

Jeté Ballet into the 21st Century:
Increasing Audience Engagement through the Integration of Technology in Ballet
Performances
for
Master of Arts

Arts and Culture

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Abstract

Ballet audiences are disappearing in a modern society preoccupied with technology on a personally interactive level. To connect with these audiences the ballet world must find ways to incorporate technology to create a more engaging audience experience. Despite the ballet world's resistance to change modernization is possible without being detrimental to the essence of the art form. This paper focuses on the way ballet has integrated technology in the past and ways to embrace technology to the benefit of both the art form and its audience.

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Glossary

Age of Romanticism- an movement in the art community during the 1800's when the individual and the hero were placed above the society as a whole. It also heavily relied on the supernatural and ideas of nature. This movement affected poetry, visual art, music and dance.

Arabesque- a common ballet step where the dancer stands on one leg (the supporting leg) and raises the other leg (moving leg) off the ground with a pointed foot. Arabesques can be performed standing flat on the ground or en pointe for women or releve for men. The moving leg can be at different heights or degrees. 90 degrees means the moving leg creates a 90 degree angle with the back.

Ballet- a type of dance that was developed during the Italian Renaissance but has become one of the staples of the dance world. Founded on a French vocabulary it has a defined set of positions and steps and focuses on a sense of lightness and delicate gracefulness. Since the 1930's ballet has become increasingly athletic featuring increasingly harder and more demanding movements and positions from its dancers.

Benchmark Art Form- an art form that the National Endowment for the Arts began tracking in 1982 in the inaugural year of the survey. The term "benchmark arts" has no bearing on the intrinsic value of the art form itself.

CGI- Computer Generated Imagery

En Pointe- The position when a dancer stands on her toes in a pointe shoe.

Gel- a thin piece of colored film that is placed in theatrical lights to change the color of the light. The color can reflect a mood or setting for the stage.

Gobo- a thin piece of metal with shapes cut out of it that when inserted into a specific lighting instrument creates shadows on the stage.

Jeté- a large split leap performed by ballet dancers. Jeté means “to throw” in French which is the idea of the movement for the dancer. The dancer is throwing themselves into the air.

Pointe shoes- special stiff shoes worn by advanced ballet dancers that give the appearance of the dancers standing on their tip toes.

Proscenium stage- A type of stage that frames the performance area and sets the performers above the audience.

Raked stage- a stage that is built on an angle where the back part of the stage is elevated. This allowed audiences on a flat floor to see the feet of the dancers when they were at the back of the stage.

Relevé- a motion where the dancer rolls through the foot from standing to stand on the ball of the foot.

Suspension of disbelief-the willingness of an individual to suspend his or her critical analysis of the surroundings or events in order to experience enjoyment. Overlooking the restrictions of the medium and believing in what is being conveyed instead of what is actually seen or experienced.

Tech Week- the time before a performance when the dancers move from the rehearsal space into the theatre. This is the time when the stage elements i.e. costumes, lighting, props, and sets are introduced to the production. Tech Week is usually a matter of days (Wednesday –Friday afternoon) for a show opening Friday night.

Toe box- the hard box on tip of the pointe shoe. Made of layers of canvas stiffened with paste (water and flour) and covered with satin, the toe box serves as the support system for the entire dancer and is available in a variety of widths depending on the shape of the dancer's foot. This is the part of the shoe that allows dancers to stand "en pointe" or on their toes.

Introduction

The arts influence everyday life in America whether it is noticed or not: billboards, drink labels, television, cars, jewelry, and clothes are all influenced by the visual and performing arts. Being surrounded by the arts is different than engaging with the arts. Two-thirds of the adult American population attended an art event last year while 87% say that the arts are important to quality of life (Americans for the Arts 2016, 8). Despite these numbers there has been a gradual and steady decline in the attendance of the arts over the past several decades; more than a short-term trend that affects both the visual and performing arts alike. There are many factors that cause the declining trend and goes far beyond the economic recession in 2008 (Jacobs 2013).

The National Endowment for the Arts' 2012 reports the decline in attendance has been in previously stable audience groups as documented through subscription purchases to benchmark arts (Jacobs 2013}. If no action is taken by the organizations producing these arts, the choreographers who make ballets and the dancers themselves ballet will become an antiquated art form. Audiences will literally die out as the older generations age out and the younger generations fail to replace them.

Before the reasons for declining ballet audiences can be determined and define solutions to the problem it is important to know what ballet is, how it has evolved throughout the centuries, and why its continuation matters. Though the word is well known the history and development of *ballet* is not general knowledge to most. By looking at how and why ballet began, as well as what attracted audiences originally the future of ballet can be considered.

Background

A Brief History of Ballet

Ballet is a visually striking word evoking visions of sugar plums, smiling ballerinas, and fluffy white tutus atop pink satin pointe shoes. Ballet did not begin this way. There was no single person who said 'let there be ballet' and women donned gauzy tutus, gelled their hair back into tight buns, shoved their feet into debilitating footwear and began dancing together on a beautifully decorated stage in perfect unison. Despite the vocabulary being French, ballet has its origins in the Italian Renaissance in the 1400's. Even the word "ballet" is derived from the Italian *ballare* meaning to dance. Renaissance ballet was brought to the French court by Catherine d'Medici, a great patroness of the arts in Italy, when she married King Henry II of France (Atlanta Ballet 2017). The dances, which were more similar to stately and opulently costumed court dances than what one would see on a stage today, were performed by the kings, queens, and nobles of the court in a ballroom. A century later after the Sun King Louis XVI ballet developed a codified vocabulary and the performing was turned over to professional dancers (Atlanta Ballet 2017).

Following the French Revolution in the late 1700's, fashions shifted becoming less restrictive and footwear changed from heeled court shoes to flexible slippers. Greater articulation or movement of the feet became possible propelling the advancement of ballet from a technical standpoint. Dancers could actually point their feet and rise onto the balls of their feet, perform jumps, and more graceful movements. The demand for ballet from audiences led to the development of a greater performance space including a proscenium

stage- an elevated platform stage with draped fabrics to frame the dancers which is still used today.

During the age of Romanticism, an art movement in the 1800's that extended to literature, visual art, music, and ballet that focused on nature, individuality and the triumph of heroes, the dances focused on narrative story lines that included fairies and other ethereal creatures. According to dance historians, the era of Romantic Ballet is the ancestor of modern ballet (Laemmli 2015, 3). To give the illusion of floating across the stage there were two significant applications of technology: a pulley system that moved dancers across the stage, on a series of complicated and cumbersome wires and stiffened slippers with a reinforced toe box that required years of special training to use and was restricted to a few privileged dancers. "In retrospect, the pointe shoe seems obvious and the wired ballerinas laughable, but this was hardly the case in that historical moment when both technologies were vying to make women seem as though they could fly" (Skybetter 2014, 83). The advancement of the footwear worn by ballet dancers is strongly connected to the story lines of the Romantic Era ballets heavily featuring the supernatural. Having the ability to seemingly float across the stage on their tip toes increased the ethereal feel of the ballet and provided a new draw for audiences. "Nearly two hundred years later, the Romantic-era links between the pointe shoe and the supernatural, the transcendent, and the effusively feminine are still strong" (Laemmli 2015, 3). Seemingly inconsequential the hardening of the toe box in ballet footwear has made a lasting and significant change to the ballet world that cannot be ignored.

Not all innovations create lasting and historic changes for the art form but the important part is that advances are made and spur more changes that do make a significant difference.

Labanotation, like the wire pulley system, is not the gold standard for recording choreography now but it was in 1928. Rudolf Laban saw a need to record dance for future generations. The notation describes not only steps, and, movement directions, but also nuances, characterization, and small details that could be lost when the roles were passed down from teacher to student over a number of generations (Dance Notation Bureau 2017). Allowing a choreographer to restage an entire ballet was a huge improvement on word of mouth from teacher to student in 1928 when the video recording technology was expensive and unreliable. As the technology to film and show dance increased the necessity to rely on Labanotation decreased. As the art form evolves, so does the technology associated with it such as the incorporation of filming and even lighting developments.

Electronic stage lighting is able to change colors and brightness at the touch of a button with no changing of gels or lighting instruments and is a massive improvement from the smoky oil lamps and dim candles used in the 19th century. Designers have even utilized lasers and projections to enhance the performance from a spectator perspective (Gomez 2014). Lighting engineers and designers have developed gobos, computerized lighting, and side lighting that showcase choreography and the dancers literally in a new light. Lighting of a piece creates the mood and the atmosphere shaping the dancers and the dance and enhancing the experience

Russian Influence and Advancement

During the mid to late 1800's Russia took the forefront as a world leader in ballet evolution and focused on illusions within performance to tell the story. It was not until the early 20th century with Serge Diaghilev and his Ballet Russe - around four hundred years after the creation of ballet that artistry and technique were joined. Diaghilev revolutionized not only

ballet, but the art world in the beginning of the 20th century by combining great artists from different art forms including dance, music, fashion, art, and literature.

He gave leading roles to anonymous dancers (e.g., Nijinsky, Ida Rubinstein), commissioned works by recent Conservatory graduates (e.g., Stravinsky, Prokofiev) and encouraged young dancers to try their hand at choreography (e.g., Lifar, Balanchine). Through his bold new productions, Diaghilev defined what was possible in art and reduced the cost of experimentation. (Sgourev 2016, 348)

Incorporating avant-garde aesthetics like Picasso's cubism or Stravinsky's discordant *Rite of Spring* with ballet - something that was already accepted as an art allowed the unforgiving and critical art society of the early 20th century to accept these new art forms and make their way into the mainstream culture.

The Balanchine Era

The next major change in ballet followed Diaghilev's death and was brought about by one of his students, a Russian man named George Balanchine. In 1933, Balanchine moved to America and with the help of Lincoln Kirsten established the first American ballet company eventually known as The New York City Ballet (New York City Ballet 2017). Balanchine abandoned much of the narrative ballet structure and instead focused on abstract ballets that showcased the dancers instead of the plot. His style incorporated a newfound element of elite athleticism into ballet, changing its course permanently. Balanchine is also credited with industrializing the pointe shoe industry and turning pointe work from a mere stage trick to a mandatory technical staple all female dancers must train in to dance professional. Pointe shoes not only changed the look of ballet but the training, choreography, and necessary physical requirements of dancers themselves (Laemmli 2015, 8).

Balanchine died in 1983, and though his legacy is carried on by former students, the Balanchine Trust, New York City Ballet, and the School of American Ballet have a void that has not been filled (New York City Ballet 2017). Ballet's golden age faded away as other more contemporary styles of dance came into popularity. Without a Diaghilev or Balanchine to serve as the leader for the ballet world innovative progress slowed. Not to say that there were not choreographers inventing new works but that ballet as an art form stopped moving forward and began to stagnate and the audience began to disappear.

Problem

The decline in attendance is present in all age groups, genders, socio economic and education levels indicating not a casual drop in one demographic, but a generalized effect- "There's no tidy answer as to why this is happening. There is a lot of competition for leisure activities" (Cohen 2013). Luckily the NEA has not just been tracking the rate of decline but also the reasons given by those surveyed, providing some insight into ways to remedy the problem. Two major questions addressed were 1. How many people seriously considered attending a live performance but ultimately passed? 2. Why did they stay home? "If your knee-jerk answer to that second question was 'the high price of tickets, of course,' think again. While cost certainly made the list, it was less of a factor than a lack of time" (Jacobs 2013)

Organizations often lower ticket prices in an attempt to sell more seats, and while it may work on a temporary small scale it will not draw repeat patrons. Lack of time was not the only culprit prohibiting potential patrons from attending arts performances in 2012. "Inaccessibility- the perception that the venue where an event is held would be too difficult to get to- was cited nearly as often as money. In addition, one in five decided to stay home because they could not

find anyone to accompany them” (Jacobs 2013). Knowing that finance is not the main barrier to attendance enables organizations, like Ballet Austin, to adjust their methods of attracting audiences and reevaluate their systems.

Ballet Austin’s research discovered two defining reasons that brought people to the ballet: Social Experience and/or Intellectual or Cultural Experience evidence suggesting that the two were not mutually exclusive. Shedding new light on why people attend, or avoid, the ballet is invaluable information in the process of solving the audience decline problem. Attendance does not have as much to do with the performance itself as the overarching experience (Decker 2017, 6). Knowing the true reasons for the decline in attendance leads organizations to better understand the problem and creating a more applicable solution. With social needs being fulfilled through social media and smart phones the need to experience time-consuming social experiences, like attending the ballet, has decreased.

Lack of time and geographic difficulty are the key factors to solving the puzzle of what the NEA has termed “the missing audience”. Potential patrons who cite these excuses make up 13%, nearly 31 million Americans (Jacobs 2013), a substantial number who as actual patrons would add significant resources to the American arts culture. Ballet Austin found the decline in ballet attendance is caused by due to lack of time, inconvenience, and unfamiliarity. Today’s audiences are challenging the conventional notion that the arts experience is comprised of sitting in the audience of a performance and moving toward more emphasis on participation and engagement with the art. (Art Fund Works 2017. Ballet must become a more fulfilling experience that not only entertains, but also enlightens, and create a lasting impression with the audience making them want more to retain repeat patronage.

Examining the use of and impact technology has on ballet performances as a way of enticing patrons into supporting classical ballet by purchasing seats and becoming donors. The steady decline of the number of ballet patrons necessitates innovations in the incorporation of technology in performances, while maintaining artistic integrity, to ensure increased attendance in the future by engaging audiences.

Approach

A classically trained ballerina with over a decade of professional experience behind the scenes, the author has a substantial understanding of concerns facing classical ballet as an art form in a fast paced and technology dependent culture. While researching applications of technology in classical art forms the author was drawn to the real-world applications of such interaction. Additional course work in arts administration lead to a clear understanding that the arts, and especially those considered “high” art forms, are in dire trouble of becoming extinct as their audience numbers dwindle steadily. Two topics were combined, integration of technology in practical applications and declining ballet audience numbers to create a solution of problems. The research was devoted to finding not only causes of patrons’ nonattendance and types of technology to attract them, but also to find a connection between the two topics. Social media in marketing aspects to lure patrons in is not the focus of research but rather regarding the performance and presentation experience itself even to the extent of incorporating patrons’ hand held mobile devices within the performance.

Through research in academic journals, case studies, and dance periodicals information addressing not only the future of ballet and technological applications was found, but also on the history of ballet and the ways it has embraced change and modernization in the past. As an

art form entrenched in tradition with a strong reluctance to embrace change, ballet often views improvements as corruptions and deviations from the core of the art form. Showing the past advancements of ballet alleviates the trepidation the ballet community has about making changes to the art form for the future. Fears assuaged ballet organizations can incorporate technology to create a more engaging performance experience for audiences which translate to repeat patronage.

Literature Review

Change is Constant

Since the time of the Renaissance, ballet has undergone extensive changes from Louis XIV to Diaghalev to Balanchine; the performance and aesthetics of the art form are entirely different from when it began (Sgourev 2015). To show the possibility of advancement and adaptability necessary to sustain the art form for the future, it is important to look at the past advancements and study how those profited the art form and shaped it into what it is today (Atlanta Ballet 2017). Providing the perspective necessary for why declining audiences is an important problem and the role technology plays in advancing the art form and engaging audiences. In addition to the past implementation of changes, the attitudes of the current dance community also play an important role. A survey of college aged dance students discovered the largely negative and dismissive attitude toward ballet as an art form:

The majority saw its value as a technical foundation but there was hardly any mention of ballet as an expressive art form and there were comments such as “elite, upper class and virtuosic snobbery”. This concerned me as, while a percentage of these students will go on to be performers and choreographers, many will be in administration, on boards, writing about dance and shaping the dance world of the future. (Foyer 2017, 15)

The collective idea of this mindset being that ballet is a technically oriented activity and little else. Revitalizing the art form through the incorporation of technology will not only attract attention from an outsider's standpoint but an internal one as well by showing the dancers of tomorrow that ballet is not an archaic set of technical abilities, but a thriving and expressive art form that is still progressing and relevant in modern society.

Disappearing Audiences

The National Endowment for the Arts (NEA) conducts a survey focusing on audience attendance and demographics every four years and found that in 2012, adult attendance in the benchmark arts has significantly declined every year since 1982. Seen in Figure 1 (NEA 2015, 18), the audience attendance for benchmark performing arts was down to 33% in 2012, a fall of 6% in ten years.

According to a survey on public participation scheduled to be released on Thursday by the National Endowment for the Arts, one out of every three Americans, or about 78 million people, visited an art exhibition or attended a performing arts event in 2012. That figure represents a drop across the board since the last survey in 2008. (Cohen 2013)

The National Endowment for the Arts' survey is the longest running national survey studying public attendance across genres. The information collected by the NEA's survey is vital in determining the difference between localized and national trends as well as differences in attendance across art genres. "Nevertheless, the long-term trend is decidedly down for both the visual and performing arts—and the recession, which began in 2008, can't be blamed" (Jacobs 2013). Increases in personal technology, computers, internet, email, video streaming, smart phones, smart watches, and tablets have fragmented people's attention spans during

leisure hours, increasingly drawing the focus away from more traditional activities such as live performances.

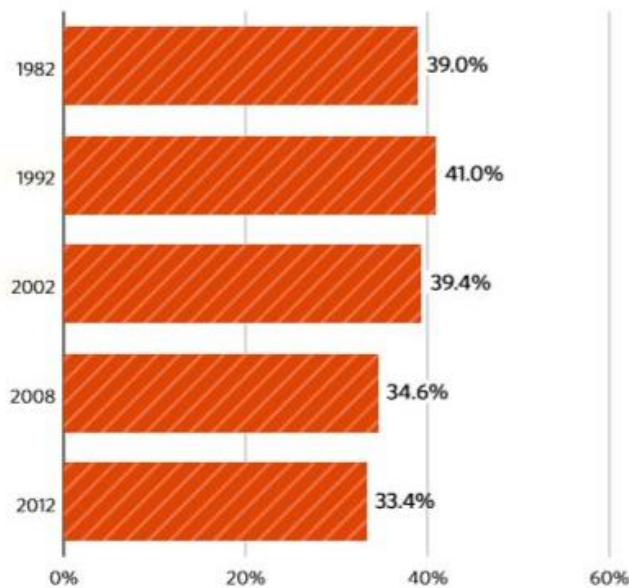


Figure 1 Percentage of U.S. Adults Attending a Benchmark Arts Activity at Least Once in the Past 12 Months: 1982, 1992, 2002, 2008, 2012

“On weekdays, Americans with full-time jobs spent 8 hours and 8 minutes a day working or traveling to work, five minutes more than a decade earlier” (Van Dam & Morath 2016).

Opportunities for leisure activities increase with the advances in technological convenience and become more important than cultural experiences. Streaming platforms provide an alternative to visual entertainment. The ability to communicate easily with friends via cell phones reduces the need for social interaction from attending social events together. To combat this decline in audience and revenue, classical ballet organizations must embrace innovation and use it to engage audiences that are more accustomed to and engrossed with technology.

New Audiences Demand Flexibility

Traditionally, ballet companies present a season in the late spring or early summer for the following year and offer discounts to those able to purchase a subscription package and pay months in advance. Those looking to purchase individual tickets must wait until just before the performance opens and are left to choose from the seats left undesired by subscribers. The issue with subscription packages is patrons are projecting decisions about attendance up to a year in the future. Subscription models do not work for the new generation of audiences who can lead a much more fast paced and flexible lifestyle. The Director of the Arts at the Wallace Foundation, Daniel Windham states.

The urgency begins with a look at the national data available to everyone: declining audiences, ageing audiences, lack of engagement. Many organizations respond with an effort to 'double down' on subscriptions. I would ask "why?" All you have is a view of the trends, but you don't know what those trends mean to you as an organization. (Traiger 2017)

Traditional perks such as free ticket exchanges and flexible subscriptions are not as desirable as in previous years. Current audiences value convenience over financial obligation. Unlike past audiences modern ballet goers are willing to pay for the convenience of not having to plan.

The audience has already moved from "arts attendance as an event" to "arts attendance as an experience." This desire for a full-range of positive experience from ticket purchase, to travel, to parking, to treatment at the space, to quality of performance, to exit-this will only increase over the next 10 years. (Thompson 2013)

A larger audience base establishes a firmer financial foundation for the organization, allowing it to further fulfill its mission and produce a higher caliber of artistic and technological work for the community. As Windham states in his assessment of Ballet Austin: "the only way

to fix a problem is to know exactly what it is” (Decker 2017, 1). Ballet Austin serves as a case study throughout this paper due to its uniquely situated position in regards to the subject of research. Ballet Austin, a mid-size professional ballet company in Austin, Texas began an extensive six-year study in 2015 to determine the cause for their declining audience base to better utilize their money and staff and support the growth of their audience building efforts. Discoveries during the initial investigation indicated that the classics perform well for ticket sales while more abstract and newer ballets were less popular.

Create, nurture and share the joy of dance through classically innovative arts and arts education programs. Within this purpose, Ballet Austin maintains a strong commitment to the creation of new work, incubation of emerging talent and integration into the community. (Ballet Austin 2017)

Ballet Austin-and many other classical ballet companies-have mission statements that include both classical ballet and creation of new work to advance ballet as an art form. The question posed to Ballet Austin by the market researchers was “How do we go about developing large audiences for entirely new work?” (Decker 2017, 1). Ballet Austin is not alone in this quandary; declining audience attendance is a challenge facing all professional ballet organizations nationwide. Before a solution can be discovered the problem must be understood.

Bridging the Uncertainty Gap

The most daunting obstacle ballet organizations need to overcome to attract audiences is the *uncertainty gap*. Uncertainty is present in aspects of everyday life and is not unique to the ballet world. Asking the server at a restaurant what they recommend is a prime example. The

patron is afraid of ordering something they will not enjoy. The stakes of this decision vary depending upon the cost of the meal.

The market research suggested that encouraging people to attend the ballet more often was less about increasing their familiarity with productions and more about bridging an uncertainty gap. Familiarity is about information whereas uncertainty about how an experience will feel is much more personal. You can give somebody a lot of information but that's not necessarily going to reassure them that they're going to belong in that audience. (Decker 2015, 5)

The more the time and financial obligation the more important the decision becomes.

Considering a night at the ballet is often several hours, involves getting dressed, planning far in advance, transportation to and parking in a metropolitan area, the personal investment in the experience is high.

In light of this, organizations have overcome attendance barriers to create repeat patronage and the financial stability of ballet for the future. This stability allows forward momentum to continue and drive innovation forward, not only from small artists, “[b]ut even for the professionals, the approach opens new frontiers. Digital environments can come alive in ways physical sets cannot” (Vanhemert 2014). Professional companies have created engaging experiences through accessing new digital sets and backgrounds.

It can be seen that distinguishing interactive dance performance from derived, immersive, or networked dance performances is a tenuous affair, since they all entail a degree of technological responsiveness and can ground experiences of bidirectionality in which the dancer controls and is affected by the relevant environmental output. Virtual reality environments and networked platforms respond to and influence the performer's experience in the same manner as do performances that unfold in a shared geographical space. (Mullis 2013, 111)

Partnership between dance and interactive technology allows patrons to become fully engaged. The more engaged the audience is the more fulfilling the performance experience feels to them. Leading to repeat patronage and the inclusion of friends and family too

Solution

Research and historical evidence proves that implantation of technology in classical art forms is nothing new. Without advances in technology ballet would not be what it is today and would likely not exist at all except as a footnote in art history books. Technological advances on stage create a more engaging audience experience, which translates to increased ticket sales meaning more money for the ballet organization that can be used to continue advances for the company. Integrated technology solutions include electronic enhancements in apparel, dynamic backgrounds and sets featuring digital and interactive projections, and the incorporation of familiar technology in performance settings. Advances like these, and the beneficial effects they have provided to ballet, dispel negative connotations and fears the ballet world associates with change and innovation.

Discussion of Solution

Not unlike other art forms, dance has been significantly influenced by the development of digital technology over the last two decades. The advent and widespread use of computers with increased processing speed, the development of programs-such as *Isadora* and *Bodycoder*-that were designed for use in dance performance, and the development of affordable and increasingly accurate sensory devices have allowed dancers and choreographers to creatively explore the intersection of the body and digital technology. (Mullis 2013, 111)

Technology continues to improve and as it does it becomes more affordable and more focused on specific purposes. Software designed specifically for dance and motion sensing

proves that technological integration into ballet is not only happening but is a growing area of development and study.

Dynamic Backgrounds

Getting audiences to buy a ticket and attend a show is not enough to save ballet. Engaging audiences in new ways while increasing the artistic merit of the experience is what will keep those audiences returning. Offering not just cheap tricks but a dazzling visual performance is the goal. Lighting designers with dance backgrounds are collaborating with choreographers from the beginning of the choreographic process instead of during tech week at the theater to produce fuller and richer visual experiences.

What a real collaboration between dance and light would look like, where each would totally affect what the other does". Fittingly, their most famous collaboration is called Two: a duet for dance and light in which the solo performer's body is both sculpted by light into something mysterious and dense, and then, by a reverse process, dissolved into radiance and air. (Mackrell 2014)

Visually stunning performances where the lines between reality and fantasy become indistinguishable have previously only been available in movies with the use of CGI. The stage effects created by choreographers and lighting designers collaborating from the onset is reminiscent of Diaghalev's partnerships with artists in other fields. In both cases the result is a more fulfilling and enticing audience experience

A more recent development is the incorporation of computer generated backdrops that can be modified and switched at the touch of a button. On June 23, 2014, the *Talarium et Lux Theatre of Russian Ballet* premiered the first production of *Swan Lake*, with an all-digital set. From the illustrious palace ballroom to the serene moonlit lake, there was no practical set used

in the production. Incorporating not only moving images within the background but also three-dimensional animation.

Using traditional set decorations is interesting for the theater-going public, but we use 3D technologies to draw more audience members, particularly children and teenagers who aren't interested in looking at traditional sets. These technologies help us to create a fairy tale that's interesting to young audience members." (Stakheev and Gazdyuk 2014)

The Talarium et Lux theatre of Russian Ballet has also performed the holiday favorite *The Nutcracker* with digital backdrops with great success. The company plans on continuing to present classics with an animated background for other classics such as *Sleeping Beauty* and *Giselle* in the years to come. Interactive backgrounds that can change based on the dancer's movements creating an entirely new and immersive experience for the audience where the dancer and the environment are not two separate things but one entity is becoming a reality with advances in technology. Collaborations exist beyond choreographers and lighting designers to include software developers as well.

Pixel is the latest from Adrien M/Claire B, a French dance company specializing in cutting-edge physical-digital performance. The group's choreography extends beyond its dancers-by projecting light onto the stage and the backdrop behind it, the company creates dynamic virtual worlds that respond to and interact with the people among them. In this latest spectacle, dancers spin inside virtual rings; they hold umbrellas that shield them from pixelated rainfall. At its best, the distinction between the physical and digital evaporates entirely. (Vanhemert 2014)

Ballet, like many of the performance arts, is about the suspension of disbelief. The audience must surrender reality and accept the world created by the ballet. A world where a young girl can dance herself to death as in *Giselle* or a funny uncle gives his favorite niece a magical toy that not only comes to life but shrinks her down and takes her on a magical adventure as in *The Nutcracker* are the modus operandi of many classical ballets. The more real

the performance feels, the less the suspension of disbelief is necessary. “Utilizing performance technologies allows dance to extend its reach, as interactive systems allow for the creation of fluid performance spaces that need not be constrained by the proscenium” (Mullis 2013, 111). Interactive technologies create a large stage for the ballet to be presented, not physically, but the perceived area that dancers inhabit is expanded.

Just like pointe shoes provided a new level of reality to the fantasy presented on stage by providing floating ethereal spirits, so does this new digital environment create a suspension of disbelief that previously was not available in theatrical performances. The key to audience attendance is engagement. Creating fully integrated worlds that dancers seamlessly move within and interact with is an amazing spectacle enriching the theater going event.

Electronic Enhancements in Apparel

Pointe shoes are the iconic symbol of ballet. Responsible for most of the major innovations in ballet choreography and training in the last century pointe shoes are prime candidates for technology integration. There have been engineering innovations with pointe shoes in the last two decades. Thermoplastics to make shoes stronger and more durable, antimicrobial fabrics used in the lining to make shoes more hygienic, and elastics applied to both the satin of the shoes and the ribbons to reduce common injuries like tendonitis. These advances allow dancers to train and perform better allowing choreographers to push the limits of physical artistry with more daring leaps, increasing numbers of turns, and harder balances.

Gaynor Minden pointe shoes have made great strides in ergonomics, creating a less damaging environment for pointe work (Gaynor Minden 2017). Engineering and artistic collaboration culminate in support for better for dancers. Just as engineering in athletic shoes has allowed sport athletes to run faster, jump higher, and perform previously unimaginable feats of human excellence so does advances in pointe shoes for ballet dancers. Without the proper foundation, the soaring leaps and dizzying turns audiences cheer and applaud for would not be possible. Audiences demand advances in technical abilities, increasingly impressive shows of physical agility, balance, and endurance, to prevent ballets becoming stagnant. As seen in Figure 2 below the image on the left from 1955 shows a technically proficient arabesque. The image on the right of the same move from 2016 is much more technically impressive to modern audiences.



Figure 2

Ballet, being an ever increasingly demanding and competitive field, requires its artists to be athletes. While the choreographers and directors insist on creating physically more demanding works to please audiences, it is up to the dancers to rise to the occasion. However, there is a limit to what the human body is capable of, especially in regards to the unnatural

movements and positions ballet is based on. Beyond the physical performance of the dancers technology can be used to add layers of engagement to the performance itself.

Pointe shoe innovations have been largely based on the fit and engineering of the shoe itself with little thought to performance elevation beyond a dancer's physical ability. Leisa Trubat, a designer and amateur dancer, designed a sewable electronic device that literally illustrates ballet movement. E-Traces follow the movements of a dancer's foot displaying the visualization of movement and weight distribution in real time. The graphics can be displayed simultaneously to a phone, computer or tablet and can be projected on the stage with the dancer (Brooks 2014). The E-Traces show minute details in dancer's weight shifts and foot movements that would be invisible from an audience perspective but with the added visual shows, shown in Figure 3 the method behind the movement giving a new layer of understanding and engagement to audiences. Operating wirelessly E-Traces do not impede the dancer's movements or alter the choreographic vision.



Figure 3

Incorporation of Familiar Technology

Advances in technology can be intimidating not only to ballet organizations but to audiences as well; usually this is overcome by using technology that audiences are already

familiar with. An example of this is within Ballet Austin's *Ballet Mania!* Program. Before the performances there are interactive booths in the lobby where patrons can interact with technology to become more familiar with the performance and the company itself. iPads are stationed in the lobby for patrons to scroll through images and information and video clips of what to expect. Sound domes provide the opportunity to hear the music from the show to gain some familiarity (Decker 2017). Easy and non-intimidating access to information bridges the uncertainty gap between patrons and the performance allowing them to comprehend and better appreciate what they were watching to create a richer and fuller experience that would bring patrons back for future performances.

Recommendations and Conclusions

Technology is often described as two steps forward, three steps back indicating the frustrations and initial setbacks that accompany any new endeavors. The inevitable failures of incorporating new technology in performance will hopefully be outweighed by the successes but it is impossible to predict how it will work out. Ballet must continue to move forward as an art form, as part of culture, and as part of society to continue to make strides towards modernization that benefit not only the dancers but also those for whom the dancers exist the audience patrons themselves.

Interpretations of Solution Outcomes

Research in peer reviewed journals and dance periodicals point towards the successful integration of technology in ballet in performances providing an increase in the numbers of ballet patrons. Technology is beginning to spread not only to the visual aspects of performances but to the dancers themselves with new innovations in ballet accessories including pointe shoes

and even new technology in ballet tights. These advances help dancers perform better the same way advances in footwear and athletic wear have improved the performance of world-class athletes. Technology helps move ballet forward as an art form and simultaneously the reports support this paper's original thesis that incorporation of technology will lead to an increase in audience numbers despite the convenience of other leisure activities.

Further Considerations

Tradition is deeply entrenched in the ballet culture not only artistically but in administration as well. For change to be accepted it needs to come from the top the chair persons, board members, and directors in order to trickle down through the entire organization (Decker 2015). Trepidation surrounding change is due in large part to fear of changing an established system. Non-profit companies have very small margins for error and with technology often being expensive to implement even a small set back could mean financial disaster for a company. This is not to say that change is impossible though. Technology can, and should be introduced gradually, with fully knowledge of understanding of how it is going to be incorporated, why it is being used and how it will affect everyone.

The internet and digital technologies have also disrupted much of the traditional art world, according to these organizations. It has changed audience expectations, put more pressure on arts groups to participate actively in social media and, in some circumstances, undercut organizations' missions and revenue streams. Even the notion of art is changing: 77% of respondents strongly agree or somewhat agree with the statement that digital technologies have "played a major role in broadening the boundaries of what is considered art (Thomson 2017)

Despite the concern over technology diluting and ruining the artistic merit of ballet NEA survey respondents uniformly disagree that it has "diluted the arts" (Thomson 2013). Instead it

is believed that technology integration is opening new pathways to arts participation and arts criticism. Even when technology is used correctly and appropriately to not detract but augment the art form it does not negate all of the negative factors. The implementation of new technology is often expensive in the startup process and is very time consuming for current staff (Decker 2015). Technology use is pervasive in arts organizations but there are costs associated with the embrace of technology, even in instances where the internet-based tools are free; usually realized as issues in staff capacity and training and new challenges connected to serving patron bases with varying tastes for tech mediated experiences of art (Thompson 2013). Increasingly without hesitation however, arts organizations are plunging into the world of digital technology.

The problems associated with technology the costs both in staffing, financial, and time are nothing compared to the losses that will be inevitably faced if modernization is not undertaken soon. The longer modernization is delayed the harder it will be to integrate technology. "Even for the professionals, the approach opens new frontiers. Digital environments can come alive in ways physical sets cannot. Still, despite whatever the company dreams up, their work is constrained by the technology itself" (Vanhemert 2014). Technology and art must develop in a parallel pathway. As one advances so does the other.

An organization's focus must be addressed in order to move forward but must be considered in light of the successes other organizations have had in incorporating technology to enhance the performance experience. The minor setbacks and initial costs are far outweighed by the increase in patronage and the enhanced performance experience that accompanies

technology. Incorporation should not be massive and sudden but incremental; growing with the art form as the two advance parallel to each other.

Minimizing Risks

A major part of modernization, according to the study done by Ballet Austin, is the importance of training existing staff on how to not only incorporate technology but how to speak about the technology with patrons and potential audiences. Modernization is not possible in a vacuum. The significance of technology needs to be accepted and embraced not only by the production staff, but by all members of a performance both on and off stage; everyone from the day to day hourly staff to the board members. The entire organization staff must be able to communicate the technology's purpose and the benefits it provides the ballet experience.

App designers will be able to use the motion-sensing software to create novel interfaces between the body and the device, mediated by choreographic intention. In this way, the body's movement through space and time becomes the means by which machines and people understand each other. As with the transition from silent films to talking pictures, moving the dancing body from the proscenium to unknown, untold platforms will be awkward and disruptive. (Skybetter 2014, 85)

Part of the process includes properly training staff in not only using technology but the best way to speak about it with the public. Including a variety of applications from describing the performance itself, to being able to work a tablet in the lobby at a performance that enhances the patron experience to hiring new staff for digital content production and camera crews.

Practical Applications of Technology in Other Art Genres

Dighalev collaborated with artists in other art areas to create a more rounded and better ballet experience for his audiences. The same practice can be applied today by examining how other art organizations and genres utilize technology to cultivate audiences and enhance their experience. Technology is present in everyday basic tasks such as reading the news, checking the weather forecast, even seeing what time it is.

A study recently released by Deloitte found that Americans collectively check their smartphones upwards of 8 billion times per day. That is an aggregate number that refers to the number of times all Americans throughout the country look at their mobile devices on a daily basis. (Eadicicco 2015).

Adapting to the current culture makes ballet more accessible to the public who may not have a familiarity with ballet but are able to understand the gateway technology. Without practical applications of technology society and culture will advance and leave those things not willing to adapt behind as historical remains. The far greater risk is in being left behind.

Live Streaming

The proliferation of internet connected devices, from phones to watches, has radically altered how audiences consume creative content. I believe we are witnessing the emergence of novel paradigms of dance performance, powered by choreographers leveraging new media and enabled by new consumer technologies. In many ways, the state of dance tech is embodied in the recent World Ballet Day, where five ballet companies from around the world live-streamed their activities, answered questions via a live forum, collected crowd sourced movements and archived everything online. (Skybetter 2014, 83).

Using digital media as a gateway to ballet has proven to be an effective strategy in reaching audiences that are unable to physically attend a live ballet performance. The incorporation of familiar technology will help to bridge the “unfamiliarity gap” that exists in the depths of the unknown realm of ballet. Whetting people’s appetite and demystifying ballet

removes this unfamiliarity boundary. Audiences exposed to ballet in a convenient environment through channels like YouTube or a live streaming platform like Periscope creates real audiences as those viewers familiarize themselves with ballet. Live streaming and digital archiving have become a mainstay of dance viewing. Traditionally ballet has been passed down from teacher to student, but in today's world technology and advanced camera filming techniques coupled with the easy availability of the internet has allowed dance companies and individual dancers to record live performances for multiple viewings by audiences all over the world with internet access. Allowing those without geographic access to experience the performance. Live streaming is a powerful tool for ballet companies that overcomes the geographic availability and convenience hurdles and allows audiences from all over the world to watch a live performance from the convenience of their phone, tablet, or computer.

Technology not only provides better dance experiences but also makes those experiences available to a wider audience through digital archives and live streaming platforms. Studies indicate viewers of live streaming events are likely to purchase tickets to a live performance in the future (Decker 2015). A person watches a live streaming performance because it is convenient and easy; the uncertainty gap is breached making ballet more accessible. Newly aware of the possibilities of ballet the viewer then purchases tickets to ballet performances locally. Enjoying the event, the viewer then relates this experience to friends and family furthering the reach of that one live stream performance. A perfect example currently being employed is Benjamin Millepied, the French choreographer's project in Marfa, Texas.

Having full embraced the incorporation of technology in the performances of his Los Angeles based company LA Dance Project. "Millepied is no stranger to choreographing for the

camera, but advances in technology have made it vastly easier for institutions to live stream performances on platforms like Periscope” (Weisenstein 2017). By live streaming a performance in Marfa, Millepied is bringing ballet to the people. Removing ballet from its home on the proscenium stage and making it available to a much wider audience.

The Vice President for research and policy at Americans for the Arts, says people “are not walking away from the arts so much, but walking away from the traditional delivery mechanisms” (Americans for the Arts 2017). Heather A. Hitchens, Executive Director of the American Theater Wing is not worried about new media replacing the live theater experience. “I believe that all this technology is fantastic, but nothing is going to replace the live experience” (Cohen 2013). Live streaming performances serve as an introduction to the ballet world. The risks associated with attending a traditional ballet experience, social component, expensive ticket prices, transportation, babysitting, and large time commitment are removed. By allowing the viewer to enjoy the performance in a low risk situation, this creates a gentler introduction to the ballet world. Bridging the uncertainty gap enables audiences to feel more comfortable and familiar with the art form before they invest in the experience, encouraging them to become future patrons.

Research shows people are twice as likely to attend a live performance in the future after watching a theatrical performance online (Cohen 2013). Providing proof that technology helps, not hinders, the proliferation of ballet audiences. Live streaming performances not only give audiences a sampling of the art form but also help to bridge the uncertainty gap and increasing the patron base. The greater the audience numbers, the increased financial stability ballet companies have due to an increase in ticket sales. Leading to an increase in the funds

available to companies allowing them to invest more money in developing technologies leading to a more fulfilling audience experience. The cycle continues in that as the audience base grows, so does the quality of performance.

Conclusion

Ballet organizations must continue to not only seek out new ways of improving the technology used in performance as choreographers and dancers constantly push the limits of what is humanly possible, but to collaborate with experts in other fields like Diaghilev did at the turn of the century. Instead of working with only other artists ballet leaders should work in partnership with engineers of all disciplines. Robotics, lighting, sound, computers and electronics as well as other genres of live performance can be used to engage audience and increase mutual patron numbers. It is time the classical arts acknowledged the benefits of technology and embraced its use within ballet to the benefit of all and the proliferation and advancement of the art form for centuries to come.

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