under communism and South African theatre under apartheid did much to raise awareness, mostly to audiences outside those countries, about life under those regimes. Even today, shows such as Emilia, both at the Globe and in the West End, are playing a role in helping to raise consciousness about patriarchal attitudes and feminism.

…What is fascinating about this new breed of artist activists is that they do not see themselves as leaders but as listeners who understand that it is locals who are experts in their own community, who do not impose projects but take their cue from what the community says it wants and needs. They see co-creating as being at the very heart of what they do. This form of arts activism – based on understated, embedded, ground-up participatory arts activity – does not draw attention to itself in the same way as the activities around XR or Tate Modern or the interventions of Pussy Riot do. But this slow form of arts activism can be genuinely transforming. It encourages cultural democracy and brings about lasting political and social change, as it supports people to rediscover their own creativity and fosters capability, motivation and ingenuity. Now that is really radical arts activism."

Gardner, L. (2019). *Lyn Gardner on Theatre and Performance: Protest Performance: Theatre and Activism | Digital Theatre*. Digitaltheatreplus. com. Retrieved from https://www.digitaltheatreplus.com/education/news/lyn-gardner-on-theatre-and-performance-protest-performance-theatre-and-activism.

2 PRESENTING PERFORMING ARTS

2.4 Performance as Protest: Evidence (Cont')

"Costumes serve a lot of purposes in activism, whether it's to become an eye-catching symbol of a group's message, to create solidarity among a group, or to set a tone for a particular event, but most importantly, a good costume or uniform becomes greater than itself. The Handmaid's Tale is a costume of the moment thanks to the popular best-selling book and award-winning Hulu show, yet because that show has become an internet phenomenon, it'll probably have lasting power. Costumes are more ubiquitous in modern-day protesting thanks to the internet, which allows the quick spread of cultures and ideas. It makes for easier organizing and planning, but also unites larger groups. However, costumes that can go viral online are more successful. Rowe attributes the rise in protest costumes to the 20th-century popularization of mass media, including television and the internet. She says that people typically up the visual presentation of their activism when there's somebody watching. In the past 20 years, with the rise of the internet and social media, there's always somebody who can see your hard work."

Velocci, C. (2018). *Why Protesters Love Costumes.* Racked. Retrieved from https://www.racked.com/2018/3/2/17042504/protest-costumes.

3 Receiving

3

Receiving Performing Arts

Audiences will deepen their connections to the performing arts through enhanced experiences that expand participation for more people in more ways. The question of what is live and how we consent to all the implications that suggests are raised.

3.1 Sensory Enhancement

As technology advances, and particularly as immersive gaming gear situates players in cross-reality situations, perception of the boundaries of the outside world shifts. With cutting edge systems currently in development and used in applications such as high-risk situational training (warfare and surgery), advanced athletic performance and for post injury physical rehabilitation, major opportunities are also being explored for entertainment.

Deeper understanding of neurosensory engagement, in particular through Virtual Reality (VR), is allowing innovations in perceptual capacity to be augmented. Brain based amplification of our sensation skills may introduce aspects of understanding previously unavailable to us. New full-body activation tools add dimension to experiences that push to transcend our current standard senses.

All audience members could have their experiences enhanced using haptic surface stimulation; those with more limited sensory capacity could have theirs augmented even more. Blind, deaf and neurodiverse audiences may be able to more fully engage with live events through tools that may provide universal benefit to the wider public as well.

Implication for performing arts
- Use of haptic corrective learning for musicians, dancers and theater performers
- More deep participation in the event
- Potential participation of currently excluded audiences and creators
- Opportunity for instrument optimization
- Higher budgets required
- May pave the way for unexpected sponsorship from tech companies

3 RECEIVING PERFORMING ARTS

3.1 Sensory Enhancement: Evidence

"Described by its developers as "a two-way interface between human body and digital world", the Teslasuit is at the cutting edge of wearable technology. With a haptic feedback system, motion capture and positioning sensors, biometric feedback and multiplayer capabilities, it can accelerate VR training and provide richer, more personalised simulations with improved realism. Sensation and performance monitoring are at the core of the Teslasuit's design. An electronic mesh distributed throughout the suit can replicate feelings of touch, wind, water, heat and cold, using tiny electric pulses. These can be triggered by actions, or on demand, in both virtual and augmented reality – resulting in greater immersion and 360-degree awareness, while engaging muscle memory. Imagine playing a VR game and you can "feel" your opponent punching you; or if you're firing a weapon and sense the recoil; or being able to feel a character hugging you; or training as a firefighter and being aware of changes in heat.

Meanwhile, a network of 10 motion capture and positioning sensors record the body's precise movements, for transfer into live virtual environments, or for offline animation recording. These movements can be integrated with Unreal Engine 4 and Unity 3D. In training applications, for example, professionals can lay down baselines that less experienced users can then compare against, to improve motor skills based on their past tracked actions.
In addition, the biometrics system monitors vital signs – enabling advanced health and performance data analysis. Real-time data collected from users can be used to relay emotional state, stress level, and other key health indicators. This enables interactive VR/AR training content that adapts to the trainee for personalised experiences, and measurement of key baselines to understand improvement or degradation over time.

"VR enterprise training is an essential part of the digital transformation agenda," says Sergei Nossoff, Chief Executive Officer (CEO) at Teslasuit. "A modern workforce needs agile, effective, and safe training. Teslasuit has focused its recent efforts on creating enterprise VR training solutions. We have combined the innovative insight of Teslasuit with the most advanced global VR training practices. Teslasuit enhances the main advantages of audio and visual VR training: increased immersion, the engagement of muscle memory, and safety. Teslasuit as a platform solution for extended reality generated great interest and demand from enterprises. The synergy of several systems allows for simulating conditions more realistically and monitoring the state of well-being of the trainee."

"We are currently focusing on working with corporate clients in the b2b segment to use Teslasuit for VR training in various industries," says Dimitri Mikhalchuk, Chief Revenue Officer (CRO) at Teslasuit. "We offer solutions for mining and processing, high-tech construction and engineering, training for firefighters and rescuers, and other industrial applications. We are constantly updating and improving the Teslasuit product. In the future, Teslasuit will have most broad applications in medicine and rehabilitation, sports and fitness, games and entertainment."

Fox, W. (2019). *Teslasuit: A full-body VR suit.* Futuretimeline.net. Retrieved from https://www.futuretimeline.net/blog/2019/07/30.htm.

"Musical haptics is an emerging interdisciplinary field investigating touch and proprioception in music scenarios from the perspectives of haptic engineering, human–computer interaction (HCI), applied psychology, musical acoustics, aesthetics, and music performance.
…While current digital musical instruments (DMIs) usually offer touch-mediated interaction, they fall short of providing a natural physical experience to the performer. With a few exceptions, they lack haptic cues other than those intrinsically provided by their (passive) mechanics, if any (e.g., the kinematics of a digital piano keyboard)—in other words, their behavior is the same whether they are turned on or off. Such missing link between sound production and active haptic feedback, summed to the fact that even sophisticated sound synthesis cannot (yet?) compete with the complexity and liveliness of acoustically generated sound, generally makes the experience of performing on DMIs less rewarding and rich than playing traditional instruments. Try asking a professional pianist, especially a classically trained one, to play a digital piano

3 RECEIVING PERFORMING ARTS

3.1 Sensory Enhancement: Evidence (Cont')

and watch out! However, one could argue that establishing a rich haptic exchange between musicians and their digital tools would enhance performance control, expressivity, and user experience, while the music listening experience would be improved by conveying audio-related vibratory cues to the listener. Indeed, a recently renewed interest in advancing haptic interaction design for everyday intelligent interfaces—shared across the HCI and engineering communities, as well as the consumer electronics industry—promotes the idea that haptics has the potential to greatly improve usability, engagement, learnability, and the overall experience of the user, moreover with minimal or no requirements for constant visual attention. For example, haptic feedback is already used to improve robotic control in surgical teleoperation and to increase realism and immersion in virtual reality applications.

With regard to applications, haptic musical interfaces may provide feedback on the performance itself or on various musical processes (e.g., representing a score). In addition to enhancing performance control and expressivity, they have a high potential as tools for music tuition, for providing guidance in (intrinsically noisy) large ensembles and remote performance scenarios, and for facilitating access to music practice and fruition for persons affected by somatosensory, visual, and even hearing impairments. A notable example is: The virtuoso and profoundly deaf percussionist Evelyn Glennie explained her use of vibrotactile cues in musical performance, to the point of recognizing the pitch, based on where the vibrations are felt on her body. A further potential application of programmable haptic feedback in musical interfaces is to offer a way of prototyping the mechanical response of components found in traditional instruments (e.g., the kinematics and vibratory behavior of a piano keyboard), thus saving time and lowering production costs, as opposed to traditional hardware development."

Papetti, S., & Saitis, C. (2018). *Musical Haptics: Introduction. Springer Series On Touch And Haptic Systems*, 1-7. https://doi.org/10.1007/978-3-319-58316-7_1

"The California-based company, which has been quiet about what it's been working on for five years, has finally shared its plan for the world's "first true smart contact lens." But let's be clear: This is not a product you'll see on store shelves next autumn. It's in the research and development phase—a few years away from becoming a real product.

…Mojo Vision is all about "invisible computing." The company, whose founders include industry veterans from the likes of Apple, Google, Amazon, and Microsoft, wants to reduce our reliance on screens. Instead of pulling out your phone to check why it buzzed in the middle of a conversation, look to the corner of your eye to activate an interface that will tell you in a split-second.

"We want to create a technology that lets you be you, lets you look like you; doesn't change your appearance; it doesn't make you act weird walking down the street," said Mike Wiemer, co-founder and chief technology officer at Mojo Vision. "It's very discreet and frankly, substantially, most of the time it doesn't show you anything."

At the moment, the lens receives power via a wearable you wear on the wrist, which also handles much of the computing. Eventually, Wiemer said he thinks the team might drop the wearable in favor of a smartphone-based solution.

If you're looking straight ahead while wearing the lens, you won't see anything visually disrupting. But peek to a corner in any direction and you'll see icons pop up, ranging from a calendar, weather, notifications, music playback, and more. Stare at the arrow next to these icons to expand them even further to see more details, like a three-day forecast for example, or all your calendar events for the day. It took me about a minute to figure out how to navigate the interface; it could all change at any moment, but it's promising to see just how simple it is to use."

Chokkattu, J. (2020). *The Display of the Future Might Be in Your Contact Lens*. Wired. Retrieved from https://www.wired.com/story/mojo-vision-smart-contact-lens/.

3 RECEIVING PERFORMING ARTS

3.1 Sensory Enhancement: Evidence (Cont')

"Advancing virtual reality (VR) technologies are leveraging the brain's visual and auditory systems and brain-body interactions to immerse users in virtual environments. However, there is significant and untapped potential for transformative cross-fertilization at the nexus of VR experiences, neurotechnologies, and frontier brain research – both in the deployment of neuroscience research to drive greater VR immersion, as well as the use of VR in research to further our understanding of the brain/mind and in the clinic to improve health outcomes.

On May 22-23, 2019, CIFAR convened a roundtable for Fellows in the Azrieli Program in Brain, Mind & Consciousness along with global leaders in the VR industry to explore how to drive forward the development of more immersive designed realities as well as a richer understanding of the human brain. Key insights and next steps that emerged from the discussions include: the importance of non-visual (e.g., auditory, haptic and social) information for immersive VR experiences; the opportunity, and need, created by VR to better understand how humans distinguish between real and simulated experiences; and the effects of prolonged VR use on health and child development. Participants also raised important ethical issues related to privacy and data ownership, and explored how academia and industry could enhance collaboration through improved data sharing.

…One model of perception suggests that our brain is a "prediction machine" with "top-down" information processing, using past experiences to make inferences about the signals it receives. Thus, given the appropriate sensory inputs, humans can be tricked to perceive a simulation to be real. Improving neuroscientific understanding in this area can inform VR development, e.g., by identifying the most essential parameters for creating an immersive VR experience or realistic animated characters that do not fall into the "uncanny valley". At the same time, by creating simulations that allow researchers to manipulate sensory inputs from the environment or the consequences of actions, VR tools could facilitate the study of how humans perceive reality.

…Visual and auditory information helps drive emotional engagement within a VR experience. However, our perceived reality can be enhanced by layering other feedbacks such as haptics (sensation of physical touch) and even passive inputs such as heart rate, eye movement and breath. Using multisensory integration to create VR experiences that are more immersive and inclusive (e.g., for users with disabilities) is an area of active investigation.

…While VR is typically focused on the individual experience, humans are intrinsically social – experiencing a phenomenon with other people and moving in synchrony lead to increased trust and cooperation. This synchrony in body movement as well as brainwaves can be shaped by the beat and groove of music. Thus, understanding non-verbal auditory and motor aspects of social interactions can be instructive for creating better VR experiences and for exploring how VR can integrate a shared or multi-user element."

The Future of Neuroscience and VR. CIFAR. (2019). Retrieved from https://www.cifar.ca/cifarnews/2019/08/07/the-future-of-neuroscience-and-vr.

Heralded as the most significant technological innovation since the smartphone, virtual reality is poised to transform our very notions of life and humanity. Though this tech is still in its infancy, to those on the inside, it is the future. VR will change how we work, how we experience entertainment, how we feel pleasure and other emotions, how we see ourselves, and most importantly, how we relate to each other in the real world. And we will never be the same. Peter Rubin, senior culture editor for Wired and the industry's go-to authority on the subject, calls it an "intimacy engine." While once we needed another person to feel the sensations of closeness, trust, vulnerability, confidence, and titillation, VR will give us the ability to induce these sensations by ourselves for the first time in human history. This metamorphosis, Rubin argues, is going to have a powerful impact on relationships that will ripple throughout our society and our individual lives.

Rubin, P. (2018). *Future Presence – Peter Rubin – Hardcover.* Harper-Collins Publishers: World-Leading Book Publisher. Retrieved from https://www.harpercollins.com/9780062566690/future-presence/.

"The world we experience is not the real world. It's a mental construction, filtered through

3 RECEIVING PERFORMING ARTS

3.1 Sensory Enhancement: Evidence (Cont')

our physical senses. Which raises the question: How would our world change if we had new and different senses? Could they expand our universe? Technology has long been used to help people who have lost, or were born without, one of the five primary senses. More recently, researchers in the emerging field of "sensory enhancement" have begun developing tools to give people additional senses—ones that imitate those of other animals, or that add capabilities nature never imagined. Here's how such devices could work, and how they might change what it means to be human.

For decades, some deaf people have worn cochlear implants, which use electrode arrays to stimulate the auditory nerve inside the ear. Researchers are working on other technologies that could restore sight or touch to those who lack it. For the blind, cameras could trigger electrodes on the retina, on the optic nerve, or in the brain. For the paralyzed or people with prosthetic limbs, pressure pads on real or robotic hands could send touch feedback to the brain or to nerves in the arm.

…We can also substitute one sense for another. The brain is surprisingly adept at taking advantage of any pertinent information it receives, and can be trained to, for instance, "hear" images or "feel" sound. For the blind, a device called the BrainPort V100 connects a camera on a pair of glasses to a grid of electrodes on a person's tongue. At first the effect just feels like tiny bubbles, but eventually users can learn to read stronger points of stimulation as bright pixels and weaker points as dark ones, and can form a mental picture.

…Scientists are also exploring ways to add senses found elsewhere in the animal kingdom. For instance, a handheld device called the Bottlenose, built by amateur biohackers, uses ultrasound to detect the distance of objects, then vibrates the user's finger at different frequencies, giving him or her echolocation. Other devices provide the navigational sense of migratory birds: A company called feelSpace sells the naviBelt, a belt that points you in your desired direction by vibrating on your waist. Another company, Cyborg Nest, sells the North Sense, a device you can attach to your chest that vibrates when pointing north. In the future, cochlear implants could be tuned to pick up really low frequencies, such as those used by elephants, or really high ones, such as those used by dolphins. Bionic eyes could be built to allow humans to see ultraviolet rays (as butterflies, reindeer, dogs, and other animals can) and infrared light (as certain snakes, fish, and mosquitoes can).

…Perhaps we'll even achieve that so-called sixth sense: ESP. Kevin Warwick, an engineer at Coventry University, in the U.K., wirelessly connected an electrode in his arm to one in his wife's arm, so that wherever they were, they could feel when the other flexed a hand. Eagleman wants to take that idea one step further and wirelessly connect heart and sweat monitors on his wife and himself so they can sense each other's moods.

…Exactly how all this tinkering will change us remains to be seen. Harbisson says that gaining animals' senses "would allow us to connect with nature and to other species in a more profound way." But if shared senses connect us to other species, might sensation inequality pull people apart by creating new categories of haves and have-nots? We already struggle to agree on what's real and what's fake; that problem seems likely to get worse as technology creates new means of perception.

Hutson, M. (2017). *Beyond the Five Senses*. The Atlantic. Retrieved from https://www.theatlantic.com/magazine/archive/2017/07/beyond-the-five-senses/528699/.

3.2 What is Live?

Live streaming performances has become normalized at every scale, from big budget productions using professional services such as Eventstream to individual performers broadcasting from their bedrooms on YouTube. Access to content from any platform is expected and can be perceived as introducing or magnifying presentations rather than replacing them.

With immersive technologies advancing rapidly, the ability to share an event with your non-colocated peers from the comfort of home means "live" isn't what it used to be. Online globally connected gaming using hyper-realistic animation, VR and haptic feedback is already a multi billion dollar industry, with competitive e-sports audiences totaling more than 450 million viewers last year. These experiences are not confined to shooter games. Just Dance offers Massively Multiplayer Online motion based interactions where players create avatars, with costumes and backgrounds, and introduce their moves in real time with fellow dancers around the world. On Mabinogi players can compose and play music. Having practiced participatory engagement through gaming, the passive role of spectator may no longer satisfy some audiences when they do attend events in person. With diminished reverence for expertise, consumers, especially younger ones, are seeking opportunities to be involved in some sense and often expect to be understood as peers.

Implication for performing arts

- Understanding "live" as a spectrum of experience may alter performance copyright
- Royalties may need renegotiation

3 RECEIVING PERFORMING ARTS

3.2 What is Live? : Evidence

"Creative expression, by definition, is constantly evolving to respond to the world in which it's developed. Over the past few centuries, artistic trends have undergone a huge transformation – from the classic portraiture and realism of the late 1800's, abstract expressionism of the mid 20thcentury to the postmodernism of recent times. Now that we're firmly in the all-consuming grasp of the digital age, it's inevitable that the art we consume, and the way we consume it, is going to move with the times.

#Cam4art is an online webcam-based performance art event that responds to digital intimacy and internet live-stream culture. Creator Nick Tee says that "in Performance Art, there is a history of performing to the camera, but very rarely does that involve live-streaming." Through streaming directly from bedrooms, studios, galleries – or really anywhere with a webcam and an internet connection – Nick wants to give the artist more control. "By creating it online, we can bypass venue rental, box offices, these restrictions." This is raw performance art, straight from the horses mouth."

Manson, M. (2016). *Is live streaming the future for performance art?*. Huck Magazine. Retrieved from https://www.huckmag.com/art-and-culture/live-streaming-future-performance-art/.

"Live streaming through social networks has become a growing trend for performing arts institutions interested in reaching larger audiences and expanding their online presence. In a study conducted by the Pew Research Center on how cultural organizations use different kinds of technology platforms to engage audiences, 29% of participating organizations stated that they host online events, with 81% of them streaming videos and 86% claiming to have expanded their online events within the past several years. Advancements in technology, increased usage of social media, and evolving trends in consumption of art challenge arts organizations to rethink how they present their content, and for many, live streaming has been a valuable and successful practice. The California Symphony and Lincoln Center are just two of many performing arts organizations that have succeeded in reaching larger audiences from utilizing live streaming technologies. A live stream, by definition, is "a live transmission of an event over the Internet." There are countless ways to go about doing this, all of which come with unforeseen costs, benefits, and legal hurdles. It is vital for performing arts organizations to be aware of why live streaming is important, what options are available, and what obstacles must be overcome to utilize live streaming in a successful and ethical way.

Over the past decade, audience participation and engagement in the arts has evolved tremendously in ways that are highly compatible with live streaming. In 2012, 71% of U.S. adults, or 167 million people, consumed art through electronic media at least once during the previous year. Consumption included art forms such as music, ballet, theatre, and opera, and much of the consumption was done using TV, radio, internet, or a mobile device. These use patterns show that participating in the arts through digital channels is a method of engagement that many people are choosing to do, and live streaming is one way to support this. By broadcasting performances through live streaming mediums, performing arts organizations align directly with the current trends of using electronic media to consume art.

In addition to aligning with current trends in arts participation, live streaming removes barriers to access the performing arts. In 2015, the most commonly reported barrier to attending arts events was time. Live streaming overcomes this barrier by eliminating time constraints associated with traveling, eating meals, and devoting the entire performance time to being at the actual performance. With live streaming, audience members can watch performances from any place and do not have to devote any time to traveling to the performance location. Additionally, audiences who utilize live streaming do not have to give up other activities of their day in order to view a performance, meaning audiences can engage with performances without it disrupting their plans.

Other barriers to attending arts events include high costs, difficulty in traveling, and not having someone to attend with. Once again, live streaming confronts these barriers in that it is of little to no cost for audiences, does not involve traveling, and can easily be enjoyed independently. For any arts organization wanting to reach potentially interested audiences, live streaming is structured in a way that removes barriers that might prevent audiences from becoming involved with your organization."

King, E. (2018). *Live Streaming Performing Arts Using Social Media: Why, How & Best Practices* [Ebook]. https://static1.squarespace.com/static/51d98be2e4b05a25f-c200cbc/t/5d88f3e58e91e0342c-55bcbc/1569256422366/King+-+Live+Streaming+Performing+Arts+Using+Social+Media.pdf.

3 RECEIVING PERFORMING ARTS

3.2 What is Live? : Evidence (Cont')

"Music and dance features in MMORPGs are a pinnacle of the social experience. Unless you are a completionist, the only reason you would sing, strum and dance in an MMORPG would be to display your creative genius to others and get them to join in. Features like this really help to break up the grind that is often present in end-game MMORPGs, giving you an opportunity to sit back and get expressive with friends. If you prefer, you could travel the MMO world as a bard, singing stories of your guild's latest raid conquest.

Mabinogi features an interesting music system that allows players to learn and play a variety of instruments. This learned skill also has non-social applications such as reducing the growth times of your crops and producing gameplay buffs."

Nicol, M. (2016). *The Best Social features in MMORPGs – MMOs. com*. MMOs.com. Retrieved from https://mmos.com/editorials/best-social-features-mmorpgs.

"The global MMO gaming market was USD 26.9 billion in 2016 and is estimated to reach USD 44.6 billion by 2022 at a CAGR of 8.9% during the forecasted period. F2P category generates more revenue than its counterpart, P2P owing to its vast number of subscriptions and revenue generation through other sources.

Massively Multiplayer Online games (MMO games) are the online games that are capable of supporting a large number of players, typically at the same instance across globe. These games are played by customers using personal computer, video game console, smart phones and other mobile devices. Action genre are the top priority for the consumer and thus are highly regarded by the top companies. Major types of MMO games are role playing, real time strategy, simulations, sports, racing, casuals, etc. among others. New MMORPGs (Massively Multiplayer Online Role-Playing Games) with fresher mechanics and features are taking the internet by storm regardless of the business model.

Factors such as increase in development of hardware platforms, emergence of gamification, increase in online content, growth of multiplayer games, increasing usage of virtual currency are driving the MMO market."

Global Massively Multiplayer Online (MMO) Gaming Market - *Forecast to Reach $44.6 Billion by 2022 – Research and Markets. Businesswire.com. (2017)*. Retrieved from https://www.businesswire.com/news/home/20171115005641/en/Global-Massively-Multiplayer-Online-MMO-Gaming-Market.

"Mobile digital technologies allow co-presence in digital and physical spaces, including those surrounding fan conventions. Fans attending these events may wish to share real-time experiences with a wider online community who are keen to participate. However, this can create conflict with other stakeholders. This case study of activities that took place in 2016 and 2017 during Supernatural (2005–) conventions run by Creation Entertainment uses ethnographic and survey methods to examine the effect of technology platforms used for online participation during these events, including live streaming apps such as Periscope. Results show that live streaming provides positive benefit both for fans and the event organizers, and that the liveness of streams can be critical to community building and can encourage ticket purchase. However, lessons can be learned regarding transitions and boundaries between grassroots fan activity and commercial service.

…The findings here echo those from previous work examining the positive effects of live streaming on live audience attendance. As online and off-line spaces blur and compress, the difference between participating remotely and in person is less concrete. Distinctions remain, but both modes interact and contribute to the wider fan experience. Digital tools provide new avenues for fandom engagement and community building, and there are avenues for commercial revenue generation by these platforms that do not negate the fan experience. However, there are complex interactions between the technology, the online community, and the off-line experience. These must be carefully and cautiously managed to avoid alienating the community or losing key features that are the basis of the success.

Future use of these technologies both by fans and commercial producers should not disregard potential opportunities for increased profitability and fan positivity, but they should take care during monetization. The power dynamics inherent in the encouragement or prohibition of such services are critical, and the nature of sharing versus broadcasting must be considered.

3 RECEIVING PERFORMING ARTS

3.2 What is Live? : Evidence (Cont')

A successful model must be inclusive; this is particularly important if existing fan practices through appropriation of technology will be affected by the introduction of commercial alternatives. Fans are not averse to paid models if value, mutual respect, and engagement are built into the approach.

   Questions still remain over the nature of such private footage when it is released online, as well as aspects of ownership and reuse. Future exploration of the nature of digital public spaces must address these ownership questions, as well as who benefits and who is affected by previously transient, restricted experiences being recorded and shared in a permanent record. As fan communities become more embedded in the rapidly evolving hybrid physical/digital world, the future of sharing technology necessarily affects the future of fandom."

Jacobs, N. (2018). *View of Live streaming as participation: A case study of conflict in the digital and physical spaces of "Supernatural" conventions | Transformative Works and Cultures*. Journal.transformativeworks.org. Retrieved from https://journal.transformativeworks.org/index.php/twc/article/view/1393/1929.

"Through the TV broadcast of major festivals, some may argue that we already have in-home entertainment that gives us a festival feel. Indeed, these streams allow people to enjoy large-scale events without the downsides - long lines, bad weather overpriced hot dogs and more - but, a 2D experience is not as immersive as a real-life event.

   …For many, experiencing a concert in VR will be very appealing - access to your idol without the frustrations of live events (clean toilets, no queuing for a drink, no long journey home etc), plus the ability to have some control over your experience. For example, you can dial up or down interaction with other fans, you can also easily report those acting inappropriately. Another benefit, as this Mashable reviewer points out, is that everyone is fully engaged in the music and properly in the moment - there are no smartphones.

   The downside? VR isn't capable (yet) of capturing full reality. The smell of a sweaty music venue, the feel of the clammy air, the full body hug from a mate as the first chord is struck. Technology will never completely replicate the full sensory experience of a live music event. But we can get close.

   For those that physically cannot make it to a sports stadium or festival, VR offers access into an otherwise prohibited world. For fans that cannot afford tickets to music concerts, VR (for now, Facebook is apparently working on a pricing model) offers an opportunity to participate and join the conversation around major gigs for free. With binaural sound and high-quality streaming video, VR really is the next best thing to the real thing.

   It's not just VR that is changing the way we experience events. AR is becoming an increasingly common feature at conferences and festivals.

   …Immersive technologies have a unique ability to drive a deeper connection with audiences creating powerful and memorable experiences. Whilst we will see artificial intelligence, facial recognition, personalization and many more tech trends making an impact on the event scene, it's the VR, AR and MR integrations that will win the hearts and minds of attendees and fans."

Rogers, S. (2018). *Are VR And AR The Future Of Live Events?*. Forbes.com. Retrieved from https://www.forbes.com/sites/solrogers/2018/11/26/are-vr-and-ar-the-future-of-live-events/#ba4d3e34243f.

"Technology once only found in the recording studio has recently been adapted and used for on-stage performances. According to vocalist, electronic music composer and lecturer Donna Hewitt, "Recording and performance practices are trending towards each other and this is being propelled by a combination of technological shifts, a broad change in the level of production literacy of musicians, and an increasing shift towards more technologically intensive performance, either on stage (in terms of the musician's own performance tools) or off stage."

   In other words, the use of technology on stage has greatly increased, with artists becoming more experimental with the use of technology in their live performances.
The introduction of recording equipment and new pieces of tech to the stage has evolved and shaped the term "live performance". For instance, loop pedals record vocals and instruments in real time, then loop the sound back to the artist. These nifty pieces of tech allow you to create layers of sound and add textures to live performance.

   …As the concept of watching things "live" becomes more of a normality, how does this affect the way audiences view an artist's performance?

3 RECEIVING PERFORMING ARTS

3.2 What is Live? : Evidence (Cont')

Of course, seeing your favorite artist perform through a screen is not the same as seeing them in the flesh, but if more and more people are watching performances live, would this not decrease the number of people attending live shows?

Actually, 67% of live video viewers are more likely to buy a ticket to a concert or event after watching a live video of that event or a similar one. The use of technology here then acts as great advertising for artists by increasing attendees and therefore ticket sales. It's also clear that people value the experience of being physically "there" at a concert more because they are part of an exclusive group experiencing a special moment in time."

Cornell, K. (2017). *As Recording Technology Advances, How Does the "Live Experience" Change? - TuneCore*. United States. Retrieved from https://www.tunecore.com/blog/2017/10/recording-technology-advances-live-experience-change.html.

"In most current Western performing arts spectators are generally relegated to "receiver" status, having little impact on the creative process involved in performances except indirectly through the effects of appraisal reactions. Since the 1920s, attempts and experiments in theatre, dance and contemporary art, for example "The Living Stage" improvisational theatre, Adrian Piper's collaborative performances called "Funk Lessons", and Dada artists' "Mock Trial" organised by Breton, have explored new ways to encourage audience participation in performances by becoming actively involved and by interacting. Often such approaches are drawn from non-Western traditions of participatory music performance where everyone present actively participates in the performance as participants and potential participants "performing different roles" which often take place in rites and initiation ceremonies. The form of the music in these situations is within predictable structures but open to a lot of improvisation and its aim is focussed on social bonding. Similarly, composers have encouraged performers to make their own interpretation and judgement on the form of the performed piece and make live decisions on how to play the piece. For example, Luciano Berio's Sequence for solo flute offers performers the freedom to choose how long to hold a note within a predetermined framework, Lawrence D. "Butch" Morris' Conduction system proposes an exchange between composer/conductor and instrumentalists that provides the immediate possibility of altering the musical attributes of a performance. Until recently, most approaches for audience participation relied on gestural and verbal communication and low technology tools. This may hinder in-situ interactions with a large number of participants, constrain the creative possibilities and impose time constraints. With advances in human computer interaction a number of digital techniques for technologically mediated audience participation emerged, exploiting various platforms and sensors, from lightsticks, to mobile devices, and tangible interfaces. In this paper we propose a web application that enables audiences to co-create musical performances with performers in an interactive way through voting and visualisation. The system is scalable to large audiences and enables quasi-real time audience-performer interactions. It makes several novel contributions to participatory live music performance systems: (i) interactions are mediated through a voting sys-tem that can be operated by audiences from a web client application on their mobile devices, (ii) audience-to-performer grouping assignments are automated based on client connection, (iii) audience members are attributed unique digital identifiers which can be tracked for personalised feedback and analysis purposes, (iv) quasi real-time visualisations are generated by a visual client following audience-driven creative data. Following a user-centred design approach an application of the system was developed to support an interactive musical system, Open Symphony, for audience-directed improvisations built on playing modes[10]. Surveys conducted with both performer and audience participants showed that the system transforms the traditional concert experience e.g.through changes in creative ownership as well as the performance practice, providing a challenging ground for performer to test new creative forms."

Zhang, L., Wu, Y., & Barthet, M. (2016). *https://www.researchgate.net/publication/322937415_A_Web_Application_for_Audience_Participation_in_Live_Music_Performance_The_Open_Symphony_Use_Case* [Ebook]. https://www.researchgate.net/publication/322937415_A_Web_Application_for_Audience_Participation_in_Live_Music_Performance_The_Open_Symphony_Use_Case.

3 RECEIVING PERFORMING ARTS

3.2 What is Live? : Evidence (Cont')

"JB answered back right away. "I believe the future is less about what 'live theatre' is or isn't, and more about the further blurring of lines of categorization." People will be less clear about the difference between "theatre" and "live performance" and "immersive" and "public art" and "interactive," he said, "especially once 'reality' based technologies like AR/MR/VR invade the live sphere with faster and smaller real-time processing."

Mandell, J. (2017). *Will Future Storytelling Include Live Theatre?*. HowlRound Theatre Commons. Retrieved from https://howlround. com/will-future-storytelling-in-clude-live-theatre.

"The conventions of our art have changed in the past. It is only for a little over 100 years that we have come into structures specifically designed for the acoustical challenges of live perfor-mance, sat with the expectation that other members of the audience will be quiet and courteous, watched the house lights dim completely out, and applaud nearly ever performance we see no matter how good or bad it may have been. The conventions of our art form have changed over the millennia and must continue to change into the future. We cannot hold sacred conventions that marginalize potential new audiences simply because that is what we have always done. The truth is that no other art form has better possibility for incorporating mobile technology and the digital space into its conventions than theatre. In a time where I constantly read responses comparing a boring theatrical production to the exciting experience of the blockbuster movie my students attended, it is theatre's live and immediate engagement that makes it flexible and able to meet these young audiences where they live: online."

Thomas, K. (2015). *Theatre in a Mobile World*. HowlRound Theatre Commons. Retrieved from https://howlround.com/theatre-mo-bile-world.

3.3 Considering Consent

Deeply immersive art forms, where the wall between on stage and off is blurred, are emerging with new subtle interactions enabled through digital tools. They also present new challenges. Can an audience determine the limits of the experience of performance? Increasingly, the right to be forewarned is established as a social contract between presenters and audiences. University professors, news anchors, movie theaters and newspapers alert their readers and viewers of potentially upsetting content that may trigger people to remember prior experiences.

For more extreme or experimental performances, some type of contract may be required. In a digitally enhanced world, those contractual exchanges may be continuously delivered throughout an event. A haptic wristband could pulse to warn you to look away and could be dialed to your individual level of comfort with content.

Should performers have digitally enhanced boundaries as well? In an immersive situation, who can be touched, and how, need to be established in order to protect those on display. Japanese experiences with subway groping may provide an example through wearable apps developed to "repel" perpetrators using crowd notification or sound alerts.

Other Internet of Things advances have given rise to clothing with embedded sensors and Arduino activated devices that deliver a jolt to anyone attempting inappropriate touch.

Implication for performing arts
- Trigger warnings become legal protections
- Protective tools for performers emerge

3 RECEIVING PERFORMING ARTS

3.3 Considering Consent: Evidence

"Immersive theatre is a form known for its up-close-and-personal, open-world approach to audience interaction, encouraging its participants to "lose themselves" in the story and open up to a world of fantasy. It is a medium of blurred boundaries: between who is a performer and who is a spectator, and what is real and what is pretend. Despite this structure, there are certain "real-world" rules that can't be overlooked, nor should these rules be seen as a threat to the sacred (and sensitive) art of immersing an audience in fantasy.

…In the fluid environment of an immersive show, consent is vital. Almost every show includes some kind of opening speech, or a time to learn the "laws of the land": don't open closed doors, don't use your phones, don't speak unless spoken to. This time is built into the show, considered standard and expected by those familiar with the form. Discussions regarding consent are easily accommodated within these prep periods, as evidenced by many of the productions running today. Even inside the imaginary world of a show, government regulations and the laws of basic human decency still apply, regardless of how risqué or dangerous the show's content may be. Making audiences aware of the performers' rights as people should never be sacrificed to keep up an illusion, or to protect the tone of a show. Safety is not something to be dressed up in a bow or glossed over. It is a deliberate, straight-forward, logistical foundation, without which a show cannot continue. Asking audience members to respect the performers, as well as making them aware of reporting and removal protocols, should be tantamount to pointing out emergency exits."

Ableson, L. (2018). *Constructing Consent In Immersive.* Medium. Retrieved from https://noproscenium.com/constructing-consent-in-immersive-a8d6cfdeeede.

"For the most part, audiences and performers over the last couple of hundred years have entered more traditional theatre spaces clearly knowing the boundaries, and understanding the unwritten contract between them which keeps the actors on the stage and the audience in the auditorium.

…In Boris Chamatz's 10000 Gestures the naked or near naked cast invade the auditorium clambering over the audience. I found it thrilling when I saw it a couple of years ago, but I can understand that the unprepared might see it as an invasion of personal space in which they are touched without giving prior consent. How too does a production and its impact change as the world changes, particularly at a moment in time when many women are reliving trauma related to the resurfacing of the sexual harassment because of the #MeToo movement?

Or what about Ontroerend Goed's Internal, a piece which seductively invites the audience to give away secrets in a one-to-one situation, and then betrays those secrets to the wider group? Or Blast Theory's 1998 Kidnap in which they invited people to pay £10 to enter a lottery to be kidnapped. Would-be participants signed a disclaimer form. Two months later, after a period of surveillance, two of the entrants were kidnapped and held for 48 hours with their incarceration live streamed. The participants could leave at any time by using a safe word they had included on their disclaimer form.

Kidnap offered participants a get-out clause, but in most instances, particularly in a public space, an audience will go along with what the performers ask them to do, not least for fear of getting it wrong and looking stupid. The power dynamic puts them at a loss, although as the late Adrian Howells, a maker of intimate and one-to-one performances par excellence, once declared: "nobody ever actually died of embarrassment." But he was acutely aware that sometimes you feel as if you might.

Nonetheless, it is a rare audience which challenges the power of performers, as happened in Badac's 2008's The Factory at the Edinburgh fringe, which attempted to cast the audience as Holocaust victims. Some members of the audience resisted all attempts at coercion, much to the chagrin of the company.

3 RECEIVING PERFORMING ARTS

3.3 Considering Consent: Evidence (Cont')

…The more intimate the experience the more important it is to have boundaries in place to protect both audience and performer. I once found myself at a One on One theatre festival where I was unexpectedly asked to remove all my clothes. I refused, but in other circumstances I have quite happily taken my clothes off because I was forewarned about the nature of the performance, knew where the boundaries lay and could make an informed decision about whether I wanted to participate or not.

If performers must be confident that the audience will behave courteously towards them, so audiences must also be assured that there are safeguards in place to protect them. Particularly when the performance puts the audience in a place of potential vulnerability and risk.

Gardner, L. (2019). *Lyn Gardner on Theatre and Performance: The Performer and The Audience: A Changing Contract | Digital Theatre.* Digitaltheatreplus.com. Retrieved from https://www.digitaltheatreplus.com/education/news/lyn-gardner-on-theatre-and-performance-the-performer-and-the-audience-a-changing.

"Informed consent is discussed a lot, as well it should be. In medicine, in sex, and occasionally in art that tip-toes past a point of implicit understanding. Most performances, traditionally, are performed in theaters. And theaters are laden with given contracts. Most audiences enter theaters very much knowingly, with tickets that they've purchased and certain expectations. And in most performance spaces, it is glaringly apparent which space(s) are for audience, and which are for performance.

The space for the audience may have chairs.

Maybe there are people who direct the audience to their seats. They usually are wearing special clothes.

Cell phones are no-nos, as is talking or texting or unwrapping hard candies.

In other words, the audience has rehearsed their parts as well. Most know their queues and directives, and are pretty cognizant of when the performance begins and ends. Both the audience and the performers are exercising learned behaviors derived from rehearsal. Except for the audience, breaking character is not so much forgetting as it is transgressing a social contract — one that dictates precisely the way an audience is and is not supposed to react to staged performance.

All of this works because the performance, oftentimes, is rehearsed and safe. Enough so that the audience does not need to react, even if they're worried about themselves or the fates of the characters. The audience knows not to run up and save Hamlet from his death because it's fake, and the actor's fine. What happens in the performance space is rehearsed imagination and learned disbelief, and all plays — onstage, or off — are in on the game.

But it also works because the audience knows, and consents.

But what if the audience is unsure of the rules. What if an actor asks a member of the audience a question. Does she respond? Does she stay quiet? What if the performer touches her, or invites her onstage? What are the rules then?"

Meacham, T. C. *Art to Which You Don't Consent.* SixByEight Press. Retrieved from https://www.sixbyeightpress.com/art-to-which-you-dont-consent/.

"About half of U.S. professors use trigger warnings, which are brief tags meant to alert students that certain class texts and images contain material related to racism, sexual violence, or other trauma-related topics. In an email conversation with me this week, Gust, who uses plural pronouns, told me they were still in support of the warnings. That's despite the fact that a few studies have recently come out suggesting that trigger warnings have little impact—positive or negative—on those who see them.

In a 2018 paper, three Harvard researchers had participants either see or not see trigger warnings before reading passages that contained disturbing content, such as a gory murder scene from Crime and Punishment. The researchers found that trigger warnings actually slightly increased people's self-reported anxiety—but only among people who believed that words can cause emotional damage. Overall, the warnings had no significant effect."

Trigger warnings are primarily intended to help people who have experienced traumatic events, such as rape. The Harvard study did not include any people who self-reported an experience of trauma, which cast doubt on how widely it could be applied to all college students. A more recent study addressed that limitation but achieved essentially the same results. Partici-

3 RECEIVING PERFORMING ARTS

3.3 Considering Consent: Evidence (Cont')

pants who were warned that they were about to watch graphic footage or read a graphic story felt just as badly as those who weren't warned. They had a similar number of intrusive thoughts afterward. Seeing a trigger warning only slightly decreased the participants' attempts to avoid thinking about the graphic material.

This finding—that trigger warnings made practically no difference for any of these symptoms—was true even for participants who had a history of trauma, including subjects whose type of trauma matched the nature of the content they watched. "These analyses suggest trigger warnings have trivial effects even among people for whom such warnings may be specifically intended," the study's authors find.

Khazan, O. (2019). *The Real Problem With Trigger Warnings.* The Atlantic. Retrieved from https://www.theatlantic.com/health/archive/2019/03/do-trigger-warnings-work/585871/.

"The "Digi Police" app was originally issued by Tokyo police three years ago, but a function to scare off molesters was only added recently. Since then, the app has reportedly been downloaded hundreds of thousands of times — unusual for a government-developed mobile application. Women in crowded trains and other public places in Japan often face sexual harassment, but are typically too afraid to call out for help due to a sense of embarrassment. With the app, victims can press a "repel groper" icon to produce a written message saying "There is a groper here. Please help". With another press, the message turns red and a voice repeatedly says, "Please stop!" The app includes an alarm and can notify a designated email address when used — a feature that can also be used by children and their parents."

Groped daily on packed trains, Japanese women are turning to help from an app. ABC News. (2019). Retrieved from https://www.abc.net.au/news/2019-05-23/anti-groping-smartphone-app-highly-popular-in-japan/11140714.

3.4 Performance for Everyone (2.0)

As established in previous research, enabling a wider population to enjoy and participate in performing arts has long been a goal of arts organizations. New technology developments are breaking down barriers to enjoyment for those with physical, developmental or social impediments. Demands to reduce inequity include consideration of the rights of indigenous peoples, protection of racialized citizens and income desegregation. Digital tools are part of making change.

More extreme inclusion and accessibility are on the horizon as ever more effective tools are created to mimic hearing, sight and touch. Even impediments to language comprehension can be overcome using real-time AI enabled translation headsets (although setting words to music is not yet realized.) At the 2020 Oscar awards, 10 international "Elsas" sang the nominated song from the movie Frozen 2 in different languages – imagine the digital translation of musical voice into a dialect of your choice, live.

The impetus to provide greater levels of equitable experiences may be motivated by legislative insistence on providing access to all those who wish to safely participate. Moving into the future, levels of inclusion may be regulated, but the business case for making room for more people may more effectively convince organizations.

Implication for performing arts
- New artists
- New markets
- New audiences

3 RECEIVING PERFORMING ARTS

3.4 Performance for Everyone (2.0): Evidence

"One such device is Waverly Labs; Ambassador, an artificial intelligence-enhanced translation headset. Capable of performing professional-grade live speech interpretation, the device has the potential to revolutionize international tourism, education, and commerce.

How Ambassador Works

Waverley Labs' game-changing translation solution has two parts—a single earbud and an accompanying mobile application. Ambassador pairs with the user's smartphone via Bluetooth to connect the device to the startup's cloud-based neural network. Afterward, the headset can perform three distinctive live translation functions.

Ambassador's Listen mode uses a built-in microphone array and voice recognition algorithms to capture the speech of anyone within an 8-foot radius. The wearable then uploads the recorded audio and can translate it into one of 20 languages and 42 dialects. The interpreted speech is played back in the user's native language through the earbud.

Meanwhile, Ambassador's Lecture mode allows for inverted interpretive functionality. When active, it translates a user's speech into a different language that can be broadcast through their smartphone or a Bluetooth-enabled speaker.

Lastly, the artificial intelligence-enhanced interpreter's Converse mode facilitates communication between people who speak different languages. To use it, two to four users pair their Ambassadors to one smartphone. The networked earbuds then record and translate the participants' conversation in real-time.

In other words, Ambassador is a real-world version of the universal translators from "Star Trek.""

McKellop, M. (2019). *Waverly Labs' translation headset is a revolutionary wearable | The Burn-In. The Burn-In.* Retrieved from https://www.theburnin.com/startups/waverly-labs-ambassador-ces-2020-real-time-speech-translation-2019-12/.

"The study's key findings indicated that responsive digital platforms can democratize critical exchange; foster slower, more reflective critique; and positively shift perceptions of unfamiliar artforms amongst non-attenders. A sustained process of digital engagement during the creative process was revealed to facilitate contextualization and cognitive decoding and thus enhance kinaesthetic and emotional engagement during an ensuing live performance. However, confirming previous findings, it proved challenging to maintain engagement amongst online participants, particularly amongst non-attenders, which reinforced the importance of social modes of engagement.

…Ultimately this kind of digital platform has the potential to encourage a deeper, richer, more relational and democratic engagement between audiences, artists and arts organizations. Beyond the arts, the platform was shown to impact positively on participants' wider feedback mechanisms, both at work and at home, indicating its potential wider educational and sociological role in enhancing interpersonal skills and encouraging empathy with others."

Walmsley, B. (2016). From arts marketing to audience enrichment: How digital engagement can deepen and democratize artistic exchange with audiences. *Poetics, 58*, 66-78. https://doi.org/10.1016/j.poetic.2016.07.001

"…MotionSavvy, (is) a 9-person startup hatched by a team out of the Rochester Institute of Technology in New York, that's set its sights on solutions that help the deaf and hard of hearing to communicate more easily. MotionSavvy's product – which it calls UNI – is a motion-sensing tablet device set for launch next year that reads sign language using Leap Motion sensors. It translates what its user is signing and speaks the words. When the UNI hears someone else talk, it transcribes the words into visual text on its screen for its deaf user to read.

… "It will give deaf people the ability to live the lifestyle they want," says CEO Ryan Hait-Campbell , who founded the company alongside Wade Kellard, Jordan Stemper and CTO Alex Opalka. "It will mean the difference between a six-digit job and a minimum wage job."

… One of the challenges MotionSavvy has had to overcome has been the fact that sign language is a complex, nuanced way of communicating, with its own colloquialisms and geographical differences—it's tough to make one digital dictionary for all. The team is looking to vault that roadblock by launching what its calling Sign Builder—a crowd-sourced collection of signs uploaded by a vast community of users. At the moment the company has a 300 sign database—impressive but far from its goal. "We're hoping by next year, when we launch, we'll have 30,000 to 50,000 signs," says Hait-Campbell."

Strauss, K. (2014). *Tech Tackles Sign Language -- MotionSavvy.* Forbes.com. Retrieved from https://www.forbes.com/sites/karstenstrauss/2014/10/27/tech-tackles-sign-language-motionsavvy/#372e746e7862.

3 RECEIVING PERFORMING ARTS

3.4 Performance for Everyone (2.0): Evidence (Cont')

"Relaxed performance — an approach to performance that challenges what have developed as strict expectations and codes for audience and performer engagement and behaviour — is making theatre and other types of live performance like fashion shows and musical events more accessible.

…Relaxed performances aren't only a matter of comfort or preference. In June, 2019, Canada passed the Accessible Canada Act. Under this law, government organizations, Crown corporations and government-regulated industries must create accessibility plans, develop feedback tools and consult disabled people. Failure to do so can result in fines up to $250,000.

We anticipate this act is a first step — and that once these measures are embedded in government institutions, they will spread. If art is that which helps society to confront difficult truths and imagine better futures — and we believe it is — then arts organizations will perhaps strive for a higher standard than complying with law.

Artists tend to desire and welcome difference, whether off or on stage. By transforming our cultural spaces and imaginations, we foresee arts organizations creating expansive visions of belonging.

Rice, C., & Besse, K. (2020). *How a radical form of accessibility is pushing the boundaries of theatre performance.* The Conversation. Retrieved from https://theconversation.com/how-a-radical-form-of-accessibility-is-pushing-the-boundaries-of-theatre-performance-125797.

"GestureTek Health has a range of multi-sensory systems that enable people with even severely limited mobility to interact with dazzling virtual reality environments, while exploring their own creativity and imagination.

Dozens of immersive gesture-controlled special effects, images, objects and adventure simulations can be controlled with just the wave of a hand, the blink of an eye or the sweep of a foot – with no need to hold, touch or be attached to anything.

Whether it's for sensory stimulation, relaxation or rehabilitation therapy, GestureTek Health's immersive virtual reality displays & equipment make a positive difference in the lives of people with disabilities. Patients have fun while building self-esteem, independence and cognitive capacity.

The displays can be projected onto a flat surface of any size and shape— including walls, floors, tables and counters. Systems can also be featured on any size of screen, including video walls."

Sensory Engagement | Gesturetek Health. Gesturetekhealth.com. Retrieved from http://www.gesturetekhealth.com/solutions/sensory-engagement.

"For some companies/venues simply including AD (audio description) in performance is "enough" without sufficient critical thought as to how it is functioning technically or creatively. Integrated access has sought to overcome the perceived failings of traditional access provision. At its worst integrating the access artistically can override its primary purpose. At its best access becomes part of the creative process, encouraging artists to interrogate their art and offering them another creative tool while providing an immersive experience to its users. BSL (British Sign Language) is already highly visible and offers something new to the mainstream audience. AD is still largely unknown. Research in museums shows that open, multisensory AD can enhance the whole audience experience, making a visit more memorable for everyone, not only the sector(s) of the audience with specific needs. It is possible that open, multisensory AD can achieve the same for live performance."

Fryer, L. (2018). *Integrated access… is it working? - EXTANT.* EXTANT. Retrieved from https://extant.org.uk/integrated_access-_is_it_working/.

"The divisions separating theatre, dance, and music—which continue to structure not only academic departments but also performing arts venues and funders—are not only artificial but also culturally narrow, owing to the development of text-based drama and visually choreographed dance in Europe and its colonies. When in Europe and North America we speak about theatre and dance as distinct genres, we are carrying forward assumptions about speech, narrative, gesture, and composition that derive from European forms. There is every reason to unmake these divisions, not only because they prevent us from understanding related forms elsewhere in the world but also because they continually reinscribe colonial cultural categories in our own lives. A similar point can be made with regard to music: here again, it is only the specific cultural de-

3 RECEIVING PERFORMING ARTS

3.4 Performance for Everyone (2.0): Evidence (Cont')

velopment of European-influenced "art" music, with its ontology of notation and fantasy of pure sound, that allows us to conceive of music as distinct from theatre and dance.4The breakdown of boundaries between these genres and the rise of interdisciplinary performing arts practice since at least the 1960s could be seen as aligned, at least potentially, with efforts to decolonize academic and cultural institutions. Yet it would be far too simple to assume that these movements always work in tandem, as interdisciplinary arts can easily remain within the fundamental parameters of Euro-American whiteness, especially if they allow themselves to regroup under the banner of performing arts.

There are countless "global" forms and traditions in which narrative, speech, song, melody, movement, and gesture are woven together in ways that pay no heed to European genre distinctions. Indeed, attempting to generate a list of these would be counterproductive, taking the European categories for granted as the background against which otherness is defined.

…In her introduction to *The Oxford Handbook of Dance and Theater*, Nadine George-Graves demonstrates some aspects of this tension. On the one hand, her emphasis on "corporeality as an idea that unites the work of dance and theater scholars" suggests a focus on embodiment that could have radical implications for these and other fields. On the other hand, in her bid "to define an emerging field," George-Graves maintains a set of modernist distinctions that work in some ways against this potential. This is particularly evident in her dismissal of sports, where she suggests that only the competitive element "holds our attention," and of yoga and exercise, which "rarely involve an audience.

… I have argued that dismantling disciplinary boundaries, such as that between theatre and dance, should only be a first step in the direction of a more fundamental decolonial move that resituates performing arts in a wider context of healing, martial, ritual, sexual, and other embodied arts. Even if performance studies has to some degree allowed academic institutions to recognize the public and discursive dimensions of nominally private acts, we still need a richer framework for embodiment to help us decenter western techniques of audiencing and spectatorship in our understanding of embodiment and practice. Tracing the notion of decoloniality through indigenous, black, and critical white studies, I have tried to show here that embodied arts are crucial arts of survival, "arts of living on a damaged planet," arts of the past and future, and arts of the earth as well as arts of the body. It is not possible to engage with the sources cited above and still imagine that embodied arts could refer only or even mostly to performing arts. We need interdisciplinary work across theatre and dance and music, but we also need intersectional work across race and gender and religion, and this needs to take place not only in terms of what we study but also in the very structure of who studies, how, and where. The challenge to decolonize academia demands a reconsideration of the place and role of bodies—including white bodies—in its spaces."

Spatz, B. (2019). *Notes for Decolonizing Embodiment* [Journal]. https://muse.jhu.edu/article/731297#info_wrap.

"It's perhaps no surprise that the Broadway industry has traditionally served audiences that are of a 'higher class' — theater itself is sometimes viewed as an art form reserved for a select few. The Broadway League in their annual report on the demographics of Broadway audiences, reveals that 80% of all tickets in the 2014–2015 season were purchased by Caucasian theatergoers, and that the average age of all audience members was 44 years. Additionally, the average annual household income of Broadway theatergoers was $201,500, much higher compared to the U.S. national average of $54,462. In other words, Broadway audiences are, for the most part, older, wealthy and white. Despite these stark statistics, the prevalence of social media in recent years has revolutionized the way theatre fans of all backgrounds experience Broadway — changing what it means to witness and engage with live theatre.

…The use of digital technologies can positively influence how people witness theatre and, in turn, make theatre more accessible to those who previously could not engage with it. In his essay "Theatre in a Mobile World: Critiquing Convention and Calling for Innovation," author Kyle A. Thomas writes that the survival of any art form — but especially one as fleeting and ephemeral as theater — is dependent upon introducing new generations to that form through

3 RECEIVING PERFORMING ARTS

3.4 Performance for Everyone (2.0): Evidence (Cont')

the mediums they understand best. Thomas' main point is that more and more individuals now view digital spaces as the site of their truest selves, or at least a place where they can create their 'self.' What theatre does best is presenting human beings, telling very human stories, to an audience who experiences a greater version of their own humanity through the actions and conventions of the stage. To make those stories salient to a diverse, 21st century audience, the theatre industry must use digital technologies in some way — there's no ignoring it anymore."

Lewis, J. (2016). *How Social Media is Revolutionizing Broadway.* Medium. Retrieved from https://medium.com/digital-living/how-social-media-is-revolutionizing-broadway-3b5e8c3981eb.

"Does digital technology increase or reduce inequality? By digital technology I'm talking about the internet, mobile phones, and all the other tools we use to collect, store, analyse and share information digitally. There's no doubt that with digital technology comes the potential for equitable access to communication, information, resources, trading capability and social connectedness. We've seen how digital technologies have transformed the world of work, social networking, national and international trade, and provided a platform for financial inclusion.

…But once we realise that 4 billion out of the world's 7 billion people do not have access to the internet, it becomes clear that not everyone is enjoying the benefits that digital technology can provide. When digital technology is designed by the rich and for the rich, the potential for it to deliver societal benefits for low-income populations is radically diminished, and as a consequence, inequality deepens. The mere existence of technology is not enough to bridge the socioeconomic gulf that exists within our societies. To deliver the actual benefits of digital technology to the socioeconomically disadvantaged, a needs-based approach combined with a supportive ecosystem is needed. By this, I mean that new digital technologies are designed specifically to address the needs of the socioeconomically disadvantaged, and that this group is given the tools and support required to make use of digital technologies.

…There is clearly significant latent potential in digital technology to help ameliorate inequality. But with a culture where the primary goal is to capture the greatest number of new users, where profit and convenience trumps all, the tremendous societal benefit of the internet will go sadly unrealised. A shared value vision of digital technology, where tech delivers social and environmental good, combined with business benefits is absolutely within reach. But a needs-based approach coupled with a supportive digital ecosystem is required if there's to be any chance of success. The question is: does the tech industry have the imagination to redeploy its efforts to cater for people's social needs, rather than for the richest citizens' need for convenience and profit?"

Moscardini, C. (2017). *The untapped potential of digital technology to reduce inequality – Corporate Citizenship Briefing.* Corporate Citizenship Briefing. Retrieved from https://ccbriefing.corporate-citizenship.com/2017/04/13/untapped-potential-digital-technology-reduce-inequality/.
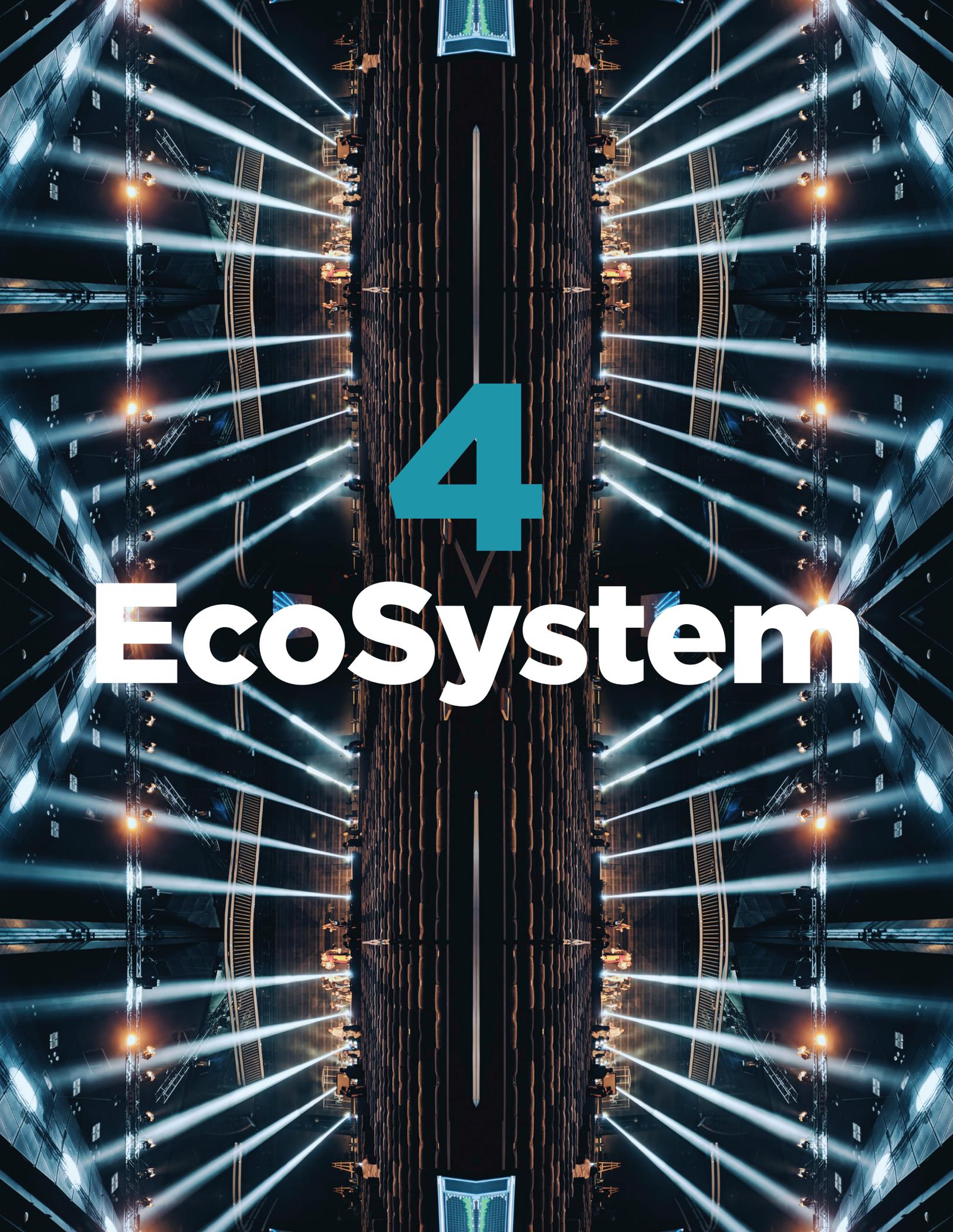
4
EcoSystem

4

EcoSystem of the Performing Arts

The impact of larger systemic issues that affect the arts as we experience major societal changes are investigated. Even more rapid computerization is connected to our ability to protect work and workers, while finding new approaches to funding is urgent. Evidence for the performing arts as a health benefit could change our consumption.

4 ECOSYSTEM OF THE PERFORMING ARTS

4.1 Next Network

Although still in its infancy, quantum computing is inching forward to a total revolution of the computational realm, propelled by massive funding levels from both governments and the private sector. Speeding up data problem solving by exponential orders of magnitude, the expectation is that once quantum processing is functional, that the transformation of science and technology development will be unrecognizable. The follow-on effect will impact all manner of innovation, but particular interest is being pinned on medical advancement, clean energy transformation and supply chain efficiencies. The business of the performing arts is likely to benefit from productivity improvements and increased reach made possible by more powerful computers.

In a more immediate sense, roll-out of 5G networks has just begun in Canada, despite national security concerns related to determining which international equipment providers will provide infrastructure. The changes in capacity 5G represents will propel new levels of automation, greater data acquisition and speedier delivery of content across multiple platforms. Deployment will only be to 20 major markets across the country at first, confirming concerns about an unequal urban rural divide. Communications technology intersecting with the internet of things suggest immersive content delivery is just around the corner.

Finally, the next rapidly accelerating innovation sphere involves hands direct brain-computer interfaces. Neurologically controlled devices process signals through a headset, activating apps and equipment, and even cars as Nissan's brain-to-vehicle experiments demonstrate.

Implication for performing arts
- More powerful tools come with the challenge of competition from ever more impressive and easier to access to technically generated screen based entertainment

Quantum Computing

"Quantum computing takes advantage of the strange ability of subatomic particles to exist in more than one state at any time. Due to the way the tiniest of particles behave, operations can be done much more quickly and use less energy than classical computers. In classical computing, a bit is a single piece of information that can exist in two states – 1 or 0. Quantum computing uses quantum bits, or 'qubits' instead. These are quantum systems with two states. However, unlike a usual bit, they can store much more information than just 1 or 0, because they can exist in any superposition of these values." *

*Beall, A., & Reynolds, M. (2018). *What are quantum computers and how do they work? WIRED explains.* Wired. co.uk. Retrieved from https://www.wired.co.uk/article/quantum-computing-explained.

4.1 Next Network: Evidence

"Quantum computers will never fully replace "classical" ones like the device you're reading this article on. They won't run web browsers, help with your taxes, or stream the latest video from Netflix.

What they will do — what's long been hoped for, at least — will be to offer a fundamentally different way of performing certain calculations. They'll be able to solve problems that would take a fast classical computer billions of years to perform. They'll enable the simulation of complex quantum systems such as biological molecules, or offer a way to factor incredibly large numbers, thereby breaking long-standing forms of encryption.

The threshold where quantum computers cross from being interesting research projects to doing things that no classical computer can do is called "quantum supremacy." Many people believe that Google's quantum computing project will achieve it later this year. In anticipation of that event, we've created this guide for the quantum-computing curious. It provides the information you'll need to understand what quantum supremacy means, and whether it's really been achieved."

Hartnett, K. (2019). Quantum Supremacy Is Coming: Here's What You Should Know | Quanta Magazine. Quanta Magazine. Retrieved from https://www.quantamagazine.org/quantum-supremacy-is-coming-heres-what-you-should-know-20190718/.

"In October 2019, Google announced that its quantum computer, Sycamore, had done a calculation in three minutes and 20 seconds that would have taken the world's fastest supercomputer 10,000 years. "Quantum supremacy," Google claimed for itself. We now have a quantum computer, it was saying, capable of performing calculations that no regular, "classical" computer is capable of doing in a reasonable time.

Where do you buy a computer like that? You don't. Google's Sycamore can't run Word or Chrome, it can't even run a nice friendly game of Minesweeper. In fact, Google's supreme quantum computer doesn't know how to do anything, other than perform one useless calculation. It resembles the huge computer in "The Hitchhiker's Guide to the Galaxy," which came up with the calculation of 42, as the "Answer to the Ultimate Question of Life, the Universe, and Everything" – although no one knows what the question is.

… The conventional wisdom is that the slowdown in the rate of the improvement of classic computers is the engine driving the accelerated development of quantum computers. QM takes a different approach. "There's no need to look for reasons to want more computing power," Sivan says. "It's a bottomless pit. Generate more calculating power, and we will find something to do with it. Programmers are developing cooler applications and smarter algorithms, but everything rests on the one engine of calculating power. Without that engine, the high-tech industry would not have come into being."

…In fact, modern encrypting is based on the same computer-challenging problems. When we enter the website of a bank, for example, the communication between us and the bank is encrypted. What is the sophisticated Enigma-like machine that prevents outsiders from hacking into our bank account? Prime numbers. Yes, most of the sensitive communication on the internet is encrypted by a protocol called RSA (standing for the surnames of Ron Rivest, the Israeli Adi Shamir, and Leonard Adelman), whose key is totally public: breaking down a large number into prime numbers. Every computer is capable of hacking RSA, but it would take many years for it to do so. To break down a number of 300 digits into prime numbers would require about 100 years of calculation. A quantum computer would solve the problem within an hour – and hack the internet."

Carmeli, O. (2020). The quantum computer is about to change the world. Three Israelis are leading the revolution. haaretz.com. Retrieved from https://www.haaretz.com/israel-news/.premium.MAGAZINE-quantum-computing-is-changing-the-world-three-israelis-are-leading-the-revolution-1.8530603.

4 ECOSYSTEM OF THE PERFORMING ARTS

4.1 Next Network: Evidence (Cont')

"The most significant development might be in physics, where researchers exploring superconductivity hope to one day use quantum computing to identify a material that is superconductive at room temperature by using qubits to model different compounds and test their characteristics.

If such a superconductor is found, then that will change everything, honestly. It would allow us to eliminate energy loss from the transmission of electricity and transform our energy grid, reducing the power generation required to power everything to a fraction of what it is today. If we get our power requirements down enough and we could power the world on renewable energy very, very soon."

Loeffler, J. (2019). *What Will Quantum Computing Change, Exactly?*. Interestingengineering.com. Retrieved from https://interestingengineering.com/what-will-quantum-computing-change-exactly.

"It's the fifth generation – 5G – of mobile broadband that will eventually replace, or at least augment, the current 4G network connection your phone uses.

With 5G, you'll see download and upload speeds somewhere between 10 and 20 times faster. That means downloading a full-length HD movie in mere seconds.

Latency, or the time it takes devices to communicate with each other over wireless networks, will also drastically decrease, while cellular coverage will be wider and connections will be more stable. 5G also brings the ability to connect many more devices at once.

WHY DOES IT MATTER?

Already exploding global mobile data traffic is expected to grow five times by the end of 2024, according to telecommunications giant Ericsson. Current networks won't be able to handle that load. As it is, carriers are running out of capacity in many major cities and users are already experiencing slowdowns during busy times of day.

The future of autonomous and interconnected devices operating cars, homes, factories and cities requires 5G, say experts.

Groups of drones will be able to communicate while tending to crops or carrying out search and rescue operations. Cars will navigate the roads and talk to each other over 5G. A future of augmented and virtual reality delivered through mobile devices will be built on 5G, too. Sophisticated wearable health devices will monitor signals and communicate with doctors in real time and the capacity for remote and precision surgery will soar."

MacLeod, M. (2019). *Lightning fast but a political minefield: the trouble with 5G in Canada. CTVNews.* Retrieved from https://www.ctvnews.ca/sci-tech/lightning-fast-but-a-political-minefield-the-trouble-with-5g-in-canada-1.4713396.

"According to a survey by Ericksson, "92% of executives from 100 major telecom operators, globally, agree that 5G will pave the way for new emerging technologies." and one of the major areas of innovation and growth would revolve around the "Internet of Things" (IoT). With 5G comes the possibility of realizing the potential of new and improved type of IoT framework within museums. What exactly does this mean? There a four components of IoT: the "Things" themselves, a network, the Internet, and back-end services. The end goal is to build an interconnected system and 5G enables the most IoT friendly ecosystem to date. Installing IoT infrastructure within museums could involve networked sensors, "smart" lighting and frames, fully contextual digital signage, and new types of experiences layered on top of the new network.

… By tapping into the 5G network, museums will be able to collect more nuanced information in real-time about the popularity of specific exhibits, spaces, and objects, in addition to demographic data about its visitors. New research on IoT application in museums illuminates just that: "IoT can be used to gather and analyse visitor generated data, leading to data-driven insights that can fuel novel, adaptive and engaging museum experiences." This will open up new possibilities for designing exhibitions, launching targeted marketing campaigns, and contextual content based on visitor interests."

5 Ways 5G Could Impact Museums — Cuseum. Cuseum. (2019). Retrieved from https://cuseum.com/blog/2019/7/8/5-ways-5g-could-impact-museums.

4 ECOSYSTEM OF THE PERFORMING ARTS

4.1 Next Network: Evidence (Cont')

"The global media industry stands to gain $765bn in cumulative revenues from new services and applications enabled by 5G ($260bn in the US and $167bn in China). Thanks to the new network capabilities brought by 5G, annual mobile media revenues will double in the next 10 years to $420bn in 2028 ($124bn in the US). The transformative impact of 5G will go well beyond just enhanced mobile media. It will disrupt the industry on many levels, with new business models and new immersive interactive experiences to capitalize on. Video, gaming, music, advertising, AR, and VR will all see fundamental changes due to 5G, bringing content and audiences closer. Ultimately, we expect 5G to help bring a new, tactile dimension to entertainment.

… Immersive media (AR, VR and cloud gaming): Low latency will make content such as virtual and augmented reality and gaming more interactive, which in turn could create a whole new category of media. The possibility of fully interactive gaming can be made both technologically and economically affordable with 5G. The benefits of low latency and MEC (Mobile Edge Computing) are not limited to the consumer arena.

• Localized content delivery for in-venue media: MEC will allow for local storage of content, bringing down the cost of transporting the content and even making it easier for operators and content providers to efficiently provide targeted localized content. With MEC, new live-media experiences could be delivered in large public venues such as stadiums and concert halls.

• New dedicated networks for high-profile media distribution: Network slicing can allow operators to provide media companies with dedicated networks for media distribution. This will make it easier for operators to sell media companies and other content distributors a guaranteed level of performance. An operator could take a network slice and dedicate it to 4K video streaming or to the delivery of high-profile real-time events such as the Super Bowl in the US. "

Barton, E., Renesse, R., Schoolar, D., & Gallagher, R. (2018). *HOW 5G WILL TRANSFORM THE BUSINESS OF MEDIA & ENTERTAINMENT* [Ebook]. https://newsroom.intel.com/wp-content/uploads/sites/11/2018/10/ovum%E2%80%93intel%E2%80%935g%E2%80%93e-book.pdf.

"Personal computing will become very, very personal. Currently, our interface is through the peripheral nervous system - input by touch and voice; output to eyes and ears. In a very personal future, we would work directly from our brains, integrating 3D nanoelectronics with our neural networks. We have already created the blueprint for 'innervated' or cyborg tissue and recently shown how electronics can be injected into and intermingled with the brain. To modify Descartes's 'cogito ergo sum', my future of computing is, 'I think, therefore it happens'."

Volpicelli, G. (2015). *What will personal computers look like in 20 years' time?*. Wired.co.uk. Retrieved from https://www.wired.co.uk/article/future-of-personal-computers.

"Whereas eye tracking solutions mostly use cameras and infrared reflections bounced off the eye to determine where a user is looking, MindAffect's approach analyzes signals from the brain to determine what a user is looking at.

To accomplish this, MindAffect flashes each button on an interface (such as every key on an onscreen keyboard) at a different frequency. As the user shifts their gaze from button to button, the company says, the unique frequency the user sees causes their brain's visual cortex to generate similarly unique signals. A non-invasive EEG headset detects and amplifies these signals, and MindAffect's algorithms work backwards to match the signal to the desired action or input. MindAffect says its current algorithms require little to no training to function accurately."

Kumparak, G. (2019). *TechCrunch is now a part of Verizon Media*. Techcrunch.com. Retrieved from https://techcrunch.com/2019/12/11/mindaffect-wants-to-let-us-control-devices-with-our-minds/.

"Stroke patients who learned to use their minds to open and close a device fitted over their paralyzed hands gained some control over their hands, according to a new study from Washington University School of Medicine in St. Louis.

By mentally controlling the device with the help of a brain-computer interface, participants trained the uninjured parts of their brains to take over functions previously performed by injured areas of the brain, the researchers said.

"We have shown that a brain-computer interface using the uninjured hemisphere can achieve meaningful recovery in chronic stroke patients," said Eric Leuthardt, MD, a professor of neurosurgery, of neuroscience, of biomedical engineering, and of mechanical engineering & applied science, and the study's co-senior author."

Washington University School of Medicine. (2017). *Mind-controlled device helps stroke patients retrain brains to move paralyzed hands: Device reads brain signals, converts them into motion*. ScienceDaily. Retrieved from www.sciencedaily.com/releases/2017/05/170526165907.htm

4 ECOSYSTEM OF THE PERFORMING ARTS

4.1 Next Network: Evidence (Cont')

Nissan presented on the concept the Brain-to-Vehicle (B2V) system, a tool which uses minute gestures made by humans to determine the future course of action by predicting what it is required to do.

Nissan says the tech is the result of research into using brain decoding technology to predict a driver's actions and detect discomfort. The system can be used to enhance driver performance and provide real-time personalization of autonomous drive mode and other functions. There are two main functions currently being studied by Nissan engineers: prediction and detection. The former kicks into action when the car is in manual driving mode, while the latter comes in handy in autonomous driving mode.

In prediction mode, the brain-to-vehicle system will use a set of yet undefined means to identify signs that the driver is about to initiate a movement. If B2V detects the driver is about to turn the steering wheel or push the accelerator pedal, the cars' computers would send signals to the respective hardware to get it ready for the task and make them respond more promptly.

Nissan hopes that B2V would allow the average Joe to become better at driving, while at the same time allowing highly skilled drivers to outperform themselves.

The detection function is meant to sense when the driver is feeling uneasy while the car is in autonomous mode. Depending on what it picks up, the car will be able to change its driving configuration to better suite the rider's needs. That includes, for instance, picking the fast lanes on highways.

Patrascu, D. (2018). *Nissan Brain-to-Vehicle Technology First Details*. autoevolution. Retrieved from https://www.autoevolution.com/news/nissan-brain-to-vehicle-technology-first-details-124978.html.

4 ECOSYSTEM OF THE PERFORMING ARTS

4.2 Distributed Protection

Opportunities to more effectively track transactional value creation and dissemination of payment are enabled using distributed computing such as blockchain. Artists, venues and audiences may benefit from secure and authenticated payments and information transfer, especially as new platforms for consuming performance emerge, and personal information is required for access. Royalty payments, which have been difficult to monitor and manage in industries like music streaming could be significantly simplified. Additionally, as digital assets become more important elements of artistic creation, demonstrating proof of authorship or ownership becomes necessary.

Decentralized digital ledgers come at a cost. Validating blockchain is extremely energy intensive, contributing to greater greenhouse gas emissions. Rebuilding the creative economy with fair remuneration suggests a transfer of prosperity. Profit making incumbents in the existing system may not support a shift in power and control.

Implication for performing arts
- Better contractual negotiation and transparent payment for creators and performers
- Potentially increased equity
- Cyber theft managed,
- Increased potential audiences for presenters

Blockchain

A blockchain is a time-stamped series of unchangeable records of data that is managed by a cluster of computers not owned by any single entity. Each of these blocks of data (i.e. block) is secured and bound to each other using cryptographic principles (i.e. chain).

The blockchain network has no central authority — it is the very definition of an open and democratized system. Since it is a shared and immutable ledger, the information in it is open for anyone and everyone to see. It records transactions between two parties efficiently and in a verifiable and permanent way. Anything that is built on the blockchain is transparent and all involved are accountable for their actions.

4.2 Distributed Protection: Evidence

"Increasingly, art is both digitally produced and presented, offering opportunities for blockchain to secure the entire value cycle of a piece of art. The technology-art divide no longer exists as technology becomes an integral part of creating, displaying, signing and selling art."

Garner, B. (2019). *10 Ways Blockchain Technology is Changing Art | CoinCentral.* CoinCentral. Retrieved from https://coincentral.com/blockchain-technology-art/.

"In the creative economy, blockchain can redefine how artists are remunerated by acting as a platform for creators of intellectual property to receive value for their work. A common complaint lodged by artists is that, as performance-rights organizations and new intermediaries such as Spotify and YouTube increasingly insert themselves into the value chain between artists and their audiences, artists receive smaller cuts of revenue and have less say over how their creative works are priced, shared, or advertised. For example, on Spotify it would take between 120 to 170 streams for rights holders to receive their first penny.

"Today, when anyone wants to pay for the right to play a song at a concert or the right to play a song in a movie, this causes quite a lot of transaction friction and takes time," says Wences Casares, CEO of Xapo, one of the largest custodians of Bitcoin.

"People end up doing it without paying or not doing it at all.

"It's likely the case that [creative work] is in reality worth much more, but the problem is creative work is undervalued due to all of the transaction frictions we see today."

Several features of blockchain can serve as a platform to address these issues.

Blockchains can host "smart contracts" to help artists manage digital rights and allocate revenue shares to contributors to the creative process. Such smart contracts have the potential to replace conventional contracts, which can be esoteric and leave some artists with little power over the terms for the content they generate.

Royalties could be designed to be more inclusive, offering fairer terms for composers, lyricists, and musicians—all stakeholders involved in the creative process. PeerTracks is an example of a service for artists to seek immediate royalty payments and ownership of their content. The service works by attaching a smart contract to every song an artist uploads and dividing the revenue according to the terms the contract stipulates.

…Creative content can be mispriced. By tracking the demand for creative content, pricing could be more dynamic. Prices for creative content could fluctuate according to supply and demand. Moreover, artists could control prices and have the ability to set prices themselves without having to go through a complex web of intermediaries.

As the blockchain could provide records of who has been granted access rights to creative works, this could then be harnessed to price creative works dynamically. Perhaps more important, because artists will be closer to their creative work than before, they may have a stronger voice in the pricing scheme and could, therefore, provide discounts on their works at certain times.

…Blockchain can help link reputations to specific "addresses" on the blockchain, thus allowing both producers and consumers of creative content to verify one another. This could encourage stronger collaboration and better behavior, by promoting cooperative terms for content creators and consumers alike. Participants who repeatedly don't fulfill terms in a contract or try to game the system would have their actions recorded, acting as a deterrent against bad behavior."

Takahashi, R. (2017). *How can creative industries benefit from blockchain?.* McKinsey & Company. Retrieved from https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/how-can-creative-industries-benefit-from-blockchain.

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4.2 Distributed Protection: Evidence (Cont')

"Anyone who follows the cultural industries — art, music, publishing, theater, cinema — knows of the tussles between artists and those who feed off of their talents. The traditional food chain in movie-making, for example, is a long one: Between those who create a film and those who pay for it — movie goers, cable subscribers, pay-per-viewers, advertisers, rights licensees, and institutional sponsors such as the National Endowment for the Arts — is a multitude of middlemen: online retailers (Amazon, Walmart), streaming video services (Netflix, YouTube, Hulu), theatre venues (Wanda's AMC, Regal, Cinemark), product placement and media agencies (Propaganda GEM, Omicom's OMD), film producers (Columbia Pictures, Marvel Studios, Disney-Pixar), movie distributors (Sony Pictures, Universal, Warner Bros.), home marketers (Fox, HBO), cable and satellite services (Comcast, DirectTV), video syndicators (PMI, TVS), film libraries and archives (Eastman House, Getty Images), and talent agencies (WME, CAA, ICM), each with its own contracts and accounting systems. That's a staggeringly long list. Each of these middlemen takes a cut of the revenues and passes along the rest, with the leftovers typically reaching the artists themselves months later, per the terms of their contracts. So concentrated is the power in this feeding frenzy that many actors have taken themselves off the menu by launching their own companies within the existing industry model. The same is true in music, too. For example, Grammy-award winning singer-songwriter Imogen Heap has been a pioneer in the field with the launch of Mycelia, a think-and-do-tank whose goal is "to empower a fair, sustainable and vibrant music industry ecosystem involving all online music interaction services," using blockchain. Artlery, a company founded by technologists and artists, is attempting the same thing for physical art such as sculptures and paintings. But for most artists and creators, that's not an option.

Enter blockchain-based platforms and programmable templates called smart contracts. Blockchain is a new technology platform, running on millions of devices and open to anyone, where not just information but anything of value — money, titles, and deeds, but also music, art, scientific discoveries, and other intellectual property — can be moved and stored securely and privately, where trust is established not by powerful intermediaries like movie studios, streaming services, banks, or other companies, but rather through mass collaboration and clever code.

Combine this powerful new technology with an artistic community that values inclusion; integrity; transparency in deal making; respect of rights; privacy; security; and fair exchange of value, and you've got yourself a new ecosystem for motion pictures, video games, and other creative pursuits."

Tapscott, A., & Tapscott, D. (2017). *Blockchain Could Help Artists Profit More from Their Creative Works.* Harvard Business Review. Retrieved from https://hbr.org/2017/03/blockchain-could-help-artists-profit-more-from-their-creative-works.

"In addition to helping with the creation of new forms of fine arts, the combination of VR and blockchain also amplifies the way people experience performing arts. A considerable portion of revenue in music is earned through live concerts. However, the attendance of such concerts is limited by the capacity of the venues, which not only disappoints enthusiastic fans who don't get to buy the tickets, but also limits the artists' earning potential. To solve this problem, a platform powered by blockchain enables audiences to experience live concerts virtually using VR equipment. Audiences pay for virtual concert tickets, and VR interactions with celebrities and artists, through their designated cryptocurrency, which creates a self-sustaining ecosystem. The system not only enables more fans to experience their idols but also helps creators and performers to earn more."

Joshi, N. (2018). *Blockchain and Virtual Reality are together reshaping the art industry – Technology For You.* Technologyforyou.org. Retrieved from https://www.technologyforyou.org/blockchain-and-virtual-reality-are-together-reshaping-the-art-industry/.

"Anders Andrae, a researcher at Huawei Technologies Sweden whose estimates are often cited, told CBC News in an email he expects the world's data centres alone will devour up to 651 terawatt-hours of electricity in the next year. That's nearly as much electricity as Canada's entire energy sector produces.

And it's just the beginning.

4 ECOSYSTEM OF THE PERFORMING ARTS

4.2 Distributed Protection: Evidence (Cont')

Andrae's calculations, published in the International Journal of Green Technology, suggest data centres could more than double their power demands over the next decade. He projects computing will gobble up 11 per cent of global energy by 2030 and cloud-based services will represent a sizeable proportion of that.

"This will become completely unsustainable by 2040," Andrae wrote.
So, what's driving the increased demand for data? Streaming video is currently the biggest culprit, with platforms like Netflix and Amazon Prime Video eating up 60.6 per cent of all internet traffic, according to network analytics firm Sandvine, headquartered in Waterloo, Ont. And streaming video usage is only growing.

But higher-speed 5G cellular networks, more widespread artificial intelligence and the nascent Internet of Things, such as smart home devices, are guaranteed to send data demands through the roof. Autonomous vehicles, for instance, require a constant flow of information to stay on the road.

The information and communications technology sector as a whole is thought to be responsible for two to three per cent of global greenhouse gas emissions — roughly on par with the often-criticized airline sector.

However, data-voracious tech giants are pledging to clean up their act. Amazon Web Services is the market leader in providing cloud computing to other companies. AWS, as it's known, says it exceeded 50 per cent renewable energy usage in 2018 and has committed in the "long term" to exclusively use clean power sources, such as wind.

Finding green solutions "is not just something that's nice to do," said Marc Musgrove, a spokesperson for Digital Realty, a California-based company that operates data centres around the world. "It's an imperative" demanded by the company's clients, including Facebook."

Daigle, T. (2020). 'Completely unsustainable': How streaming and other data demands take a toll on the environment | CBC News. CBC. Retrieved from https://www.cbc.ca/news/technology/data-centres-energy-consumption-1.5391269.

"To automate trust, some Essential Eight technologies – such as blockchain, IoT and AI – work together to ensure the authenticity of data, verify identities and enable secure multi-party transactions. For example, IoT sensors can track a pallet of food from the farm to the warehouse to the store, verifying the entire supply chain. This authenticates where a shipment is en route, as well as the conditions during each leg of the journey: Is the shipping container becoming too hot, too cold or too humid? This information is recording in a secure, unchangeable blockchain. Together, IoT and blockchain create an immutable supply chain, ensuring that buyers are getting an authentic product that has not been damaged along the way. These technologies can also verify whether a product that contains hazardous materials has been disposed of correctly and safely."

The Essential Eight technologies. PwC. Retrieved from https://www.pwc.com/gx/en/issues/technology/essential-eight-technologies.html.

"Current blockchain designs run on algorithms that can consume up to 215 kWh per transaction (i.e., the equivalent of letting an incandescent light bulb of 25W burn for a full year). This is mainly because validating and securing transactions on the blockchain requires huge computing power. For example, the servers that run bitcoin's software are estimated to use at least 22 terawatt-hours (TWh) per year, which is almost the level of Ireland's annual electricity consumption. An expansion of blockchain will require additional "data mining" and consequently additional energy consumption."

Omezzine, F., & Schleich, J. (2019). *The future of blockchain according to experts in the energy sector.* The Conversation. Retrieved from https://theconversation.com/the-future-of-blockchain-according-to-experts-in-the-energy-sector-111780.

4.3 Financing the Arts

Emergent new financing models for not-for-profit organizations in the performing arts are a necessary evolution. Fundraising is becoming challenging as traditional private philanthropic sources reorient their gifts, government cultural funds are tightened in an era of fiscal restraint, and ethical funding comes under scrutiny with activist rejecting the support of big oil and pharmaceutical corporations that have been generous in the past. Expect more disruption as measurable attainment of donor goals become a bigger imperative.

Increased self-financing may be a necessary path. For organizations seeking to reach a wider audience, live streaming offers a global reach and the potential for additional revenue, as long as fair pricing is adopted. Audiences are willing to pay, but may "pirate" digital feeds if barriers to participation are too high. Much broader viewership outside local catchments areas is both an opportunity for building loyalty. However the bar is raised competitively as international high caliber organizations introduce more content into the mix. In-event branded digital content can be a significant stream of secondary revenues, possibly equivalent to intermission concession sales in the real world.

Use of digital technologies creates frictionless marketing, payment and crowd management opportunities while generating data that can be used for analytics. Tapping into information may generate innovative new campaigns to connect with audiences and funders and methods of providing delightful experiences. Customers may move to a data-as currency model, where they exchange valuable "tokens" of information in return for access to services.

Implication for performing arts

- Increasingly competitive landscape for funding
- Increased ability to provide more accurately tailored offerings
- New skills required for fundraising

4 ECOSYSTEM OF THE PERFORMING ARTS

4.3 Financing the Arts: Evidence

"Despite the extraordinary, imaginative, and powerful work they create, it's not easy being an arts organization these days. Like many in the non-profit world, arts organizations face significant challenges: inadequate and unpredictable funding, fatigued and under-resourced staff, and a rapidly changing environment that throws traditional strategies into question. Additionally, the arts sector must address the implications of changing audience demographics, shifts in how culture and entertainment are purchased and consumed, and a widening gap between the explosive increase in art practices and limited sources of available revenue.

Across all of civil society, organizations are searching for innovative solutions to the enduring problem of financial resources. Social finance, which seeks to mobilize capital for the public good, is one of the most promising responses to emerge. Social finance tools create opportunities for investors to finance projects that realize both financial and social returns. A growing number of foundations, endowments, and other organizations managing pools of capital are embracing the promise of being able to organize their investments to achieve this blend of financial and social value. This prospect has particular potency for endowment-based organizations, like foundations, as it allows the latent potential of the organization's capital to be deployed in pursuit of its mission, thus massively amplifying the impact of investments.

…The Arts Impact Fund pilot program provides an intriguing example of how an impact investment fund can be targeted to a particular non-profit sector, and that the arts sector can be entrepreneurial and adaptive when it comes to new ways of doing business. It also highlights some of the potential challenges of impact investing for a sector that sometimes requires smaller levels of investment per project and lacks the clear, quantitative social outcome measures of areas such as education, affordable housing, green technology, or other impact investing sectors. Greater visibility of the arts as an "investable" sector and greater coordination between various players will be key to developing impact investment as a source of funding for the arts in Canada.

For arts organizations, engaging in the broader discourse on social innovation that is happening in other sectors would be one way to start enhancing both visibility and awareness, including through participation in workshops and training. Making connections and building common cause with organizations from other parts of the non-profit sector who may have more experience with alternative financial and organizational models, could also bring some new ideas to the arts sector, and contribute to the momentum of social finance as a field. Collecting examples and building up an analysis of what works, what doesn't, and various "pros and cons" of using loan financing as opposed to grants, donations, or other types of funding could be extremely helpful for arts organizations looking for alternative ways of financing their work."

Pellerin, C., & MacKinnon, E. (2018). *More than money: How social finance can build* [Ebook]. The George Cedric Metcalf Charitable Foundation. https://metcalffoundation.com/site/uploads/2018/01/Metcalf-SocialFinance-Report-final-1.pdf.

"Great live music often makes for great video. The modern stage show found at concerts frequently involves hypnotizing light effects, precise choreography and grandiose theatrics. When pulled off correctly, these elements create a compelling performance whether onstage or on screen.

Sometimes, concert video is even better than being there thanks to onstage proximity. While the show-going experience is a full-sensory one, let's be honest: we're often situated far from the artist or band, confined to the rear of a club or in the nosebleed seats of the venue. The distance is too far to see and appreciate what's happening onstage. We can hear the music fine, but the nuances and performance craft are easy to miss.

Live concert streaming is also big business, rightfully taking a seat at the table of leading categories of popular interactive online content alongside the likes of esports tournaments, internet casinos with large progressive awards and engaging VR tourism applications.

Since the advent of streaming platforms, both multi-platinum artists and emerging acts have embraced online streaming as a critical component of commercial viability. And with the now decades-old decline in physical album sales, artists and bands increasingly turn to broadcast shows online as a means to generate revenue from existing fans while raising awareness among the uninitiated."

Far Out Staff. (2018). *How live streaming has changed the concert experience and how you can find shows online*. Far Out Magazine. Retrieved from https://faroutmagazine.co.uk/how-live-streaming-has-changed-the-concert-experience-and-how-you-can-find-shows-online/.

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4.3 Financing the Arts: Evidence (Cont')

"Social media platforms such as Facebook and Instagram may have helped spur the wave of targeted direct-to-consumer (DTC) brands that have hit the market, but streaming TV may be where the category expands. That is one key takeaway from new research commissioned by the video ad platform Telaria and Hulu.

The research looked at the media consumption habits of DTC shoppers, and found these consumers spend 13 hours per week watching live or on-demand streaming TV. That is 20% more time than they spend watching cable TV, and 70% more time than they spend on social media.

In addition, there was a positive correlation between adding streaming TV to the media mix. DTC shoppers who watched both streaming and linear TV were two times as likely to buy a product after seeing an ad that those consumers that only saw on linear TV."

Weprin, A. (2019). *Direct-To-Consumer Shoppers Spend More Time Streaming TV Than On Social Media*. Mediapost.com. Retrieved from https://www.mediapost.com/publications/article/334316/direct-to-consumer-shoppers-spend-more-time-stream.html.

"Several factors contribute to the appeal of a freemium monetization model for games. Because fee features are a potent marketing tool, "the model allows a new venture to scale up and attract a user base without expending resources on costly ad campaigns or a traditional sales force. Companies that launch their games on multiple platforms can take advantage of multiple opportunities.

In a freemium model, micro-transactions are an important element driving incremental revenue. Companies that are using the freemium model typically see the share of sales rise and fall then rise again in a predictable way over time. Those that don't account for this phenomenon isk failure. For example, early adopters are more likely to pay for premium offerings than late adopters, who are more price-sensitive. Introducing new features helps drive more sales, and is a cornerstone of the model.

The use of behavioural economics is being increasingly used to persuade consumers to purchase virtual goods through dynamic pricing, targeted at defined market segments. For example, developers iterate their pricing models in real time, such that price points change in reaction to responses by targeted users. "In the end, it is use of psychology, pricing and game mechanics that are driving monetization.""

de Rosa, M., & Burgess, M. (2014). *Monetizing Digital Media: Trends, Key Insights and Strategies That Work* [Ebook]. http://www.ontariocreates.ca/Assets/Research/Research+Reports/Monetizing+Digital+Assets/Monetization-report+Digital+Assets.pdf.

"The Internet is becoming an ever-more central part of our everyday lives, and raising money is no exception to that rule. With the Baby Boomer generation aging, Millennials, and members of Generation Z will soon make up the majority of donors. Failing to adapt to these new groups by not making smart use of online fundraising platforms is a path to financial hardship for even the most deserving organization.

Therefore, strategic, informed use of these tools is paramount. Although simply posting your crowdfunding campaign page and hoping for donations is better than nothing, it isn't enough to help you reach your goals. The nonprofit marketplace is getting more competitive, as more and more campaigns fight for attention. What's more, ongoing changes to the social media algorithm are making it harder to get noticed—not only to acquire new donors but also to keep them engaged in the long run.

To generate sustainable, long-term funding, nonprofits need to be creative, on top of trends, and psychology oriented. If done properly, these approaches will result in donors who take joy from staying connected to your cause and being part of your community, and whose year-over-year donations are not only a backbone of your organization's funding but a source of pride for them.

This is a pivotal moment for the nonprofit fundraising sector. The way donors give and engage is changing, shifting from fewer major-sized donations to a model of repeated micro-giving, with lower overhead per transaction and higher rates of engagement with your cause. To suit this new donor preference, projects that refactor themselves to focus on small, very specific goals result in higher rates of success, donor satisfaction, and, of course, aggregate dollars raised."

Hatton, D. (2019). *Why Smaller Donations Are One of 2019's Biggest Online Fundraising Trends*. Trust.guidestar.org. Retrieved from https://trust.guidestar.org/why-smaller-donations-are-one-of-2019s-biggest-online-fundraising-trends.

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4.3 Financing the Arts: Evidence (Cont')

"Donors practicing venture philanthropy see their gifts as investments and draw on the analytical rigor of the for-profit world to assess the nonprofit organizations they support. It has become increasingly popular as businesses show more concern for social good, traditional funding sources have shrunk, and donors demand more impact from their giving.

…Over the past decade or so, we've seen significant shifts in philanthropy's approach to addressing some of society's biggest problems and the growing popularity of market-based or market-inspired solutions to these challenges. At the same time, ideas like shared value, the notion of businesses favoring social good over a pure economic gain, or impact-investing have become more common, due in part to declining funding from traditional sources, including federal funding, and donors' growing demand for more impact from their charitable dollars. Philanthropy and private equity used to be very distant worlds. Today, the idea of venture philanthropy has become more widespread. But how does venture philanthropy work and how does it relate to traditional forms of grant-making? And short of starting their own foundation, how can donors take a venture philanthropy approach?

… In terms of where venture philanthropy fits in the landscape. I think it takes a different piece of that pie for each of us, just like a balanced investment portfolio. The biggest risk with the gift of charity, though, is you make a gift to a social entrepreneur or not-for-profit that doesn't have the impact that you expected. A social venture fund can diversify your philanthropic investment among many expertly-vetted not-for-profits, and you can be a part of a fund's impact with a tax-deductible grant made payable to the fund, for example."

How Venture Philanthropy Works and Its Role in Effective Charity (SSIR). Ssir.org. (2020). Retrieved from https://ssir.org/podcasts/entry/how_venture_philanthropy_works_and_its_role_in_effective_charity#.

"Access to funding is increasingly competitive as the number and diversity of arts organizations rises. In the 1950s, the Canada Council for the Arts funded just 29 arts organizations (Canada Council for the Arts, 2001). Its 2017-2018 annual report noted that it funded 2244 organizations and groups in those years. The doubling of the Canada Council's government funding to $360 million by 2021, announced in the 2016 federal budget, will make a difference for many but will likely not fully address the explosive growth in the arts in Canada and long-standing inequities by art form or region.

There is no longer enough public funding available to make it feasible for artists to establish and maintain a non-profit organization (Marsland, 2013). While the non-profit model creates accountability and connections to community through the organization's mandate, board, and volunteers, it demands considerable staff time to maintain. This is a particular challenge for smaller arts organizations.

…Competition for scarce resources, changing arts practices, evolving technologies, and the blurring line between the "for-profit" and "non-profit" sectors mean that many artists work outside of the non-profit model (Litzenberger, 2013). Public arts funding bodies are trying to adapt and to support artistic collaboration and emerging work. Meanwhile, Canadian artists, particularly those who are self-employed, continue to live financially precarious lives.

Keeping an arts organization healthy in Canada is a balancing act between time spent on administrative and artistic work, generating private and public revenue sources, taking artistic risks, hitting earned revenue targets, and staying relevant to current audiences while engaging new ones."

Wilhelm, K. (2019). *A Balancing Act: Supporting the Arts in Canada | The Philanthropist.* The Philanthropist. Retrieved from https://thephilanthropist.ca/2019/05/a-balancing-act-supporting-the-arts-in-canada/.

"Given the changing landscape, and given that data is currency, how else can customers be empowered to use their own data to create value for themselves? Some companies have gotten ahead of the curve and started to create new businesses around these questions. BIGtoken is a consumer managed data marketplace spun out from the performance marketing company SRAX. The concept was born out of SRAX's realization that the amount of information they

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4.3 Financing the Arts: Evidence (Cont')

had access to and value they were creating from other people's data was a problem. As a solution, the company launched an app, which uses blockchain technology to provide transparency and consumer control, where consumers own, manage, verify, and sell their own data. As opposed to a company controlling and profiting from data as a currency, BIGtoken delivers that control and value right into the consumers hands, and consumers have responded – the app acquired 11 million + users globally just 6 weeks out of beta. SRAX's CEO Chris Migilino highlights how BIGtoken is "creating a whole new marketplace, and opening up a whole new avenue to do business" in his recent interview with Forbes. The platform's strong traction suggests that the model of agency + data as currency increasingly resonates with consumers, and that there is room for more innovation in and around data.

What does the future look like? What other business models can be created from the changing environment? Imagine a future where companies like Netflix aren't using Facebook to merely advertise to potential customers. Rather, they're working with Facebook to bring users onto the Netflix platform by enabling customers to pay with "tokens" made from data they've sold through BIGtoken. In this scenario, Facebook would expand from being an advertising platform to a data platform with the ability to onboard customers to other platforms. Customers would have more incentive to sign up for new services without spending "hard cash"

… rather they would use data as "cash" -a Data-As-A-Currency (DAAC) model. This is a very different multi-sided platform than the one that Facebook executes today. However, as the landscape continues to shift toward transparency, more (consumer) control and increased shared value among stakeholders, business models must also shift with these changes."

Lokitz, J. *If data is the new currency, how might consumers have agency over their value exchange? – Business Models Inc.* Business Models Inc. Retrieved from https://www.businessmodelsinc.com/data-is-the-new-currency/.

4.4 Culture Vitamins

Although there have been anecdotal suggestions regarding the contributions the arts make to overall happiness and fitness, in the past those improvements were not widely understood. Now, advanced neurological and physiological testing is providing robust evidence of the beneficial impact of live performance on mental and physical health. Using algorithmic methods as well as pattern finding through AI, researchers are discovering more detailed links between sensory immersion, shared experiences and well being.

In some jurisdictions, such as Denmark and Australia, participation in performance, either as audience or as performer is medically prescribed, and is seen as a more cost effective treatment than pharmaceuticals. Social prescribing, or the act of identifying treatment outside the medical framework, has been understood as a way to reduce treatment wait times, to reduce pressure on the healthcare system and primarily to relieve mental health concerns. However, in addition, the World Health Organization last year released a comprehensive synthesis study on the overall physical improvements related to arts participation in prevention and promotion of wellbeing, as well as management and treatment of acute and chronic illnesses. Validating body worn devices can pick up heart rate changes, sleep patterns and blood oxygen levels which can translate to situational levels of stress and relaxation.

Implication for performing arts

- Increased audience pool based on prescription
- Deeper understanding of the impact of performance on healthy minds and bodies
- Marketing opportunities

4 ECOSYSTEM OF THE PERFORMING ARTS

4.4 Culture Vitamins: Evidence

"Depression affects 300 million people across the globe and is the leading cause of disability worldwide according to the World Health Organization (WHO). It costs the global economy $1 trillion every year but fewer than half of those affected receive any treatment.
So Denmark is trying a different approach: People suffering from depression are encouraged to take part in cultural activities. They call it Kulturvitaminer – "culture vitamins" – and it is being trialled in four cities.

As well as avoiding drugs and their side-effects, Kulturvitaminer does not require the direct involvement of clinical staff but can be run by trained lay people. It involves getting people together in small groups to experience everything from concerts to communal singing.
In Aalborg, where group singalongs are very much part of the program, they also have an arrangement with the local symphony orchestra for groups to attend rehearsals and concerts. Scientists say listening to music reduces stress and anxiety, both of which are associated with depression.

…Those taking part say that, as well as the beneficial effects of individual activities, having something to focus on outside themselves helps their recovery. They report that being with other people who share similar experiences also really helps.
Supporters like Mads Duedahl of the health and culture administration in Aalborg say Kulturvitaminer is a cost-effective way to help people with depression. He says culture connects people and opens doors to new insights, which can create a renewed desire for life. It also helps help them get back into employment."

Mental health at work. World Economic Forum. Retrieved from https://www.weforum.org/focus/mental-health-at-work.

"The research paints a very clear picture: a rich cultural life delivers significant economic and social benefits to the Australian community. Opportunities to be involved in arts and culture can be, and often are, transformative in both general and specific ways. Arts and culture inspire and enable meaningful change across our diverse communities and within individual lives, including in the areas of some of Australia's biggest public policy challenges.

Health and wellbeing

Australia has an aging population. Conditions like dementia are becoming increasingly common, with estimated costs of more than AUD$1 trillion over the next 40 years. Australia has strong policies about using arts and culture to influence the social determinants of health—that is, the conditions in which we grow, live, work and age, including how strong our social networks are, lifestyle factors, and our psychological states, which have been strongly linked to health, wellness, and life expectancy. However, these policies are often not being systematically implemented.

There is substantial evidence that, when art and culture are used in clinical settings, they consistently deliver improved physical, mental and emotional health outcomes. Engaging with arts and cultural activities impacts the social determinants of health and has been found to mitigate the risks of dementia. In 2016, Australian researchers produced the first dose-response style study of arts and mental health, showing that 2-hour "doses" of creative activities per week could enhance mental wellbeing in a general population."

Australian Academy of the Humanities. (2019). *TRANSFORMATIVE: IMPACTS OF CULTURE AND CREATIVITY* [Ebook]. https://www.humanities.org.au/wp-content/uploads/2019/11/ANA-InsightReportTwo-FullReport.pdf.

"The provision of mental healthcare services may likely benefit from a holistic approach that includes a variety of treatment options that prioritizes patient safety and preference. The performing arts is gaining popularity among service users as an adjunctive form of treatment for mental illness. There is a growing body of evidence that provisionally supports the claim that art therapy, 'Possesses the power to heal psychological wounds'. The North American Drama Therapy Association defines drama therapy as, 'The intentional use of drama and/or theatre processes to achieve therapeutic goals' and that it is 'active and experiential'. This review article discusses and describes the merits of dramatherapy and how this treatment modality can contribute to a patient's recovery from psychological distress."

Hankir, A., Kirkcaldy, B., Carrick, F., Sadiq, A., & Zaman, R. (2017). *THE PERFORMING ARTS AND PSYCHOLOGICAL WELL-BEING* [Ebook] (pp. 196-202). Medicinska naklada. https://pdfs.semanticscholar.org/d9f1/a9044a9cd750c40f4e6fff261a76bc5c3e63.pdf.

4 ECOSYSTEM OF THE PERFORMING ARTS

4.4 Culture Vitamins: Evidence (Cont')

"We investigated how the audience member's physiological reactions differ as a function of listening context (i.e., live versus recorded music contexts). Thirty-seven audience members were assigned to one of seven pianists' performances and listened to his/her live performances of six pieces (fast and slow pieces by Bach, Schumann, and Debussy). Approximately 10 weeks after the live performance, each of the audience members returned to the same room and listened to the recorded performances of the same pianists' via speakers. We recorded the audience members' electrocardiograms in listening to the performances in both conditions, and analyzed their heart rates and the spectral features of the heart-rate variability (i.e., HF/TF, LF/HF). Results showed that the audience's heart rate was higher for the faster than the slower piece only in the live condition. As compared with the recorded condition, the audience's sympathovagal balance (LF/HF) was less while their vagal nervous system (HF/TF) was activated more in the live condition, which appears to suggest that sharing the ongoing musical moments with the pianist reduces the audience's physiological stress. The results are discussed in terms of the audience's superior attention and temporal entrainment to live performance.

Live music performance offers a special experience that is impossible through speakers or a headphone. This unique experience, often described as "communication" or "interaction", has been studied empirically. For example, "visual" aspects of live performance, even presented as a video without sound, help the audience differentiate the performer's intended levels of expressivity [1] and emotions [2, 3], enhancing the observer's physiological reactions [4]. We investigated the effect of live performance on the audience's physiology, not through a video but through a live context. By doing so, we tapped into a biological aspect of a performer-to-audience communication.

… In sum, we have revealed effects of live performance on the audience's physiological reaction. The audience's vagal nerve is activated in the live context, suggesting that live performance reduces stress and induces attention in the audience as compared with the recorded performance. The physiological entrainment by musical tempo can be facilitated only during live performance."

Shoda, H., Adachi, M., & Umeda, T. (2016). *How Live Performance Moves the Human Heart.* PLOS ONE, 11(4), e0154322. https://doi.org/10.1371/journal.pone.0154322

'Liveness' is central to dance, theatre and music performance – and to political rallies, sports events, reality TV and university lectures – but what exactly sets live experiences apart from recorded ones? How is our understanding of 'liveness' shaped by social media and new immersive technologies like virtual reality?

…Over five years, the NEUROLIVE research team will explore how liveness is generated and experienced. Across a series of newly created dance performances, it will study the minds, brains and bodies of performers and spectators during the experience of live events.

The project combines motion capture, mobile brain and body imaging, audience experience measures and machine learning techniques to produce a measure of 'liveness' that is grounded in the live performing arts, yet applicable to new and not yet developed digital technologies. NEUROLIVE develops a new kind of transdisciplinary collaboration, in which artists and scientists co-design artworks and scientific studies, including live dance performances, psychological experiments, and artist-led research workshops, culminating in a 'liveness handbook' – a critical guide to understanding live experiences in the digital age."

Cox, S. (2019). *Studying the neuroscience of live performance. Goldsmiths, University of London.* Retrieved from https://www.gold.ac.uk/news/neurolive/.

"People getting treated for depression often have to suffer through months of trial-and-error testing of different drugs to see which of them—if any—will help. For a long time, scientists and clinicians have hoped for a biological means of diagnosing depression or predicting which patients will do better on a given treatment. A new study takes a step toward the latter kind of prediction by finding a distinctive signature with the noninvasive technique of electroencephalography (EEG) to test who will benefit from one common antidepressant.

The study, published Monday in Nature Biotechnology, followed more than 300 people with depression as they began taking the drug sertraline (Zoloft) or a placebo. A computer algorithm could discern the EEGs of those who fared well on the drug from those who did not. Trained on one group, the algorithm also effectively predicted results in several others.

4 ECOSYSTEM OF THE PERFORMING ARTS

4.4 Culture Vitamins: Evidence (Cont')

…EEG measures electrical activity of the brain via electrodes placed on the skull. Some patterns of activity on the left side of the organ suggested that a patient would fare better on sertraline, Trivedi says. In the study, researchers used the same algorithm to try to find a signature—the absence of the same marker—that predicts which patients will respond well to transcranial magnetic stimulation (TMS), which delivers repeated magnetic pulses to areas of the brain thought to be involved in depression."

Weintraub, K. (2020). *Is an Anti-depressant Right for You? Ask Your Brain Waves.* Scientific American. Retrieved from https://www.scientificamerican.com/article/is-an-antidepressant-right-for-you-ask-your-brain-waves/.

"It's all too easy in these chaotic times to understand how someone with a stressful job might start feeling isolated at work, wrestle with anxiety, and develop insomnia. That's how Katie, a young lawyer, found herself increasingly disconnected, spending her weekends in bed.

"She was just trying to get through the day," says Caroline Ogilvy, a clinical independent social worker who met Katie when she came into her primary care office, an affiliate of Boston's Brigham and Women's Hospital, to get help with her depression. (Because of medical personal privacy laws, "Katie" is a pseudonym.) At the time, Ogilvy was recruiting patients for research the hospital was conducting with Companion MX, an app that uses data collected from cellphones to monitor patients' mental health, and Katie's symptoms made her eligible to participate.

Patients like Katie who used Companion MX had their location, screen time, and outgoing calls and texts tracked via their smartphones, in addition to filing mood logs through the app, which are analyzed using voice analysis. The app turned all this data into scores for mood, interest, social connections, and energy — categories that can be used to coach patients toward behavior changes.

Deducing details of a person's health through how often they text or when they leave home is called digital phenotyping, and it's a rapidly growing area of research. Phenotypes, generally speaking, are the traits, like behavior and appearance, derived from how your genes interact with your environment. Today, these environmental interactions happen not just in the physical world, but online, too.

Some researchers are now even using the term as a catch-all for the data people leave behind on the internet, social media, and other technology. The smartphones, Fitbits, sleep trackers, and other connected devices that constantly surround us generate an incredible amount of rich social and behavioral data. Jukka-Pekka Onnela, a network scientist at the Harvard T.H. Chan School of Public Health who has helped pioneer the study of using cellphone data for medical purposes, explains that something as simple as a text message can reveal a lot about someone's health. "It's like a micro-cognitive assessment. You have to have executive function, memory, linguistic function — it's these little things that turn out to be incredibly informative about a person's state."

Parshley, L. (2020). *Our phones can now detect health problems from Parkinson's to depression. Is that a good thing?.* Vox. Retrieved from https://www.vox.com/the-highlight/2020/2/5/21056921/phones-health-apps-data-digital-phenotyping.

"We've been looking to support innovation in dance – new fields, new approaches etc – and we're interested in what happens at the crossroads of dance and new technologies, and how technology might interfere with dance creation to produce something different. We've started supporting artists who look in this direction."

…"The future of dance is not only that technology takes the power on stage, but also how it can help choreographers and dancers themselves to develop their skills, and to develop new aesthetics." he says.

…Alistair Spalding, artistic director of Sadler's Wells, explains that they are also thinking a lot about how technology might influence the world of dance. "It's about understanding what impact digital culture will have on the art form," he says.

"How can we, as an art form, use the tools of the digital age to create better understanding between people? In other words, to use the tools for themselves, but also to use our qualities of bringing communities together through the use of digital tools. Whether it's to do with digital or not, there's a high prevalence of loneliness and isolation, and we want to see whether the combination of our art form and digital tools can help to bring people together."

Turney, E. (2018). Will technology affect the future of dance? | *international festival.* The Stage. Retrieved from https://www.thestage.co.uk/features/2018/will-technology-affect-future-dance-festival-international-dance-day/.

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It's the responsibility of our combined organizations to provide technology leadership within the greater arts community and to collectively facilitate a collaborative learning environment that benefits everyone. We fully intend to use our institutional influence to create connections with the technology sector and provide access to smaller organizations and individual artists.

From Digital Stage Project Mandate