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Broadcasting Theatrical Productions:
Considerations for Small Theatres

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Abstract

This project explores how a traditional theatrical production may be adapted for online streaming. A case study of a WPI theatre organization's first streamed production is used to form considerations on how an individual theatre company can approach transitioning their own content to a digital platform. Recommendations identify the scope of film and streaming equipment required as well as necessary changes to individual theatrical departments. The conclusions of this paper provide a flexible framework for theatre companies to produce streamed content.



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Acknowledgements

I would like to thank everyone who made this project possible. First and foremost, I would like to thank my advisor, Professor Frederick Bianchi, for his guidance and his patience. At his direction, I was given a chance to explore a subject I am deeply passionate about with his support.

I would also like to thank the WPI Humanities and Arts Department, including its theatre faculty Despoina Giapoudzi and Patrick Crowe, as well as Department Head Professor Kathryn Moncrief. The theatrical production this project analyzed and used as a case study would not have been possible without their dedication to ensuring theatre could still happen at WPI in unprecedented times.

Finally, I would like to acknowledge and appreciate every student who worked on LOVE/SICK by John Cariani as produced by Masque as its A-Term 2020 show. I had the honor of working as the show's Producer, and I designed and coordinated the film component of the show – something Masque had never done before. The show was a collaboration of over 40 WPI students, each of whom made the show excellent in a different way. The full production team is listed in Appendix A.

Executive Summary

Background and Introduction

Theatrical performance has evolved from ancient civilizations independently practicing performance across the globe into the modern day with major economies depending on ticket sales for shows bolstered by moving lights and smoke machines. Broadway theatres, with their near limitless funding, have coordinated digital releases for select productions over the past few years. Small theatre organizations, including community and college programs, rarely have had the opportunity to explore the transition from stage to screen. These groups would benefit from proven research on this transition to guide them through the process. This research would lower the financial risk of purchasing new film technology and the time cost of trial and error associated with going into the transition blindly.

This project aimed to identify the changes to the traditional theatre production process that occur when implementing filming and streaming technologies. Recommendations for small-scale theatres were derived from this research that would fill the gap of information needed to guide a theatre organization through its digital transition.

Worcester Polytechnic Institute's theatre organization, Masque, shared its first lives-treamed production in Fall 2020 – LOVE/SICK by John Cariani. My experience producing this show provided an ideal case study for identifying and analyzing every change a production must consider to successfully produce digital content.

I focused on investigating the following themes:

1. Adapting existing theatrical spaces, equipment, and supplies for filming.
2. The new film equipment and editing software needs of a theatrical company intending to film their production.
3. Distributing the production on a digital platform once it has been filmed and edited.

Recommendations - Individual Theatrical Departments

Theatre organizations need to **evaluate designs from the perspective of film and streaming**. Based on the outcome of each department in the case study, the following suggestions should be given to designers:

- Avoid white fabric, furniture, and paint to **reduce light reflection and overexposure**.
- Avoid fabric with repetitive geometric patterns to prevent moiré patterns.
- **Test elements under stage lighting** through a camera lens as much as possible

prior to filming, and budget time for adjustments resulting from these tests.

- Use natural makeup styles as opposed to theatrical ones.

• **Coordinate lighting and video editing** early in the production, especially regarding moments of drastic color change, and determine what should be done with lighting fixtures vs editing software.

Any **design elements** beyond the scope of the above recommendations **should be tested using the camera model** intended for filming before confirming its implementation in the production.

Recommendations - Camera Selection

In choosing an appropriate camera for production purposes, a theatre organization should consider:

- Zoom range
- Autofocus quality
- Sensor capabilities in low-light conditions
- Ease of use

I recommend that a theatre **use at least three cameras**, all the same model for cohesive video quality. I suggest using one camera as a static wide shot and any other cameras as manually operated, moving cameras for **dynamic shots and framing**. The choice of camera will also determine whether a Black Magic Web Presenter is needed for streaming from camera to monitor, or if a compatible software is available as an alternative.

Production-specific factors that will affect camera layout include:

- Cast size – a larger cast will be benefitted by increasing the number of manually operated cameras
- Physical staging – the camera configuration for a scene utilizing the full stage will vary from that of a scene using a small section of the stage. Additionally, intimate staging will benefit from close-ups shots.
- The physical theatre itself – a proscenium stage offers different filming opportunities than a black box theatre, and both will differ from that of a thrust stage.
- Method of streaming from camera to monitor – USB, SDI, and HDMI cables are capable of different lengths while preserving content quality. SDI is not compatible with some cameras, such as DSLRs, but will provide the longest cable length.

A flexible camera layout that is consistent throughout a show may be easier to plan and

maintain. It may be necessary for productions where staging is consistent throughout the show or shows written in such a way that stopping and starting between scenes to change camera configurations is difficult to execute. Scene-by-scene camera layouts can raise the overall quality of the final video product **by tailoring the configuration to specific scene elements**. This allows the Director to have more flexibility over their staging and artistic vision.

Recommendations - Editing Considerations

I recommend that theatre organizations **utilize both live editing and post-production editing**. The combination of practices saves time while increasing the overall quality of the final product. Live editing produces an accelerated starting point for post-production editing. Most splicing between shots will be completed during filming, with real-time camera adjustments in response to discoveries made during live editing. Post-production editing can then be dedicated to audio and color-grading adjustments, as well as minor splicing edits to the existing video.

In general, theatre organizations should consider **ease of use, functionality, and financial budget** when choosing a post-production editing software that best suits their needs.

Recommendations - Live Broadcast vs Pre-Recorded Broadcast

The choice between pre-recorded streaming and real-time streaming **must be made early in the production** timeline to cement approaches to designs and artistic vision. The presence of post-production in the production timeline introduces opportunities for color-correction, color-grading, and audio mixing that the lighting and sound departments would have to otherwise make up for with additional planning and testing. A Director may have less flexibility in their blocking of actors if cameras must remain in fixed positions during a real-time stream.

A theatre organization should **consider the reliability of their overall streaming configuration** before choosing real-time streaming. A reliable internet connection and camera battery life that exceeds the length of the production are both vital for a real-time streaming production. They must also accept that a live stream may have reduced quality compared to a pre-recorded stream. However, a theatre company with a comfortable level of experience in pre-recorded streaming should not be afraid to make the jump to real-time streaming. The **live performance** factor of theatre is what **draws in performers and patrons alike**.

Conclusion

This paper serves as a starting point for streaming a theatrical production as a small theatre organization. Given proper guidance, streaming can be a valuable medium for theatre orga-

nizations to **share their work with a larger audience**. The findings and recommendations discovered through this project prove the feasibility and potential for **quality streamed performance** in amateur, academic, or professional spaces. Theatre productions can build on this work to meet their individual needs and create a new standard for digital performance.

Authorship

This paper was written and revised entirely by Mason Kaye.

The case study used to guide this project was a production of LOVE/SICK written by John Cariani, put on by Worcester Polytechnic Institute's theatre club, Masque. Mason Kaye served as the show's Producer and oversaw all decisions discussed in this paper, though the production itself was created in collaboration with over 40 WPI students. To view all contributors, and their roles, refer to the show's program (Appendix A).

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1. Introduction

Theatrical performance has evolved from ancient civilizations independently practicing performance across the globe into the modern day with major economies depending on ticket sales for shows bolstered by moving lights and smoke machines. Some theatrical productions have found their way online, through illegal bootlegs or official filming, but most have shied away from investing time and resources into filming live performance for digital distribution. Theatre can be a social commentary on critical issues, an absurdist artistic art form, or a feel-good spectacle. Something that has persisted for thousands of years primarily as recreation (either as a creator or a consumer) must have a major, widespread emotional impact.

The 2020 COVID-19 pandemic turned every theatre in the world dark. For New York City Broadway theatres alone, over a year's worth of tickets – millions of patrons, over a \$1 billion in gross profit – have been lost. The resulting economic and social damage highlights how important theatre is, but also how vital it is for theatres to adapt to new methods of performance in the absence of a live in-person audience. Livestreams will be the only way for audiences to safely consume theatre for the foreseeable future. Yet, most theatre companies do not have the experience to produce quality livestreamed productions. They do not have the technical resources to suddenly make the daunting transition online.

Livestreamed theatre has primarily been accomplished by large, professional theatre organizations that are guaranteed a profit from digital distribution due to their shows' popularity. Livestream itself is a large industry encompassing many platforms and genres, but traditional theatre makes up an incredibly small niche of it. Bringing theatrical productions to digital platforms involves incorporating foreign technical and design elements from the film and broadcasting industries. Many individuals involved in theatre question how filmed theatre differs from a movie and how much of the spirit of theatre is lost in the digital transition.

Broadway theatres, with their near limitless funding, have coordinated digital releases for select productions over the past few years. Small theatre organizations, including community and college programs, rarely have had the opportunity to explore the transition from stage to screen. Plenty of research has been performed on the craft of moviemaking, but little has been done to explore bringing theatrical performance to the screen in a manner that differentiates it from a movie. Smaller theatre organizations would benefit from proven research on this transition to guide them through the process. This research would lower the financial risk of purchasing new film technology and the time cost of trial and error associated with going into the transition blindly.

This project aimed to identify the changes to the traditional theatre production process that occur when implementing filming and streaming technologies. I investigated how individual

theatre departments are affected by the digital medium. In addition, I designed and analyzed a potential theatrical streaming set-up that can be adapted to fit the specific needs of any production. Recommendations for small-scale theatres were derived from this research that would fill the gap of information needed to guide a theatre organization through its digital transition.

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2. Background

The primary focus of this project was to evaluate the transition of theatrical productions onto digital platforms by using a recent WPI production, led and produced by the author, as a case study. To prepare for this case study and contextualize the historical precedents of livestream and theatre, this chapter presents an overview of the following:

1. Histories of livestream, film adaptations, and recent livestreams of Broadway productions
2. Descriptions of livestream software and platforms that are currently used to produce and host content online
3. An overview of factors that have slowed or prevented livestreamed theatre productions from being more commonplace

2.1. History of Livestream

The history of this topic is broken into two parts – the broader history of livestream, and then the existing examples of livestreamed theatre. Today, the word livestream is most associated with internet livestreams, the most recent medium to popularize real-time video. The livestreaming platform Twitch, focused on professional and recreational hobbies, boasts 3.8 million unique broadcasters as of February 2020 (Iqbal 2020). Twitch's competition includes streaming-focused platforms (Microsoft Mixer), video platforms incorporating livestream (YouTube Gaming, Vimeo), and even social media platforms (Facebook Gaming, Facebook Livestreams, Instagram Livestreams). The content ranges from esports to vlogs (video blogs), cooking tutorials to chess competitions – a subject for every viewer.

Twitch was launched in 2011, just one year after the 100th anniversary of Public Broadcasting (Ruben 2010). It is easy to take older forms of livestream for granted, having grown up with live cable news, live sports, and live radio. Live performance has been tied to livestream since its origins; the Metropolitan Opera made history in live broadcasting a performance throughout New York City, popularizing radio communications for entertainment. Next, it was Kraft Foods Co. that intertwined theatre and live broadcasting – from 1947 to 1958, Kraft Television Theatre brought 650 plays to live television (“Kraft Television Theater,” n.d.). The series included plays from a wide range of notable playwrights and actors and was churning out hour-long performances for \$165,00 (equivalent to \$1.7 million in 2020) apiece towards the end of its run. Two decades after that, NBC began airing Saturday Night Live, the same sketch comedy show that continues to receive acclaim to this day.

2.2. History of Theatrical Adaptations for Film

The film industry has already proven that theatrical scripts stand up to the scrutiny

of the public. Starting in the 1940s, an American media company, Metro-Goldwyn-Mayer Studios Inc., or MGM, popularized the movie musical genre (Thomson 2011). Their films featured major stars such as Judy Garland, Fred Astaire, and Frank Sinatra, and many of the film titles are linked to hit musicals. Some of these titles were adaptations of pre-existing stage musicals (works of Rodgers and Hammerstein such as *The King and I* and *Oklahoma!*, for example), while others were made for the screen and later adapted for the stage (*An American in Paris*, *Singin' in the Rain*).

After MGM's success, other production companies followed suit, and the movie musical continued its popularity into the 60s and 70s. These musicals were primarily based off existing stage musicals, albeit with some artistic freedom in adapting the stories for the screen. At the box office, movie musicals tended to reach the top ten highest grossing films of the year in North America (Finler, 2003). They also held their own at the Oscars, netting nominations and wins in various Academy Award categories over the years. This trend has continued to the present day, as seen by the immense success of Academy Award winning *La La Land* or the Disney *Frozen* Franchise.

2.3. Recent History of Theatrical Performance and Livestream

There has been some effort, primarily amongst Broadway-level productions, to create a catalogue of filmed performances that can be digitally streamed online. This has been spearheaded by BroadwayHD.com.

BroadwayHD is a company that partners with major theatre companies to film and distribute Broadway and West End productions through an online subscription service. The company makes theatrical productions more accessible to a wider audience. Show creators are compensated for their partnership with BroadwayHD and additionally benefit from the scalability that livestream offers allowing for increased and diversified audiences. Through this model, the financial burden of filming is entirely relieved from the theatre companies themselves, and the business model is supported by theatre patrons.

A handful of Broadway productions in history have gained popularity that well exceeds that of their contemporaries. The most recent example of this is *Hamilton* created by Lin-Manuel Miranda. Disney purchased the distribution rights to a filmed version of *Hamilton* for \$75 million in 2020, and upon release, the show was viewed by millions online (Keogan, 2020).

2.4. Livestream Platforms

This section will cover 4 possible platforms that a theatre may use to host their content. This list is not exhaustible. Some theatres may choose to use smaller, more niche platforms or host the content themselves. The following platforms were chosen based on popularity among theatre companies during the COVID-19 pandemic. Each section will briefly describe

the website, its user base, cost of use by content creators, video uploading capabilities, and privacy options – all factors relevant when considering which platform to choose to host theatrical content.

2.4.1. YouTube

YouTube is a video-sharing platform owned by Google that supports video uploading and livestreaming. It hosts all genres of content. It is the most popular website of its kind with over a billion users (Iqbal, 2020).

The company's revenue comes primarily from ads placed at the beginning or end of the video, and using the site is free for both viewers and content creators.

Users can upload an unlimited number of videos, each of which can be up to 12 hours in length. They may also stream an unlimited number of times with no restrictions on stream length.

YouTube's privacy settings are somewhat limited; videos and streams can be public (accessible to anyone via search engine), unlisted (accessible only by direct link), or private (accessible only to the content creator).

Theatre companies using this platform will appreciate the ability to stream or upload videos for no fee, the recognizable brand of YouTube for their patrons when performing the new transition from live audience to digital, and the ability to hold unlisted streams and videos to accommodate some theatrical licensing agreements. However, hosting original or public content will be difficult for new potential patrons to seek out on their own due to the number of existing content creators on the website. The unlisted videos may not fulfill a licensing agreement's request to keep the stream or video private, because the video is still accessible by anyone who has a direct link.

2.4.2. Vimeo

Vimeo is a video hosting, sharing, and services platform owned by IAC that supports video uploading and livestreaming. It hosts all genres of content, though its content creators are primarily of artistic professions. A few hundred million users use Vimeo to watch content (Sivakumar, 2020).

Vimeo operates with an ad-free model. It generates revenue by offering tiers of subscription services to content creators. It is free to watch videos hosted on the website.

Users are limited to the amount of video they can upload per week and per year, depending on which subscription tier they purchase. The highest tier, Premium, does not have a weekly limit and offers 7TB of storage. Vimeo Premium is also the only tier that allows for livestreaming.

Vimeo's privacy settings are flexible; videos and streams can be shared with anyone (accessible via search engine), no one (accessible only to content creator), only people the content creator follows, only people the content creator chooses, only people with a direct link, or only people who have been given a password.

Theatre organizations will appreciate using a platform that focuses on artists as their primary client base, the ability to customize how private a video or stream is, the integration with Livestream Studio 6 editing software, and the customer service Vimeo may be able to provide given that it serves a fraction of the content creators a site like Twitch or YouTube does. Original content or public content also has the opportunity to show up in searches or recommendations for new patrons. However, the price point for Vimeo Premium may be intimidating or impossible for a theatre company to fulfill, and lower tiers do not accommodate streaming and have limitations on uploads.

2.4.3. Twitch

Twitch is a video livestreaming service owned by Amazon that supports video streaming only. It hosts all genres of content, though its content creators are primarily video game streamers. The website sees over a hundred million users per month watching its content (Iqbal, 2020).

Twitch generates revenue through ads, which are played when a user opens a stream and when the host chooses to play them. It also allows viewers to subscribe to individual content creators, of which Twitch receives a portion of the payment. It is free to stream and watch content on the website.

Content creators are unlimited in the number of streams or their length. Once the stream is over, a video of the broadcast is available for 14 days. Twitch Turbo is a monthly subscription that allows content creators to host their past broadcast videos for 60 days.

Twitch does not offer privacy settings for content creators to restrict access to their broadcasts. Twitch Partners, selected by Twitch and whom have contracts with Twitch as their full-time jobs, have the option to restrict their streams or past broadcast videos to subscribers of their channel who pay a monthly fee.

Theatre organizations will appreciate using Twitch as a free platform for broadcasting public or original content that does not have access restricted by licensing agreements. Twitch also provides "categories" such as 'creative' that makes the stream searchable for new potential patrons. However, the lack of privacy settings prevents theatres from using the platform consistently for non-original content due to licensing agreements, and they would not be able to use the website to permanently host videos of prior content.

2.4.4. ShowTix4U

ShowTix4U (ShowTix4U.com) is an online ticketing platform that offers integrated video streaming and video on-demand in response to the COVID-19 pandemic (“ShowTix4U To Launch New Theater Streaming Platform”, 2020). They are partnered with Music Theatre International(MTI) and Broadway Media Distribution. ShowTix4U is tailored specifically to the performing arts genre. Users, both content creators and viewers, are restricted to the United States and Canada.

Setting up an event on the website is free; the website generates revenue through ticketing on the event. “Free” streaming tickets for patrons cost the content creator \$1/ticket, and other tickets cost \$1.85 (MTI show) or \$1.90 (non-MTI show) plus 3.5% of the ticket cost, per ticket, to be paid either by the content creator or patron, per the content creator’s decision. Their pricing will be updated on January 1st, 2021. Content Creators may choose to run ShowTix4U ads on tickets to generate a small portion of revenue per ticket.

Content is available during the times and dates specified for the event by the content creator. Content creators may host an unlimited number of events, so long as they have purchased any necessary royalties for the show they are producing.

ShowTix4U content is only accessible to patrons who purchase tickets, but anyone may choose to be a patron. Content is then accessible using a QR code or access code on the digital ticket.

Theatre organizations will appreciate ShowTix4U as a platform that is specifically designed for their purposes, including customer service tuned in to their specific needs and the ticketing system integration that negates the need for a third-party ticketing platform. This website is best for productions that plan to sell tickets for their productions. A show that does not sell tickets for a fee may be deterred from using this platform because of the cost that potentially limits their audience size.

2.5. Editing Software

Video editing software falls into one of two categories: live editing and post-production editing. Live editing is performed in tandem with filming, which makes it ideal for broadcasting. Post-production editing can serve as a supplement to live editing (to polish videos created with live editing) or be the primary editing method used (to start with all video sources already completely recorded).

In the following subsections, I explore the most popular small-scale choice for both categories of editing software, as well as possible alternatives.

2.5.1. Open Broadcaster Software (OBS)

Open Broadcaster Software (obsproject.com), or OBS, is a free to use, open-source streaming and recording software. The software supports live editing by taking in multiple

video sources and allowing the user to preview and switch between these sources, recording one video with all transitions in a .mkv file format that can be converted in .mov or .mp4 within OBS. OBS can stream live content to most streaming platforms as well as pre-recorded media added as a source.

OBS is ideal for theatre organizations with a small budget in need of a live editing software because its interface is simple enough that basic editing and streaming can be performed without a learning curve, but the software still offers more complicated features that a theatre manager can learn over time to improve their overall stream quality and complexity.

Alternatives to OBS that offer similar functionality include Livestream Studio, XSplit, and vMix. The full versions of these alternatives are not free, though Livestream Studio in particular is ideal for organizations planning to use Vimeo as their host platform due to integration.

2.5.2. Adobe Premiere Pro

Adobe Premiere Pro (adobe.com) is the video editing software offered in the Adobe Suite Creative Cloud subscription. It is a film-industry standard for editing video in post-production and offers a variety of tools related to video, audio, and color grading. Videos can be exported in dozens of different file formats, including those specifically designed in quality and aspect ratio for YouTube and Vimeo.

The Adobe Creative Cloud Suite can be a worthwhile investment for theatre organizations looking to improve their publicity and graphics as well as video production. Though many video editors exist, Premiere's wide array of tools create better final products than most free alternatives cannot achieve.

A popular substitute to Adobe Premiere Pro is DaVinci Resolve, though the learning curve for Resolve is generally agreed to be much steeper than that of Premiere. Free alternatives to both exist with less complicated interfaces, including iMovie and Microsoft Photos, though with less available video editing tools.

2.6. Limitations for Streaming Theatre

In this section, I explore a few factors that may prevent or deter theatre organizations from pursuing a livestream set-up for their productions.

2.6.1. Theatrical Publishing Rights

There are several major publishing companies that plays or musicals may be distributed through, and every published show will have a set of rights that a theatre must adhere to when performing. The rights to a show are determined by both the publishing company and the playwright, which means that streaming rights, for example, may be more difficult or impossible to acquire for some shows.

As of December 2020, Music Theatre International (MTI) (mtishows.com) represents 440 musicals; among those include all Disney Musicals, all works of Stephen Sondheim, Mamma Mia!, Les Misérables, and most Broadway hits. Of the 440 musicals they represent, 104 are available for streaming (23.6% of their catalogue), and another 37 on top of that are available for streaming only as school productions (8.4% of their catalogue). It should be noted that the number of shows available for streaming licenses are not all unique productions; for example, Shrek the Musical accounts for three of these shows, including the original version, a junior version, and a theatre for young audiences version. After removing 38 duplicates, only 78 shows are available for general streaming and another 26 are available for streaming as school-only productions.

MTI Streaming Availability

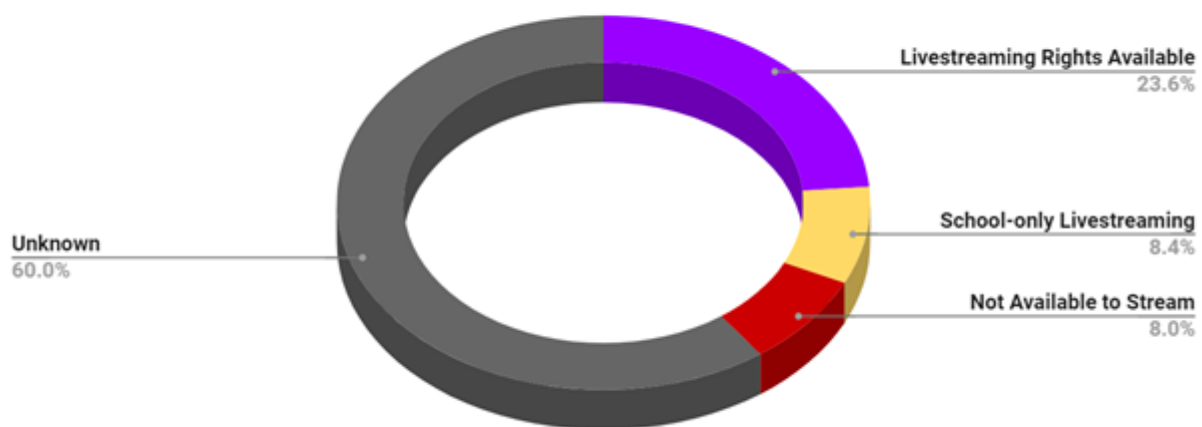


FIGURE 2-1: BREAKDOWN OF STREAMING RIGHTS AVAILABILITY FOR MTI

Though the COVID-19 health crisis has encouraged companies like MTI to expand their streaming selections, there are some productions that are explicitly noted to be unavailable for streaming. MTI currently lists 35 titles that they know cannot be streamed. Theatrical Rights Worldwide has provided emergency streaming licenses for their entire catalogue except for the show Spamalot (Culwell-Block, 2020). Concord Theatricals, the parent company of Samuel French, Inc., does not offer any pre-established streaming licenses to theatre productions, but are willing to negotiate streaming rights on a case-by-case basis. Shows that have recently had a film adaption are also more difficult to stream, as film productions often aim to acquire exclusivity rights. When film adaptations are successful, theatrical productions

are disallowed from streaming their own video versions.

When COVID-19 social restrictions are eventually eased, the theatre world will likely have more streaming licenses available for theatrical shows. Some current licenses are only “emergency” licenses to allow theatre to persist despite social distancing measures. The rush to make more shows available for livestream highlights why so few theatrical productions have attempted to do so in the past - aiming to livestream a production vastly limited the shows one might be interested in producing.

2.6.2. Financial Implications of Streaming

For most American theatre organizations, streaming is a large financial burden and resource sink. Community and amateur groups strive to break-even with ticket sales, concessions, and donations without the additional burden of filming equipment purchases and upkeep. From my experience as Treasurer for two college performing arts clubs, college theatre organizations operate at a loss for the purpose of academic enrichment. Even just one decent event video camera on the lower end of the cost spectrum, like the Panasonic AG-AC30 (\$1250 at bhphotovideo.com), will still cost over \$1k at the bare minimum. This is precious funding that could go to replacing lighting fixtures (a standard Source 4 Lighting Fixture costs around \$550 per fixture at bhphotovideo.com) or supplementing payment for cast and crew. The long-term benefits of livestream, such as growing and diversifying their audience, may not outweigh the risk of such a large upfront financial investment for many theatres already struggling to get by.

3. Methodology

The goal of this project was to evaluate the challenges and feasibility of a theatre company producing a digitally streamed performance, having never done so before. Using Worcester Polytechnic Institute's theatre club, Masque, and their A-Term 2020 production of LOVE/SICK by John Cariani, as a guide, I will investigate the following themes:

1. Adapting existing theatrical spaces, equipment, and supplies for filming
2. The film equipment and editing software needs of a theatrical company intending to film their production
3. Sharing the production on a digital platform once it has been filmed and edited

3.1. Adapting Existing Theatrical Spaces, Equipment, and Supplies for Filming

A theatre company does not have to start from scratch when entering the realm of streamed performance, but not all elements of theatre translate naturally to the medium of film. A film set can be chosen or built to accommodate a director's vision, while theatre companies may be limited to performing arts spaces intended for live audiences. Some costumes may not read well on camera, or lighting effects may not, or the physical staging of actors. New job positions open up and others may disappear when cameras come into play. A Producer hoping to lead their theatre company onto a digital platform must reexamine every aspect of their show from the perspective of a camera lens.

Danielle DeMatteo, founder of SheNYC Arts, puts on an annual short play festival with live audiences on a proscenium stage. In 2020, the play festival was forced to move to a digital format due to the COVID-19 pandemic. I emailed her questions related to that transition for this project. For the complete interview, see Appendix B. When asked "Have any production positions (designers, roles focused on livestream, etc.) been added or removed? And/or have existing positions been adapted to include responsibilities related to the digital platform?" Danielle responded with the following:

"Unfortunately, yes. We had to cut our Production Managers and Lighting Designers and all those backstage positions. One of our Production Managers took on the role of a Digital Production Consultant to help all of our shows plan the logistics of their livestream, which has proven to be really helpful (adjusting the lighting in your house can totally change a Zoom reading, it turns out!). Outside of that, all of our other positions have definitely had to adapt -- we've basically had to all learn brand new skills from scratch. I had never even opened iMove before this summer; we've all had to get familiar with the streaming technology; and we've had to be a support system to our writers while they, too, are trying to figure this all out."

3.1.1. Costumes on Camera

Changes in the Costumes Department were minimal, as costumes have equal impact on stage as on screen. For financial purposes, the Costumes Department was asked to avoid spending budget on shoes, as camera shots would often showcase actors above the knee.

3.1.2. Makeup on Camera

Regular stage makeup intends to help an actor's features read better from further away. Heavy mascara, thicker eyebrows, and lots of blush are all common elements when designing makeup for theatre. Using cameras avoids needing to observe actors at large distances and negates the need for heavy makeup. The Hair and Makeup Artist focused on natural, everyday makeup for the actors.

3.1.3 Lighting on Camera

A camera's sensor will require more light than an audience member's naked eye. Lighting planned to use more lighting fixtures and higher intensity levels to light everything on stage to the needs of a camera. The Lighting Designer also planned to attend each filming night and adjust lighting cues as needed due to the uncertainty of how lighting would read through the camera.

3.1.4. Sound on Camera

Some theatres, particularly those who produce musicals, have sound mixing equipment for mixing to a live audience. Smaller theatres, like the black box used by Masque, can rely on having actors project their voices loudly. However, capturing audio is a vital part of filming performance.

The sound team needed to capture actors' voices all across the stage at even levels. They hung three shotgun microphones spaced out in the lighting grid and connected all three mics to an X32 sound board. I needed a way to incorporate that audio into my filming set-up, and the best way was identified to be plugging stereo audio into the Black Magic Web Presenter discussed under Subsection 3.2.2.

Sound effects that are usually played through speakers in the lighting grid were also considered. Playing all sound effects through speakers to be recorded through the microphones would produce lower quality effects and potentially muffle actors' voices. However, some sound effects act as cues for actors' movements or lines. Any sound effect that an actor relied on was played live through speakers in the space, while all others were to be added in post-production editing.

3.1.5. Scenic on Camera

Physical scenic elements were minimal for this production. There was a heavier focus on scenic art, which entailed painting a mural on the walls of the theatre. This design choice

would provide a backdrop to help frame the show. The use of cameras would prevent the stage from feeling empty despite the few furniture pieces used, as framing could be focused specifically on where actors and furniture currently existed.

Wide shots would be needed to establish scenes and fully capture the work completed by the scenic art team. The lighting team was asked to throw as much light as possible at the mural to ensure that it came out well on-camera.

3.2. Film Equipment and Editing Software for Theatrical Performances

The equipment needs of a production will vary depending on cast size and the physical space being filmed. Masque's production of *LOVE/SICK* by John Cariani was performed in a black box theatre and featured pairs of two actors at a time. The software needs of a production are less dependent on an individual show and more so on the personal preferences and workflows of the production members involved.

3.2.1. Cameras

3.2.1.1. Considering Set-Up

Before deciding what cameras a company may want to acquire, it is important to determine how the cameras are to be used, as to base the camera specifications on the specific set-up.

If I have two actors, the scenes are likely more intimate in nature. In this scenario, close-ups on actors are easy to catch even if you only had one camera to use. A black box theatre is often appreciated for allowing the audience to sit near the action happening on stage, and close-up shots help simulate that connection between audience and actor. A smaller theatre limits the number of different camera angles you might be able to achieve without having other cameras in the shot, so having more than a few cameras can be troublesome and unnecessary.

The number of people available to dedicate to the camera set-up must also be considered. It is possible to get away with having no camera operators, but you would want to increase the number of cameras for angle variety. To avoid having cameras being seen in shots, (assuming that the audience is seated on multiple sides of the stage), you might invest in smaller cameras that can be hidden easily amongst the seating or in the lighting grid. Alternatively, if the audience only faces one direction, contrasting shots could be achieved by focusing different cameras at varying focal lengths.

LOVE/SICK utilized a 3-camera set-up, where two of the cameras were operated by personnel and a third provided a static shot of the entire stage. This allowed the two manned cameras to focus on getting close-ups of individual actors. The wide shot could be used to establish the scene, capture large movements, or to cut away to if a camera op had fumbled

somehow. The theatre used has audience banks on two sides, which meant that having more than three cameras would be difficult to manage without camera operators appearing in one another's shots. One could reliably have two camera operators available for show nights, but three was less likely, and the static shot did not require a third person to be available.

The production was pre-recorded for streaming, which meant that the three cameras could be moved between scenes to best accommodate the specifications of each scene.

3.2.1.2. Technical Specifications

Now I knew that I needed three cameras, two of which were capable of quality close-ups under stage lighting and would be manually operated, and a third that didn't need much focal length but did need automatic features to make up for the lack of operator. I had some camera operators who were familiar with cameras but had not worked with them extensively or professionally, and another who did not have any camera experience at all.

The camera also needed a high-quality sensor to accommodate theatrical lighting, enough battery life to reliably make it through 3 hour-filming sessions, and the ability to film in 1080p HD. These are more general specifications that apply to most theatrical filming scenarios.

I ended up using two Panasonic AG-CX350 4K Camcorders for the manually operated cameras and one Canon EOS Rebel T8i Digital SLR Camera with a Canon EF-S 18-135mm f/3.5-5.6 IS STM Lens. The Panasonic Camcorder was specifically created with broadcasting and live event streaming. Its internal sensor was highly sensitive such that it captured phenomenal quality video under stage lighting. The camcorders also had a large focal length that could capture the entire stage or just an actor's face. Despite all the fancy features, adjusting the settings beforehand would allow people with minimal camera experience to confidently operate the camera, which made it ideal for this production. The Canon DSLR was a choice made primarily for financial reasons - the lower quality (but still decent quality!) video was acceptable because it would only need to capture wide shots, and the lens was one already owned personally by a member of the production.

The set-up also included camera accessories. Each camera had a 128GB SD Card that would be removed each night, uploaded onto a computer, and then formatted for the following day. This footage was intended to be used to recover footage in case the live-edited video had to be adjusted. The SD card size was chosen based on assuming filming would take no more than 3 hours each day, and 128GB meant confidently going through each filming without worrying about reaching the SD's storage capacity.

Halfway through each filming night, the batteries on all cameras would be switched out for fully charged batteries. The batteries most likely would have made it to the end of filming without the camera shutting off, but that would risk ruining a take because of a dead battery.

Each camera was mounted on a Magnus VT-300 tripod. These tripods are fairly light in weight, which makes them easy to move around a theatre as needed. Their pan and tilt are very smooth, which is important when working with camera operators with less experience - the shot jerking around with a sensitive pan and tilt would impact video quality.

3.2.2. Livestream-Specific Equipment

Webcams are built with the specific purpose of connecting with a computer; other cameras are not. To view all three cameras from a computer monitor, I needed my computer to treat the Panasonic Camcorders and Canon DSLR as webcams.

To accomplish this, I used the Blackmagic Web Presenter, which converts any SDI or HDMI source into a USB webcam for your computer. I wanted the SDI input option because SDI can maintain video quality over longer distances than HDMI can, and longer cables would allow cameras to be placed further away from my computer than an HDMI cable might allow. I also did not need the streaming device to produce 4K video, which is a selling point for similar technologies on the market.

The static DSLR camera did not need as much flexibility as the camcorders, as most possible camera-placements would allow the camera to capture a wide shot of the stage. The Canon company has a free, downloadable software called EOS Webcam Utility that is compatible with most of their products. This software is specific to Canon cameras, so it could not have been an option for the Panasonic Camcorders, but it allowed me to bypass a physical piece of technology like the Web Presenter when connecting my DSLR to my laptop. I needed a microUSB to USB cable to connect the DSLR and the laptop, which run much shorter than SDI and HDMI before video quality begins to degrade.

For comparative purposes, the cables available to me were multiple 50ft SDI, multiple 25ft HDMI, and one 8ft microUSB to USB with a 3ft USB cable extender.

3.2.3. Editing

The LOVE/SICK production had five days after filming wrapped up to edit before the show was streamed online. Still, editing while filming saves time, allows filming to adjust based on what the editor is seeing on-screen, and is overall more efficient than beginning the editing of a project in post-production.

Live editing is accomplished with a livestream broadcasting software, of which there is an array to choose from. I wanted a free software that was designed to capture multiple sources, had functionality to stream to all known platforms, had adjustable hotkeys I could use to cut between sources, and featured a preview before a confirmed switch. This fits many streaming software available on the current market. I ultimately chose Open Broadcaster Software (OBS) due to its popularity, flexibility in open-source code, recording in .mkv files that prevented

potential data loss from equipment or human error, and my comfort with its user interface.

A separate software was needed to make edits to the video file produced by live editing. This software would need to take in the individual recordings of each camera and the live-edited recording and align them. This would allow me to replace portions of video with a different camera source if errors were made during live editing, such as missing a key movement from an actor, distracting movement from a camera operator, or simply because a different shot just looked better.

Adobe Premiere Pro was used as the post-production editing software. This choice was made as I already owned the Adobe Suite for personal uses and am most familiar with its interface. DaVinci Resolve would be a second choice as a free alternative to Premiere Pro, albeit with a steeper learning curve.

3.3. Broadcasting the Show on a Streaming Platform

The performing rights for Masque's production of LOVE/SICK allowed for three days of digital performance in the form of pre-recorded video accessible for all 72 hours and/or streams set at specific times. The performing rights also specified that the video and/or stream must be privately accessible to only those who had reserved a ticket.

I wanted the show to be accessible to as many people as possible and considered how set stream times in a limited time frame might prevent interested parties from being able to access the show. I also saw the value for audience members in simulating the theatre experience with a set show time and shared viewing experience. The streams would feature a prerecorded video, so it was little extra effort to give audience members the choice between a watch-any-time video and a stream.

I needed a video hosting platform that accommodated both video uploads and streams that could have access restricted to a set of people. I also needed this platform to be free for users, as Masque as an organization does not traditionally charge for tickets. I ultimately chose to plan to use YouTube, because I valued how users would be most familiar with this platform. Masque had had a minimal online presence beforehand, so using a recognizable hosting platform would help ease the transition into the new digital medium for audience members.

3.4. Research Limitations

The scope of the filming component of LOVE/SICK was limited by several factors that make certain method decisions unique to the production. The challenges outlined below had a significant impact on the outcome of the production and should provide context for choices described in previous sections.

3.4.1. Financial Limitations

Masque is a student organization under WPI's Student Government Association (SGA). Funding for Masque productions is allotted via a yearly budget broken down by show, with the ability to petition to fund specific additional events or equipment. Several filming equipment choices were determined by their price point to acquire quality items with a tight budget; funds for filming equipment were not guaranteed until an equipment list was made and approved by SGA.

Unlike some other theatre organizations, Masque does not charge for tickets and thus does not make a profit on any shows. Masque also cannot fundraise to accumulate additional funds. Commercial theatres may consider either of these approaches to help supplement the cost of purchasing new technical equipment.

All equipment had to be available through a rental vendor. Individual shows cannot make large purchases of equipment for Masque, and the cost of purchasing all desired equipment could not be justified without further testing and use of the equipment.

I also could not justify spending money on a video hosting platform when free alternatives exist. Vimeo Premium is a long-term investment that far exceeded the scope of my production budget, though it was more ideal for my purposes and is integrated with Lives-tream Studio 6 live editing software for ease of use.

3.4.2. The Effects of COVID-19

Every step in this process had to be considered through the lens of COVID-19 precautions. It would not have been possible to hold large hands-on workshops to increase overall experience with film equipment within the club or production, which would have spurred additional interest in camera operator positions. The space capacity of the Little Theatre, which hosts 100 audience seats, was adjusted to 14 people including all production staff. Work had to be consolidated to as few people as possible to limit the number of individuals interacting with the same equipment. The filming set up had to be designed such that one individual could set up all cables and software needed, and additional individuals only interacted with their assigned camera.

3.4.3. Time Limitations

In-person work for the production began on August 31st. Filming would begin on October 5th and be completed by October 10th, and the show was to be streamed starting on October 16th. This timeline gave 5 weeks for all production members to complete work and an additional 6 days for filming, all while students were completing work for academics and other commitments. This gave a tight timeline for all components of the production to be considered. There was little opportunity for trial and error, so using any equipment or software with a learning curve would severely hinder the production timeline.

The equipment rental for all camera supplies would last 10 days, starting the Friday prior to filming. This gave me three days to learn the entire set-up and work through any technical issues that might arise. Additionally, this meant that I could not test how many elements of the production looked through the filming set-up until the first filming day.

3.4.4. Deciding Against Live Broadcasting

Ultimately, one of the key differences between film and theatre is that theatre is traditionally live performance. The engagement between audience and performer is valuable and unique. Broadcasting the show live was possible – but I was concerned with the possible issues I might face with live broadcasting.

There were already many new variables in play for this production with the filming element. I expected technical issues to arise. Production members, including actors, did not have prior experience with live performance for film. As both Producer of the show as a whole and leader of filming, I would be responsible for overseeing cameras, live editing the performance, and overseeing the broadcasting platform simultaneously. The anticipated stress of adding live broadcasting as a factor to an already stressful set of circumstances felt as if it could only be a hindrance to the production.

4. Findings

This chapter is organized in response to the previous chapter, and thus on a per-objective basis.

4.1 Effects of Streaming on Specific Theatrical Departments

Prior to any filming, LOVE/SICK's individual departments were considered in the context of cameras. During the filming process, I identified how well the effects of streaming on individual departments were anticipated. The findings consider how theatrical designs are benefited and hindered by the change in media type.

4.1.1. Costumes Department

Compared to other departments, costumes were minimally affected by the livestream transition. The department was benefited by the film component through close-up shots that allowed costume details to stand out more compared to viewing with the naked eye from an audience bank. Costume quality could be better appreciated with this perspective. There were two instances where factors I did not anticipate impacted the quality of how costumes appeared on-camera.

The first was wrestling with exposure setting to accommodate white or light, bright clothing. The theatre floor and structural support I-beams were black and heavily contrasted with the white, forcing the choice between the clothing being blown out or everything but the clothing being too dark. Even when filming in a theatre space that does not contrast so heavily with bright clothing, this would still pose a problem. The whites could contrast with any darker clothing worn by the actor or nearby actors, or contrast with an actor's skin color if they have a dark complexion.

There are strategies in photography to eliminate blown out whites from photos, but they are primarily solved by adjusting fill light or diffusing light. Theatrical lighting and photography lighting differ enough that the lighting department may make major sacrifices to their design to accommodate costumes. The alternative to fixing a problem during filming is to edit it out in post-production; sophisticated editing software like Adobe Suite and DaVinci Resolve have capabilities to improve blown out colors without compromising the rest of the frame.

I did not have the time to properly mask blown out colors in post-production editing, though I was able to adjust shadows and contrast to somewhat fix the problem. Adjusting the shadows and contrast of an entire frame instead of just a small section would make cutting between shots more noticeable if the shadows and contrast change too much.

The second complication came from checkered patterns. I discovered a concept known as moiré patterns or the moiré effect, where the sensor resolution of a camera is exceeded by a

repetitive pattern. This creates an optical illusion of a third pattern that is less pleasing to the eye than the intended pattern. With the high-quality sensor in the Panasonic cameras, the moiré pattern was a mild case compared to what it could be with another camera, but still was not ideal. Most tricks in photography meant to reduce or eliminate moiré rely on having a static, or un-moving, subject, which is not feasible with video. The most reliable way to reduce moiré in a theatre stream is to eliminate offending patterns from the costume design.

4.1.2. Hair & Makeup Department

The Hair & Makeup department had the easiest transition between stage and screen of any department. The use of video cameras and close-ups allowed for specific artistic choices, such as eyeshadow or a specific hairstyle, to be better observed and appreciated. The medium of streaming opens up more opportunities for the Hair & Makeup Artist to be creative without any downsides.

4.1.3. Lighting Department

Lighting was the most daunting department to transition. Every lighting fixture owned by Masque was used in the grid to include as much light as possible on the stage. The Lighting Designer frequently made changes to lighting cues after the first run of a scene on filming night to adjust to how things looked on camera, because they were unable to conduct tests before cameras arrived..

One of the most consistent issues that came up was actors stepping out of pools of light. In-person, when an actor steps out of their light, it is unfortunate and makes it difficult to see their face. When an actor cannot find their light on camera, the contrast is more drastic, and they begin to blend in with shadows. Several scenes had unusable takes because an actor was standing in a section of low light for a long period of time. This was solved by redirecting actors in-between takes but would be difficult in a more limited timeframe. It could also be solved by having actors rehearse under stage lighting conditions earlier in the process, but this would force lighting teams to finish work sooner to accommodate.

A fundamental aspect of theatrical lighting is the way lights can fill a scene with color. Changing to a filmed performance had both negative and positive effects on this use of color. As a positive note, color-grading editing can be performed in post-production to enhance color choices made by the Lighting Designer. However, some cameras have difficulty adjusting to sharp changes in color. The Panasonic camcorders used could not capture fast transitions to deep reds in a scene because of low-light conditions. This was adjusted in post-production but would have been of higher quality if the cameras' sensors had picked up more of the scene.

The filming aspect did allow the Lighting Designer to showcase their gobo (a screen

placed in front of a light to create a specific shape). The clock-shaped gobo was pointed directly at the floor and filmed separately from scenes. This involved moving lights from their positions in the grid during scene filming to a different location and was thus done last. The gobo was filmed using the whole frame and overlaid in post-production to create transitions between scenes. An in-person audience would have been unable to see the gobo's detail, primarily because of their viewing angle.

4.1.4. Scenic Department

The scenic department's scenic art component worked beautifully both in-person and on-camera. When considering how the costumes department was impacted by high contrast, I realized that using a mural background in a black box theatre was ideal for filming. If we had been filming against a black background, it would have been more difficult for the camera sensors to pick up individual actors without overexposing costumes and skin. Like the costumes department, scenic should avoid white paint or furniture and be cautious of patterns and textures on furniture fabric.

The scenic department was also benefited by cameras because the space felt fuller in most scenes. Even if a scene only took place on a portion of the stage, the cameras focused on that spot. The scenic department did not have to worry about including additional set pieces for the sake of filling the space; the scene was framed around the set.

4.1.5. Sound Department

The sound department encountered trouble on the first night of filming that required quick adjustments to the sound set-up. Originally, three shotgun microphones were hung in the lighting grid and all connected to an X32 soundboard, which then plugged into the Black Magic Web Presenter as stereo. After the first filming run of the night, I discovered that the audio was not recording as expected, and the live edit of the run did not have any audio.

The sound engineer was unavailable for troubleshooting that evening, so the sound became more similar to that of a film set. Two shotgun microphones were removed from the grid, and each one was plugged into one of the Panasonic camcorders with XLR cable. This change was possible because each scene only featured two actors, so there would always be one directional microphone pointed in their direction. This fix was effective but would have been less ideal with a larger cast, as sound levels would be more complicated.

One of the benefits of transitioning sound from theatre to film is the options for post-production. In editing, audio levels can be adjusted, and background noise can be addressed, two things that are impossible to change during a live in-person performance. There is also opportunity for design choices such as internal narrative or flashbacks that include sound clips from earlier sections of the show – a choice that sometimes occurs in film but can

be more difficult to recreate on stage. A special circumstance related to the COVID-19 pandemic had an actor record a song clip in their personal living space and then pretend to sing on stage as the sound clip played through speakers. Using the recording of the song playing in the theater and the original soundtrack overlaid, the recording sounded more natural than it ever could have in-person.

Professionals in the film industry universally agree that poor sound quality can ruin an otherwise great film. Financial priority in a production should be given to quality microphones; Masque's production used Sennheiser MKH-416 Short Shotgun Microphones. The improved quality between using the Sennheiser microphones and the internal camera microphones was immense. Theatre organizations that regularly produce musicals will likely have an easier time adjusting their sound for video streaming, as musicals often have actors wear lavalier microphones on their person and would not need to purchase any additional sound equipment for the digital transition.

4.2 The Filming Process

This section will describe and analyze the events of filming and provide evaluations of practices and equipment used.

4.2.1. Overview of Scheduling

The filming process was broken up over five days with an additional sixth day factored in as a make-up day in case issues arose during planned filming times. The show was made up of nine individual scenes, so about two scenes were filmed each day.

Scenes ranged from 10-15 minutes long, so the Stage Manager and I scheduled 1 to 1.5 hours to give time to run the scene 4 times. An additional hour per scene was factored into the beginning of each filming day for set-up, and another hour was added at the end of each filming day for clean-up. For a complete overview of the Filming Schedule, see Appendix C.

The first day of filming was the most challenging. There was not a set precedent of operations that happened or how they needed to happen, and technical debugging was needed at various points in the night. It was the only day that required using the full amount of time planned (6 hours), but all filming we had set out to do that day was accomplished.

The rest of filming week was an immense success. Everyone on the production adapted quickly and demonstrated that while the circumstances were new, theatre production members can find familiarity and rhythm in filming the show. I found that the Stage Manager and I had over-scheduled the amount of time needed each day which made pacing comfortable. If a scene needed to be filmed an additional one or two times to get the best performance from actors, the decision to do so was easy and stress-free.

The makeup day was used to film one scene. However, this was due to an issue with props and unrelated to the filming element of the production. The lighting team then set-up their gobo and had plenty of time to test their equipment before I filmed the effect.

4.2.2. Overview of All Equipment Used

The following is a breakdown of specific pieces of equipment used during filming. For a complete rental list with prices, see Appendix D.

Panasonic AG-CX350 4K Camcorders: These broadcasting camcorders were manually operated by production members. Aperture, focus, and zoom were the primary elements manipulated. The camcorders independently recorded every take in addition to the video recorded through live editing.

Black Magic Web Presenter: This technology was used to stream video from the Panasonic camcorders to the laptop being used to live edit. One of the web presenters had difficulty with its SDI in, so an SDI To HDMI converter was used. An SDI cable sent media from the camcorder to the converter, and an HDMI cable came from the converter and plugged into the web presenter. The other web presenter handled SDI without issue.

Canon EOS Rebel T8i DSLR: This camera provided a static wide shot of the entire area used in a scene. It was on autofocus and did not need to be manually operated aside from starting and stopping recording. Canon Utility Software negated the need for an additional Black Magic Web Presenter for this camera.

Camera Accessories: All cameras were paired with an extra battery and a 128GB SD card. All cameras were mounted on tripods, and a dolly was used with one of the Panasonic camcorders.

ASUS - ROG Zephyrus M15 Laptop: This computer was used to monitor the video coming from all three cameras and live edit with Open Broadcaster Software. All three of its USB ports were used in this set-up.

4.2.3. Final Camera Positioning

The diagrams below demonstrate the various camera positions used during filming. To give the director the freedom to stage each scene however they wanted, I needed to stretch the flexibility of the three-camera setup by introducing several layouts.

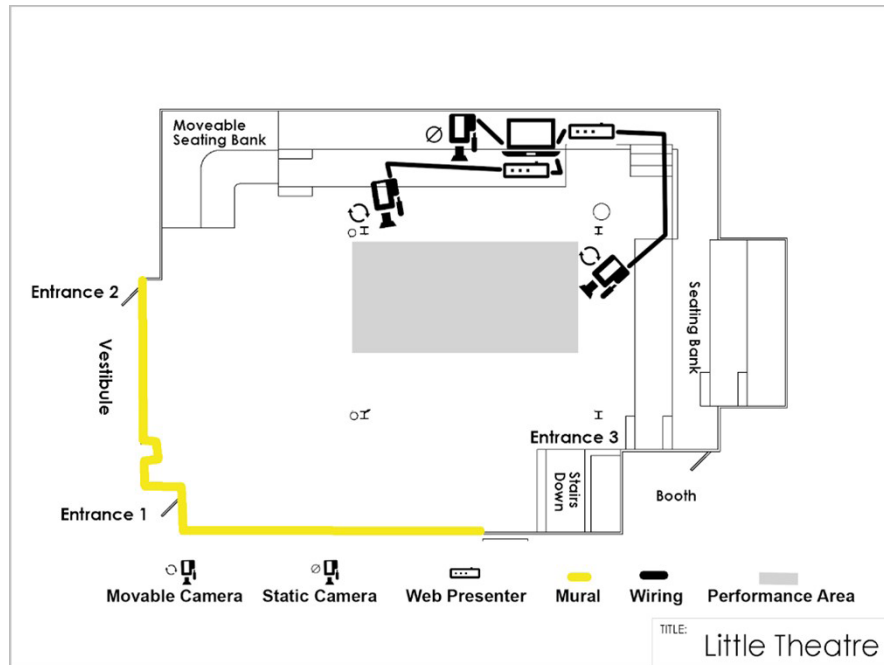


FIGURE 4-1: CAMERA LAYOUT 1

This camera layout was the most common. Each Panasonic camera could focus on one actor at a time— the camera on stage left focused across to the actor on stage right, and vice versa. If actors switched sides, the camera operators would generally switch which actor they were following.

The DSLR stood in the furthest back seating row parallel to the center of the scene area to capture as much of the scene as possible.

The left-most moveable camera tended to be the camera using the SDI to HDMI converter because the distance from the laptop was greater, and the combined SDI to HDMI set-up added extra length. This camera also used the dolly to change the exact camera placement during a scene to improve angles.

Limitations with this layout were sometimes evident. The camera with a dolly had to maneuver around one of the structural I-beams, which was difficult to perform smoothly. The DSLR was well above normal height and had to be tilted downwards to capture the scene full. This sometimes felt strange, because the other two cameras filmed at a normal height, changing the perspective of the video.

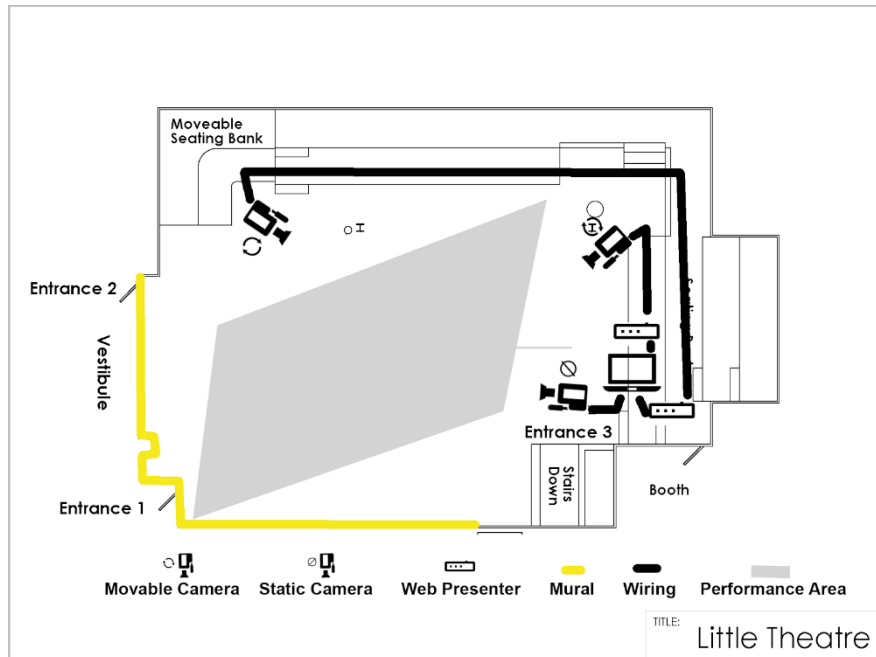


FIGURE 4-2: CAMERA LAYOUT 2

This layout was used to follow a scene that utilized most of the stage area. The actors moved frequently, so the moveable cameras tended to be more zoomed out compared to other scenes. This way camera operators were able to capture all the action in the scene without difficulty.

In other scenes, the placement of the static camera would have primarily captured actors' backs. The staging of this scene avoided this problem.

The biggest limitation with recording such a large section of the stage was that the camera by Entrance 2 was visible in the frame of the static camera.

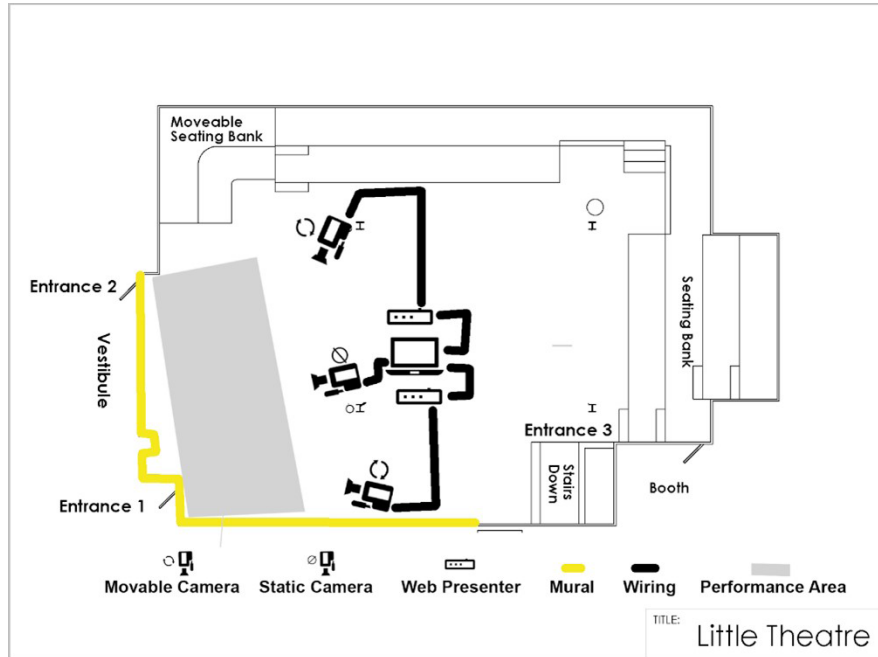


FIGURE 4-3: CAMERA LAYOUT 3

This layout was the only one where a camera was not within immediate range of a seating bank. The use of the moving camera further from the seating banks provided a perspective of the staging that audiences would not normally be able to see. The use of the static camera in the center of the stage had a similar effect.

I did not encounter any limitations with this configuration.

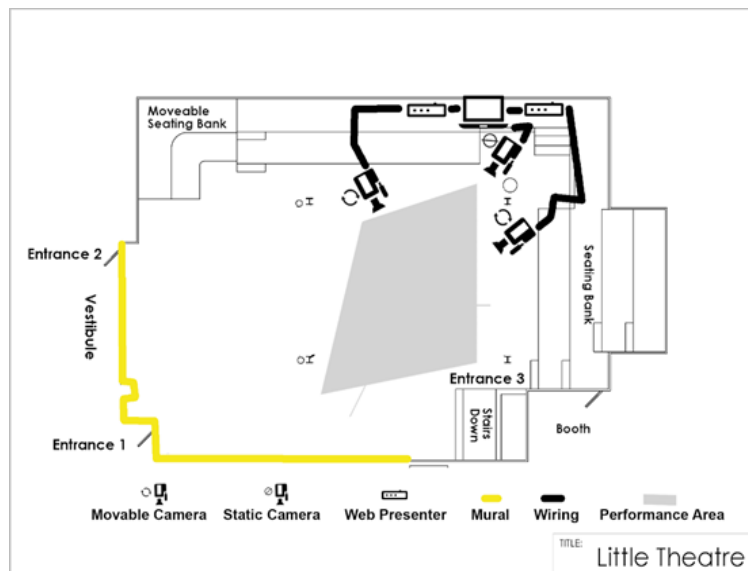


FIGURE 4-4: CAMERA LAYOUT 4

This layout was the only instance of using the DSLR to focus on a specific actor. For most of the scene, one actor sat in place. The static camera was directly in front of her and focused

downwards. The moveable camera on stage right was used as the wide shot during this time but moved at the end when the actor who had been sitting moved upstage.

The limitations with this configuration included having to use the static camera to film the sitting actor. This choice was made because using it for the wide shot meant capturing a camera operator in the frame, regardless of how it was positioned.

4.2.4. Guiding Camera Operators

The original plan was to split camera operation between three production members over the course of six filming days. Due to conflicts, a total of five production members served as camera operators across the filming days.

One step which helped camera operators to succeed was holding filmed practice runs. This first take of the scene was recorded and live editing, but it was acknowledged that this run was guaranteed to not be used in the final product. This lessened the pressure on camera operators to perform perfectly on the first try. They had room to experiment with zoom and aperture without worrying that it would impact the quality of the show. The lower stakes of the practice run made it easier for camera operators to take note of adjustments to make for future runs.

The camera operators would have benefitted from watching rehearsals prior to filming week, but this was not possible because of scheduling complications and space capacity requirements. The filmed practice runs were the first exposure camera operators had to the staging and content of each scene. Nonetheless, camera operators picked up things quickly. After a short number of runs, they were able to capture the scene without making any impactful errors.

I, as the live editor, and both camera operators present each day were on a coms system that allowed us to quietly communicate during filming. The major benefit of live editing a production regardless of whether the stream itself is live is the ability to provide camera feedback in real-time. If both camera operators were following the same actor, I was able to redirect one of them immediately to a better shot. This real-time communication also allowed the operators to adjust focus and aperture such that a shot could be improved before I switched to it on my monitor.

4.2.5. Evaluating Camera Choices

The two major factors I considered when evaluating each camera were quality of video in the final product and ease of use.

The Panasonic AG-CX350 4K camcorders exceeded expectations. Overall, these cameras produced high quality video without sacrificing ease of use. The benefits included:

- Quick autofocus for following moving subject (though manual focus was often used)

- Zoom range allowed for a wide variety of shots during a scene from a single camcorder
- White balance and general sensor quality provided accurate coloring
- Did not produce noise grain in low-light conditions
- Low latency when streaming from camera to computer with SDI cables

The only major disadvantage to the Panasonic cameras was their difficulty in adapting to fast color transitions. The sensor could easily handle scene openings and endings with lighting going from dark to bright and vice versa. However, it struggled to adjust when cool wash lighting had a rapid switch to red LEDs.

In comparison to the Panasonic camcorders, the Canon Rebel t8i DSLR did not measure up to the same standard of quality. The drawbacks included:

- Autofocus was distracting and unreliable
- White balance leaned warm despite attempts to adjust
- Noise grain did occur under low-light conditions
- Did not adjust well to sudden changes in lighting intensity, making it impossible to use the Canon for the opening or closing shots of scenes

By selecting this camera to be stationary editing around key moments, I was able to avoid the effects of some of the most glaring weaknesses. The biggest difficulty I had in working with the Canon DSLR was that I had to adjust color grading in post-production for all shots used. The difference between the Panasonic and the Canon cameras was noticeable and would have impacted the overall quality of the show if left unresolved. This forced me to spend significant effort to color-correct this inconsistency.

I believe that the lower cost of the wide camera did not make up for the resulting amount of time lost during the post-production editing process. Working with only one model of camera would have been easier, more effective, and more enjoyable.

4.3 The Editing Process

The benefit of live editing was exemplified during the short amount of time allotted to post-production editing. Working with Open Broadcaster Software produced an accelerated starting point for editing in post-production, as much of the splicing between shots was already completed.

OBS handled the three source cameras well and allowed me to monitor all three cameras at once, pull one camera into preview to ready it for the next cut, and confirm the current camera being recorded. This was overwhelming at first, because it can seem impos-

sible to monitor five videos at once. However, the live editing of a scene always quickly improved with practice. By the fourth run of a scene, the live edit video produced was ready for post-production fixes.

I was able to adjust hotkeys in a manner that made logical sense to me – camera 1, 2, and 3 were those respective keyboard keys, the spacebar key sent a camera to preview, and the period key cut to the preview video and began recording it. This became muscle memory by the second day of filming.

I had to manually sync audio to video in Adobe Premiere Pro due to sound complications described in subsection 4.1.5. This added a few extra minutes to the editing of each scene, but overall did not have a major impact on the editing process.

The second step in post-production was adjusting splices that were off in live switching. Trimming the end off a shot and replacing it by starting the following shot even just a second earlier can improve the quality of cuts. My goal in editing was to follow natural movement from actors and give actors equal screen time for their performances, and this sometimes is not quite accomplished in live editing.

I spent the most time in Premiere adjusting shadows and highlights. Many shots needed to be brighter or darker to flow more seamlessly into the next. On occasion, I would discover a moment where an actor stood in low light and would need to make their facial features more visible. The color-grading of the Canon DSLR shots also needed to be adjusted and made significantly cooler in tone.

Each scene had a first and second draft in post-production. The first draft would be sent to the executive board for feedback, and the Director would request a different shot at a specific time or note a technical error that had been missed in the first round of editing. This allowed the Director to have some creative control over the video editing process without offloading all the extra work on them.

Editing made elements of the production possible that would not have occurred with an in-person audience. For example, each transition between scenes was a rewind of the scene before it, overlaid with a semi-transparent video of the lighting team's clock gobo. This helped tie the individual scenes together and provided a new artistic feature to the show.

Crediting all production members during the show was also made possible by editing. The show was concluded with cinematic-style credits of all production members taken from the show's digital program. This provided a new way to celebrate and thank the cast and crew of a show for all the work they dedicated to the production.

4.4 Streaming the Finished Product

The show was available for three days as a watch-any-time video and as a stream each day at 7PM EST. YouTube was used to host both watch methods.

One difficulty with using YouTube was the outdated tutorials associated with a platform that has changed its user interface several times. Tutorials for setting up streaming would refer to an old interface and mention buttons that no longer existed or that had been renamed to something else. For example, there was no current guidance on how to produce a link to an active or scheduled livestream.

The show link was distributed via email through a third-party ticketing service. This allowed me, as the Producer, to interface with patrons but was also an additional task that needed to be completed during an already-busy time. The value of a service like ShowTix4U that integrates ticketing with video sharing became clear while using YouTube. Patrons did not have trouble using the link, so the familiarity of the YouTube interface on their end was a valuable aspect of the platform.

The show was streamed by uploading the media file to OBS and linking the software with YouTube. I did not encounter any problems with this set up. In general, issues did not turn up when performing the actual act of streaming. The most important aspect of streaming to YouTube is ensuring that the internet connection is strong and reliable. Buffering briefly occurred when moving the laptop being used to stream between locations because of the internet connection range.

The watch-any-time video version was very popular received 43% of total views of the production. There were instances where an individual would miss the streamed version and then decide to watch the video version instead. The flexibility of providing both options boosted overall viewing of the production with little additional work done on the production's end to make both occur.

4.5. Analysis of Changes Needed for a Real-Time Streaming Experience

Masque's production of LOVE/SICK by John Cariani could have explored real-time streaming, but I decided early on to pursue a pre-recorded streaming option. At the time, there were too many variables to consider before taking on a challenge that Masque as an organization had never pursued before. In this section, I consider how the production would have needed to adapt its practices to successfully stream a live performance to audience members.

The timeline of the production would have been altered such that the week of filming for pre-recorded streaming was a set of practice runs to troubleshoot problems and identify weaknesses in the camera layout. Given that the 5 days of post-production of editing would

also be available, that time would most likely be used to make design adjustments to individual departments based on findings that did not become apparent until filming.

There would have been more time to make adjustments that improved the overall quality of the live edit, but there would also be more pressure for perfection. OBS does offer some color correction options, but one pre-set filter would not be sufficient for theatre productions and the many different lighting cues that affect color grading. Real-time streaming means that any issues or accidents that happen during a take are permanent.

The camera layouts would also have to be re-considered. Each camera configuration was designed to optimize the quality of the scene but moving all equipment during a live stream without interrupting the video feed would be near-impossible. The static wide shot camera would have to remain in a set place for the entire run along with the Black Magic Web Presenters and the computer running and streaming OBS. The moveable cameras would have some flexibility in between scenes if transitions were filmed solely from the wide shot, but they would still be limited by fixed cable length. The Director would most likely have to reconsider actors' blocking within the scope of a fixed camera set-up.

The production team would also need to be wary of technical troubles. A lightly tugged cable, forgetting to use a fully charged camera battery, an unstable internet connection, and any other array of small issues can completely sideline a real-time stream. Camera operators would need to be vigilant about every move or choice they make, as their camera may be live at the present moment. An actor stepping out of their light cannot be redirected. Every transition between cameras would be unchangeable, putting immense pressure on the editor.

I believe that Masque, as a theatre organization, could eventually pursue real-time streams of their production, but not before they become comfortable and proficient in pre-recorded streaming.

5. Conclusions & Recommendations

In this final chapter, I summarize what was learned about each theatrical department in relation to film after reviewing the finished show. In addition, I make evaluations based on technology not used in the case study production based on general patterns that emerged from findings. This is followed by filming and editing considerations a theatre organization should explore while planning their streaming timeline and set-ups. I conclude with an overview on making the choice between real-time streaming and streaming pre-recorded content.

5.1. Considerations for Individual Theatrical Departments

Theatre organizations need to **evaluate designs from the perspective of film and streaming**. Based on the outcome of each department in the case study, the following suggestions should be given to designers:

- Avoid white fabric, furniture, and paint to **reduce light reflection and overexposure**.
- Avoid fabric with repetitive geometric patterns to prevent moiré patterns.
- **Test elements under stage lighting** through a camera lens as much as possible prior to filming, and budget time for adjustments resulting from these tests.
- Use natural makeup styles as opposed to theatrical ones.
- **Coordinate lighting and video editing** early in the production, especially regarding moments of drastic color change, and determine what should be done with lighting fixtures vs editing software.

Considering general patterns from these outcomes, I also believe that set electrics should be avoided or carefully constructed. Many set electrics will be too bright for a camera to accommodate in addition to actors or set elements nearby. Any set electrics used should not be considered a real lighting source and should act as more of a set piece.

Another recurring element in theatre that would not transition well to film are cycloramas and scrim. In theatre, a scrim or cyclorama is intended to be used as a backdrop or for shadowed silhouettes, but this violates the suggestion of avoiding whites and identifies a similar problem as set electrics. If being filmed, the fabric would have to be the primary focus of the frame, negating the usual reason for using them. Productions should consider graphics or other editing that can be created to utilize the film medium for a substitute.

Any **design elements** beyond the scope of the above recommendations should be **tested using the camera model** intended for filming before confirming its implementation in the production.

5.2. Considerations for Camera Equipment and Layout

The exact technical equipment and camera layout will vary with the needs of each theatre organization and production.

In choosing an appropriate camera for production purposes, a theatre organization should consider:

- Zoom range
- Autofocus quality
- Sensor capabilities in low-light conditions
- Ease of use

The Panasonic AG-CX350 4K camcorder model used in my case study met all the above criteria for theatrical production use. It may be a starting point when setting out to purchase or rent cameras for a theatrical production. I recommend that a theatre **use at least three cameras**, all the same model for cohesive video quality. I suggest using one camera as a static wide shot and any other cameras as manually operated, moving cameras for **dynamic shots and framing**. The choice of camera will also determine whether a Black Magic Web Presenter is needed for streaming from camera to monitor, or if a compatible software is available as an alternative.

Production-specific factors that will affect camera layout include:

- Cast size – a larger cast will be benefitted by increasing the number of manually operated cameras
- Physical staging – the camera configuration for a scene utilizing the full stage will vary from that of a scene using a small section of the stage. Additionally, intimate staging will benefit from close-ups shots.
- The physical theatre itself – a proscenium stage offers different filming opportunities than a black box theatre, and both will differ from that of a thrust stage.
- Method of streaming from camera to monitor – USB, SDI, and HDMI cables are capable of different lengths while preserving content quality. SDI is not compatible with some cameras, such as DSLRs, but will provide the longest cable length.

A flexible camera layout that is consistent throughout a show may be easier to plan and maintain. It may be necessary for productions where staging is consistent throughout the show or shows written in such a way that stopping and starting between scenes to change camera configurations is difficult to execute. Scene-by-scene camera layouts can raise the overall quality of the final video product **by tailoring the configuration to specific scene el-**

ements. This allows the Director to have more flexibility over their staging and artistic vision.

5.3. Considerations for Editing Practices

I recommend that theatre organizations **utilize both live editing and post-production editing.** The combination of practices saves time while increasing the overall quality of the final product.

Open Broadcaster Software is a free, beginner-friendly live editing software that can be used as a starting point for theatre organizations. They may find some elements of OBS lacking once they develop more experience with live editing, which will help make informed decisions when choosing an alternative paid software. I suggest that theatre organizations that have invested in Vimeo as a streaming platform utilize the integrated Livestream Studio 6 software for additional ease of use.

Live editing produces an accelerated starting point for post-production editing. Most splicing between shots will be completed during filming, with real-time camera adjustments in response to discoveries made during live editing. Post-production editing can then be dedicated to audio and color-grading adjustments, as well as minor splicing edits to the existing video.

Post-production video editing software is a large market with many options available at a range of prices. Some options include:

- Adobe Premiere Pro: This software is a professional standard in the film industry. Adobe Suite also offers bundles containing Adobe Suite and other useful programs that can be used to improve a theatre’s publicity and graphics.
- DaVinci Resolve: This software offers similar functionality to Premiere at a free price point. The learning curve is steeper than most editing software.
- iMovie/Microsoft Photos: These are the Apple and Microsoft built-in video editing programs, respectively. They are the easiest options to pursue for those new to video editing, but they may not encompass the full range of functionality needed for professional live-streaming.

In general, theatre organizations should **consider ease of use, functionality, and financial budget** when choosing a post-production editing software that best suits their needs.

5.4. Real-Time Streaming vs. Streaming Pre-Recorded Content

I strongly recommend against real-time streaming for a theatre organization’s first streamed performance. In my experience, the medium of filming theatre introduces many new elements that a theatre production will not have encountered before, and real-time streaming asks them to perfect those new elements in a limited time frame with less opportunity for

trial and error.

The choice between pre-recorded streaming and real-time streaming **must be made early in the production** timeline to cement approaches to designs and artistic vision. The presence of post-production in the production timeline introduces opportunities for color-correction, color-grading, and audio mixing that the lighting and sound departments would have to otherwise make up for with additional planning and testing. A Director may have less flexibility in their blocking of actors if cameras must remain in fixed positions during a real-time stream.

A theatre organization should **consider the reliability of their overall streaming configuration** before choosing real-time streaming. A reliable internet connection and camera battery life that exceeds the length of the production are both vital for a real-time streaming production. They must also accept that a live stream may have reduced quality compared to a pre-recorded stream. However, a theatre company with a comfortable level of experience in pre-recorded streaming should not be afraid to make the jump to real-time streaming. The **live performance** factor of theatre is what **draws in performers and patrons alike**.

5.5. Closing Remarks

This paper serves as a starting point for streaming a theatrical production as a small theatre organization. Given proper guidance, streaming can be a valuable medium for theatre organizations to **share their work with a larger audience**. The findings and recommendations discovered through this project prove the feasibility and potential for **quality streamed performance** in amateur, academic, or professional spaces. Theatre productions can build on this work to meet their individual needs and create a new standard for digital performance.

6. References

- Broadway League. (2019, November). The Demographics of the Broadway Audience 2018-2019 SEASON. <https://www.broadwayleague.com/research/research-reports/>
- Culwell-Block, L. (2020, March 16) Live Streaming Rights Made Available to Amateur and School Productions Facing Cancellations in the Wake of COVID-19. Playbill. <https://www.playbill.com/article/live-streaming-rights-made-available-to-amateur-and-school-productions-facing-cancellations-in-the-wake-of-covid-19>
- Finler, J. W. (2003). The Hollywood Story. Wallflower Press.
- Keogan, N. (2020, February 3). Disney Acquires Distribution Rights to Hamilton Film in \$75 Million Deal. Paste Magazine. <https://www.pastemagazine.com/movies/hamilton/disney-to-distribute-hamilton/#:~:text=15%2C%202021.,and%20then%20stream%20on%20Disney%2B>
- Kraft Television Theater. (n.d.) Nostalgia Central.
<https://nostalgiacentral.com/television/tv-by-decade/tv-shows-1950s/kraft-television-theatre/>
- Iqbal, M. (2020, October 30). Twitch Revenue and Usage Statistics (2020). Business of Apps. <https://www.businessofapps.com/data/twitch-statistics/>
- Iqbal, M. (2020, October 30). YouTube Revenue and Usage Statistics (2020). Business of Apps. <https://www.businessofapps.com/data/youtube-statistics/>
- Ruben, M.K. (2010, January 26). Radio Activity: The 100th Anniversary of Public Broadcasting. Smithsonian Magazine. <https://www.smithsonianmag.com/history/radio-activity-the-100th-anniversary-of-public-broadcasting-6555594/>
- ShowTix4U To Launch New Theater Streaming Platform. (2020, May 7). TicketNews. <https://www.ticketnews.com/2020/05/showtix4u-to-launch-new-theater-streaming-platform/>
- Sivakumar, B. (2020, March 11). YouTube Vs Vimeo: A Detailed Comparison. Feedough. <https://www.feedough.com/youtube-vs-vimeo/>
- Thomson, D. (2011, November 10). MGM musical: All singing, All dancing. The Guardian. <https://www.theguardian.com/film/2011/nov/10/mgm-musicals-judy-garland-fred-as-taire>
- Where to Watch Broadway Online: The Theater Lover's Guide to Streaming. (2020, July 8). Broadway Direct. <https://broadwaydirect.com/where-to-watch-musicals-online-the-musical-lovers-guide-to-streaming/>

7. Appendices

Appendix A: Production Contributors

Executive Board:

Position	Name
Producer	Mason Kaye
Director	Katie Doucette
Production Manager	Spencer Francis
Stage Manager	Caitlin Kuzma
Assistant Stage Manager	Carrie Grella
SQUAD Liaison	Amanda Dings

Drama/Theatre Staff:

Name
Despoina Giapoudzi
Pat Crowe

Designers:

Position	Name
Lighting Designer	Jenna Charron
Asst. Lighting Designer	Charlie Snow
Asst. Lighting Designer	Nicholas Sorel
Scenic Designer/Master Carpenter	Joseph Salvato
Asst. Scenic Designer/Asst. MC	Zahava Preil
Scenic Art Designer	Minh Anh Kieu
Asst. Scenic Art Designer	Emily Osterloh
Sound Designer	Caitlin Enright
Asst. Sound Designer	Mitchell Jacobs
Costumes Master	Catherine Masiello
Asst. Costumes Master	Reagan Hajjar
Props Designer	Joelynn Petrie
Graphics Designer	Rebecca Ramthun
Hair & Makeup Artist	Joelynn Petrie
House Designer	Luca Ialongo
Asst. House Designer	Rosaline (Albert) Guo

Crewheads/Coordinators

Position	Name
Master Electrician	Jeff Collard
Master Electrician	Kate Rosivach
Asst. Master Electrician	Alex Jozitis
Scenic Art Coordinator	Collin Touchette
Asst. Scenic Art Coordinator	Grace Holod
Asst. Scenic Art Coordinator	Lauren Eppinger
Publicity Manager	Kyle Mikolajczyk
Asst. Publicity Manager	Emily Osterloh
Props Coordinator	Tyler Bouwens

Camera Operators

Position	Name
Camera Operator	Joshua O'Grady
Camera Operator	Finbarr O'Sullivan

Actors

Show	Position	Name
1. Obsessive Impulsive	Woman	Julia Awad
	Man	Speros Steven Perakis
2. The Singing Telegram	Singing Telegram Man	Adam Ferrarotti
	Louise Overbee	Ilana Whittaker
3. What?!?	Ben	Drew Silvermail
	Andy	Nelson Jorge Pires Jr
4. The Answer	Keith	Owen Forman
	Celia	Kelly Heffernan
5. Uh-Oh	Sarah	Abigail Duval
	Bill	Owen Forman
6. Lunch and Dinner	Kelly	Julia Awad
	Mark	Adam Ferrarotti
7. Forgot	Jill	Minh Anh Kieu
	Kevin	Luca Ialongo
8. Where Was I?	Abbie	Kelly Heffernan
	Liz	Abigail Duval
9. Destiny	Jake	Drew Silvermail
	Emily	Katie Stratton

Lighting Crew

Name
Victoria Tetreault
Nicholas Sorel
Nicholas Frangie
Caroline Major
Bella Vignola
Luca Ialongo
Amirtha Babu

Scenic Art Crew

Name
Nicholas Sorel
Caroline Major
Jessica Wang
Luca Ialongo
Amirtha Babu
Meenakshi Meyyappan
Stephanie Reis

Sound Crew

Name
Bryce Bienz
Thomas Piccione

Appendix B: Interview with Danielle DeMatteo

Q: How many, if any, of the shows have been adapted to fit a digital platform? (in terms of the script itself)

A: All the shows will be performing digitally, though most have stuck pretty closely to their original script. The only one to note would be Charlotte Ahlin, this year's recipient of our New Play Residency. She was tasked with writing a new play from scratch, just for the festival! Therefore, it was pretty early in her writing process when we announced that this would all be 100% digital, so she was able to pivot to a concept that was really friendly to this medium. Her new show will be a digi-play about kids playing Dungeons & Dragons, so they spend the whole play interacting via computers. (She's also hilarious, so I'm really excited about this one!)

Q: What is the cast size range of the shows in the festival? Has the size of the cast influenced a show's difficulty in adapting to the digital platform?

A: The cast sizes are all over the place! I think our smallest cast is just 3 characters, and we go all the way up to a musical with a cast of 30. There are some technical issues that make it tough to have bigger casts in this format. For example, only so many people can be seen on a Zoom call at once, etc. We've been utilizing Streamyard, because that allows you control -- in a bit of a more cinematic way -- which faces are featured on the screen. But even that, too, has a participant limit. Of course, if you're a video-editing master, you can edit as many faces to be on the screen as you want, but being that we're all theater folk, not many of us have that skill (yet!).

Q: The festival is available through private YouTube links - what decision-making went into choosing to host using this platform? Did you explore other hosting platforms?

A: We're using Streamyard to actually stream the performances live, so for those of us hitting the "go" buttons on the back end, we're only looking at Streamyard. Streamyard then funnels the video into a private Youtube link, so while we're making the show on Streamyard, the viewer is watching on Youtube. We basically decided to use it by looking at all of the options, and while none of them are perfect, this was the best of the bunch. Youtube is a website that basically anyone with an internet connection has access to, and most people are very used to using -- so that's what will be the most friendly to all of our audiences (as opposed to, for example, using Facebook live or watch party, which would require users to have a Facebook account; or using a site like Vimeo that a lot of non-film people aren't super familiar with). Our audience members tend to be all over the age spectrum. If we were a company that really only had millennial/Gen Z followers, we may have considered something like Facebook live or Twitch. But we've got a lot of subscribers from all different generations, so wanted to make

sure this experience was as simple and user-friendly as it could be.

Q: Have any production positions (designers, roles focused on livestream, etc) been added or removed? And/or have existing positions been adapted to include responsibilities related to the digital platform?

A: Unfortunately, yes. We had to cut our Production Managers and Lighting Designers and all those backstage positions. One of our Production Managers took on the role of a Digital Production Consultant to help all of our shows plan the logistics of their livestream, which has proven to be really helpful (adjusting the lighting in your house can totally change a Zoom reading, it turns out!). Outside of that, all of our other positions have definitely had to adapt -- we've basically had to all learn brand new skills from scratch. I had never even opened iMove before this summer; we've all had to get familiar with the streaming technology; and we've had to be a support system to our writers while they, too, are trying to figure this all out.

Q: What led you to decide to stream pre-recorded performances, as opposed to performers acting in real-time?

A: Shoddy New York City wifi! Haha. We didn't want to risk any actors' wifi going out during the live stream and messing up the performance for everyone else. And, streaming pre-recorded performances allowed our writers/directors more creativity in how they edit the video and adapt their story to the digital medium.

Q: How has the festival been impacted financially in switching to a digital platform?

A: It's actually not clear, yet. We're very fortunate that we were (mostly) able to get refunded on all of the venues we had rented for the summer, so we have saved money from that perspective (we also spend thousands of dollars on in-theater equipment like curtains, lights, etc, so saved all those costs as well). But, ticket sales for the festival are our biggest source of revenue for the whole year. While we've always been 100% certain we will only make a small fraction from online performances of what we would normally make in ticket sales, we truly have no idea how much money will end up bringing in. I'm optimistically hopeful that it will be enough to balance out the expenses of our much-smaller-than-usual budget (we're already close to that on our LA festival!).

Q: What kind of hardware (cameras/mics) have shows been using? Did the festival provide equipment to shows, or was each production responsible for acquiring livestream equipment?

A: Each show has just been using whatever they have around the house! We didn't want anyone to have to purchase equipment for this, especially if they're only going to be using it once. iPhone cameras, editing on their laptops, some people who are musicians had fancier

mics laying around (and a lot of our LA folks tend to own cameras, because...that's LA). Those of our staff members who happened to already know how to edit videos have been helping out the shows who need it with their editing work, too.

Q: After troubleshooting the various aspects of livestreaming theater, would you consider attempting livestreamed performances again in the future? There's something to the "magic of live theater", but what positives do you see in livestreaming a performance?

A: I agree that the magic of live theater is important, and I can't wait to go back to it! However, we have noticed that the shows that have sold the most tickets thus far are the shows that are based outside of our 3 core cities (we have one person from London, two from South Carolina, one in Pittsburgh, and one in Chicago). We believe it's their friends and families back home rushing to sign up to watch something that they normally wouldn't have had the option to see. So, I'm hoping we might be able to work an element of livestreaming into the Fest in the future, so that out-of-towners can support their friends going up on a big stage in New York City, without having to get on a plane to do it. :)

Appendix C: Filming Schedule

Monday 10/5/20:

- 5:00PM Space Reservation Start Time
- 6:00PM Call Time for Actors, Camera Operators, Executive Members
- 6:45PM Practice Run Scene 1
- 7:00PM Filming Scene 1
- 8:00PM Prep for Scene 2
- 8:45PM Practice Run Scene 2
- 9:00PM Filming Scene 2
- 10:00PM Begin Clean-up
- 11:00PM End of Space Reservation

Tuesday 10/6/20:

- 4:00PM Space Reservation Time
- 5:00PM Call Time for Actors, Camera Operators, Executive Members
- 5:45PM Practice Run Scene 1
- 6:00PM Filming Scene 1
- 7:00PM Prep for Scene 2
- 7:45PM Practice Run Scene 2
- 8:00PM Filming Scene 2
- 9:00PM Begin Clean-up
- 10:00PM End of Space Reservation

Wednesday 10/7/20:

- 4:00PM Space Reservation Time
- 5:00PM Call Time for Actors, Camera Operators, Executive Members
- 5:45PM Practice Run Scene 1
- 6:00PM Filming Scene 1
- 7:00PM Prep for Scene 2
- 7:45PM Practice Run Scene 2
- 8:00PM Filming Scene 2

9:30PM Begin Clean-up

10:30PM End of Space Reservation

Thursday 10/8/20:

4:00PM Space Reservation Time

5:00PM Call Time for Actors, Camera Operators, Executive Members

5:45PM Practice Run Scene 1

6:00PM Filming Scene 1

7:00PM Begin Clean-up

8:00PM End of Space Reservation

Friday 10/9/20:

6:00PM Space Reservation Start Time

7:00PM Call Time for Actors, Camera Operators, Executive Members

7:45PM Practice Run Scene 1

8:00PM Filming Scene 1

9:00PM Prep for Scene 2

9:45PM Practice Run Scene 2

10:00PM Filming Scene 2

11:00PM Begin Clean-up

12:00AM End of Space Reservation

Saturday 10/10/20 Makeup Day:

8:00AM Space Reservation Start

9:00AM Call Time for Actors, Camera Operators, Executive Members

9:45AM Practice Run Scene 1

10:00AM Filming Scene 1

11:00AM Begin Clean-up

Appendix D: Full Equipment Breakdown

Name	Time to Rent	Total
SanDisk 128GB SD Extreme Pro 300MB/s UHS-II U3 Memory Card	10 Days	\$39.00
Panasonic AG-CX350 4K Camcorder	10 Days	\$300.00
Blackmagic Web Presenter	10 Days	\$56.00
Blackmagic Web Presenter	10 Days	\$56.00
Extra Panasonic VW-VBD58 Battery	10 Days	\$35.00
Extra Panasonic VW-VBD58 Battery	10 Days	\$35.00
Panasonic AG-CX350 4K Camcorder	10 Days	\$300.00
25 Foot HDMI Cable	10 Days	\$21.00
Blackmagic Design <u>BiDirectional</u> SDI/HDMI Converter	10 Days	\$24.00
Extra Canon LP-E17 Battery	10 Days	\$22.00
Canon EOS Rebel T8i Digital SLR Camera	10 Days	\$72.00
50 Foot BNC Male to BNC Male SDI Cable	10 Days	\$20.00
50 Foot BNC Male to BNC Male SDI Cable	10 Days	\$20.00
Sennheiser MKH-416 Short Shotgun Microphone	10 Days	\$116.00
Sennheiser MKH-416 Short Shotgun Microphone	10 Days	\$116.00
Sennheiser MKH-416 Short Shotgun Microphone	10 Days	\$116.00
SanDisk 128GB SD Extreme Pro 300MB/s UHS-II U3 Memory Card	10 Days	\$39.00
SanDisk 128GB SD Extreme Pro 300MB/s UHS-II U3 Memory Card	10 Days	\$39.00
Mangnus VT-300 Tripod with Fluid Head	Purchased	\$79.95
Mangnus VT-300 Tripod with Fluid Head	Purchased	\$79.95
Pearstone DWL-2 Universal Tripod Dolly	Owned	N/A
Manfrotto Compact Action Aluminum Tripod (Black)	Owned	N/A
Canon EF-S 18-135mm f/3.5-5.6 IS STM Lens	Owned	N/A