

Project #3

Theatrical Design & Automation Technology:

A Literature Review

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Abstract

Through the lens of digital breakthroughs in production technology, this literature study aims to examine the technological shifts occurring in contemporary American theater. There has been a vast component of incorporating digital technology in theatrical productions worldwide. A range of technologies are now available, and research literature has revealed their impacts on production, design, and technology in the world of theater. This literature review specifies how digital technology has advanced the theatrical stage in scenic, lighting, and projection design.

Keywords: theatrical design, history of theater design, scenic design, lighting design, projection design, automation technology

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Introduction

Theatrical designers are exploring and creating different techniques with a variety of new digital tools that enable them to coordinate and control dozens of elements. These elements include lights, sound, sets, and special effects that derive from a single technological button. Technology has moved into the theatrical world slowly but surely, less than ten years after the first helicopter to land onstage in the musical *Miss Saigon*. Since then, theater companies have been gearing towards computers and computer assisting programs to help assist with the creative theater process.

In 1975, *A Chorus Line* became the first Broadway production to utilize a computerized lighting board. Once this show succeeded in its computerized lighting board, different forms of technology impacted theatrical areas of lighting, scenery, and projection in a variety of shows. This literature review examines current technologies and how technology has improved live theater.

History of Theatrical Design

Theatre is a form of art which has roots in classical Greece and is centered on tradition, social critique, and observation. The earliest documented dramatic concept was written by Aristotle and titled, *The Poetics*. This dramatic work identified six basic components of theatre such as: narrative, character, thinking, diction, melody, and spectacle. These components create storytelling (Aristotle et al., 1995). Since the early historic times of Aristotle, utilizing lighting, sets, costumes, and sound has been a crucial component of theatre production. Nowadays, theater technicians are combining ancient art form mixed with new digital technologies. This technique will help to connect with the performers and audience members.

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The variety of technology used and the viewers' experiences with *The Poetics* contributed to the design process and technological integration. Creators use technology as a tool to improve the creativity of their work. Technology has helped evolve into its own genre of art. Looseleaf (2007) conveys that in theatrical productions there are "two shows going on: the artists' and the technology behind the scene" (p.49). Theater technicians have to consider how the artist's vision and technological software and devices could combine to tell the tale of their story.

Scenic Design

An audience member's journey through a production is made possible by scenic components. Throughout the years, computer technology has been used in moving sets. A few examples of technological systems that have helped designers and crew workers create theatrical enchantment for decades include rigging systems operated by pulley systems, hydraulic lifts, and turntables operated by winches (Young & Minetor, 2010). Stage automation is the technique of moving props and other set pieces. Live and immersive entertainment uses machine-generated movement to either set the scene for a production or to completely change the storyline. Automation technology enhances possibilities in scenic components, particularly in regards to the smoothness and pace of the movement. Even though technology is moving forward in theatres, a human operator is still required. "While the automated action equipment is very predictable, the guy at the control desk needs to have dynamic control to fit in with the actors, who are not always predictable" (Richards, 2008, p.39).

Scenic Interactivity

Virtual reality and interactive digital technology are becoming more prominent in many theatres around the world. However, these forms of technology are being introduced in a variety of applications. Rather than simply being utilized for entertainment, interactive technologies aim to develop the plot and generate meaning inside the production. In Saltz's (2001) study on scenic design, he explored the functions and meaning of new technologies in theater. Saltz outlines his definition of interactive media to include, "sounds and images stored, and in many cases created, on a computer, which the computer produces in response to a live performer's actions" (p.107). These sensors can be positioned on the performer or around the venue - an imminent example of an interactive technology including virtual reality.

The virtual reality technology, "invites the audience, viewer, user to participate in or interact with art work that involves being able to navigate freely within a three-dimensional environment created by computer software" (deLahunta, 2002, p. 105). Such example of this three-dimensional environment is the, "Beyond Van Gogh: The Immersive Experience". This is a 360-degree outlook experience. The exhibition's major attraction is a 360-degree projection of a series released up of a long flow of van Gogh paintings, quotations, and animatics. In-depth displays based on the life and work of well-known painters have been developed by at least five businesses, one of which, controversially, is a prominent museum. There are approximately 40 separate Van Gogh rooms active or shortly to open throughout the United States.

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Design Software

Digital technology has an impact on both the design process and what occurs on stage. Software like AutoCAD, Vector Works, Sketch Up and more have made computer generated modeling attainable at a variety of levels (O'Neill, 2005).

Spikemark is a well-known program that converts one's goals for automation into automated motion. Spikemark automation software, which has been completely rebuilt, offers a logical structure, a clever cue production methodology, a versatile playback experience, and strong show control connections for theater technicians (Creative Connors, 2021). Spikemark is also completely free to use. The Spikemark Simulator permits a creator to create prompts and organize a show without any associated equipment, whether the creator is learning in a classroom, programming their upcoming show, or testing out automated scenery for the first time.

The advantages of digital developments in drafting software and 3D modeling include: the technology being more available and less expensive; enhanced and easier collaboration between designers; and more time and space for challenges of developing (O'Neill, 2005).

Lighting

Stage lighting helps in supplying visibility of stage and performers, establishing a mood and location, help to support the production style, and creating visual compositions and movements. The essential components of a lighting system include lighting instruments, lighting consoles, and dimmer power control systems, all of which can create a complex technological

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environment for innovation (Strong, 2010). This section covers the new trends and products in design, fixtures, and control systems.

Light Design

Since the early 1980s, automated or moving lightings have been a component of the theatrical process (Cadena, 2010). Automated lights started to move toward digital luminaries in 1998 as a result of technological lighting improvements. These luminaries “allowed a significant development of expressive flexibility in lighting and set design, and helped overcome the constraints of 'traditional' automated luminaries” (Cadena, 2010, p.3). Digital controls for color, position, and intensity are now possible with smaller, more affordable instruments. LEDs (Light Emitting Diodes) over the past ten years have become “brighter and brighter to the point they can finally be a useful lighting tool in our market” (Eddy, 2011, p.43). Automated lighting has begun to play a supporting role to new digital technologies; however, it still plays a significant role in the majority of contemporary productions (Cadena, 2010).

The most widely used digital communication protocol for lighting equipment used in theater, concerts, and special events is called DMX512. “This system was created in reaction to several alternative proprietary systems created in the 1980s” (Creative Connors, 2021, p. 14). In addition to lighting, DMX512 has been utilized to control fog machines and other special effects as well. There are programs for turning a PC into a lighting controller on the market. Although it would be a great investment to any theatre, it is quite expensive - totaling at approximately \$1000 or more.

Projection Design

As early as the 1960s, artists started incorporating video and projection features into theater. Nowadays, projection design is being used more often within today's productions. Napoleon (2011) describes the inherent benefits of projection. "Projection is a very efficient way of doing theatre, a drop would take three scenic painters 12 hours each, and then the drop is just there. It takes one person between eight and thirty hours to do one piece of animated content. It's a better use of time and money" (p.37). The literature on projection focuses on how it evolved to play a part in production design as well as the specific tools utilized to make it possible.

A New Element to Projection Design

Projection design is becoming to play a more prominent and regular role in the industry. Nearly "two thirds of Broadway plays had dedicated projection designers" (Luber, 2007, p. 16). Every year, projection design is becoming more prominent in theaters. The usage of projections in theaters has advanced technology and opened up brand-new possibilities. Show control systems, 3-D stereoscopic displays, infrared sensors, and animation software are some of the new projection equipment. Media servers are the systems that are being developed to manage media and projects. Numerous separate systems were needed to run in order to control the various media elements (such as projections or video). More than ever, projection design is changing now from moving scenery, static images, lighting effects, and much more (Smith, 2011).

Just recently, the musical *Back to the Future the Musical* has begun modeling and visualizing the complex time-change sequences. This is bringing major automation and video together. "The project required the ingestion of sound, lighting and automation data, all of which

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was handled seamlessly” (Disguise, 2021, p. 43). Pre-visualization was heavily used by theater technicians to create the moving car movements.

The advancement of new theatrical production technologies has led to increased facility expectations and requirements. However, it is crucial to avoid having to resort to technology when making choices about developing or modifying a theatrical facility. One must first build their theatre with nails, paint, and wood. Once the foundation is built, the addition of technology is integrated into the theatre. “Theatres are built with long life spans and technology that is unforeseen when the building is being planned will inevitably arrive” (Strong, 2010, p.63). Shakespeare stated it best, “we know what we are, but we know not what we may be” (Rieger, 2009, p. 46).

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