Computer Technology in The Design Process

2010

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COMPUTER TECHNOLOGY
IN THE DESIGN PROCESS

By

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B.F.A. University of Southern Mississippi, 2003
M.F.A. University of Central Florida, 2010

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Fine Arts
in the Department of Theatre
in the College of Arts and Humanities
at the University of Central Florida
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2010
ABSTRACT

This is a study of computer technology’s impact on the theatrical design process. The tools of communication provided by technology were studied, and an analysis was conducted in the classroom of Digital Rendering, Digital Rendering Videos, and 3d CADD. Afterwards, these tools were applied to an actual production of West Side Story where, with the addition of 3d light simulation software, the tools were used to communicate the design ideas from the lighting designer to the director. The goal of this process was to provide a “real to life” virtual representation of the show to the director with the least amount of confusion. An additional goal was to test the limits and functions of the software; trying to learn all the benefits that could be provided to the process of mounting a theatrical production.
ACKNOWLEDGMENTS

As this process comes to an end, there are countless people who deserve my thanks and gratitude among those are: my director and fellow designers for their help, patience, and understanding; to our professors who gave their insight, time, understanding, forgiveness, and office; to the stage managers, board operator, master electrician and other technical staff members who were always there ready to help even with something as simple as a supportive word; and to our fellow classmates who that helped us survive this process even to the point of bringing us food when we would work long and forget to eat. This list of people is so long that I would not be able to list them all and give due credit, but there is one person that I believe deserves to recognized. He is Daniel Dansby my assistant lighting designer. I can say confidently that this project would never have succeeded without him. I have said many times in the process that anyone working on a project of this magnitude would be lucky to have as assistant such as Dan. This young man volunteered to be the assistant for the show without any understanding of what was going to be asked of him, and he never gave up or failed to give his all. In fact, he was the one to help me stay focused throughout this project and to persevere. Dan was willing to take on every new challenge. He brought to the table his can-do attitude, his knowledge of computers and theatre, and most importantly, his desires to learn and succeed. I could never give Dan enough credit for the assistance that he has given me in the project. To this young man, who I know will succeed in life and who made this project’s success possible, I whole heartily thank him and wish him the best in his future endeavors.
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CHAPTER 1: TOOLS

Tools are the single most valuable mechanisms available to mankind. This one word, tool, describes an extremely wide and unlimited amount of apparatus that advances humanity to the next level. The progress of tools parallels the progress of mankind: Beginning with the caveman and his pointed stick used to kill for food, progressing through the invention of the wheel, the lever and fulcrum that allowed for the pyramids to be built, culminating in the development of the steam locomotive, the airplane, and the computer. Tools have even allowed man to leave his own planet and travel the stars and each tool that man has invented has been used to invent the next tool or build the Next Big Thing.

Theatre has not been absent in this evolution of the tool. A theatre practitioner reaches out to find these new tools and incorporate them into his or her daily operation. The Greeks used the eccyclema (wheeled platform to present the dead) and the dues ex machina (machine used to present the gods) (Brockett 89). Also, the renaissance practitioners used fly systems (Brockett 160-64). Today theatre practitioners use motors, hydraulics, electric light, and sound systems to accomplish their art. Of course, all of these wonderful inventions and tools would not have happened without one of man’s most simple and complicated accomplishments, the idea.

Ideas and the ability to communicate with each other have allowed the modern-day society to form, and theatre is very much a part of that exchange of ideas. From its beginning theatre has been a collaborative art. Whether it was the actors working together to put on a show or the playwright trying to get his ideas across, the communication of ideas has always been
present. As theatre progressed, directors were added and finally designers. Each addition to the collaboration brought the need for stronger and better communication.

But what exactly are we trying to communicate to each other? Ideas yes, but more importantly the elements of those ideas. How does the idea feel, how does it fit together with the rest of the show? Additionally what are its look, tone, mood, movement, and flow? The list can go on indefinitely. Ultimately, the goal is to communicate the exact idea in its complete and finished form without misunderstanding. How to accomplish this has plagued mankind since the beginning and will continue far into the future. But, the challenge is still the same: designers need communication tools to allow them to pass on their ideas.
CHAPTER 2: 
TOOLS OF COMMUNICATION IN DESIGN

The most basic and widely used expression of ideas is verbal communication. Even in today’s theatre, a designer will sit down opposite a director and discuss his idea for the show and the different paths that it can take. This method is quick and fluid allowing the team to change directions without having to invest large amounts of time. However, the method of verbal communication is not without its problem. One of the biggest issues is that the design team is communicating visual ideas without any visual reference. Something as simple as a designer and a director having different definitions for the same word can send them down completely different paths.

Introduce drawing into this scenario and now designers are using visual representation to communicate visual ideas. This simple improvement allows a world of different ideas to flow between the collaborators. This method continues to allow the process to be fluid in its conception. Making a basic drawing does not take a large amount of time and effort. Therefore, the process can change direction almost as quickly as before while allowing for more information to pass between the collaborators.

Even with the addition of drawing to the process, there are still limitations to what designers are able to communicate to directors. Two of these limitations are the lack of color and the lack of scale. Designers have found a way to combat the lack of color with color renderings. By adding the element of color to an image, the tone and mood of a scene can come through in a stronger way. Through the use of color renderings, the designer and director are one step closer to understanding and seeing the world of the play before it appears on the stage.
Another tool that addresses the lack of both color and scale is the model, a scaled-down 3d representation of the world in which the show takes place. For scenery, the model, more than any other tool, creates the closest representation to the physical set. The design team can now see exactly what they are discussing and adjust scenic elements until they are right. However, without the addition of complicated miniature lighting the model does not show lighting as effectively as a color rendering.

The tools described thus far have had a tremendous impact on the design process, and they are widely used today. However, they have never truly communicated the whole idea of a modern design. All of these tools are static and do not effectively communicate movement and transition.

Since lighting is very abstract and intangible, designers have been forced to develop new methods of communication to express lighting ideas. While scenery and costumes can be communicated effectively with static images, lights require the communication of movement and transition.

It was not until the computer revolution and more importantly the improvement of computer graphics that new possibilities have opened up for communicating these ideas. What are these new possibilities and how do they make communication better?

In this exploration, I tried to answer that very question by exploring the use of digital rendering formats to construct and show a virtual representation of a play. Along with, how it would move from moment to moment. The platform for this exploration has been my graduate college career culminated in the University of Central Florida’s production of *West Side Story* in fall 2008. Through the next few chapters I will use examples from classroom exercises and
personal experience to discuss the development of the idea and the form of the communication tools. Then, I will show how these tools and others were applied in an actual production setting. Finally, I will explain what we learned about communication and other surprises that presented themselves along the way.
CHAPTER 3:
DIGITAL RENDERING

Digital rendering in the scope of theatre is still in its infancy. It has grown quickly and will continue to expand as electronics become increasingly more powerful. But what is digital rendering and how does it differ from the other tools of communication? Digital rendering in its most simple definition is drawing or painting using a computer. It has the same principles and goals of traditional drawing and painting. The limitations are similar, but there are distinct advantages as well.

As with most operations on computers, changes to digital renderings can be made faster than by hand. A hand drawn rendering has to be re-started from the beginning every time a change is made. But in the virtual world, with a simple click of the mouse a color can be changed, a line moved, or an object erased. What could take hours by hand can be accomplished in seconds. Also in the electronic world, designers do not have to start their project from scratch. The designer can take a picture and build from it and manipulate it to fit into the rendering.

The digital rendering does, however, introduce a new set of limitations. One is quality. When rendering by hand, quality is determined mainly by the personal skill of the person rendering. In digital rendering, a person’s ability or inability is compounded by the capabilities of the software and the computer. Even if the designer is using the best software and equipment available, sometimes digital rendering does not attain the quality that hand rendering can. However today’s digital renderings have come a long way in quality and this level of quality will certainly continue to improve.
CHAPTER 4:
DIGITAL RENDERING VIDEO

Digital Rendering Video is the name that I have given a tool which grew out of the need to communicate specific lighting cues to my lighting design classmates as part of an assignment. The assignment was to complete a lighting design for a piece of music and to digitally render three images to showing three looks. I wanted to communicate more than a static image of the music; I wanted to communicate how the lighting moved.

I accomplished this by using Photoshop to make my digital renderings. Because of Photoshop’s layering capabilities, I was able to set up the image for one moment or cue. Then by adding or removing layers, I was able to build an image of how the lighting would look in a transition. The last step was building another image of what the final cue would look like.

Figure 1: Beginning Look of a Transition
But, these images by themselves do not add up to movement, because they are out of context and movement is about time. To resolve this issue, I placed the images in PowerPoint and
programmed the transition time between slides to give context to the images of cues and transitions. Now instead of having a static image of my vision, I had three or more images to show how the lighting would move with the music.

The final product was a far more effective way of communicating my overall idea than the static images would ever have been. However, this method did have its drawbacks. While something is better than nothing, I was left at the mercy of Power Point transition times. I was limited to fixed timings of fast, medium, and slow, none of which matched up to what I was trying to accomplish. This lack of control left my ability to manipulate the medium, and therefore my ability to communicate timing, extremely limited.

I was successful in overcoming this problem in another assignment in a scenic design class. In this project, I chose to use a blend of traditional and digital rendering techniques. I started with hand renderings of moments of the show scanned those images into Photoshop. I was able to digitally manipulate the traditional renderings to create both variations of the moment and entirely new moments.
Figure 4: Original Hand Drawn Sketch

Figure 5: Girl Playing in a Shower of Flowers
Figure 6: Girl looking Through a Window

Figure 7: Girl as a Woman in Front of Window
Instead of using Power Point as in previous attempts, I used Windows Movie Maker. This new software allowed me to have more control over the timing and transitions of my images. Also, it allowed me to sync up the music and sound with more precision.

With this new-found precision, I was able to add a small amount of animation. I wanted to have flowers raining down on the stage. With the use of Windows Movie Maker, I was able to build a series of stills with flowers falling and animate them in order to create the illusion of raining flowers in the video.

This method was successful in accomplishing my goal. I was able to communicate clearly what I envisioned this world to be and how the characters would move through it. In addition to constructing this environment of visual elements, I was also able to successfully add a soundscape. In this incarnation, I had almost a full package encompassing most of the scenes to communicate mood, tone, and movement.

The major draw-back of Digital Rendering Video is that it is time consuming. The processes of building this type of video takes more time than just rendering a still image. In order to effectively communicate an entire moment through animation, numerous stills must be rendered. When communicating with stills, select key moments can be shown with the viewer filling in the rest of the sequence. Animation presented in this manner is confusing to the viewer, however; the entire sequence must be shown in order to be effective. Through this project, I learned that if a designer is to try this method he or she must have a serious commitment to communicating the whole picture. The digital rendering video method should not be employed if a designer cannot devote the time to create enough renderings or if the transitions are not integral to the design.
CHAPTER 5:
3D DIGITAL RENDERING (CADD)

Drafting in its most basic form has been around since the caveman, but the modern form was born in the Egyptian and Chinese Empires (American Design and Drafting Association). The adoption of this style of communication has allowed for the construction of most of the modern world. Drafting allowed architects and designers to communicate to builders. However due to its 2d information, it only allowed for limited communication to owners or directors. It has only been in the past 75 years when electronics came into play that this level of communication changed (American Design and Drafting Association). In the beginning CADD, Computer-Aided Drafting and Design, was basically a computer replacement for hand drawn 2d drafting. Now, CADD has grown to include 3d modeling. It has started to allow architects and designers to communicate to owners and directors in a more visual and intuitive manner. As with traditional 3d models, owners and directors have gained a better understanding of a design.

The virtual 3d model has the same values as a traditional model, but it streamlines the process between the drafting and the model. As is the benefit of most things digital, it allows the designer to edit and modify without having to start over or destroy the original. Spatial challenges can be identified in a virtual 3d space and changes can be made before the project is moved into the real 3d world.

Just as the virtual 3d model shares the benefits of a traditional model it also shares the limitations. It does not allow the director to see movements in real time. Actually, it can be more challenging than a real model because, depending on the design, digitally moving an element of a 3d model may be more difficult than moving the same element by hand in a
tradition model. From a lighting standpoint, lighting a virtual 3d model can have the same
limitations as lighting a real model. While it may be possible to place lights to create a close to
accurate representation of the actual lighting, this is only really done as a static image. Designers
are not able to show movement and change in the lighting as the show progresses from place to
place and moment to moment.

Virtual 3d models have other limitations as well, including the knowledge of the user, the
hardware, and the software available. As in digital rendering, these limitations are centered on
the quality of the final image. Digital models that are created without good or above average
versions of software and hardware will pale in comparison to models created in a traditional
format. Though just as in digital rendering, as time passes all of these limitations are being
improved upon.
CHAPTER 6:
SIMULATION SOFTWARE (3D PRE-VISUALIZATION)

The latest tool to be introduced is simulation software. This tool takes the virtual 3d model built in CADD and adds functional virtual lights to the model. Designers are now allowed to turn on the lights and see the result in a virtual world. Also, they can make changes to the lights in real time and possibly receive close to real life results. This tool will hopefully allow designers to finally be able to communicate the one thing that continues to elude them, change. This tool will not only show mood and tone in an environment but also how mood, tone, and the environment change from one moment to the next. The ability to do this in a real time manner will allow designers to maintain a fluid design process. The designers will be able to make certain changes quickly as opposed to having to go a re-render an image to communicate the change.

Since simulation software was introduced into the market, it has been used for a number of different applications including theatre, concerts, and major events. With each passing year the capabilities and quality of simulation software has increased. Although the following timeline is not intended to be all inclusive it gives a sampling of pre-visualization’s growth and use.
<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>Cast System formed, creators of WYSIWYG (Cast Group of Companies Inc.)</td>
</tr>
<tr>
<td>1999</td>
<td>WYSIWYG used by Ken Billington for <em>Footloose</em> to pre-cue moving lights for the opening number (Barbour) (Maiman).</td>
</tr>
<tr>
<td>2000</td>
<td>WYSIWYG used at the Sydney Olympics to pre-cue moving lights for opening and closing ceremony (Schiller 123-45).</td>
</tr>
<tr>
<td>2002</td>
<td>WYSIWYG used at University of Florida to teach lighting concepts to students (Kaye)</td>
</tr>
<tr>
<td>2004</td>
<td>ESP Vision becomes available (Live Design)</td>
</tr>
<tr>
<td>2006</td>
<td>Vision used by Mike Swinford for <em>Redneck Revolution</em> to pre-cue 90% of a moving light rig with large focus on color and positioning (Sandberg)</td>
</tr>
<tr>
<td>2006</td>
<td>ESP announces Vision 2.0 (Eddy)</td>
</tr>
<tr>
<td>Summer 2007</td>
<td>London’s Royal Opera House starts to go virtual by making a one year investment to construct a virtual model of the theatre and uses Vision to focus a moving light rig, test scenic shifts, and archive information (Panait).</td>
</tr>
<tr>
<td>2007 – 2008</td>
<td>ESP Vision used by Jeff Ravitz to pre-cue a transfer to a moving light dominate outdoor rig for Bruce Springsteen and the E-Street Band Magic Tour (Dr. James L. Moody 278)</td>
</tr>
<tr>
<td>Summer 2008</td>
<td>Vision 3.0 Beta used to prep the Beijing Olympics (ESP Vision)</td>
</tr>
<tr>
<td>August 2008</td>
<td>Vision used by Gregory Montague for <em>West Side Story</em> to generate renderings for communication with director and pre-cue the show</td>
</tr>
<tr>
<td>September 2008</td>
<td>The Royal Opera House publishes the results of their yearlong study in Live Design (Panait).</td>
</tr>
</tbody>
</table>
An analysis of this timeline implies that users in the industry have a strong association of pre-visualization with moving light rigs, because it has been predominantly used as a tool for designers and programmers to prep consoles, focus moving lights, and pre-cue moving light cue sequences. It is unclear if and how designers are using pre-visualization to communicate with directors. I feel confident that communication is occurring because of the published discussions about the quality of the program’s rendering. From the published literature, it is also unclear if designers are using the programs to build looks focusing on the subtleties of light and how it falls on the body, or if they are using the simulation software only to take care of the broad stroke looks and cue sequences.
CHAPTER 7:
WEST SIDE STORY
(REAL WORLD APPLICATION OF THE NEW TOOLS OF COMMUNICATION)

The assignment of West Side Story as my thesis production presented me with an opportunity to apply what I had been working on in the classroom. At the beginning of this process, I realized that the scope of this project was going to be large. I became interested in trying simulation software to see if it could fulfill its potential of facilitating communication in the design process, making the tech process as effective as possible.

My plan was born out of the challenge to create a lighting-heavy show that could help communicate time and location while flowing musically. Also, the show also had to be created within a limited timeframe. Given these parameters, I developed a plan for creating the lighting for the show which took advantage of the digital work-flow. Initially, I needed to establish a vocabulary with the director. After establishing a vocabulary, while the scenic design was continuing to be solidified, I planned to start work on answering the question of how to address the musicality of the show by creating abstract Digital Rendering Videos that would allow me to communicate my ideas for tone, shape, and movement for some of the songs. I would only do a sampling for time purposes. After that, as the scenic design became solidified, I would start taking what was learned from the abstract videos and applying it to digital renderings along with Digital Rendering Videos that would show the movement in a more contextual way. Following the completion of that phase, I would put the scenic and lighting designs into simulation software and attempt to facilitate communication by pre-cueing the show and showing the director how the show would look in a “real to life” rendering. My hypothesis was that through this effort a
The major element of the show would be taken care of beforehand, allowing the production members to accomplish all that needed to be done in the limited tech time.

The artistic team assembled to accomplish this was as follows:

Director - Be Boyd
Lighting Designer - Gregory Montague
Asst. Lighting Designer - Daniel Dansby
Scenic Designer - Joseph Rusnock
Asst. Scenic Designer - Steven Ricker
Costume Designer - Dan Jones
Stage Manger - Lisa Million

**Foundation of Communication**

I knew building a foundation of communication would be imperative to easing this process. To address this in my first lighting design discussion with the director, I brought in a series of design magazines. We spent a good bit of that meeting establishing vocabulary. After a while, the discussions slowly shifted into the look and feel of the show.

**Abstract Videos**

After the director and I had started to build our vocabulary, the next step was to work on the Abstract Videos. This was a twist on my previous experiments with Digital Rendering Videos. In this case, instead of stringing together a series of renderings of what I believed the final product would be, I would build a series of images that were an abstract representation of what I thought the show or, in this case, a song, would feel like.
Figure 8: Image from Abstract Video for “Something’s Coming”

Figure 9: Image from Abstract Video for “Something’s Coming”
After building the images, I tried to put them together in a way that would be representational of the lighting cues for any one particular song. It was my hope that this string of images would communicate a sense of tone, texture, and movement of the songs.

I structured the videos so there would be visual changes in the video at the moments where changes in the lighting would be warranted on stage. I ignored moments that might warrant a change just to make the video more visually interesting. One of the nice things about these videos is that they forced me as a designer to explore the music in a purely abstract way without the worries of lighting the actors and scene. This helped me develop a starting cue structure early in the process before the scenic design was settled. Because I was also exploring the texture of the music and moments of the show, I was able to start getting an idea for the gobos that I wanted to use during the show.

The videos enabled the director to see how I worked musically and interpreted the musical inflections into visual design. Because of the video, the director knew early in the process that I understood music and how it moved. Also, the videos prompted a discussion of how the show should be played, whether as a typical musical or as more realistic, and what moments of the show should be more fantastic or subdued. I believe this work enhanced our communication for the rest of the process.

**Digital Rendering Videos**

The next step in my planned process for *West Side Story* was to create Digital Rendering Videos like the ones that I had previously made for my classes. However, due to the time constraints, I made the decision to skip this part of the plan to make sure that we would be able to accomplish our goals in pre-visualization. Also I believed that if we were able to get the
simulation software to work that it would provide us with its own version of Digital Rendering Videos.

**Determining the Software and Computer for 3d**

After evaluating several software packages and reviewing the available literature detailing previous pre-visualization projects, I decided to use Vectorworks as our CADD program and ESP’s Vision 2.2 as our simulation software. I chose these programs, because they worked together. Additionally, Vectorworks was the CADD program being used by the scenic design team and Vision has real time programming capabilities.

Since software is dependent on hardware. Once the software was chosen, I purchased hardware that met the requirements of the software in order to minimize potential problems. The resulting system is listed in Table 2. The price for the software and hardware was approximately five thousand dollars.
Table 2: Equipment used in this Project

**Hardware**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alienware Area-51 7500 Computer</td>
</tr>
<tr>
<td></td>
<td>Intel Core 2 Duo E8500 3.16GHz 6MB Cache 1333Mhz FSB</td>
</tr>
<tr>
<td></td>
<td>Dual 512MB NVIDIA GeForce 9800 GT</td>
</tr>
<tr>
<td></td>
<td>4GB Dual Channel DDR2 SDRAM at 800Mhz – 4 x 1024MB</td>
</tr>
<tr>
<td></td>
<td>Windows XP Professional OS</td>
</tr>
<tr>
<td></td>
<td>750GB SATA 3Gb/s 7,200RPM 16MB Cache</td>
</tr>
<tr>
<td></td>
<td>Single Drive 20x Dual-Layer Burner (DVD+RW)</td>
</tr>
<tr>
<td></td>
<td>Dual High Performance Gigabit Ethernet Ports</td>
</tr>
<tr>
<td>1</td>
<td>22” Samsung 2253BW – 1680x1050 (2ms) Widescreen Flat Panel monitor for Alienware</td>
</tr>
<tr>
<td>1</td>
<td>19” Samsung 953BW – 1440x900 (2ms) Widescreen Flat Panel monitor for Alienware</td>
</tr>
<tr>
<td>1</td>
<td>Geek Squad 1285VA UPS for Alienware</td>
</tr>
<tr>
<td>1</td>
<td>DMX-USB Interface Box by SAND network Systems</td>
</tr>
<tr>
<td>1</td>
<td>Wireless router</td>
</tr>
<tr>
<td>1</td>
<td>ETC Emphasis Lighting Control System w/ Expression 3 faceplate</td>
</tr>
<tr>
<td>3</td>
<td>17” Flat screen monitors for the Emphasis System</td>
</tr>
<tr>
<td>1</td>
<td>Ethernet router for Emphasis System</td>
</tr>
<tr>
<td>1</td>
<td>UPS for Emphasis System</td>
</tr>
<tr>
<td>2</td>
<td>Personal Laptop Computers</td>
</tr>
</tbody>
</table>

**Software**

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vectorworks 2009 (Student Edition)</td>
</tr>
<tr>
<td>1</td>
<td>ESP Vision 2.2 (Two Universes)</td>
</tr>
<tr>
<td>1</td>
<td>Whole Hog 3 offline software (to use Vision without a console)</td>
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<td>1</td>
<td>Lightwright 4</td>
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<td>Adobe Photoshop CS3</td>
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<td>Microsoft Excel 2007</td>
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<td>Microsoft Movie Maker</td>
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Learning the Software

In this project, there were definite goals that I wanted to accomplish. The first major goal was to show the director a “real to life” version of the show before tech. The second goal was to accurately and effectively pre-program the show with a minimum amount of changes in the actual theatre. Most of the advertisements and word of mouth that I had seen to this point, indicated that these two things were possible and were, in fact, the whole idea behind the software. I also had a secondary set of goals that centered on the idea that if the project was done correctly by using the right software. Many tasks that are often repetitive would only need to be done once such as: drafting in 3d and using Vectorworks viewports to create 2d paper work without having to draw elements twice; exporting information into Lightwright and Vision from Vectorworks without having to change the data after importation; using all of Lightwright’s tools such as focus notes to the fullest to make life easier. In an effort to set this project up in a way to perform tasks once we often had to repeat the tasks multiple times to get the work-flow correct. Once we learned the correct methods and sequencing, we were able to streamline the process and were able to save valuable time in future projects.

In any new project a user has to learn the tools for that project. For this project, Assistant Lighting Designer Dan Dansby and I had to learn how to use a variety of software including: Vectorworks, Lightwright, and Vision. During this project, we found that the manuals were cryptic or incomplete. In addition to user manuals, we also gathered information from trade publications and online resources such as user groups and message boards. Through the course of this project, we developed a list of core knowledge that would be important to anyone attempting a similar project. This list is detailed in Table 3.
Table 3: Core Knowledge to Understand at the Beginning of a Simulation Project

**Vectorworks**
- How to set up a Structure that uses Layers and Classes Effectively
- How to Apply and Manipulate Color and Texture
- How to use and work with Viewports and Section Viewports
- How to Export Information to other Programs such as Lightwright and Vision

**Vision**
- How Vision sets up and divides Information into Nodes
- How to Navigate in Vision by both Mouse and Coordinates
- How to set up and use Visions “Transform Nodes” Function
- How to Construct Gobos and Color Strings for use in Vision
- How to Adjust and Correct Color Issues (Screens and Color Temperature)

**Lightwright**
- How to Perform Normal Operations and Basic Tasks
- How to set and Write Focus Notes

*More information about these features is located in Appendix B

Before starting a project, understanding these basic concepts before starting a project would make the process of using Vectorworks, Vision, and Lightwright much smoother than the process we experienced.

**Process of Building and Working with the 3d World**

While the previous section lists the concepts that need to be learned before *starting* this type of project, this section details how we performed the actual project. Table 4 is a list of an order of events that was devised from our learning experience through our process and mistakes.
Table 4: An Order of Events for Working with Simulation Software

- Set up a Comfortable Work Space
- Learn the Functions, Limitations, and Shortcomings of the Software and Equipment
  - Learn the Functions of the Console: Tracking, Focus Points/Palettes, etc.
- Determine File Management
- Find Functional Simulation Fixtures for Actual Fixtures that are to be used
- Construct a 3d Model of the Space
  - Get Accurate and Correct Information and Measurements
- Import a 3d model of the Set
  - Establish a Point of Origin (VERY IMPORTANT)
  - Develop 3d “Guideposts” to help Navigate in 3d Space
- Draft the Light Plot
  - Recognize that “Auto” Features are both a Benefit and Curse
  - Use Viewports to make Printable Versions of the Paper Work
- Export Information into Lightwright
- Find or Construct Gobos, Color Strings and other Accessories needed for the Virtual World
- Perform Test Exports into Vision
  - Determine the Number of Faces (fewer faces = faster rendering times)
  - Check Orientation of Fixtures
  - Check that Color, Gobos, and Attachments are Functioning Properly
- Interface Vision with the Actual Lighting Console
- Focus the Plot in the Virtual World
- Create Focus Renderings in Vision
- Use Vision to Prep the Actual Console
- Program the Show into the Console
- Create Renderings and Videos for Artistic Team

*More information about these steps can be found in Appendix C.
It took a two month period to develop this list. Over the course of those two months, we went without a lot of sleep and started to fall behind in our other class work. But, we were learning a lot and continued moving forward.

While working in Vision, it was discovered that an accurate perception of depth was lost when looking at the stage. Imagine yourself sitting in the house of a real theatre, looking at the stage and trying to place something seven feet upstage without any reference guides. The problem is compounded in virtual space by having variable zoom and viewer placement, both of which tend to erase natural depth perception. To handle this problem, we went back to Vectorworks and added what we called “hockey pucks” in the center of our lighting areas. The pucks geometrical shape was round, approximately four-inch diameter columns about an inch tall in neon green.

Figure 10: Image of Pucks Used to find Locations on Stage
They were colored neon green to make the pucks easier to see and to prevent it from being lost in the scenery. Additional, neon green does not match anything else in our set. Hence, Vision placed the pucks into their own node which enabled us to turn them off when rendering.

We found that Vision allowed for an extremely realistic focus of the fixtures with pan/tilt, focus of beam edge, gobo indexing, and shutters. Before the actual focus call, I was able to walk through everything that needed to be done in real life in a virtual world. When combining this with the theatre being drawn as correctly as possible, I was able to see what was going to work and what was not before starting to work in the actual space. We were able to see obstructions that were in the way of a shot and take note of instruments that were likely to prove troublesome at the actual focus.

Happily, we discovered that Vision renderings only took a few seconds. Armed with that information, we decided to make focus renderings. These focus renderings enabled us to create a picture of each light’s focus on the stage, including shutter cuts, gobo rotations, and beam edge. This opened the door for me as a designer to have other designers help call focus. Since I had already done it once in Vision, I was able to give them a picture of my intended focus and quickly answer most of their questions.
Figure 11: Focus Picture of Tree Gobo for Act 1 Scene 2

Figure 12: Focus Picture of Warm Wash from Stage Right
Also, Vision gave us the ability to train a novice board operator to program the console. Normally we would not be able to do this until we had made it into the theatre, losing valuable programming time. However, by using Vision the board operator trained and gained experience before we ever made it to the space.

After the virtual show was focused, the time came for us to start setting levels. At which point, I began to have a better understanding of the program, and what it could do for me. A design consideration that weighed heavily for me is the plasticity of the forms on stage. I knew that pre-visualization had been used to help designers and programmers to prep consoles, to build broad stroke cue sequences for moving light movements, and “air graphics”, a term used by Dr. Moody in *Concert Lighting* to describe beams of light in the air (48). I wanted to know if Vision would let me see the small subtleties in lighting that allow designers to sculpt a body on stage. Could I truly set a detailed finished cue or only attain an approximation? I found that Vision does make an effort to give that kind of information but it is not exact. When looking at the simulated cues and armed with knowledge of previous designs I knew that the levels were misleading. If we were to put the cue on stage, it would look very different from the simulation. By using an understanding of levels from other shows and relying on my intuition of what a cue would look like in reality as opposed to the simulation screen, I was able to build looks that I felt would stand a better chance of transferring to the stage with little to no later adjustment.

Another concern to any designer is how colors work together. Part of my “interpreting” of the virtual cues was a realization that the virtual color temperatures of the conventional fixtures did not appear accurate. After making color corrections to the fixtures in order to make the colors appear right, I did not see anything else that sent up red flags in terms of color. Colors
that I had previously used together were reading the way I expected them to. From this, I was reassured that the colors that I had chosen were going to work well together.

With the cues locked into the console, we had finally reached the point that we could create digital renderings of the show. Up to this point, I had created only a handful of traditional lighting renderings for our design meetings.

These images were helpful and allowed discussions to continue with the director but I was now ready to put the software to the test. As we programmed, I created renderings of some key moments of the show. Vision’s speed at rendering allowed me, to click render, wait a few seconds, give the file a name, and continue with programming. Thus, we could create renderings without losing a great deal of programming time.
Another feature that we made use of was the ability to create videos of cue sequences using Vision’s “video render mode.” Vision recorded the DMX code and timing as we ran through the cues for a song, listening to the music and executing the cues in time. When we finished, Vision would take the recording of the code and render each frame of the video. The rendering process for a four minute song would take about an hour. Therefore we would wait until the end of the night to render the videos. After the rendering was finished I would import the video into Windows Movie Maker, import the audio track, sync the audio and video, and generate the final movie.

**Presenting the Renderings to the Director**

With renderings generated, we were able to start showing the director what we had been working on and planning. It had been just under two months, many long days, and little sleep since the start of our work with the new computer, only a few days before focus. Before this point, we had established a vocabulary with the director, presented Abstract Digital Video Renderings, and traditional lighting hand renderings. Now the moment of truth, we were going to present as “real to life” renderings as possible from Vision.

I showed the director the video that we made of “Maria” and a series of stills.
Figure 14: Prologue

Figure 15: Mambo
Figure 16: Doc’s Shop

Figure 17: Maria’s Balcony “Tonight”
Immediately, she was ecstatic about being able to see the songs and what we were planning. She reacted and gave feedback in such a way that I felt she truly understood what we were trying to
say with the images. Most of the feedback was positive, and she liked the direction that we were taking with the show. This feedback was a great step forward for me, because I was worried about communication after some of our early meetings. The stage manager told me after the first design meeting, when establish a vocabulary that while the director and I might not be on the same page that we were now at least in the same book. After seeing the stills and video that we created with Vision, we were able to say that the director and I were on the same page. This would not usually occur until tech, and we did it before we focused the first fixture.

Vision had passed this moment of truth, and if this held true through tech and opening, it would help the director and me get ahead of the game. At this point I was perhaps not as far ahead as I would have hoped but I was ahead.

**Other Avenues to Explore (Focus Notes and Renderings)**

The crew hanging the actual plot had gotten ahead of schedule and stayed there. They were even far enough ahead that we could call focus a week early. However, we could not take advantage of this because we needed the last week to finish working with Vision and because of my work schedule. But I wanted to see what other options pre-visualization offered us. Dan Dansby, assistant lighting designer, was free that week-end; so we decided that Dansby would call a focus that Saturday. We would have the main focus on its regularly scheduled day. Dansby had never called a focus before. He would now have the chance to be in the lead without the pressure of having to complete the focus in eight hours. He would be able to take his time and figure out what did work and what did not work. It also provided the benefit that if he found something that did not work we would have a week to correct it before the main focus. Since I
would not be there this gave us the ability to test the value of the focus renderings and to see if our understanding of the virtual plot would hold true in the real world.

The results from this endeavor were mixed. For Dansby as a young designer, it was a great success to get a taste of what it means to focus. He told me afterwards that he learned a lot. He was able to spend some of the time working with one of our professors, Bert Scott, asking questions and trying different ways to call the focus and correct problems. As far as finding problems, I sent him with a list of lights that Vision identified as possible problems and told him to make sure he got a look at them. Dansby was successful in finding that some of those lights were indeed problem areas and needed to be addressed. But the question of the value of focus renderings was inconclusive. The identified problem lights would have been found without the renderings. Due to Dansby’s inexperience in calling a focus he did not get far enough with the focus that I feel comfortable saying that the focus renderings made a large impact.

However, I still wanted a better answer as to whether or not the focus renderings were of any value. Professor Chip Perry and I decided to have the Advance Lighting class come in and call part of the focus to test the value of the focus renderings. Everyone would benefit in multiple ways from this process. It would allow me to test the value of the focus renderings. For the class, most of whom had never called a focus before, this would give them a chance to do that. They would also be exposed to a multi-designer focus which from my understanding had not been done at UCF before or at least not recently. Now they would get the chance to see how things can move along faster, how to work as a team to accomplish the focus, and what problems can arise. It would be a great learning experience for them. Of course, we did not walk into this foolishly. During that week of class we had each student call focus for a couple of lights. We
also established progress markers: if we did not reach our early goals we would stop and I would call the rest of focus.

On Saturday, Dansby had hook-ups and instrument schedules ready for everyone, plus the focus notes with renderings that we generated in Lightwright. We took a few minutes to brief the designers on this paperwork, gave them each their section of the plot, and then we started the focus. While the focus was going on, I would occasionally call a focus. Most of the time, I would verify what was being called and answer questions about how I wanted things to be focused. Since I had focused the show in the virtual world it was easier for me to answer the questions. As the day progressed, we were ahead of all of our progress markers and actually stopped the main focus at six hours. I then went through and checked the focus and did a little trim out, but for the most part the focus was well done. This proved to me the value of the focus notes and focus renderings. I was able to have three to four rookie designers who had never seen the plot until that day and knew nothing about the show call a successful focus in six hours. They were armed with only focus notes and a few questions, most of which were about how to call a focus in general as much as they were about this particular plot. To me, this was a success and I could only image what experienced designers would have been able to do using focus renderings.

**Transferring into the Space**

Before the focus on Friday we sent the console to the theatre to have it set-up and checked to make sure everything was in working order. By that point we had only been able to get the first act programmed. To keep things in perspective, the console was prepped and act one was programmed before the first light was focused. With the show focused and the console in
the space there was nothing virtual anymore. It was now time to test and see if the transfer to real life was a success or if we would be in the theatre reprogramming the show.

One of the first things we checked was the focus points for the moving lights. I believed that would be a quick way to see if we were close. If it worked, the lights would go where we wanted them to go; if not, the lights could potentially be pointed anywhere. To my great relief, the lights all went to within inches of where we wanted them to go and the amount that they were off could be the result of how well we could see in Vision. Next we checked the looks in the sub-masters but all the color was not loaded in the lights, so to get a true picture we had to wait until Monday. After looking at the sub-masters I became a little worried that we had created nothing but a lot of mud.

On Monday we finally could get a real look at what Vision allowed us to accomplish. Remembering that we believed we were going to find the sub-master looks too dark and in need of an increase in level, we started checking the looks. Again success, the looks were what we wanted but a little dark, though with a simple key stroke and roll of the level wheel that was corrected. The last step was checking the cues. As we found with the sub-masters, some of the cues were too dark and again with a simple key stroke and roll of the level wheel, they were corrected. We were actually able to get through all of this in a short amount of time.

**Tech Rehearsal**

Monday after focus was the first day on set for the actors and only five days until tech rehearsals. After discussions with the director, we decided that since we had the first act of the show in the console we would go ahead and start running lights for rehearsals that week. When
we made it to the point that no lights were programmed, we turned on work light for the actors and continued to try and build cues.

During the course of this week we were able to make adjustments to the cues and timing; the director could see more of the show in context and start giving us notes about problems and the actors could start getting used to the lights. Of course, not everything was in place yet. For example, we did not have the follow spot operators but this rehearsal time was still very useful to our process. At one point in the week the director stopped the rehearsal and started to adjust the actor’s blocking to make sure that they would be in the light. This was a normal enough action that no one, not even, my team realized what had happened until I pointed out to them that in a normal UCF production that simple action would not have been possible until days later during tech if it was not for the steps we took with Vision. By having the first act of the show in the console, the director was able to make adjustments based on not just the scenery but also the lighting before tech rehearsals began.

This week was additional time to see how the plot worked and to get an understanding of what was working; another week for my board operator to increase her skill and become accustomed to how I approached programming the show; and another week of discussions with the director about what was and was not working. This early introduction of lighting also gave the student stage manager extra time to become familiar with the cueing structure. In essence, we took our tech weekend and dress rehearsals and added five days. Even though lighting was not the focus, forward movement was being made in every front that lighting affected.

Finally, we came to tech weekend where we planned to tech act one on Saturday and act two on Sunday with a full tech run Sunday night. Even with the success that we had already
seen and all the positives, I was still nervous because, to this point lighting had not been the focus.

To my relief the tech rehearsals went very well. The director and I were able to communicate clearly with each other thanks to the work we had done early in the process to build a vocabulary. From the understanding of the design that I had based on the virtual cuing sessions, when a change needed to be made, I was able to give clear and accurate estimate of time that it would take to adjust, so that the director and other members of the design team could work on other issues.

For act one on Saturday, we did not have any major surprises because I was able to show the director images of most of the base looks in Vision. With the exception of a few locations, we were able to go straight to dealing with timing, balance, and other elements. An example of Vision’s impact on the process allowed us to run the song “Maria”: without having to make any changes, the director said it looked good to her and we moved on. When the day ended, we had successfully made it all the way through act one and finished on time. My lighting team stayed a little later to make sure we had everything ready for the next day and then went home.

I knew going into Sunday that tech was going to be rougher because I only had a couple of base looks from Vision to show the director before we loaded in. Also during the past week it was the act that the director had worked the least so she was not able to see a lot of looks beforehand. Luckily for us, the second act of the show was shorter. As expected the day was rougher and required more time to get the cues established, but from all of the prep work, training, and understandings we had built, we were able to move quickly and effectively through the show. And again we ended on time having met our goals. Being able to preprogram only the
first half of the show actually proved instructional, as we could see how well the preprogrammed section went verses a section that had not been programmed.

After the tech week-end we had three dress rehearsals and one preview before opening. After tech was finished I felt we were in a position that we would have been on any other show that finishes tech on a solid footing. We had finished our experiment on the impact computer technologies would have on our design process.
CHAPTER 8: MODIFIED DESIGN PROCESS

During this process one question that was continually asked of me was if it was worth it. For what we accomplished, was it worth all the time, effort, and stress? During the process my answer was “we will know when it comes to tech and we go home at a decent hour.” Now at the conclusion of this process the answer is, for this project at this time, with our skill level of the equipment and software we were using, as much as I hate to say it, is probably “no”. If this project were outside of educational theatre the cost would not have been able to be recovered in the short term. But as students the value probably will never be able to be measured. We learned so much about the equipment we use, or could use, to accomplish lighting in theatre. I was also able to learn a great deal about different ways to communicate with my director and for me, given my often difficult time with verbal communication, this was a great help.

The other question to ask though is “are these new tools worth it for the long term?” I feel the answer is a resounding YES! In our project there was a large learning curve that we had to overcome before we could start to see the real value that these communication tools offered in the design process and in communication. And even with that holding us back, we were still able to see a measurable effect that these new tools had on our process. I believe that if this project was not used as a time to learn but as an opportunity to apply what we had already learned, the time investment would not have been as great and the effects of the investment would have had a stronger impact on the final production. A small example of this is UCF’s production of The Lark. Professor Chip Perry used Vision to help with his lighting design. While he did not pursue Vision to provide a strong real-to-life image, he did use it to determine
how he would gain the lighting angles he wanted around the scenic elements. He also used Vision to communicate with his director, not necessarily with finished looks but to establish the building blocks of the looks. Professor Perry and his assistant used lessons that Dan Dansby and I had learned in our process and Professor Perry was able to get further along in less time. From looking at the speed at which they moved through the program what we did with *West Side Story* could be done in half the time if we had already been familiar with the software.

As awareness of these computer-based tools becomes wider spread, as the tools become better, and as labor cost rise, we will see a strong shift into the use of and desire for these tools. As directors start to understand that there is a way they can see the show earlier than Tech they will want these tools on a regular bases. To add all of these new tools will require us as practitioners to modify the design process and our expectations of it.

One of the biggest differences will probably have to be the addition of more time. For even with the best computers and software to make things move fast, we will have to start the design process earlier to allow the time to build the images. Just as time had to be given for designers to generate color renderings, so will time have to be given for the digital rendering options. This difference does not come without its struggles though as our design processes are controlled by economy. But as labor cost continues to rise, the cost of extra virtual design time will start to pale in comparison to the cost of technicians in the space. But in the meantime the technology will have to become faster, and more user friendly. Also designers and companies will have to find tricks to help save time and cost. One of which would be to construct 3d files of the spaces that are used on a regular basis so that only the set and plot have to be constructed for each show.
Another consideration in the use of these tools will be a different approach and reeducation of the lighting designer’s role. To some, the lighting designer is not needed until after the scenic design is established and for others the designer is present from the beginning but often is not a full participant in the process, bringing their reactions to other design elements to the table. However, with the Abstract Video Renderings, the lighting designers can add more than just their opinion in the beginning of the process. As directors and designers become familiar to this element, it can help to establish a tone and feeling of movement early on and the lighting design element can begin to be discussed in the same depth as scenery and costumes.

Another place these tools can have an impact is in the long-distance design process. Because these tools operate in the digital world it will be possible for designers to send images over long distance with ease. Even in West Side Story we used this benefit to send the renderings quickly via email to the artistic team as well as my professors. This helped keep everyone aware of which direction the show was going.

While Digital Renderings would probably take the same amount of time as traditional color renderings, the movement into pre-visualization could potentially have a major impact on the design process. Perhaps in the future a designer could sit in a rehearsal hall and cue the show during rehearsal while discussing the movement and timing with the director. This would allow the time on stage to be better spent. The advances that computer technology have brought to theatre have been great and the advances already brought to the design process have been equally significant; but the technology still to come will without a doubt have an impact our understanding of what the design process is.
APPENDIX A:
IMAGES FROM DESIGN CONCEPT TO THE STAGE
Act 1, Scene 4 Cha-Cha:

Tony and Maria First Meet

Figure 20: Lighting Sketch for Cha-Cha

Figure 21: Lighting Sketch for Cha-Cha
Figure 22: Traditional Lighting Rendering for Cha-Cha

Figure 23: Pre-visualization Lighting Rendering for Cha-Cha
Act 1, Scene 6 Doc’s:

War Council

Figure 25: Lighting Sketch for Doc’s
Figure 26: Traditional Lighting Rendering for Doc’s

Figure 27: Pre-visualization Lighting Rendering for Doc’s
Figure 28: Show Photo of Doc’s

**Act 1, Scene 7 One Hand One Heart:**

**The Wedding Scene**

Figure 29: Lighting Sketch for Wedding
Figure 30: Lighting Sketch for Wedding

Figure 31: Traditional Lighting Rendering for Wedding
Figure 32: Pre-visualization Lighting Rendering for Wedding

Figure 33: Show Photo of Wedding
APPENDIX B:
WHAT WE LEARNED ABOUT THE SOFTWARE’S FEATURES
Vectorworks

Setting up a Structure that uses Layers and Classes Effectively

Good 2d CADD drafting practice entails developing an organizational structure for files at the beginning of the project. 3d files are even more dependent on a well organized structure.

An initial consideration in Vectorworks is what elements should be in classes (categorizing method to group objects by graphical and visibility attributes) and what elements should be in layers (categorizing method to group objects to make navigating the drafting workspace easier) (McBeath 157). We started by trying to use mostly classes and figured out that was not the best approach. A layer can have many elements from different classes and one class can be referenced by multiple layers, but classes cannot have elements from other classes unless they are symbols. Or another way to look at it is, layers can be used to draft and classes to organize references. For example, we put each lighting position on its own layer and all of the fixtures for that position were also put on that layer. For our classes we put all like elements together such as a class for lighting positions, one for ERS, and one for fresnels in order to navigate by positions or types.

Applying and Manipulating Color and Texture

In any 3d drafting, use of textures is key and the draftsman needs to learn how to apply them, how to map them, and how to use classes to help apply them. But when working with Vision, manipulation of the color becomes necessary as well. Vision has layers, just like Vectorworks, that can be made visible and invisible; but unlike Vectorworks the layers are made automatically, constructed based on the color or texture. Vision puts all like color/textures together in the same layer. This means that if the same texture is used for the floor and ceiling,
every time that layer is turned off because the ceiling is in the way the floor will also be lost.

Dan Dansby determined that by changing just one point of the RGB value of a color, Vision will process it as a new color and assigns it into its own layer and that for textures to build a duplicate texture with a different name will separate it from the other like textures. For example, when we needed to separate a brick texture, Dansby duplicated the texture and named it brick2 (Dansby). To do this for every color/texture would be drastically ineffective but to determine what needs to be separated and change the color and names on those elements is not as time consuming. Also one or two test exports into vision would be valuable to ensure the designer has the desired control.

**Using and working with Viewports and Section Viewports**

Viewports are another feature of Vectorworks that allows the designer to transfer information from the 3d drafting to a printable 2d format. One of my goals for this project was to see how effectively the information could be pulled from our 3d drafting to create the plans and plots for print. We found that if a drafting is set up correctly, viewports make it easy to lay out the sheet layers.

When drafting in 3d, items have to be put above each other the same as they would be done in real life. In our theatre we have a FOH Cove position with one pipe directly above the other. If we were to print from our design layer, the lights on these two pipes would have been stacked on top of each other, making it impossible for anyone to read the information. But with viewports, this was not a problem. The viewports ability to turn on/off layers and to be positioned at different locations without regard to the design layer made it possible for us to place the “under” position at a different location so that it could be clearly visible. Since we
placed each lighting position and its lights on its own layer, we were able to use multiple viewports and only turn on the position layers needed for the corresponding viewport.

After we figured out how to make good use of the viewports for the plot, we had to determine what to do for a centerline section. Vectorworks has a section viewport function that allowed us to accomplish the center line section. The only trick to this function is that Vectorworks defaults its cut lines to be fire engine red which I found undesirable. But I found that Vectorworks automatically made a new class for its cut lines and by going to the class’s settings we were able to change the color to whatever we wanted.

**Exporting Information to other Programs such as Lightwright and Vision**

Exporting to Lightwright is not that difficult because Vectorworks has already built a feature to ease this process. Something that became useful with data exports was the ability to open a data file in Excel as well. This ability to open information in Excel was useful because, for an unknown reason, we were having ghost fixtures show up in the plot and they were complicating the exports to Vision. The ghost fixtures were exact replicas of the existing fixtures with the only difference being the UID number, a field that is unique to every light regardless of duplication or cut/copy/paste (Dansby). By being able to look at the information in Excel, we could find the ghost fixtures and use their UID with the Find/Modify function to get rid of them.

Exporting to Vision, however, was a learning process. For Vision to import properly a plug-in function must be added to Vectorworks and a new work space created. Once the plug-in is in place, the draftsman has to start assigning information to the lighting symbols. When using Vision there are two ways to draft lighting symbols. One is to use the symbols that Vision
provides which should be immediately ready to export. The other is to use stock or custom symbols and after drafting the plot assigning fixture tags that Vision will understand. We had chosen to do the later because we liked our symbols better. Once the tags were attached to the lighting fixture, Vision would gather other information such as color and gobo from the object info palette. The color, gobo, and lamp wattage all need to be checked, though, because the Vision plug-in may not understand the information that is entered. For example, colors could not have a space between the letter and number. If R 65 were entered, Vision would not understand; but if R65 was entered, then Vision could find the color. Another thing that Vision did not understand was NC for no color. To combat this we gave all no-color fixtures R00.

After all the tags have been assigned and the information checked, an export to Vision is possible provided there is at least one 3d element present. With our set and theatre this was not a problem. We did learn that a Vision export, unlike a Vectorworks data export, exports only the visible layers. This became a useful piece of information later because we learned that it is possible to merge new information into an existing Vision file. That ability to merge became helpful when edits of new lights and changes in placement had to be made. By having positions in separate layers, we were able to make an edit, turn on only that layer, export just its information, and merge it with our working Vision file. This became a great value because we found that making edits in Vision can be difficult and that going back to Vectorworks and re-exporting was far more effective.

Vision
Setting up and Dividing Information into Nodes

Vision organizes its information by dividing color/texture into, for lack of a better word, layers called nodes. In addition to assigning each color/texture into an individual node, each lighting fixture gets its own node as well. Because Vision automatically creates its own node structure, it is advisable to take some time to go through and label the nodes to help navigate. The nodes for lighting fixtures are organized by type of fixtures, so ERS are all grouped together in a folder and fresnels are in another folder. The lighting fixtures ESP Vision Unit Number or name is pulled from a parameter in the object info palette. As the plot is drafted it is possible to label the fixtures in a way that is easier to find. Vision uses the unit channel for its unit number by default but by going into the ESPUserConfig.XML file, we were able to change the mapping from the default parameter of channel to unit number. We found it to be easier to navigate through Vision by unit number than by channel.

Navigating in Vision both by Mouse and Coordinates

After getting the nodes organized and labeled, we also had to learn how to move through the drawing. In Vision this is not that difficult because it relies on a mouse. Vision also let us set up predetermined camera views to make moving through the drawing easier. But when it comes to moving elements around in 3d space, it can be a little bit of a challenge. Vision’s X, Y, Z axis are different from those in Vectorworks. In Vectorworks, X is left/right, Y is depth, and Z is height. In Vision, X is left/right, Y is height, and Z is depth.

Setting up and using Vision’s “Transform Nodes” Function

In addition to Vision allowing us to see the lighting in virtual space, there is a feature which also lets elements move in 3d space via DMX control. With this function we were able to
show the scenic shifts that were to be performed in the show, bringing our images one step closer to “real to life.” Vision does this by creating DMX transform nodes. The nodes are structured similar to folders in that all of the elements that are meant to be affected by that node are placed in the folder. This is another point at which the planning and organization of nodes is valuable because to move a particular element all of its parts need to be in an isolated node that can be put into the transform node. Also, an understanding of navigating with coordinates in 3d space becomes necessary. The nodes need to be given a range of motion and if it is a pivot node, a pivot point has to be specified on an X, Y, Z grid. For example, we had a pivoting fence as part of the scenery and we needed to determine a specific pivot point. We were able to do this by taking measurements in Vectorworks from our point of origin and using that information to specify the proper values in Vision.

**Constructing Custom Gobos and Color Strings**

Vision also provides designers the ability to build their own gobos and scroller color strings. This feature requires Photoshop, an Nvidia plug-in, and creative thought. To make a gobo there is information in an appendix of the manual, which is helpful. To build a gobo an image is built or imported into Photoshop and its alpha channel is established or adjusted, after which the Nvidia plug-in is used to create a new image file. It is all about the alpha channel; the negative space is what lets the light through. But there are no instructions on how to make a color string. To figure out what we needed to do to build a color string for our scrollers, we used the information about building a custom gobo and looked at a couple of strings that were provided as stock with Vision. After determining they were an image able to be built in Photoshop, we started a new image with the same parameters as the stock strings. Then we went
to the manufacturers’ web page to get a digital sampling of the colors for our strings and inserted them into the Photoshop image. After that point we used the same method of making a gobo to make our color string. Once we finished we put the UCF string into the fixtures, and much to our surprise it worked on the first pass.

**Adjusting and Correcting Color Issues (Screens and Color Temperature)**

We started with making sure that the color on our monitors was the best that it could be. Some of the problems encountered in dealing with digital imaging involve monitors not being set properly or colors not matching across different monitors and print. To overcome the matching issue, we decided that we would show the director the renderings on our monitors only. To balance them properly, we used software that came with the monitors and also double checked this with a set of color bars that came on a DVD. After we set up the monitors we found that the color being generated by the lighting fixtures in Vision did not look right. After verifying that we were telling the fixtures the right color and through experimentation we found that if we shifted the color temperature of the fixture up from 3200 or 3600 degrees Kelvin to approximately 4600 to 5000 degrees Kelvin, the colors would appear more accurate. Although this adjustment had to be made on all of the static fixtures, the color for the moving lights in the rig appeared correct from the beginning. I theorized that this discrepancy in colors was a programming oversight which occurred because the program was built to make colors look correct at the higher color temperatures used in moving lights while overlooking the lower color temperatures used in static fixtures.

*Lightwright*
Performing Normal Operations and Basic Tasks

Setting and Writing Focus Notes

With the help of our professor we were directed to a web page that had instructions on how to use the worksheets. Another useful feature of Lightwright is that pictures can be inserted into the focus notes, so we were able to take images from Vision and use them to give a better idea of how the lights were to be focused. This helped us in exploring other avenues that Vision could open for us.
APPENDIX C:
INFORMATION LEARNED ABOUT THE ORDER OF EVENTS
Set up a Comfortable Work Space

A comfortable work space can make a large impact on the process. We started in my apartment which was small and cramped because I did not have a space open enough the set up the equipment well. But once we added the lighting console we moved to Professor Chip Perry’s office. This was a fortuitous decision because over the next month to two months our stress level became high and his office provided a more comfortable work environment.

![Figure 34: Work Space in Professor Perry’s Office](image)

Learn the Functions, Limitations, and Shortcomings of the Software and Equipment

We knew that there was a large chance that everything we programmed in Vision would need to be changed once we moved into the space. To confront this, we tried to make sure that we used all of the features that our lighting console offered to make edits faster and easier. One of the first things we did was to determine if the console had a tracking mode or if it was non-
tracking only. After looking over the manuals and conducting a few tests we determined that the console did not have a tracking mode but it did have a tracking record function. With that function, even though we were not able to have the console track all the time, we would at least be able to track forward edits that we needed to make which was a time saver.

Another function that we made sure we had an understanding of was the console’s focus point function. This function follows the same principle as pallets on other consoles, except that Emphasis would record the level of every channel whereas another consoles would only record the levels of channels are being manipulated. We had to be cautious in building focus points to prevent additional problems, but the benefit of having the console reference the focus points for cues allowing us to only reprogram the focus points was worth the risk.

After spending some time investigating focus points, we found that it was possible to recall specific attributes of a focus point. For example, if we built a focus point of a moving light in blue color and recalled that focus point, it would recall every value above zero. Most likely the pan/tilt, iris, shutter, and/or color would be recalled and would distort what we were programming but if we recalled only the color then the only change that would happen would be that our light would turn blue. After learning this we tried to build focus points for everything that we thought would need to be edited or would help speed programming. We recorded a basic set of moving light positions, a few scene specific moving light positions, moving light color and gobo positions, and scroller string positions.

To help with the editing of cues, we had tracking and focus points, but beyond that we also needed to be able to program quickly. Fortunately, tracking and focus points helped with speed but we used groups to make things faster as well. The groups allowed us to group things
together in order to access them with fewer key strokes but unlike focus points, the cue will not reference them, they are only helpful in programming.

**Determine File Management**

In the beginning we had to make a determination of how we wanted to approach our file management. One big issue that we wanted to avoid was losing all of our data due to a corrupted file. We decided that we would never overwrite a file; instead, we would save our work as a new file each time with a date and time stamp. We did this not only for Vectorworks but also for Lightwright, Vision, and Emphasis. This gave us the ability to back up to the last file if we made a mistake or decided we wanted a different approach. Dan Dansby was also responsible for backing up our information; he made sure that there was a copy of almost all our files in two to three different locations.

**Find Functional Simulation Fixtures for Actual Fixtures that are to be used**

To make exported fixtures work in Vision, we had to assign the correct personality to their symbol. For the mainstream fixtures such as Source Four and 6” Fresnel, finding symbols was not a problem. However, since Vision is primarily used for large moving light rigs, such as those in concerts and industrials, finding symbols for more obscure or less used in rock n’ roll fixtures was a little more difficult. For these obscure fixtures we chose symbols that mimicked them the closest and tested them in Vision; some were successful, others not so much. Compounding the symbols selection some symbols did not work at all and others did not work correctly. For example, the zip strips did not project light at an even spacing of every third cell across the whole unit but instead, divided the unit into three sections left, middle, and right. Vision’s software representatives will build and fix personalities that are needed and that are not
in the Vision library, but this can take a little bit of time. In a project such as this it should be verified that the fixture personalities are in the inventory and in working order at the beginning.

**Construct a 3d Model of the Space**

We started to build a 3d model of our theatre which became a challenge unto itself, as not one of the drawings we had for our space was accurate enough to build in 3d. The problem was that these scenic or lighting drawings were drawn to be “close enough” or were, in some cases, totally wrong, as they were meant to show scenic and lighting elements in the space, not the space itself. I would venture to say that if most theatres took their drawings and tried to build them in 3d, they would run into the same problems. Dan Dansby overcame this problem by going into the space and measuring almost everything to make sure we had measurements that were as accurate as possible. Dansby was also given a set of original architectural plans from the 1980’s which we were able to use as a basis for our new plans. To make the best use of these original drawings, we scanned the prints into Vectorworks and drafted over them.

**Import a 3d Model of the Set**

The assistant scenic designer Steven Ricker was willing to draft the set in 3d for us but there were a few issues that came from this. As with Dan Dansby and me, this was Rickers first time to draft a set in 3d for a realized production. One of the first issues that we encountered was that a point of origin was not established. With Vectorworks not requiring specific coordinates to draft in 3d, the lack of a point of origin did not become a problem until we did a test import into Vision. Once we were in Vision and started trying to place elements, we had no point of reference. To solve this we went to our drawing in Vectorworks and set a point of origin to be at deck level where center line meets plaster line.
**Draft the Light Plot**

Drafting a lighting plot in 3d was not that terribly different from drafting in 2d. One reason for this is that Vectorworks has an auto attach feature to attach fixtures to lighting positions. With this feature we turned on the layer of the lighting position we wanted and dropped our lights into it. Because the position had already been given a Z height, all associated fixtures were automatically placed at the proper height. When we were working in an area that had a position directly over another, we would just turn off the position that we did not need. Although the auto attach feature is a good thing it can also cause problems. One of these problems arose as we were trying to use the auto attach feature for fixtures at deck level. We made the whole floor a lighting position which ended up being a bad idea because it never worked properly. Some of our fixtures attached themselves to this position instead of the pipe we tried to assign them to. The other problem we had with this function was fixtures auto attaching to the wrong position or not updating a change in position. We did not find a good way to work around this problem. Although we would correct the information, part of the time the correction would be maintained and at other times it would not.

**Export Information into Lightwright**

We had to export our information into Lightwright but these programs are made to work together so there was nothing unique about our export into Lightwright.

**Find or Construct Gobos, Color Strings and other Accessories needed for the Virtual World**

Most of the gobos that we chose to use were in the Vision library, but a few were not and we also wanted a couple of custom gobos. After we learned how to build our own Vision
custom gobos, we were able to go to the manufacturer’s web page and copy an image of the gobos that were not in the library, which we used to build the gobo as if they were custom. For the truly custom gobos we drew them in Photoshop and constructed the image file that Vision needed. A benefit of generating the image in Photoshop was that I could print on PCP blue paper and could use an acid burn technique with the PCP blue paper which acted as a resist to construct the actual custom gobos for the production. In keeping with the idea of the efficient use of programs, this is an example the same information being used in multiple ways and task only having to be performed once.

**Perform Test Exports into Vision**

In exporting to Vision it is wise to pay attention to the number of faces that are exported. Vision is only able to process up to one hundred thousand faces and, in general, the fewer faces the faster it will work. This required going back into the file and drafting some of the elements to be more simplistic while trying to maintain the original look. Ricker, assistant scenic designer, had inserted human figures into the drawing so that he could generate some digital renderings from Vectorworks. At first we thought that we could use those same figures for our visualization, but quickly discovered that was a bad idea. On our first export with these figures, we had too many faces resulting in the program crashing. Vision’s stock set of 3d elements allowed us to insert figures into the drawing once it had been imported, relieving the need for us to build figures in Vectorworks. The reason for this is that the stock figures are flat planar surfaces rather than Vectorworks’ extruded/filler/curved figures (Dansby). In addition to the figures, Vision has other stock elements that are drums, stages, amps, and other rock n rock items.
Interface Vision with the Actual Lighting Console

Initially we used Whole Hog 3 PC Offline console software to test our lighting fixtures but eventually we needed to connect the actual console, ETC Emphasis with Expression 3 faceplate, to test how it worked with Vision. One of the first things we had to determine was how we were going to get access to the lighting console. By the time we were ready for the console the other show in the space had finished so the board was available, but I was unwilling to leave my computer set up in the theatre for a month or more. The solution was to set up the board and my computer in Professor Chip Perry’s office; this would keep school property at school and be a more controllable and secure location for my computer. However, this presented an access problem for the crew doing the hang who needed to test the rig to make sure everything was patched and ready for focus. To resolve this problem my assistant and I took the responsibility of the patch using dimmer numbers provided by the Master Electrician. However, for testing the rig the Master Electrician needed something that would generate DMX. Fortunately, in addition to my Vision package the school also had purchased a Vision package, giving us two VBoxes and operating software. The boxes allowed the console to communicate to vision but the software could also generate DMX. The Master Electrician used school’s VBox to test the fixtures by using the DMX generation function, and we used mine to connect the console to the computer.

Using the VBox to make the connection was not difficult. But getting the VBox software to work correctly did require a minor amount of work which, fortunately, was accomplished in a short amount of time.
Focus the Plot in the Virtual World

Through experimentation we found that Vision imported all of the lighting fixtures unfocused and pointing in the same direction. We also found that Vision allowed an extremely realistic focus of the fixtures with pan/tilt, focus of beam edge, gobo indexing, and shutters. A designer would be able to step through everything that would need to be done in real life in a virtual world before the actual focus call. Although I felt that this ability was valuable, I knew we should make sure everything was ready before we started to focus the static lights in Vision because this control would, in essence, cause a virtual focus call. Just as in a real life focus call I did not want to refocus the lights after investing the time in a virtual focus call.

One function that Vision offers that does help make focus go quickly is the use of the mouse pointer to determine the location the fixture is to focus on. After the light had been roughly focused, the finer adjustments were addressed.

Create Focus Renderings in Vision

Use Vision to Prep the Actual Console

Program the Show into the Console

Because we used the actual console, there were minimal differences in programming with Vision verses real life, but as the virtual file size increased the lag did start to become an issue because we were unable to execute cues in real time. This caused us to make a best guess on our cue timings.

Create Renderings and Videos for Artistic Team

As we went along I had renderings created of some key moments of the show and with Vision’s speed at making a rendering, we were able to click render and wait a few seconds, give
the file a name, and continue on with programming. Thus, we could create renderings without losing a great deal of programming time.

Another feature that we made use of was creating videos of cue sequences. To do this we would select Vision video render mode and assign it a file name. Once we hit record, Vision would record the DMX code and timing and we would run through the cues for a song, listening to the music and executing the cues in time. After we had finished we would stop the recording and Vision would take the recording of the code and render each frame of the video. The rendering process for a four minute song would take about an hour so we would wait until the end of the night to render the videos. After the rendering was finished I would import the video into Windows Movie Maker and import the audio track to sync them up and generate a video of that song.
WORKS CITED


Dansby, Daniel. Personal Interview Gregory Montague. 18 February 2010.


Sandberg, Marian. "It's a Redneck Revolution." _Live Design_ 1 April 2006.