Visual Design Process:
Communicating with Storyboarding and Augmented Reality

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Submitted towards the fulfillment of the requirements for the Doctor of Architecture Degree.

School of Architecture
University of Hawai'i

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We certify that we have read this Doctorate Project and that, in our opinion, it is satisfactory in scope and quality in fulfillment as a Doctorate Project for the degree of Doctor of Architecture in the School of Architecture, University of Hawai'i at Mānoa.

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ABSTACT

In the building profession, it is essential for architects to communicate clearly and effectively to numerous people. This thesis introduces a design process utilizing two visual tools— Storyboarding and Augmented Reality—as a methodology for stronger visual communication. Storyboarding is a visual design tool that communicates concepts, ideas, and specifics quickly through clear illustrations. It allows designers to visually communicate to a team and change ideas during the development phase of a project. Augmented Reality is a visual tool that communicates superimposed digital information through a composite view of the real and digital world. This gives designers the ability to present more information about completed projects. Through further investigation of this design process, I have found that it is the balance between the two and the transition of information between design phases that allows for a brand new process of visual communication throughout a design project's entirety.

INTRODUCTION

"A picture is worth a thousand words," is a perfect adage that captures the essence of this doctorate project's main topic: visual communication. As architects, we have to communicate different levels of information to many different people. We communicate with our peers, our bosses, our clients, other building professionals and the public, but not all of them require the same amount of information on a project. However, whoever the presented information is for, one thing is certain, it needs to be clearly understood.

In architecture and in any other profession, clear communication is essential to a project's success. Out of the three forms of communication—oral, visual, and written—I feel that visual communication for architects is the most effective form to communicate an idea clearly to a group of people. According to a study by New York University psychologist Jerome Bruner, "people only remember 10% of what they hear and 20% of what they read, but about 80 percent of what they see and do."[6] Through the research of this thesis, I have found that the architectural design process could be greatly influenced by two tools of visual communication: Storyboarding and Augmented Reality.

Generally, when visual aids are used for communicating, they are accompanied by an idea, a narrative, a history, or a meaning. One such tool that has been used countless times and is considered one of the greatest design processes for visually communicating an idea is storyboarding. Developed in 1933 by the Disney Studio, storyboarding helped change the animation and film industry because through "sequential presentation of narrative and characters, weak spots are easily seen and changed, and the all-important story line developed and strengthened."[7] Throughout the years, this process was adapted by numerous professions which include, but are not limited to, the fashion industry, the game industry, the business industry, and even the soft-

6 Lester, Paul. "Syntactic Theory of Visual Communication." Syntactic Theory of Visual Communication. Web. 7 Mar. 2013. <commfaculty.fullerton.edu/lester/writings/viscomtheory.html>.

7 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. ix

ware programming industry.

However, storyboarding is not a common practice in the architecture profession. It is also becoming less used now that current technologies are continuing to make the building profession's work process quicker. Building Information Modeling (BIM) tools like Revit are revolutionizing the productivity of a design project. However, storyboarding is a tool that is beneficial and still relevant for the architecture design process.

Storyboarding has many great attributes that can help architects communicate visually throughout the duration of a project's design process. Through research and my participation in the 2012 Disney ImagiNation Competition, I was able to understand the pros and cons of storyboarding. In this competition, I worked with a partner, and together, we submitted an entry that utilized storyboarding throughout the entire project. Impressing the panels of judges without being able to present the project verbally was a real testament to our understanding of the development of the project and the effective visual communication of storyboarding.

I have found that there are three key benefits of storyboarding for architecture. The first is that it's an inherent design editing process. It allows designers the ability to see the whole picture by arranging everything produced thus far on a board, wall, or large table. During this process, I found that it was much easier to work as a group in deciding what was clearly being conveyed, what needed work, and what should be omitted. In fact, I found that it helped to clarify our idea much more effectively as we decided what images were unnecessary and should be removed to create a more concise and clear story.

The second key benefit is that it's an efficient way to visually communicate an overall idea that encompasses anything and everything from buildings and atmospheric quality to people, landscapes, and more, to a group of people. During the beginning brainstorming sessions of the ImagiNation Competition, we started off by saying our ideas out loud or writing ideas and words

down. This created a lot of confusion as we were interpreting both the ideas and the words differently. However, sketching out our thoughts allowed us to visually represent and communicate the ideas that we were thinking much more effectively.

The third and final key benefit is that ideas can be presented swiftly. The speed of storyboarding is what makes it a strong tool for design projects during the conceptual phase. Quick sketches enabled my team to organize our thoughts and develop ideas quickly. If we did not agree on a particular sketched concept, we could quickly toss that concept out and sketch another one. This process would continue until we had one cohesive idea that encompassed the saved concept sketches.

"The immediacy of visual communication also allows for easy visual comparison of two or more items and the illustration of a new product line or business development."[8] This is precisely why storyboarding is such a great visual tool to use when communicating to a group of people.

Conversely, storyboarding does have its shortcomings, for example, representing large quantities of fine details. Additionally, the interaction between the user/viewer and the storyboard is limited. During the competition, we found that in storyboarding, it's not about showing lots of detail with one image, but instead showing a specific idea well with one image. Also, sometimes storyboarding was difficult to interact with during the development phase of the project. Unlike architectural 3D models that are used to visually see and feel the 3D space, storyboarding its currently limited to a flat 2D perspective image.

Another drawback that I was unaware of until I experienced it myself was that it can become very time consuming and sometimes difficult to use chosen design concepts during the

8 Switzer, Christine. "What Are The Benefits Of Visual Communication Over Verbal?." LIVESTRONG.COM - Lose Weight & Get Fit with Diet, Nutrition & Fitness Tools | LIVESTRONG.COM. Web. 7 Mar. 2013. <http://www.livestrong.com/article/157920-what-are-the-benefits-of-visual-communication-over-verbal/#ixzz2MWl5jIw3>.

final culmination of a project. During the final phases of design, when developing high resolution renderings for the final submission to the ImagiNation competition, the process became much more tedious and time intensive. It was no longer a quick process that portrayed ideas rapidly; instead, it felt more like each image was a canvas painting. Lastly, unlike computer files that can save multiple versions with ease, storyboarding's quick editing process can sometimes prevent the use of various iterations of an image. However, I found that this only applies when drawing directly on paper and can be mitigated by drawing the images directly on a computer with a software program like Photoshop.

As I delved deeper into storyboarding as a design process for architecture, I came to believe that storyboarding cannot meet all the needs of an architect in his/her efforts to communicate effectively through all phases of a design project. While storyboarding is a great asset for architects during the beginning phases of design, its lack of refined finished projects and user interaction posed a problem. This thesis is about a visual design process for the duration of an entire project, and storyboarding only covers the beginning phases of design. Therefore, in order overcome the shortcomings of storyboarding, I looked at what architects currently use to drive communication and project development: technology.

Researching technology proved to be a great solution. There are numerous software programs currently available to architects like Revit, AutoCAD, 3dsMax, and more. For visually presenting ideas, technologies like "3D projectors and motion capture technology are becoming more widely assessable and can bring simulations and demonstrations to life by making them interactive and accessible to the entire class."[9]

One drawback, however, is that technology becomes obsolete within a couple of years. In

9 Williams, Troy. "To empower students, let's bring interactive learning tools into the classroom." VentureBeat Tech. People. Money. Web. 7 Mar. 2013. <http://venturebeat.com/2012/10/30/interactive-learning/>.

order to develop a lasting visual communication design process, I needed to find a technology that has the potential for growth. One particular technology that caught my attention was augmented reality (AR). Augmented reality is an emerging technology that has the ability to superimpose digital graphics using a device to create a composite view of the real world and of the digital world. Upon further research and experimentation, I discovered that augmented reality has the ability to address the drawbacks of storyboarding.

There are several key features of AR which can help supplement and complement storyboarding. The first is the ability to convey a whole scene with large amounts of information and fine detail. While researching and testing AR myself, I found that it can portray detailed 3D rendered models. It can also show details like wall dimensions, material colors, and more.

The second benefit is the ability to offer a person an interactive learning experience. Depending how the augmented reality application is set up, viewers may be able to walk 360 degrees to see the entire 3D model. AR has the capability to visually represent an idea, teach an idea, and promote learning. For instance, AR has already helped in the Deaf community. "Not only can the deaf learn new words in sign, but the [AR] magazine can also help teach those who don't understand sign at all how to speak it. As far as applications of augmented reality go, this one is particularly good because it takes something static (a magazine page) and creates a better learning experiencing by animating it."[10]

As with storyboarding, through experimental testing, I gained a greater understanding of what augmented reality's capabilities are. I have found that it is a great tool for visually communicating developed projects that have more detailed information. It's also a technology that can be used in numerous methods. For instance, many companies like Google and Nintendo are invest-

10 Bilton, Ricardo . "VentureBeat | News About Tech, Money and Innovation." VentureBeat. N.p., n.d. Web. 3 Dec. 2013. <http://venturebeat.com/2013/09/10/deaf-magazine-uses-augmented-reality-to-teach-readers-sign-language/>.

ing in this newer technology to market products, develop games, promote websites, and create new technology hardware, among other applications.

Nevertheless, like storyboarding and any other tool, AR has its drawbacks. While AR can display a massive amount of detailed information, that information can become overwhelming. I have found that with too much to see, the viewer can be caught up in the unique experience and might not be able to deduce the important information that is being presented. For example, I mentioned that depending on how the AR application is setup, a viewer could see 360 degrees around a 3D model. In this case, if the intended purpose is to demonstrate a specific detail in a project like a particular wall construction, it can be quickly overlooked.

Another weakness is that this technology is still in its infancy and portraying a single concept or idea can be long and time consuming, which is not ideal at the beginning of a project's conceptual design phase. As of now, Augmented Reality tends to work best when visually representing and communicating a product or project that has been completed and thoroughly thought through. However, in the future, as the technology of Augmented Reality advances, the amount of time it takes to implement AR may be drastically reduced.

As mentioned above, both storyboarding and augmented reality have benefits and shortcomings. However, my focus is the complementary nature of storyboarding and augmented reality. It was evident from my research and experimentation with both tools that each stood at different spectrums of the design process. Storyboarding is great for quick conceptual design, which normally occurs in the beginning of a project. Augmented reality on the other hand is great for representing visual information at the end of completed projects. It is the marriage of these two tools that form a visual communication design process that can be beneficial to the architectural profession and any other design field.

Other theses have also investigated the use of storyboarding and augmented reality. So

how does my process differ from those? A thesis called “Augmented Reality Based Interactive Storyboarding,” looks into developing a storyboard composition tool. This tool allows users of any experience to be able to storyboard with the use of 3D scenes and the real environment. While I find the validity of developing a tool that allows anyone to storyboard a great idea, my thesis focuses on using storyboarding as a conceptual design process for visually representing an idea quickly through sketches. It’s not about changing the storyboarding process with augmented reality, but rather maintaining the essence of storyboarding’s strengths and mitigating its weakness with augmented reality.

Another thesis, “Coeno-Storyboard: An Augmented Surface for Storyboard Presentations,” looks at storyboarding and augmented reality as a means to create a more collaborative work environment utilizing a digitally augmented tabletop interface. While my thesis does mention how storyboarding and augmented reality are great tools for working with a group of people, it’s not about the specifics of working well in a collaborative environment. “Coeno-Storyboard” talks about creating a better collaborative workflow environment while my thesis investigates two visual design tools as a design process for better communication.

And lastly, the thesis “Storyboarding with Augmented Reality” is about modifying the traditional method of storyboarding by adding technology. While this thesis seems a bit more in line with what I am doing, it’s about using AR for easy digital manipulation of content and interactivity. It also focuses on the different products that can come out of utilizing storyboarding with augmented reality. In comparison, while I mention that one of ARs benefits is that it can create a more interactive experience, the design process I am proposing is about a transition from storyboard to augmented reality. It’s about utilizing the full potential of each tool by compensating each other’s weakness to visually communicate to a group of people at any time during a design project.

Each of these theses have their own merit in the investigation of storyboarding and augmented reality, but none of them focused on using these two tools as a transitional design process through the duration of a design project. As mentioned earlier, this thesis focuses on the balance between the two and the transition of information between design phases that allows for a brand new process of visual communication.

In design, there is no one correct way to develop a project. As such, this design process doesn't have any specific set of rules to follow and it doesn't follow any other design process. However, to show how it can be utilized, a general and traditional architectural methodology was used and resulted in a process broken into six different design phases, from beginning to completion.

In Chapter 7, Section 3, there is a graph that illustrates the transition from storyboarding to augmented reality. In phases 1, 2, and 3, storyboarding is predominantly utilized because these are the conceptual and development phases of a project. These phases capitalize on storyboarding's inherent design editing process, its ability to communicate clearly to a group of people, and its ability to quickly sketch ideas. While augmented reality plays a lesser role in these phases, it still can help to visually present more information like a detailed text description of a particular image.

However, as the project comes closer to full completion, in phases 4, 5, and 6, it shifts to utilizing augmented reality more consistently. During these phases of design, many elements of the project are digitally developed, for instance, 3D models and detailed construction documents. This allows for quicker workflow. As mentioned earlier, AR capitalizes on fully developed ideas and projects because it has the ability to show lots of detail and to create an immersive interactive experience. During these phases, storyboarding is limited but the sketches themselves can still be utilized as placement markers for communicating specific ideas and what is seen in augmented reality.

This design process is the result of research and experimentation to learn the pros and cons of storyboarding and augmented reality. Both storyboarding and augmented reality have strong visual communication ability, but neither tool can meet the communication needs of an entire design project. Consequently, merging the two tools to complement and supplement each other's strengths and weaknesses and effectively convey an entire design project through visual aids is beneficial to the architectural design process.

CHAPTER 3 - STORYBOARDING

Introduction

3.1 – History

3.2 – Principles

3.3 – Process and Technique

3.4 – Others who utilize Storyboarding

Conclusion

INTRODUCTION

Presently, when I ask someone, “What do you think storyboarding is?” a typical response is generally attuned to Disney and any animated film. This is to be expected as storyboarding was developed through the collaboration of Walt Disney and Bob Thomas. It is this fact and the fact that it is a common tool used consistently for film and animation that it is rarely mentioned being utilized by other professions.

People don’t typically think about using storyboards in another professional setting, for example architecture. However, now days in many professional settings (not just architecture), storyboarding is being adapted as a practical methodological tool to visually present ideas, develop ideas, and solve problems. Storyboarding’s practical visual prowess provides a great way to communicate with others and can prevent confusion or misinterpretation of information.

Storyboarding is a quick way to convey ideas to other people through visual means. Animators use it to show a sequence of images that illustrate a scene within a movie. However, it is an old process, which begs the question of why anyone would want to continue to use storyboarding, a tool that was developed in 1933, when emerging technologies and software can provide more visual information? Why would film or any other profession try to adapt an old tool? The reason is simple, because it still works well. Storyboarding can help with numerous things like communicating specific details, conveying overarching concepts, and developing ideas.

While storyboarding is an older tool, it has helped many projects succeed, not only in film but also in architecture, fashion, business, and other professions. In Chapter 3, storyboarding will be analyzed starting with its history and principles, followed by the process and techniques, and ending with where storyboarding exists today. This chapter will help to show why storyboarding is still relevant to this day and why it will continue to be relevant in the future.

CHAPTER 3.1 – HISTORY OF STORYBOARDING

THE ORIGINS OF STORYBOARDING

Presently, both film directors and animators use storyboarding in the development of their films. "Storyboarding was invented at the Disney Studio and is today a worldwide standard procedure for the production of both animation and live-action films and videos. In storyboard's sequential presentation of narrative and characters, weak spots are easily seen and changed, and the all-important story line developed and strengthened."[6] According to Diane Disney Miller, the eldest daughter of Walt Disney, the first storyboards were used for the animated short film *Three Little Pigs* released on May 27, 1933.

> "Walt told Bob Thomas that the "first real storyboard was born" in Webb Smith's office:
>
> "Web was an old newspaperman and a cracking good cartoonist," Walt said. "We would sit in his office in the morning and think up gags. Say Pluto was tracking a caterpillar. You'd have shots of him tracking up and down hills, then maybe shots of the caterpillar on the dog's nose or tail.
>
> "Well, after lunch I'd drop in Webb's office and he'd have the story sketched out on sheets of paper. They'd be scattered all over the room, on desks, on the floor, everyplace. It got so tough to follow them, we decided to pin all the sketches on the wall in sequence. That was the first storyboard."[7]

Before the *Three Little Pigs*, animations studios did not use anything resembling storyboarding. In 1913-1914, most animations were loosely themed and didn't possess an actual storyline. The animation studios didn't have a Story Department and thus the animators themselves

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6 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999. p. ix

7 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 24

were the ones who made up the string of gags one would see during the early 1900s. However, due to the lack of structure, the comedic jokes were often confusing to audiences.

> According to Richard Huemer, an animator who started his career in 1916, "We didn't write any stories up, commit them to paper, that is. We didn't know what a [story]board was," he recalled. You could yell across the room, 'Hey, Dave! I want to talk to you. Suppose we do this.' And then we'd sit down and talk it over and laugh our heads off at our great gags, and then I would animate it. So it was very relaxed at Fleischer's."[8]

Walt Disney's first animation studio began producing the same sort of carefree and unstructured animations. Due to Walt's and his colleagues' inexperience at the time, their animations stacked gag after gag without any real structure or story because that was the norm for developing an animation. However, at the end of a group session of brainstorming comedic ploys, Walt would try to create continuity and a story from each gag.

At that point, Walt started to make conscious decisions about what he wanted to portray and do with animation. He wanted to develop stylistic films and give personality to the animation characters through body movements and their actions. Walt wanted the characters to feel real and believable to the audience. In 1927, he said, "I want characters to *be* somebody. I don't want them just to be a drawing."[9] Walt Disney did not like the restrictions of cartoons and wanted to have distinguishable work that looked more realistic and natural. During this time of change and film analysis, Walt was on the brink of discovering storyboarding.

> "Walt and his small crew turned away from the magical world of Felix the Cat, Koko the Clown, and Krazy Kat. They began to study the camera angles, the effects, and the editing of the films of Buster Keaton, Charlie Chaplin, Harold Lloyd, Lon Chaney, and Douglas Fair-

8 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 6

9 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 7

banks. They relearned timing and how to build and tailor gags for specific characters, how to stage scenes clearly, and how to use crosscutting and camera dissolves for emotional impact."[10]

Before formal storyboarding became a regular practice, the first Mickey film, made in 1928 by Ubbe Iwerks, was drawn like a comic where there were six panels on one page accompanied by Walt's descriptions of the action. These sketches provided descriptive imagery of each major scene. However, there were still many discrepancies with the illustrations as the characters did not clearly portray what tasks they were doing. "The little barefoot mouse in short pants standing left of center, what is he pointing at and why? Is he the boss giving instructions to the other animals? Or a bothersome kid pointing at the strange contraption?"[11]

Due to the discrepancies, each panel was viewed and given a specific marking, however the "Checks, double checks, and numbers in red, blue, and black pencil, some underlined, some circled, their meanings and importance to the action [are] now lost."[12] While the marking meanings are unknown, what is known is that Walt indicated an "X" or "Cut" on panels with major changes. This was to prevent any redrawing, as presenting a new idea or changes were difficult because the drawings were confined to the six panels on a page.

The next phase of inching closer to the storyboarding we know today was when animation introduced music, voices, and sound effects. Walt knew that he could use sound to further develop the cartoon's realism. "Story sketches for Steamboat Willie drawn by Iwerks reveal the careful planning that went into synchronizing imagery with music, voices, and sound effects."[13] Now, instead of a page with six panels accompanied by separated written text, Walt had detailed type-

10 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 7

11 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 8

12 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 8

13 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 9

written descriptions on twelve pages which had box panels that illustrated the main idea of each scene. However, the detailed descriptions and limited sketches put the weight of the description on the words more than the pictures.

In the 1930s, the Disney studio began hiring animators, illustrators, and writers. Soon, there was an art school on the studio lot to help the staff refine their draftsmanship skills in life drawing. This helped to improve the Mickey Shorts and allowed an emphasis on solid drawing, story construction, and personality gags, which paved the way to storyboarding.

While Walt became more narrative-driven, with very detailed written descriptions of what each scene should be like, the problem of lacking space for corrections which came with using mostly text to clearly describe what was missing in the few illustrated main scenes remained. But this did not stop the progression of the Disney studio. As technology developed and a multiplane camera began being used to illustrate depth, Disney artist draftsmanship skills improved and the story sketches became more descriptive.

> "From 1932 to 1934, the studio Story Department increased in number from four (Ted Sears, Webb Smith, Albert Hurter, and Pinto Colvig) to a dozen. More attention to narrative details led to increased numbers of sketches showing phases of action. More and more drawings were passed around for Walt and the storymen to comment on."[14]

As the number of drawings increased to clearly describe the scenes, it became more difficult to maintain their sequential order. All of the sketches were then laid on the floor and Walt was taken through them. Due to the abundance of images and the difficulty of viewing them on the ground, the sketches were in time "pinned up on walls and large sheets of cork or celotex boards."[15] Thus, storyboarding was born.

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14 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 21

15 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 24

"Cartoonist and storyboard artist Alex Toth, offers an alternate history. He suggests that the pioneering, animator, and cartoonist Winsor McCay created the storyboard. He postulates that he must have in order to have gotten the job done on his movie *Gertie the Dinosaur*."[16]

> Toth describes the function of storyboards: Alfred Hitchcock, Delmar Daves, doted on their use to solve all or most continuity problems up front, on paper, in a storyboard. "If it won't work there, it won't work on film" was, I believe, Hitchcock's quote! He boarded every film he directed, to order. Still, he was in the minority. Be it small-budgeted "10-day wonder" or mega-million-dollar epic, it is expedient, on all counts, to board the continuity – since it is where type-written script meets "picture" for the first time – and, given a seasoned and savvy pro storyboard artist to interpret that script, is where that script is wrung-out, test-flown, till it cracks/breaks or flies beautifully on its first, maiden flight – right into production's hangar!"[17]

It was during *The Sorcerer's Apprentice*, in the fall of 1937, that the story sketches began being rendered in full color. "The most evocative are by Tom Codrick … His small gouache paintings (most 4"x6") offer, through skillful color and light and shade, the mood of the piece – from the dank, spooky cavern of the elderly magician, to a heavenly dreamscape where Mickey conducts stars and planets, to a water battle with an army of robotic brooms."[18] By the 1940s, storyboarding was not only common in animation but also regularly used in productions of live-actions films.

WHAT ARE STORYBOARDS?

16 Glebas, Francis. Directing the story: professional storytelling and storyboarding techniques for live action and animation. Amsterdam: Elsevier/Focal Press, 2009., p. 47

17 Glebas, Francis. Directing the story: professional storytelling and storyboarding techniques for live action and animation. Amsterdam: Elsevier/Focal Press, 2009. p. 48

18 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999., p. 13, p. 17

Storyboarding has been used for some time in the entertainment business, but many people may not understand what storyboarding truly is. Some may think it's just like comics, but for films while others may wonder why a producer would need storyboards in the first place. However, these questions are slowly diminishing and storyboarding is starting to become widely recognized as part of the film preproduction process. This is mainly due to many films' DVD extra features which showcase film planning stages and the involvement of storyboards.

While awareness of storyboarding has increased, the process and what storyboarding is have yet to be fully understood by the public. According to *Merriam-Webster*, the definition of a storyboard is "a panel or series of panels on which a set of sketches is arranged depicting consecutively the important changes of scene and action in a series of shots (as for a film, television show, or commercial)"[19] According to *The American Heritage College Dictionary*, a storyboard is a "A hanging panel of sketches depicting sequential scenes, as of a film being proposed or made."[20] By definition, many people understand what storyboards are, but as mentioned, the process and other aspects can be overlooked.

Storyboards are sketches that are well known for being used in the preproduction and production of films, games, and commercials. They illustrate camera angles and placements, and shot sequences. Storyboards are mainly used to facilitate the production of films by clearly stating what the challenges and potential problems will be when filming to effectively portray the narrative. The boards are constantly reworked to solve problems that would cost time and money if the director worked directly from the script. "A storyboard can break down a scene or a whole script shot by shot, allowing a production manager to effectively calculate and plan shooting days. A production designer who has access to a storyboard knows what will be in frame and can save

19 "Storyboard - Definition and More from the Free Merriam-Webster Dictionary." Dictionary and Thesaurus - Merriam-Webster Online. N.p., n.d. Web. 8 Dec. 2011. <http://www.merriam-webster.com/dictionary/storyboard>.

20 The American heritage college dictionary. 3rd ed. Boston [etc.: Houghton Mifflin, 1997. p. 1339

time and money by not overbuilding a set."[21]

According to Donald Graham, the process and how flexible storyboarding is, are the main strengths of the storyboard.

> Any drawing can be moved to a new position on the board, or eliminated, or replaced. The board of drawings is in a state of flux. Nothing is fixed; nothing is unchangeable. One drawing, because of its position on the board, may suggest a gag or a piece of business which can be added. Whole sections can be interchanged … a new function of the board becomes apparent: pre-film cutting. Close-ups can be planned against medium shots, long scenes against short ones. Unnecessary animation is automatically ruled out, and tremendous economies result.[22]

TYPES OF STORYBOARDS

As Graham mentioned, it's the flexibility of the storyboard that is its main value and what allowed the evolution of different styles of storyboarding and its use in different professions. Storyboard types evolved as a result of the different mediums used for artistic purposes, varying financial resources, and the needs of individual projects. Depending on the industry, storyboards are flexible enough to be adapted for use in numerous ways while still keeping the integrity of the storyboard process. Here is a list with a brief description of several types of storyboards the entertainment industry utilizes: editorial boards, key frames, concept boards, production illustrations, commercial boards, graphic-novel boards, game play boards, and website navigation boards.

Editorial

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21 Cristiano, Giuseppe. Storyboard design course: principles, practice, and techniques: the ultimate guide for artists, directors, producers, and scriptwriters. Hauppauge, NY: Barron's, 2007., p. 12

22 Canemaker, John. Paper dreams: the art & artists of Disney storyboards. New York: Hyperion, 1999. p. 24

Editorial boards are also called production boards. These boards are fully produced storyboards that translate the script into the director's or development team's views about the story and the camera shots. They are images used by the film and television industry, which tell the story and can be drawn as a full translation of the script to express the edited sequence of the screenplay. "The editorial storyboard is a Xerox art form in the sense that in most cases, the crew rarely works off the original storyboards. Instead, photocopies are made of the originals and then distributed to the crew. The storyboards need to be high contrast so they will reproduce well, so black-and-white storyboards are standard."[23] However, if a film has a larger budget and has more time, color renderings may sometimes be used to help with the preproduction visualization.

The boards are drawn mostly with the intent of showing camera angles/shots and composition. Often time, the sketches are drawn on 8-1/2" x 11" paper as it can be easily replicated and integrated with the script. The number of drawings and the size of the frames per sheet of paper depend on the director. Some directors prefer to have just one image per page while others would like to have 12 small thumbnail images per page.

Key frames

When full editorial boards are unnecessary and only important scenes or elements are needed, key frames are often used. Key frames are illustrated main moments in a story that are refined renderings with light and shadow. These illustrations are often used to propose and raise money for the specific production; one can think of them as sales pitch slides. They are visualizations that showcase the most prominent scenes, but they are not full-scale production illustrations with concrete decisions. They are used to advocate the scenes' mood and style. "In fact there can be a danger in showing up to a pitch meeting with too much polish on the material."[24]

23 Begleiter, Marcie. From word to image: storyboarding and the filmmaking process. 2nd ed. Studio City, CA: Michael Wiese Productions, 2010., p.12

24 Begleiter, Marcie. From word to image: storyboarding and the filmmaking process. 2nd ed. Studio City, CA: Michael Wiese Productions, 2010. p. 14

Key frames are usually one image per 8-1/2" x 11" sheet of paper.

Concept boards

Concept boards are similar to key frames. The difference is that concept boards focus on detailed illustration of the background imagery, set, and location. While key frames concentrate on important scenes of a story, concept boards concentrate more on the environmental content of the story.

Production illustrations

Production illustrations are fully rendered, highly detailed images which show lighting. These images are drawn one image per sheet at a large scale and can be larger than 14" x 20". Production illustrations are usually drawn from a wide-angle view of the set. The production designer uses these illustrations to sell an idea that reflects the designer's creative concepts to the producer and director. "The purpose of this drawing is twofold: One is to give a sense, in two-dimensions, of the appearance of the set. The other is to give the designer an opportunity to express his or her ideas on how the set might be lit."[25]

Commercial boards

These boards are highly rendered, colored, and very detailed images for the commercial industry. They are the creative concepts designed by an advertising agency as sales tools to be presented to a client. Often, commercial boards are produced before the director is hired for the job. These illustrations are drawn in standard frames of 6" x 8" and then mounted on a board. Upon completion of the boards, they are "used to get directors and production companies to bid on the commercial."[26] Once a director has been chosen, the director may create his or her own

25 Begleiter, Marcie. From word to image: storyboarding and the filmmaking process. 2nd ed. Studio City, CA: Michael Wiese Productions, 2010., p. 15

26 Begleiter, Marcie. From word to image: storyboarding and the filmmaking process. 2nd ed. Studio City, CA: Michael Wiese Productions, 2010., p. 16

shooting boards as long as they follow the commercial board's structure.

Graphic novel boards

Graphic novel boards are also called comic book boards. They are drawn with extreme detail and are developed similarly to editorial and production boards. "They are not a stepping stone for the production into moving images; therefore, they do not include directions for camera movements."[27]

Game play boards

Like the name suggests, these boards are used to map out games by illustrating game players' possible decisions and reactions to those decisions. Game play boards work as a platform to help build the story of the game through events and triggers. Often, games also have short cinematic films to help promote the game and its story. "In fact, these introductions need to be considered as animated short movies, and so you need to design the characters, locations, and so on. After this, you need to have a script ready – and then you move to the storyboard phase."[28]

Multimedia presentations

Multimedia presentations are boards that can be used for anything from website navigation to an interactive DVD. Storyboards in the multimedia field are comprehensive as everything needs to be mapped out to show the different scenarios and changes that can occur. For website navigation boards, small thumbnails are used to illustrate the connections from the navigation panel as well as animations on the site. Storyboards can be used as a flow chart for any multimedia project like interactive DVD menus. By mapping everything out in a flow chart manner, the storyboard helps to illustrate how to move information and where it will end up.

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27 Torta, Stephanie, and Vladimir Minuty. Storyboarding: turning script to motion. Dulles, Va.: Mercury Learning and Information, 2011., p. 8

28 Cristiano, Giuseppe. Storyboard design course: principles, practice, and techniques: the ultimate guide for artists, directors, producers, and scriptwriters. Hauppauge, NY: Barron's, 2007., p. 28

WHERE STORYBOARDING IS NOW

As technology continued to grow and develop, so did storyboards.

Although most storyboards are still primarily drawn by hand with pencil and paper, new trends are starting to become popular. High-powered computers, video cameras, and software are allowing more people to create their own movies for a fraction of what the cost of such an undertaking used to be. No matter the size of the movie, the use and advantages of storyboards does not change. New Technology – both hardware and software is increasing the ease with which storyboards can be made.[29]

Visual effects

One of the many uses of storyboards is to help the conceptual understanding of a scene. Scenes that involve special effects (SFX), visual effects (VFX), stunts, and complex camera setups are just some of the types of scenes that might be difficult for the crew to visualize. Because visual effects are different types of imagery that are created and integrated into the footage in postproduction, they can be hard to visualize during preproduction and production. With reduction in production costs and development of powerful computers, the use of computer-generated imagery (CGI) is becoming more popular in moviemaking.[30]

Storyboards that utilize and feature visual effects are a great communication tool for the entire film crew. However, it's also very important for the postproduction team as everything is planned out on these boards. As live action is normally filmed before visual effects are created, the scenes are planned and prepared with more detail for the postproduction phase.

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29 Torta, Stephanie, and Vladimir Minuty. Storyboarding: turning script to motion. Dulles, Va.: Mercury Learning and Information, 2011., p. 23

30 STorta, Stephanie, and Vladimir Minuty. Storyboarding: turning script to motion. Dulles, Va.: Mercury Learning and Information, 2011. p. 264

> For example, during a shoot, the cast stands in front of a large green screen that, using computer-generated imagery (CGI) and *Chroma key compositing*, will later be turned into a vast space ship with alien technology. The full scope of the scene could be lost without the help of storyboards to depict the background and the action of the scene for the cast and crew to look at before shooting.[31]

Storyboards in animatics

A unique type of storyboarding is called animatics. It's the process of taking storyboard images and using computer software to generate the sequencing of the boards. Music and speech can be added. These animatics are often used for animatic films or games.

> An animatic combines images of a storyboard, still photographs, or computer-generated 3D images edited in a sequence and synchronized with a soundtrack. In the past, storyboards were filmed in sequence with zooms and pans to simulate the motion of the scenes. An audio track or music track is then edited to the footage to create the animatic. With the advancements in technology, computer editing or slideshow software enables quick and easy animatic development.
>
> Animatics give the filmmakers a better idea of how the flow of motion, timing and sound all work together. Any potential problems can be resolved before the production phase of the project.[32]

Digital tools

While pencil and paper is still the most popular medium for drawing storyboards, technology is becoming more popular and may eventually replace traditional methods. Current technol-

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31 Torta, Stephanie, and Vladimir Minuty. Storyboarding: turning script to motion. Dulles, Va.: Mercury Learning and Information, 2011., p. 265

32 Torta, Stephanie, and Vladimir Minuty. Storyboarding: turning script to motion. Dulles, Va.: Mercury Learning and Information, 2011, p. 268-269

ogies that are being used include graphic tablets and touchscreens.

A graphic tablet is a computer tablet that allows a user to hand-draw graphics into a computer, in a manner similar to using a pencil and paper. Ironically, the better the graphic tablet is, the more closely to pencil and paper it performs. Storyboard artists do use graphic tablets for drawing boards, although the tablets are tied to workstations. This makes it difficult to use graphic tablets during meetings and on location. Pencil and paper are still primarily used on these occasions.

Storyboards artists draw not only from scratch using graphic tablets; they also scan their drawings into the computer for touch-ups, using the features provided by the tablets and the accompanying software.

Advancements in technology continue to provide more features for graphic tablets. These include a wider selection of types of paper and drawing pens. For a storyboard artist, these advancements are appreciated, however, until graphic tablets become more portable, their use for drawing storyboards will be limited.[33]

Touchscreens

One of the most notable technological advances is in touchscreen technology for portable devices and workstations. One of the drawbacks of graphic tablets is that they are not as mobile as a pencil and paper. Touchscreen technology has become mainstream with the advances made to portable devices.

Although many devices are portable, the lack of pressure sensitivity is a major drawback for storyboard artists. Until pressure sensitivity becomes a feature of these devices, most storyboard artists will not find them as effective as pencil and paper.[34]

33 Torta, Stephanie, and Vladimir Minuty. Storyboarding: turning script to motion. Dulles, Va.: Mercury Learning and Information, 2011., p. 270

34 Storyboarding: Turning Script To Motion, p. 275

CHAPTER 3.2 – PRINCIPLES

WHAT DOES IT TAKE TO STORYBOARD?

Storyboarding is often described simply as drawings that help compose a story for film. However, it deals with much more than just drawing. Yes, storyboarding is partially about drawing, but with advances in technology, new storyboarding programs have begun to emerge, and the ability to draw doesn't necessarily mean that someone's storyboards are good. One might have excellent drawing skills, but they are useless in storyboarding if the illustrations do not convey a story well. Of course, it doesn't hurt to be able to draw well or to learn to draw better.

Storyboard artists need to have a wide range of knowledge dealing with the many different film and art industry professions. They need to have an understanding of directing, editing, perspective, composition, and more. In the film industry, storyboard artists need to understand everything a director envisions and then interpret that vision and translate it into images. Therefore, it is important to learn the terminology used in the industry. For example, "the camera needs to (pan, tilt, zoom, etc.) in this shot."

Another thing that storyboard artists need to consider is how each camera shot expresses and advances the story's plot. They also need a clear understanding of the direction of the screen and where the action is happening. "Storyboard artists need to understand when and why to use special camera shots. What motivates those shots? What makes a scene funny? What makes it scary? How do you make an audience believe a character is a giant? How do you make them believe a character is only six inches tall?"[35]

35 Simon, Mark. Storyboards: motion in art. 3rd ed. Amsterdam: Focal Press, 2007., p. 15

WHERE TO BEGIN

Beginning a design project can be a challenge. Sometimes coming up with an idea or a concept can be difficult. Other times, having too many ideas can become overwhelming. In the very beginning of a project, brainstorming often takes place before any development occurs. At Disney, the Imagineering Department has a brainstorming process they call Blue Sky. Here, they brainstorm any and all ideas. During this process, any idea, no matter how obtuse it may appear, is written down and kept. An idea that was put aside at first may be brought back and become the next big thing.

> Blue Sky is a department and an idea. The department—a small group of engineers and artists—exists to help bring ideas to fruition, to "knock the sharp corners off" and refine them until they can be built. Blue Sky helps a team decide how they might approach an idea, but not what they are going to do. Some Blue Sky musings (called "untargeted") include broad ideas for an attraction involving water, or musings about a WALL-E attraction. A targeted Blue Sky project comes when there is a specific need that must be met – for example, how do we make a "magical" hotel-room key? "Strategic" projects include researching the latest developments in other fields, like visiting a Maker Faire to meet dedicated tinkerers and take the pulse of the do-it-yourself movement.
>
> Blue Sky is also a state of mind, the wide-open place where nearly every Imagineering project begins. The earliest phase of a project is always known as Blue Sky, and it can last months or years. This is where big-picture ideas first surface, systems are tested, and assumptions are checked. Here, also, initial budgets are set, before the project moves into the concept and feasibility phase, where even more kinks are worked out in preparation for building.[36]

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36 Malmberg, Melody. Walt Disney imagineering: a behind the dreams look at making MORE magic real. New York: Disney Editions, 2010. p. 48

As mentioned above, most times, a design project begins with brainstorming. However, in the entertainment industry, storyboards are often created after a script has been developed. This does not mean that the storyboards are the result of an end product. It means storyboards are the second phase to the film's design process. As mentioned before in this thesis, the storyboarding process is a critical phase for camera shots, budgeting, and clarifying ideas.

The process of storyboarding normally begins with a breakdown of the script's main elements. This is normally done by the director who envisions the words from the script as images. The director then passes on the vision to the storyboard artist to illustrate the scenes according to his or her descriptions. The end result then helps to communicate the story to everyone working on the project, thus dissipating any confusion about how something looks from another person's perspective.

With the storyboard illustrations that were developed with the descriptions from the director and script, everyone has a clear vision of the film's end result. As everyone understands what the film should look like, less time and money will be wasted on reshooting or rebuilding a set. For project and set designers, storyboards help to minimize what actually needs to be built; this can save money for other areas of the film.

An example used in the book *Storyboarding: turning script to motion,* illustrates how important storyboards are in illustrating the director's views to the team working on the film. "If you read the line: The dog ran past the tree. What type of dog did you visualize? What type of tree? What direction did you have the dog coming from?"[37] When looking at the examples given below, you might find that you had a different image in your head than what was drawn. This clearly illustrates that what a director wants could look completely different in the mind of another film crew member.

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37 Torta, Stephanie, and Vladimir Minuty. Storyboarding: turning script to motion. Dulles, Va.: Mercury Learning and Information, 2011., pg. 10

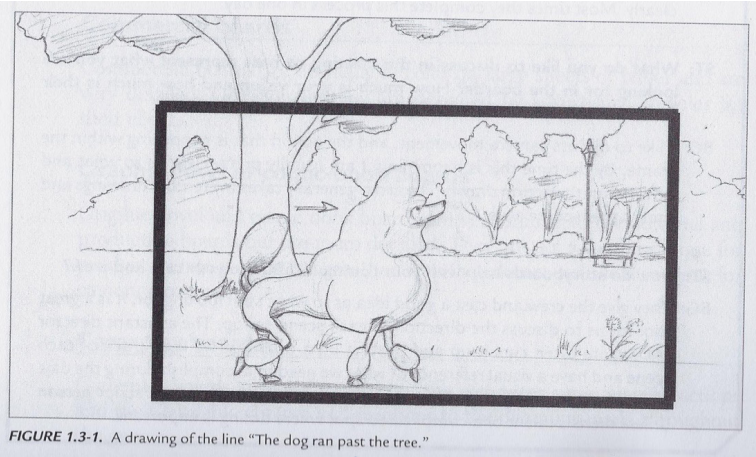

FIGURE 1.3-1. A drawing of the line "The dog ran past the tree."

Figure 1. Illustrated example from Storyboarding: turning script to motion, p. 10

The storyboard process continues by breaking the script down into scenes and shots. While this step may seem trivial to some, translating a scene visually , particularly the emotions and dynamics of the story, can be complicated. As with all professions, preparation is essential.

"The storyboard is the first visual representation of your story. The process for many artists includes creating thumbnails, roughs, and final storyboards for a project. Although the storyboarding process is different for each artist, there is one common thread, and that is to come to a project prepared and organized."[38]

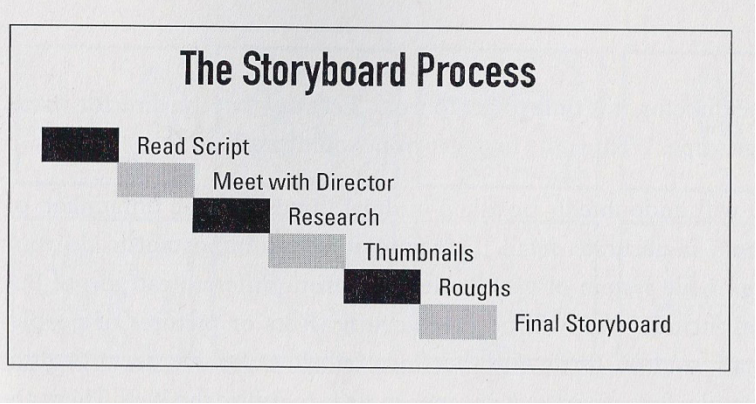

Figure 2. Illustration example from Exploring Storyboarding, p. 67

38 *Tumminello, Wendy. Exploring storyboarding. Australia: Thomson/Delmar Learning, 2005.*, p. 66

STORYTELLING

"Storytelling is the essence of filmmaking. The job of the director is to tell the story as he/she conceptualizes it and to translate that vision for viewers to see. The handling of the script translation and the amount of input from the crew members differ for each director depending on what seems to them to be the most effective way to tell the story."[39]

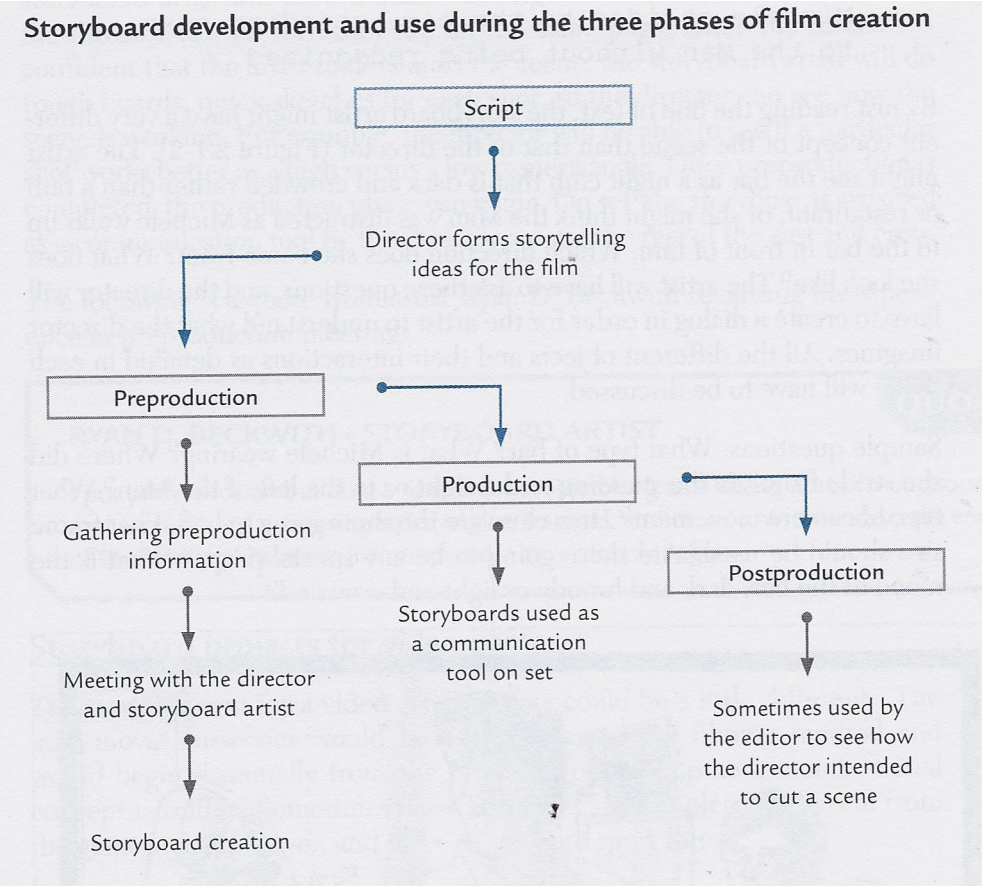

Figure 3. Illustrated example from Storyboarding Turning Script to Motion, p. 31

Good storytelling through images is difficult. Ultimately, while the sequence of images may make sense to their creator, the challenge is making sure it conveys the same message, feel-

39 *Torta, Stephanie, and Vladimir Minuty. Storyboarding: turning script to motion. Dulles, Va.: Mercury Learning and Information, 2011.*, pg. 30

ings, and thoughts to another person viewing it.

In animation storyboarding, "a story is the telling of a series of events about a character who wants something. But, the character doesn't know how to go about getting what he or she wants, so he or she has to face obstacles and the complications that ensue. The story behind builds to a crisis until the character gets not what he or she wants, but what he or she needs. This is the basic structure that most stories follow."[40]

Emotion is one of the main features that create a humanistic and relatable character and story. In many films and animations, characters go through several emotions throughout different events. The story is comprised of a "sequence of actions that build because of a characters' emotional reaction to the events."[41]

Other storytelling challenges that come with storyboarding are the technical aspects, which include framing, perspective, proximity, point of view, and compositional layout. These will be discussed later in the thesis.

LANGUAGE OF STORYBOARDING

To communicate effectively through storyboarding, learning the language of film is required. Here is part of a list of terminology with accompanying images that is used for storyboarding and film. This list was created by the American Film Institute and the whole list can be viewed in a PDF called "American Film Institute – 21st Century Educator's Handbook." [42]

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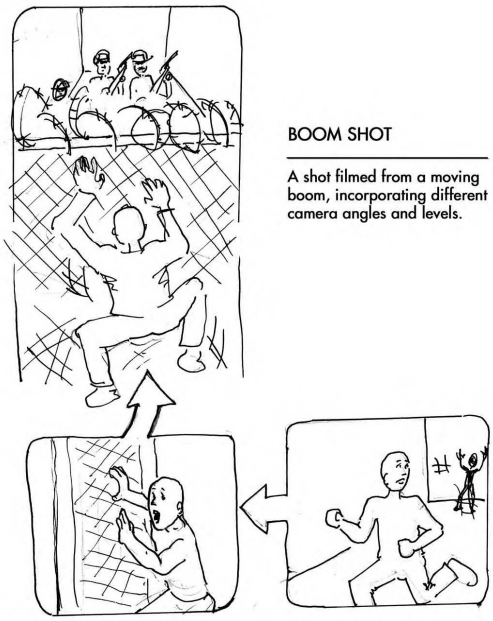
40 *Glebas, Francis. Directing the story: professional storytelling and storyboarding techniques for live action and animation. Amsterdam: Elsevier/Focal Press, 2009.*, pp. 41

41 *Glebas, Francis. Directing the story: professional storytelling and storyboarding techniques for live action and animation. Amsterdam: Elsevier/Focal Press, 2009.* pp. 87

42 American Film Institute. "American Film Institute – 21st Century Educator's Handbook." 2006. PDF File

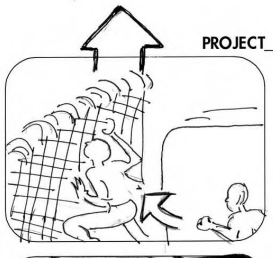


BOOM SHOT

A shot filmed from a moving boom, incorporating different camera angles and levels.

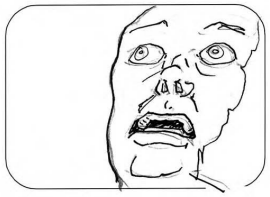
AFI Screen Education

PROJECT_____ SCENE



BOOM
A shot filmed from a moving boom, incorporating different camera angles and levels.

CAMEO SHOT
A shot in which the subject is filmed against a black or neutral background.

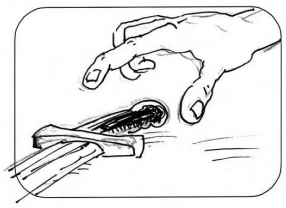


CHOKER
A tight close-up, usually only showing a subject's face.

AFI Screen Education

PROJECT_____ SCENE

CLOSE SHOT (CS)
A shot in which the subject is shown from the top of the head to mid-waist.

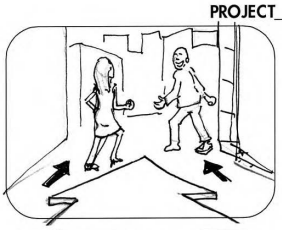


CLOSE-UP (CU)
A shot of an isolated part of a subject or object, such as the head or hand.

CUTAWAY
A shot that is related to the main action of the scene but briefly leaves it, such as an audience member's reaction to a show.

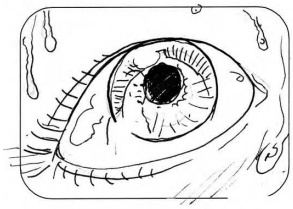
AFI Screen Education

PROJECT_____ SCENE



DOLLY SHOT
A moving shot, accomplished by moving the camera as if on a set of tracks.

ESTABLISHING SHOT
A long shot that shows location and mood.



EXTREME CLOSE-UP (ECU, XCU)
A magnified shot of a small detail, such as a subject's eyes.

AFI Screen Education

CHAPTER 3.3 – PROCESS AND TECHNIQUE

LAYOUT/COMPOSITION

Understanding how to lay out an image to create a better composition is essential to portraying the story well. While architects lay out space on a floor plan to show the flow from one space to another, storyboard artists lay out images in a consistent format that allows one image to flow into the next. The composition of the image develops the story through spatial illustrations.

Along with an attractive and meaningful layout and composition, the image needs to have rhythm.

> All the necessary elements of your composition have to be balanced. You can use a variety in shapes and values as well as carefully arranged color to get the best results. The idea is a rhythm of the best-balanced design elements and camera arrangements along with well-choreographed action. The next important step is to connect all different scenes in a sequence. Their rhythm creates the visual language…[43]

PERSPECTIVE

Perspective drawing is nothing new to architects; however, it can still be an issue. Nowadays, many architects are losing the ability to draw. This is very problematic because when clients would like to see designs changed or ideas presented while conversing in a meeting, an architect should be able to draw something that suggests what the client was thinking.

Storyboarding is a great thing for architects to learn as storyboarding is generally considered quick art. Storyboard artists need to be able to draw things on the spot when the director wants them to illustrate a shot. It may not be their best drawing, but it needs to represent the

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43 Bacher, Hans P.. Dream worlds: production design in animation. Burlington, MA: Focal Press, 2008., p. 122

basic idea well enough. Then when there is time, the drawing is revised and completed.

While architects normally draw in a certain perspective, storyboard artists need to be able to sketch out any perspective that the director envisions. Therefore, learning about perspective through the view of a camera is important. Learning common film shots is a great way to start to understand how film creates compositions of space. For example:

> A low camera angle (LA, or worm's-eye view) looking up will have a low horizon line or even a horizon line below our field of view. Horizontal lines will still have vanishing points on the horizon line. A high camera angle (HA, or bird's-eye view) looking down will have a high horizon line or even a horizon line above our field of view. All high-angle shots will have vertical-line vanishing points below the horizon line.[44]

LIGHTING

In storyboarding, lighting plays a very important role in the communication of depth, atmosphere, and emotion. Storyboarding helps to illustrate where the light is coming from, which can determine camera placement, set design adjustments, and character positions. Lighting in film can be very dramatic or natural depending on the setting.

Similarly, architecture utilizes light to highlight important design elements, create an atmospheric quality, and ultimately create visibility without being disruptive and blinding. It also helps to create contrast, which in return creates depth and mood.

In film and animation, "contrast and mood is also known as chiaroscuro: the pictorial representation in terms of light and shade without regard to color; the arrangement or treatment of

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44 Simon, Mark. Storyboards: motion in art. 3rd ed. Amsterdam: Focal Press, 2007. p.38

light and dark in a work of art."[45] In essence, it helps to make an image stand out and sets a visual tone. Using contrast can change the way an image feels emotionally as well as create visual focal points. By using the contrast technique, one can portray a happier lighter scene with light or an ominous darker scene with more darks and shadows.

Another word that applies to contrast is value.

> The lights and darks of any color are called values. Normally these values are the result of light in nature. Where there is a lot of light, you get the lightest value – white; in the darkest shadow areas, you get black. There is of course a scale of mid-values in different shades of grey. We reduce these middle tones to only three. It makes them easier to work with.[46]

COLOR

The use of color can sometimes be complicated when rendering an image. A color palette for the image or set of images is important to keep the same atmosphere, unless there is a dramatic scene change in the story. "The color palette plays an important role in the visual style of a film, animation, and game design. Color often creates a sense of time and space, establishes mood and atmosphere, and provides emotional impact. Bright colors, for instance, add energy and have a dramatic impact, while lighter hues impart a harmonious and stable look."[47]

CONTINUITY

One of the key concepts of storyboarding is continuity. For many directors and artists, continuity should be considered from the start of any project. As each frame is illustrated, they

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45 Simon, Mark. Storyboards: motion in art. 3rd ed. Amsterdam: Focal Press, 2007., p.148

46 Bacher, Hans P.. Dream worlds: production design in animation. Burlington, MA: Focal Press, 2008., p. 136

47 Tumminello, Wendy. Exploring storyboarding. Australia: Thomson/Delmar Learning, 2005., p. 132

are analyzed to see if they maintain a continuous flow of the story and images. Things like pacing and transitions create the visual flow from image to image.

"The basic principle of continuity is to tell a story that develops through the interactions of its characters. If you look a most films you will notice that many are based on the continuity editing, which allows the director to create seamless sequences that flow from one shot to the next."[48]

In film and animation, the perception of time is relative. Time can be sped up or slowed down according to the director and the plot of the story. Let's say for instance a sports game takes several hours in real life, however, in a film, it's finished within minutes. But it's the control of time that will keep the audience interested. If the film is too fast, many people become disoriented and confused, but if it's too slow, many people lose interest.

Continuity also depends on the relativity of character position and camera position. This is referred to as the line of action.

> The line of action, also known as the 180-degree rule, is one of the most important continuity tools because it helps to organize the camera angles and movements in consistent screen direction. The line of action is an imaginary line that runs right in front of the camera or the direction the eyes are looking (line of sight), which gives the audience a sense of direction for the scene.[49]

48 Tumminello, Wendy. Exploring storyboarding. Australia: Thomson/Delmar Learning, 2005. p. 138

49 Tumminello, Wendy. Exploring storyboarding. Australia: Thomson/Delmar Learning, 2005., p. 140

CHAPTER 3.4 – OTHERS WHO UTILIZE STORYBOARDS

For this doctorate thesis and to apply the storyboarding process to architecture, understanding how other professional fields such as fashion, law enforcement, and business use storyboarding is essential. The fashion industry uses mood boards, while the police utilize bulletin boards, and the business world uses the brown paper technique.

According to the *Storyboard Design Course*, some architecture studios have also used storyboard artists to help with the visualization of the project presentations. In this case, storyboarding is used during the compilation phase. The project is being computer rendered, but to make production go quicker, storyboards are used to help determine which renderings should be created for the presentation.

Usually a project needs to be seen by a panel of judges and nowadays it's possible to create virtual models of proposed new buildings, using advanced computer software to simulate lights, settings, and materials. Clearly, this type of work takes time – and so the first stage is a draft in the form of a storyboard, to define the various sequences that will subsequently be computer animated.[50]

As stated, there is proof that storyboards have been used in architecture. However, they were used in the final rendering stage. This doctorate thesis is about using and adapting the process of storyboarding to the design process of developing an architectural project. While the proof validates the feasibility of using storyboards in architecture, storyboards have yet to be used as an architectural design tool.

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50 Cristiano, Giuseppe. Storyboard design course: principles, practice, and techniques: the ultimate guide for artists, directors, producers, and scriptwriters. Hauppauge, NY: Barron's, 2007., p. 30

FASHION MOOD BOARDS

While architects have yet to adapt and use the storyboarding process as a design tool, the fashion industry has already adapted it through their fashion mood boards. "A mood board is a tool used by designers to help them get a good idea of what their clients are looking for. Mood boards are basically collages of items such as photographs, sketches, clippings, fabric swatches and color samples. A mood board can be actual or virtual. A mood board is used by many different types of designers such as those in fashion and interior design."[51]

There are several types of mood boards. One type is a decorating mood board. These boards are often used by interior designers when presenting to a client. They could have floor plans, paint samples, color swatches, and material choice. Another type of mood board is used for fashion. These contain garment sketches, magazine clippings, inspirational imagery, and items like clothing accessories or color swatches.

BULLETIN BOARDS

Bulletin boards are used in classrooms, offices, and police departments. These boards can be utilized in a similar fashion to storyboards by creating a timeline for everyday postings. However, these boards are generally used to post critical information and events, and are placed in an area that is visible for anyone to read or change.

According to the *AELE Monthly Law Journal*:

> There are at least three types of work-related bulletin boards. One is provided by the employer to further the goals of the organization. It contains announcements and messages of varied content. Management authors or controls the postings.

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51 "What is a Mood Board?" Wisegeek. N.p., n.d. Web. 2 Dec. 2013. <http://www.wisegeek.com/what-is-a-mood-board.htm>.

> Another is provided by the employer as a convenience for workers. They may advertise a vehicle or other items an employee wants to sell, to solicit a carpool arrangement or share living quarters. Management typically monitors the content and removes inappropriate postings.
>
> A third kind is maintained by a union or employees' association for the use of its members. It is often controlled by a worksite steward or a designated representative. The content is informative. [52]

BUSINESS BROWN PAPER TECHNIQUE

Similar to how architects create spatial diagrams as an organization tool and to develop programmatic requirements, the business and technology industries use the 'brown paper process.' This technique is about creating a structured mapping of the new product introduction (NPI) process. It's a very similar technique to a tree diagram, but not linear in results.

> A 'brown paper' exercise, is so called as it uses a large scale format to map an existing business process, with an emphasis on being 'rough and ready' rather than a precise, neat and tidy document. Applied to the product development process, it encourages a shared understanding of the implications of new product introduction on different parts of the business and helps to generate a shared ownership of the process. It is likely that the process map will illustrate the complexity of the NPI process and demonstrate critical flows of information, key checkpoints and areas of over (or under) bureaucracy. The output is intentionally physically large, which can be daunting at first but aims to bring the process to life.

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52 Schmidt, Wayne. "Bulletin Boards."AELE Monthly Law Journal ISSN 1935-0007 (2010): 201-202. http://www.aele.org/law/2010all06/2010-06MLJ201.pdf (accessed December 6, 2011).

COMICS

Comic and storyboard artists do basically the same thing, telling stories with illustrations. "Comics are quite a bit like storyboards, both in storytelling and in art. While storyboard art isn't usually as detailed as comic art, the use of artistic elements such as contrast works equally well in both."[53]

Comics have been around since before the creation of storyboarding but only started to pick up when storyboarding was invented. According to DC Comics,

> …the comics format as we know it today is a unique art form and literary medium that originated in the U.S. in the late 1800s. Its popularity exploded in the U.S. in 1938 with the hugely popular introduction of SUPERMAN. Ironically, it has become relatively more popular in many other countries around the world, where adults and children read it avidly. At its simplest, a comic is a series of words and pictures that is presented in a sequential manner to form a narrative.[54]

DIRECTOR'S VIEW

Here is a look at what directors feel about storyboarding and how they use them.

Steven Spielberg, Amistad

I didn't storyboard Amistad. I didn't storyboard Schindler's List. But I did storyboard all of Lost World and all of Jurassic Park. The size and the logistics of the film kind of dictates what we need to share with every member of the crew.[55]

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53 Simon, Mark. Storyboards: motion in art. 3rd ed. Amsterdam: Focal Press, 2007. p. 148

54 "DC Comics." DCComics.com, The Official Site of DC Comics. N.p., n.d. Web. 6 Dec. 2011. <http://www.dccomics.com/new_to_comics/index.html>

55 Kagan, Jeremy Paul. Directors close up: interviews with directors nominated for best film by the Directors Guild of America. 2nd ed. Lanham, Md.: Scarecrow Press, 2006., p.135

Gus Van Sant, Good Will Hunting

The first film I did was completely storyboarded with like five-hundred pages of drawings, and I used that in a Hitchcockian sense. And that was a very low-budget film. We could handle all those different drawings; we could get the shots. Then when I did Drugstore Cowboy, I was faced with an eighty-person crew. I realized that just changing your shot became a huge ordeal, and I couldn't keep with the storyboard I had drawn, so I got used to shooting a scene after rehearsing it and getting the action down, choosing the first angle and then deciding what the second angle is.[56]

James L. Brooks, As Good As It Gets

I always like storyboards because if you hand them to somebody, everybody will go away and look at that, and then you can figure out what you are doing.[57]

Curtis Hanson, L.A. Confidential

I do not storyboard, unless it's a situation for a stunt in order that everybody can see exactly what the shot is and anticipate what to build for safety reasons. In terms of communicating with the cameraman, I prefer not to storyboard. Unless, for example, the shootout at the Victory Motel, I actually did a list, a shot list; it wasn't storyboarded until, again, for safety's sake, we storyboarded certain aspects of it so that the effects people could see exactly what the expectation was.[58]

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56 Kagan, Jeremy Paul. Directors close up: interviews with directors nominated for best film by the Directors Guild of America. 2nd ed. Lanham, Md.: Scarecrow Press, 2006., p. 139

57 Kagan, Jeremy Paul. Directors close up: interviews with directors nominated for best film by the Directors Guild of America. 2nd ed. Lanham, Md.: Scarecrow Press, 2006., p. 139

58 Kagan, Jeremy Paul. Directors close up: interviews with directors nominated for best film by the Directors Guild of America. 2nd ed. Lanham, Md.: Scarecrow Press, 2006., p. 140

Peter Jackson, The Lord of the Rings: the Return of the King

I storyboarded a lot of the first movie and kind of ran out of time and so we didn't have a huge amount of storyboards. I've always just done storyboard as a really cheap convenient way of having a practice of the film beforehand.

What I like to do is to start with drawings of a set, if it's a big set or even a small one, and then I like to make models of them so that you can actually get a little camera and you can have a look around…

I love painting and illustrations and when we are beginning a movie, and it doesn't really matter what the subject matter of the film is, I love starting with painting.[59]

Peter Weir, Master and Commander: The Far Side of the World

I do a lot of storyboards, particularly for this picture. I work with the storyboard artist Dan Sweetman. I also do my own little drawings. I'll go into the set on my own at night or in the morning sometimes and sort of be each character to some extent.[60]

59 Kagan, Jeremy Paul. Directors close up: interviews with directors nominated for best film by the Directors Guild of America. 2nd ed. Lanham, Md.: Scarecrow Press, 2006., p. 140-141

60 Kagan, Jeremy Paul. Directors close up: interviews with directors nominated for best film by the Directors Guild of America. 2nd ed. Lanham, Md.: Scarecrow Press, 2006. p. 219

CONCLUSION

Storyboarding has evolved to what it is today to visually communicate concepts and ideas quickly. Due to its versatility, it has maintained its relevancy and will continue to do so. While the original form that Disney developed has morphed into different tools that use a similar methodology, the essence of storyboarding remains the same.

Like any other tool, storyboarding can be used in a variety of ways by different people. It's a great tool for many different reasons including its ability to communicate ideas effectively, express atmospheric qualities, and follow a user's experience. It also has the ability to develop quick walkthrough scenario sketches to more time consuming and detailed complex components.

However, there are areas where storyboarding falls short. For example, it's not 3D or a built model, therefore a viewer cannot rotate around it. It's really good for portraying specific points of interest, but not for portraying detailed information. Another shortcoming is the limited interaction between the storyboard and the user. However, both of these shortcomings can be mitigated with the help of augmented reality, which will be discussed in a later chapter.

While storyboarding does have its shortcomings, it is still a great asset for communicating ideas visually because of its adaptability. Whatever the project, storyboarding can help visually communicate ideas. And although it may be thought of as an old tool, it's still a relevant tool.

CHAPTER 4 - COMMUNICATION

Introduction

4.1 – Evolution of Communication

4.2 – Visual vs. Verbal Communication

Conclusion

INTRODUCTION

There are multiple ways to communicate. To develop ideas and get everyone on the same page, it is essential to communicate as clearly and as simply as possible through visual and verbal communication as well as interactive and observational learning.

The saying goes, “A picture is worth a thousand words.” In the field of design, visual communication is essential to effectively communicate an idea or ideas to a client, colleague, or boss. With today’s technology and social media, visual communication is becoming increasingly important to connect with target audiences. This makes storyboarding a great option and methodology to present visual information clearly and successfully.

In order to understand why storyboarding is such an effective method of communication, this chapter will provide a little background information on communication. Specifically, this chapter will discuss the evolution of communication, compare visual and verbal communication, examine the differences between interactive and observational learning, and inspect communication at different design phases in architecture.

In the first three sections of this chapter, the discussion will involve specific research with some statistics on effective communication. The design communication section will discuss the different qualities needed from the beginning of an architectural design project all the way to the end. This will help to clarify when storyboarding could be an effective tool of communication in the design process.

4.1 – EVOLUTION OF COMMUNICATION

EVOLUTION OF COMMUNICATION

Research studies suggest that visual communication can be a more powerful tool in getting people to learn and retain information than verbal communication. Meaning, a picture really is worth a thousand words.

> All animal species have perfected a system of communication, but humans are the only species capable of spoken language. Effective communication is essential for a variety of reasons. It serves to inform, motivate, establish authority and control, and allows for emotive expression. For humans in particular, communication is also vital for creating a sense of social cohesion. Just as mankind has evolved over the centuries, our means of communication have followed suit. What began as primitive cave paintings and signed language has morphed into an endless variety of ways to express oneself to other humans.[6]

With social media, communication today has changed dramatically. Facebook and Twitter are some of the most popular forms of communication. These social giants are not only changing the way people communicate, but also the social norm for communication. People communicate using short and to the point messages rather than long verbose letters.

Today, using social media means being quick and to-the-point; this is also the case when using visual communication. The direction of visual communication correlates with society's increasingly fast pace due to advancements in technology and social media. Often, vast amounts of information are simplified to a couple of pictures. Gone are the days of long-winded

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6 "History of Communication From Cave Drawings To The Web." Retail Displays - POP Merchandise Displays | Creative Displays Now. Web. 7 Mar. 2013. <http://www.creativedisplaysnow.com/articles/history-of-communication-from-cave-drawings-to-the-web.htm>.

messages with mostly text; like social media communication, visual communication is headed towards a more efficient and to-the-point method.

One technology that has vastly changed communication is instant messaging. While it may seem like ages since we began using instant messaging, it hasn't even been two decades. Since its inception, this quick form of communication has become a necessity. However, before today's short and quick instant messages using the internet, phones, and tablets, how did we communicate? In this section, I will go back through the ages to compare communication then to how we communicate now.

Cave paintings

The earliest form of communication was cave paintings. The earliest documented cave paintings are in the Chauvet Cave which dates back to 30000 BC.

> The method involved creating pigments made from the juice of fruits and berries, colored minerals, or animal blood. These pigments were then used to create depictions of primitive life on the cave walls. The purpose of the paintings has been questioned by scholars for years, but the most popular theory states that the depictions were used as a manual for instructing others what animals were safe to eat.[7]

Petroglyphs

After cave paintings came petroglyphs, which are carvings into rock. The first petroglyphs

7 "History of Communication From Cave Drawings To The Web." Retail Displays - POP Merchandise Displays | Creative Displays Now. Web. 7 Mar. 2013. <http://www.creativedisplaysnow.com/articles/history-of-communication-from-cave-drawings-to-the-web.htm>.

are dated around 10000 BC, about 20,000 years after cave paintings. During that gap, there were other forms of communication like woodcarvings, tattoos, and arranged stones. However, the existence of these other forms is only speculative and based on the limited histories in Africa and Oceania that have survived.

Pictograms

Pictograms were the next form of communication. The difference between petroglyphs and pictograms is that petroglyphs only depicted a single event while a pictogram depicts a series of events and can be used to show their chronological order. Pictograms have been dated around 9000 BC and were used by various ancient cultures all over the world. It is also the form of communication that led the way to cuneiform script, which is the earliest form of written expression.

Ideogram

A more comprehensive form of the pictogram is the ideogram. An ideogram represents an idea by using visual and graphic symbols. It is the source of many logographic writing systems which include Chinese script.

Alphabet

The first alphabet system was developed by the Egyptians around 2700 BC using 22 hieroglyphs. These hieroglyphs were used for the pronunciation of logograms as well as to record names and grammatical intonations. The Egyptian script helped other civilizations develop their alphabetical systems including Hebrew, Latin, and Arabic.

Printing press

In 1448, Johann Gutenberg, a German inventor, developed the first printing press using movable pre-printed text blocks. He greatly reduced the price of books and made way for mass production.

Letter writing and the postman

While letter writing has been around for centuries, before 1775, it was an inefficient means of communication. In order for a letter to be sent, one would have to wait for another person to travel. Recognizing the need for more regular mail service as the United States population grew and expanded its territory, Benjamin Franklin founded the first post office in 1775 and had mail transported on a regular schedule by train.

Telecommunication

Before the telephone was invented, the optical telegraph system was used to communicate over long distances through line-of-sight signals. These were conveyed by moving mechanical blades on towers into different positions. This idea was developed and put into practice in the 1770s.

After the optical telegraph came the electric telegraph, which was able to transfer information through wires over longer distances. The messages sent over these wires were in binary code. Electric telegraphs were developed in the 1830s and were first used on the Great Western Railway in Britain.

Also invented during this time was the Morse telegraph. Samuel Morse, with the help of his assistant Alfred Vail, developed another electric telegraph that communicated using the Morse code signals.

Telephone

In 1876, Alexander Bell developed the first telephone. He ascertained the idea by observing how sound vibrations could transmit through the air and how sound could then be transmitted through wires by duplicating the wave length in a continuous current. Upon its invention, like many technologies now, the telephone was too expensive at the time for many families to invest in one.

Radio

In the 1900s, starting off as a shortwave communication method for the military in WWI, the radio developed into a whole new form of communication and entertainment. It quickly became popular and helped push the development of technology so quickly that within months, new radios were already obsolete. When the Great Depression hit, other forms of entertainment were too expensive whereas the radio wasn't.

Photography

Photography is a way for individuals to keep memories, hold a place in history, and communicate ideas. Its development began in the early 1800s with a negative process of capturing images, which created black and white images. It wasn't until the early 1940s that color was brought into photography. Unlike other forms of communication, photography can be subjective to each individual.

Television

In 1939, during the New York World's Fair, the television first appeared. However, it wasn't up to people's standards and the radio remained the preferred choice of communication. It wasn't until the late 1940s that televisions started to become the favored amenity. However, it took several years for high prices to drop and become affordable, at which point televisions became an essential item that every family wanted. Televisions changed everyday life and they have become an indispensable tool for communicating, learning, and entertainment.

Cell phones

During the 37 years that the cell phone industry has been in existence, it has grown from a $3 million industry to a $30 billion industry. The first handheld portable device was invented by Dr. Martin Cooper in 1973 and released to the public four years later. Cell phones allow everyone from senior citizens to elementary school students to communicate easily. They have changed the dynamics of social communication as one can easily talk to another person on the go without having to be connected to a landline.

Internet

The internet, like many technologies, was invented with the intention of military purposes. It was developed in 1967 as was way to link a group of computers together and share information. Email and websites were the key components until corporations started to use this tool for communication and collaboration purposes. Today, the internet is available to everyone and is the preferred tool of communication. While the television is still a good source of entertainment, the internet allows the user to retrieve specific information instantly for socializing, research, and more.

Social media and blogging

Technology has become a part of our daily routine and necessary to function in today's fast-paced world. In fact, many people feel that they cannot live without social media and blogs. Such websites are designed to create high levels of interaction between users, to be readily available, and to be user generated. In today's society, promoting yourself or promoting your company on the web is essential for growth and development; "having a web presence is vital in today's society and economy."[8] However, one must always use caution when engaging in social media and blogging because while they can create relationships, they can also destroy them.

8 "History of Communication From Cave Drawings To The Web." Retail Displays - POP Merchandise Displays | Creative Displays Now. Web. 7 Mar. 2013. <http://www.creativedisplaysnow.com/articles/history-of-communication-from-cave-drawings-to-the-web.htm>.

4.2 – VISUAL VS. VERBAL COMMUNICATION

VISUAL VS. VERBAL COMMUNICATION

Visual imagery is all around us – when we watch television, see a bus advertisement, peruse magazines, view charts, and read books. We use visual communication to tell stories, send messages, describe and teach difficult information, and engage in personal and emotional experiences. "Even though verbal communication, the ability to communicate messages through language, is often viewed as a more important or a more central type of communication, visual communication has many benefits and advantages in both personal and professional situations."[9]

While verbal communication has often been viewed as a better communication method, in today's visually stimulated society, visual communication is becoming the predominant form of effective communication. Paul Martin Lester notes, "Something is happening. We are becoming a visually mediated society. For many, understanding the world is being accomplished, not through words, but by reading images."

Visual communication is becoming a tool that helps with many things from presentations to marketing to "develop[ing] a social and cultural identity."[10] Evidence suggests that people who communicate with visuals are more effective than those who just use verbal communication. "Pictures have a direct route to long-term memory, each image storing its own information as a coherent 'chunk' or concept"[11]

Often, verbal communication can become too verbose and confusing. Whether it's to communicate complex information or a simple concept, visual communication is often

9 Switzer, Christine. "What Are The Benefits Of Visual Communication Over Verbal?." LIVESTRONG.COM - Lose Weight & Get Fit with Diet, Nutrition & Fitness Tools | LIVESTRONG.COM. Web. 7 Mar. 2013. <http://www.livestrong.com/article/157920-what-are-the-benefits-of-visual-communication-over-verbal/#ixzz2MWl5jIw3>.

10 Hewlett-Packard Development Company, LP. "The Power of Visual Communication." 2004. PDF File

11 "The Use and Capture of Images for Computer-Based Learning II - Section 1." AGOCG - Index. Web. 7 Mar. 2013. <http://www.agocg.ac.uk/reports/graphics/c apture2/sect1.htm>.

quicker than communicating verbally. "The immediacy of visual communication also allows for easy visual comparison of two or more items and the illustration of a new product line or business development."[12]

Another advantage to visual communication is the ability to relay information in a simplified way. A good example is a quote on Livestrong.com, which says "if you seek to give driving directions to a friend, you may find it easier and even quicker to draw a visual map."[13]

Visual communication can also reach a wide range of audiences globally and culturally. With visual communication, a company or individual can relay the same message throughout the world with the flexibility to adapt to different cultures instantly using a visual language that is familiar worldwide. Think of Coke as an example. The Coke logo is universally known and their marketing strategies often include stimulating visuals of human interaction/connection.

While visual communication helps communicate ideas more effectively, it's still important to communicate verbally. Not surprisingly, the most effective way to get audiences to remember the content of a presentation or demonstration is to use both visual and verbal communication. According to a study by New York University psychologist Jerome Bruner, "people only remember 10% of what they hear and 20% of what they read, but about 80% of what they see and do."[14]

Effective communication using visuals helps an audience remember and process what is being presented. That is why many training materials use visual information. It has also been

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12 Switzer, Christine. "What Are The Benefits Of Visual Communication Over Verbal?." LIVESTRONG.COM - Lose Weight & Get Fit with Diet, Nutrition & Fitness Tools | LIVESTRONG.COM. Web. 7 Mar. 2013. <http://www.livestrong.com/article/157920-what-are-the-benefits-of-visual-communication-over-verbal/#ixzz2MWl5jIw3>.

13 Switzer, Christine. "What Are The Benefits Of Visual Communication Over Verbal?." LIVESTRONG.COM - Lose Weight & Get Fit with Diet, Nutrition & Fitness Tools | LIVESTRONG.COM. Web. 7 Mar. 2013. <http://www.livestrong.com/article/157920-what-are-the-benefits-of-visual-communication-over-verbal/#ixzz2MWl5jIw3>.

14 Lester, Paul. "Syntactic Theory of Visual Communication." Syntactic Theory of Visual Communication. Web. 7 Mar. 2013. <commfaculty.fullerton.edu/lester/writings/viscomtheory.html>.

suggested by educational researchers that “83% of human learning occurs visually.”[15]

Visual communication is definitely a very powerful and invaluable tool when it comes to expressing an idea, presenting to an audience, and overall effective communication. From watching television to viewing the internet, visual communications is everywhere. However, as mentioned, the best method to achieve the retention of information is to present both visually and verbally.

15 “Presenting Effective Presentations with Visual Aids.” Occupational Safety and Health Administration - Home. Web. 7 Mar. 2013. <http://www.osha.gov/doc/outreachtraining/htmlfiles/traintec.html>.

CONCLUSION

Effective communication in any profession is essential to convey an idea to a group of people. When presenting or pitching an idea, there are three main things to consider: how to clearly state the idea, how to make the receiver understand the idea, and how to ensure that the presented information is retained. One method that covers all three bases is storyboarding.

Storyboarding engages the user (the person using the storyboarding process) in both visual and verbal communication along with occasional hands-on work posting visuals on a wall. This creates the perfect scenario for effective communication. As mentioned in this chapter, there are pros and cons to both visual and verbal communication and interactive and observational learning. The best solution often involves using both visual and verbal communication with interactive learning.

However, storyboarding's minimal interactive capabilities and inability to display large quantities of detailed information prevents it from being the only tool needed for effective communication. Pairing storyboarding and augmented reality creates the basis for effective and clear communication. One can use this combined (storyboard and augmented reality) method throughout the entire design process from the conceptual design phase to the construction phase.

Communication has come a long way from the caveman era and it is well known that effective communication is the key to a successful project in any work environment. Through studies on communication, we also know that the most effective communication combines our visual, verbal, and tactile senses.

CHAPTER 5 - TECHNOLOGY

Introduction

5.1 – Evolution in Technology

5.2 – Learning and communicating with Technology

Conclusion

INTRODUCTION

It is astonishing to reflect on how quickly our daily lives have been affected by the rapid advancement of technology. For example, evolving technologies have allowed us to change the way we communicate, from 'snail mail' to email and now to text messaging. It has also helped to reshape the built environment through technologies such as flat screens, interactive direction kiosks, and traffic lights. Meanwhile, every new generation is becoming more and more proficient with the use of new and upcoming technologies.

As mentioned in Chapter 4, storyboarding is an effective way to communicate clearly in certain design project phases. However, there are some design phases where storyboarding is not the best choice, for instance, the documentation phases which require very specific, detail-oriented information. The ever-advancing world of technology is the perfect place to look to find a means to overcome this shortcoming.

Many software programs and hardware technologies have been implemented in the design field to make workflows more efficient. Software programs like the Adobe Creative Suite and Autodesk have helped the building, entertainment, and other design-oriented professions. This again poses the question of "Why use storyboarding if new technologies are being produced?"

While new technologies are consistently being developed, storyboarding is still relevant for visual information. Nowadays, technologies and software programs like CAD, 3D Max, Maya, and Revit can show a lot of information. However, sometimes the information can become too overwhelming when presented whereas storyboarding can help direct viewers through specific information. Storyboarding is by no means a perfect tool that can show everything that the architecture profession needs. However, storyboarding's shortcomings can be filled with the use of technology.

This chapter will discuss technology on a broad spectrum. Like the prior communication chapter, this chapter will provide a basic understanding and examine the way we currently use technology. Though this process, augmented reality emerges as a technology that shows great potential to be part of an integrative design process with storyboarding.

5.1 – EVOLUTION IN TECHNOLOGY

EVOLUTION OF TECHNOLOGY

Digital technology has become absolutely necessary to function in today's society. Every business uses some form of technology to stay relevant within its respective industry, keep clients, and promote growth. If we take a step back to look at how technology has evolved, we can see how society much has changed due to these technological advancements.

The Bronze Age

The Bronze Age, named for the practice of making metal weapons from copper and tin, dates from 3300 BC to 1200 BC. It was during this time that civilization started to merge and spread to Asia, Europe, and Africa. Several advancements in technology during that time include agricultural innovations, the chariot, uses of salt, the construction of permanent settlements, and the domestication of animals.[6]

The Iron Age

The Iron Age marked the start of the Roman Empire and dates from 1200 BC to 500 BC. During this time, people started to migrate to farther on all of the continents where iron was becoming popular. Several advancements in technology during that time include glass, sundials, architecture, education, ships, and advances in trade.[7]

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6 Hassan, Tauqeer. "Short History of Technology." ezinearticles. Web. 7 Mar. 2013. <ezinearticles.com/?Short-History-of-Technology&id=4135881>.

7 Hassan, Tauqeer. "Short History of Technology." ezinearticles. Web. 7 Mar. 2013. <ezinearticles.com/?Short-History-of-Technology&id=4135881>.

Age of Ancient Civilizations

Also known as the Golden Age by many scholars for its many technological advancements, this age lasted from 500 BC to 500 AD. Technological advancements of that time include city planning, education, sanitation, paper, math, architecture, bridges, the magnetic compass, religion, aqueducts, road building, law and government, art, concrete, and philosophy.[8]

The Middle Ages

The Middle Ages lasted from 500 AD to around 1500 in Europe. It began when the western Roman Empire collapsed and ended to usher in the Renaissance. Innovations such as the windmill, spectacles, and the mechanical clock were some of the technological advancements of this era.

The Renaissance

The Renaissance, also known as the Age of Discovery, spanned the 14th century to the 16th century. During this time, many schools and universities were developed for disciplines like architecture, medicine, and philosophy. It was an age of cultural movement where some of the technological advancements transpired in education.

Age of Exploration

Also known as the Age of Discovery, this period started in the 1400s and ended in the 1600s. During this time, exploration and trade opened up a new worldview including eastern and western civilizations. Most of the technological advancements during this time dealt with explo-

8 Hassan, Tauqeer. "Short History of Technology." ezinearticles. Web. 7 Mar. 2013. <ezinearticles.com/?Short-History-of-Technology&id=4135881>.

ration tools such as navigation, cartography, and shipping.

The Industrial Revolution

The Industrial Revolution lasted from the 18th to the 19th century and began in Britain. It was during this period that daily life changed from doing everything by hand to production with machinery. The Industrial Revolution also saw the invention of the steam engine, which paved the way to inventions like steamboats and railways, which made for easier transportation.

The 19th and 20th centuries

Due to the innovations from previous ages, during the 19th and 20th centuries, there were enormous technological advancements. In the 19th century, advances in medicine, science, and exploration were made while in the 20th century, advances in mass media, telecommunication, and information technology changed everyone's daily lives. Inventions that have occurred over the last 200 years include the television, the radio, the telephone, automobiles, computers, the internet, modern medicine, airplanes, photography, nuclear power, and spacecraft.[9]

Advances in technology continue to affect our daily lives. Not too long ago, people had clunky, brick-like cell phones. These have been replaced by small, slick smartphones that not only make calls but also provide entertainment and allow people to work while mobile. With technology, a great deal has changed in the way we communicate. We can now communicate around the world in real time, interact with others more effectively, and maintain relationships more easily.

9 Hassan, Tauqeer. "Short History of Technology." ezinearticles. Web. 7 Mar. 2013. <ezinearticles.com/?Short-History-of-Technology&id=4135881>.

5.2 – LEARNING AND COMMUNICATING WITH TECHNOLOGY

LEARNING WITH TECHNOLOGY

Today, technology is like an extension of one's self. It is a necessary tool for communication, learning, and entertainment. Due to its rapid advancements, technology has quickly integrated into our daily routines while changing the dynamics of communication and learning in both the workplace and educational environments.

In the workplace, technology is being used to please both clients and employees by creating a comfortable and productive environment. It is an essential tool for a company to grow as it helps with staff retention and motivation, and enables flexible work solutions. Smarter Interactive, an audio visual integration company, discovered, "an overwhelming demand for consultancy on how to improve the delivery of workplace training in a survey they conducted at the annual Learning Technologies conference and exhibition in London."[10]

Gone are the days where classroom training was the only option for teaching employees new skills. Now, there are more interactive and blended learning opportunities. "Another term for 'blended learning' is 'hybrid learning' and this term is commonly found in formal education. But in each case, the term is now defined more broadly as to mean delivering learning using a variety of different media, formats and approaches."[11] A traditional workplace or classroom environment with physical demonstrations and training sessions is time consuming and costly. Tech-

10 Maio, Emma . "Smarter Interactive discover demand for improved workplace training at the annual Learning Technologies conference." Press Release & News Distribution | Cision Wire. Web. 7 Mar. 2013. <http://news.cision.com/smarter-interactive/r/smarter-interactive-discover-demand-for-improved-workplace-training-at-the-annual-learning-technolog,c9367804>.

11 "1: An introduction to workplace learning (part 1)" Centre for Learning & Performance Technologies. Web. 7 Mar. 2013. <http://c4lpt.co.uk/social-learning-handbook/an-introduction-to-workplace-learning/>.

nologies like “3D projectors and motion capture technology are becoming more widely accessible and can bring simulations and demonstrations to life by making them interactive and accessible to the entire class.”[12]

12 Williams, Troy. “To empower students, let’s bring interactive learning tools into the classroom.” VentureBeat Tech. People. Money. Web. 7 Mar. 2013. <http://venturebeat.com/2012/10/30/interactive-learning/>.

CONCLUSION

Technology once dreamed about (e.g. smartphones and tablets) is now reality, and people can do so much more than make basic phone calls on their phones including texting, blogging, engaging in social media, and playing games.

Technology is a part of our daily lives and it is affecting the way each profession practices. While technology often improves productivity, organization, and communication, it can sometimes become overwhelming, pose communication problems, or crash and result in lost work. Besides the occasional crash and other problems that can be mitigated through several solutions, technology continues to make its mark on the built environment and our daily lives.

As mentioned earlier, storyboarding is a great visual communication tool. However, it has a few shortcomings which can be overcome with technology, specifically augmented reality. Augmented reality can convey the detailed information necessary in the architectural design process.

Today, there are so many different hardware and software options to choose from that many times it comes down to preference. For this thesis, augmented reality and the types of programs that were used were chosen after a comparison with similar programs. No matter what type of technology is currently out in the market, one thing is certain: new technology will continue to be developed and integrated into our daily tasks and the built environment that affects our everyday lives.

CHAPTER 6 - AUGMENTED REALITY

Introduction

6.1 – What is Augmented Reality?

6.2 – How has Augmented been currently implemented?

6.3 – Other Thesis projects on Augmented Reality?

Conclusion

INTRODUCTION

Augmented reality has the ability improve and change our lives, the built environment, and the way we see the real world. Recognizing its potential, companies like Google, Yelp, and Nike have invested in developing products and marketing ads with this technology.

While this technology is not yet widely used, its growth and popularity is undeniable with an increase in the marketing ads using it as well as the much anticipated Google Glass. Unfortunately, I neither had the funds nor the resources to procure a pair for this thesis. However, looking at augmented reality's ability to superimpose digital graphics to create a composite view of the real world and the digital world sparked my idea to pair it with storyboarding.

As mentioned in Chapter 5: Technology, augmented reality shows great potential to be part of an integrative design process with storyboarding. With augmented reality's unique capabilities, it can mitigate the shortcoming of storyboarding. However, like many technologies, the strengths of augmented reality can become muted with vast amounts of information. This is where the pairing with storyboarding can help. In essence, both these tools help to balance each other out.

However, to understand the extent of the potential of augmented reality, this chapter will focus on how it's currently used and who currently uses it. This will help to identify when augmented reality should be used in conjunction with storyboarding. Augmented reality will also help to lead the storyboarding process in a new direction that fosters its relativity in the 21st century.

6.1 – WHAT IS AUGMENTED REALITY?

WHAT IS AUGMENTED REALITY?

Augmented reality (AR) is just starting to make its way in terms of becoming widely used. While it's a fairly new technology to the general public, it was actually conceived in the early 1960s. However, at the time, it was not possible to process the necessary data or graphics. Therefore, it was an impractical technology. That is until now. Today, the general public has many types of technology that can utilize AR available to them. Smartphones, tablets, and wearable technologies like Google Glass now have the capacity to process the data that AR technology utilizes from digital storage through wireless connections.

Because it's still relatively new, prices for AR technology are on the high side. However, as there are now many new apps (many of them free) for smartphones and tablets that use AR technology, tech companies like Nvidia and Qualcomm are developing more technology that incorporates AR. Therefore, as more tech products and apps are developed with AR, the prices should come down making this technology even more readily accessible and popular.

DEFINITION

According to Merriam-webster.com, augmented reality is: "An enhanced version of reality created by the use of technology to overlay digital information on an image of something being viewed through a device (such as a smartphone camera); also: the technology used to create augmented reality."[6]

While the concept of AR is not new, the term 'augmented reality' wasn't coined until Boe-

6 "augmented reality." Merriam-Webster. Merriam-Webster, n.d. Web. 2 Dec. 2013. <http://www.merriam-webster.com/dictionary/augmented%20reality>.

ing researcher Tom Caudell used it in 1990. However, it was used before it had a name. During its infancy, one could see it on televised sporting games. As mentioned in an article on digitaltrends.com by Dena Cassellaa, one could see AR—"virtual graphics being superimposed upon a real-life situation"—in things like the "yellow first-down lines sketched over a televised football game to the movie 'Who Framed Roger Rabbit.'"[7] In the football game example, "the real-world elements are the football field and players, and the virtual element is the yellow line, which augments the image in real time."[8]

Some may wonder what the difference is between augmented reality and virtual reality. After all, wouldn't "a real-time direct or indirect view of a physical real-world environment that had been enhanced/augmented by adding virtual computer-generated information to it"[9] be considered a form of virtual reality? The quick answer is both yes and no. While augmented reality uses virtual data to superimpose information on the real world, another term is used for the virtual environment. 'Augmented virtuality' is the term used when the data comprises a mostly-virtual environment where people are integrated into the virtual world, like webcam chats and videogames. This can be best explained by Milgram's Reality-Virtuality Continuum which is "a continuum that spans between the real environment and the virtual environment with Augmented Reality and Augmented Virtuality (AV) in between, where AR is closer to the real world and AV is closer to a pure virtual environment."[10] Another way of thinking about this is that AR consists of reality with some virtual data in it while AV is the virtual world that has some reality in it (refer to image on next page).[11]

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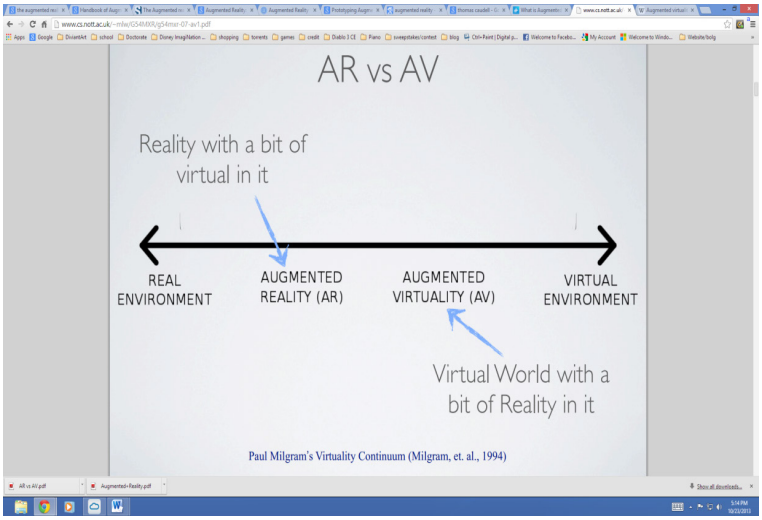
7 Cassella, Dena. "What is Augmented Reality (AR): Augmented Reality Defined, iPhone Augmented Reality Apps and Games and More." Digital Trends. N.p., n.d. Web. 2 Dec. 2013. <http://www.digitaltrends.com/mobile/what-is-augmented-reality-iphone-apps-games-flash-yelp-android-ar-software-and-more/>.

8 22. Kent, James. Augmented reality: the Augmented reality handbook - everything you need to know about Augmented reality. S.i: Kent James, 2011. Print.2

9 Furht, Borko. Handbook of Augmented Reality. 1. ed. New York, NY: Springer New York, 2011. Print. pp3

10 Furht, Borko. Handbook of Augmented Reality. 1. ed. New York, NY: Springer New York, 2011. Print., pp.3

11 Wilson, Max. "Augmented Vitality." 2012. PDF File



WHY USE AUGMENTED REALITY?

There are endless possibilities with AR. Currently, the most prominent uses of AR are in the entertainment, gaming, marketing, and education industries. The ability to superimpose more information than what is already there is a great feature. For example, a billboard ad would normally have an intriguing picture or a couple of words to draw attention. Rarely is the ad filled with detailed information about what it is promoting. Normally, someone viewing the ad would have to remember what they saw to look it up for more information. However, with augmented reality all of that information could be provided immediately along with the billboard ad's image.

For this thesis, augmented reality seemed like the perfect tool to partner with storyboarding. It has the capability to provide immediate information without having to clutter an image with a lot of text or other information that doesn't need to be presented right away. For storyboarding, a tool that consists mainly of images, augmented reality can bring another level of information that wasn't possible before.

While combining AR and storyboarding seemed like an ideal scenario, I knew I needed to

learn what had been done before by examining how AR has been and is currently used. Doing so provided guidance regarding my approach to developing a design process utilizing storyboarding and AR. The following section discusses AR uses.

6.2 – HOW HAS AUGMENTED REALITY BEEN IMPLEMENTED IN EVERYDAY LIFE?

WHO CURRENTLY USES AUGMENTED REALITY?

The AR concept has been around for more than 50 years. However, only within the last five years have we had the technology to implement AR through smartphones, tablets, and soon Google Glass. Therefore, technologically, AR is in its infancy and developers are still getting a grasp on the technology's capabilities. According to an article on the PRLog.org website, early uses of AR "often looked gimmicky or promotional."[12] However, with time and as technology continues to improve, so will the appearance and fluidity of the technology until it is integrated seamlessly into our daily lives.

As it continues to evolve, I am sure that AR will affect a lot more professional areas than those listed in this chapter. Currently, the majority of AR applications for smartphones are games or location map based applications. However, numerous companies have begun using the technology to market their products. There are many different applications on the market, but below are a few examples of how developers are using AR.

Education

Augmented reality is a great tool used for communicating ideas visually, but it can also help with teaching and learning. In Germany, a company called Morphoria developed a magazine that bridges "the gap between the worlds of the deaf and the hearing."[13] The magazine is dedi-

12 "Top Rated Augmented Reality companies." Free Press Release Distribution Service. N.p., n.d. Web. 3 Dec. 2013. <http://www.prlog.org/12179623-top-rated-augmented-reality-companies.html>.

13 Bilton, Ricardo . "VentureBeat | News About Tech, Money and Innovation." VentureBeat. N.p., n.d. Web. 3 Dec. 2013. <http://venturebeat.com/2013/09/10/deaf-magazine-uses-augmented-reality-to-teach-readers-sign-language/>.

cated to the German sign language culture and community. Its uses augmented reality to allow readers to learn more than what is printed on the pages of the magazine, thus adding a layer of information and interactivity.

According to an article written by Ricardo Bilton, "As the team points out, this works both ways: Not only can the deaf learn new words in sign, but the magazine can also help teach those who don't understand sign at all how to speak it. As far as applications of augmented reality go, this one is particularly good because it takes something static (a magazine page) and creates a better learning experiencing by animating it."[14]

Deaf Magazine by Morphoria[15]

14 Bilton, Ricardo . "VentureBeat | News About Tech, Money and Innovation." VentureBeat. N.p., n.d. Web. 3 Dec. 2013. <http://venturebeat.com/2013/09/10/deaf-magazine-uses-augmented-reality-to-teach-readers-sign-language/>.

15 Walker, Daniela. "LS:N Global." LS:N Global. N.p., 11 Sept. 2013. Web. 12 Nov. 2013. <https://www.lsnglobal.com/seed/view/8171>.

Another unique approach to learning with AR comes from the company Daqri. Their Elements 4D Interactive Blocks, which was a successfully funded Kickstarter project, is about learning the periodic table. Their idea is to teach people about elements through designed wooden blocks that interact with Daqri's app. Taken straight from their Kickstarter site, they state, "Each block face depicts a different chemical symbol, representing the elements of the periodic table. Beaming the app's viewfinder onto the blocks instantly transforms them into 4D representations of that element, like magic!"

"Elements 4D Interactive Blocks."[16]

Gaming

As computing power within both mobile devices and computers continues to improve, the gaming industry is at the forefront of implementing augmented reality. One of the first AR

16 "Elements 4D Interactive Blocks." Kickstarter. N.p., n.d. Web. 12 Nov. 2013. <http://www.kickstarter.com/projects/daqri/elements-4d-interactive-blocks>.

games to come out is from the company Metaio. This game is a first person shooter game that superimposes zombies on a mobile device.

Zombie Game by Metaio [17]

Ogmento, founded in 2009, is a company that specializes in developing augmented reality games. They are spearheading the video game industry's move to create the next generation of games played in the real world. According to an article on newtech.about.com, "Ogmento, an augmented reality game developer recently received $3.5 million of institutional funding to develop gaming applications for the iPhone and Android devices."[18]

Medical

One of the most talked about uses for augmented reality is in the medical field. Augmented reality allows medical students to practice surgery procedures in controlled lifelike environments. AR also allows students to see what professors are explaining such as complex medical

17 "Shootez du zombie en réalité augmentée « Korben Korben." Korben RSS. N.p., n.d. Web. 13 Nov. 2013. <http://korben.info/shootez-du-zombie-en-realite-augmentee.html>.

18 Perdue, Tim . "Applications of Augmented Reality." About.com New Tech. N.p., n.d. Web. 3 Dec. 2013. <http://newtech.about.com/od/softwaredevelopment/a/Applications-Of-Augmented-Reality_2.htm>.

conditions and the anatomy of a patient. Through practice and implementation, augmented reality can help reduce operation risks.

Neurosurgery is at the forefront when it comes to surgical applications of augmented reality. The ability to image the brain in 3D on top of the patient's actual anatomy is very powerful for the surgeon. Since the brain is somewhat fixed compared to other parts of the body, the registration of exact coordinates can be achieved. Concern still exists surrounding the movement of tissue during surgery. This can affect the exact positioning required for augmented reality to work.[19]

Augmented Reality Medical Education [20]

Military

In the military, there are two devices that are currently worn, the Heads-Up Display (HUD) and the Head-Mounted Display (HMD). The HUD is used mainly by fighter pilots as it is a trans-

19 Perdue, Tim . "Applications of Augmented Reality." About.com New Tech. N.p., n.d. Web. 3 Dec. 2013. <http://newtech.about.com/od/softwaredevelopment/a/Applications-Of-Augmented-Reality_2.htm>.

20 "Augmented Reality Medical Education & Live Event Case Study: "BRING IN THE BRAIN"." Marxent Labs. N.p., n.d. Web. 13 Nov. 2013. <http://www.marxentlabs.com/case-study/medical-augmented-reality-science-education-case-study-focus-live-events-bring-in-the-brain/>.

parent display positioned in front of their eyes. This display shows the pilot data that includes altitude, airspeed, the horizon line, and other pertinent information. "The term 'heads-up' comes from the fact that the pilot doesn't have to look down at the aircraft's instrumentation to get the data they need."[21] While the HUD is used by pilots, the HMD is used by ground troops. The HMD is helpful with training simulations, displaying enemy locations versus friendlies and target objectives. Therefore, AR can contribute to the safety and survival of men and women who serve their country.

Heads-Up Display [22]

21 Perdue, Tim . "Applications of Augmented Reality." About.com New Tech. N.p., n.d. Web. 3 Dec. 2013. <http://newtech.about.com/od/softwaredevelopment/a/Applications-Of-Augmented-Reality_2.htm>.

22 "First Production HMDS Orders for F-35 Pilots - Militer Review." N.p., n.d. Web. 13 Nov. 2013. <http://pena-abad.blogspot.com/2009/06/first-production-hmds-orders-for-f-35.html>.

2. The ExpeditionDI simulation system can be used in groups with wireless connectivity, allowing coordinated exercises.

"Simulator Assists Infantry Training.with Head-Mounted Display[23]

Marketing

In marketing, there has been a surge of augmented reality usage. The music, game, fashion, food, and even architecture industries have used augmented reality to promote their products. Often, AR is used in conjunction with magazines or billboards so that the image can catch a person's attention. Then, if that person is really interested, he or she can get additional information about the image using the AR app.

One of the more popular companies using AR in its marketing is Layar. This company uses a browser application for mobile devices to show both the real world around you while displaying the marketed information on your device. It also has the ability to use the GPS feature on a device to determine what data to display on someone's mobile screen. For example, it's similar to Yelp's app and use of augmented reality, which allows the viewer to see restaurants nearby according to one's location.

23 "Simulator Assists Infantry Training." N.p., n.d. Web. 13 Nov. 2013. <http://defenseelectronicsmag.com/products/simulator-assists-infantry-training>.

Layar Creator [24]

Numerous methods have been used to market products, but one movie used its popularity to campaign with augmented reality. Avatar, a movie directed by James Cameron,

> …blurred the lines between reality and animation. The promotion and advertising campaign pushed augmented reality like never before. Avatar toys manufactured by Mattel include a card that can be read by a webcam. The result is an augmented reality robot or character that comes to life on your computer screen. The technology which was developed by Total Immersion also includes interactivity by adding a button to the cards. Pressing the buttons causes the on-screen character to shoot a gun or even recite part of the script.[25]

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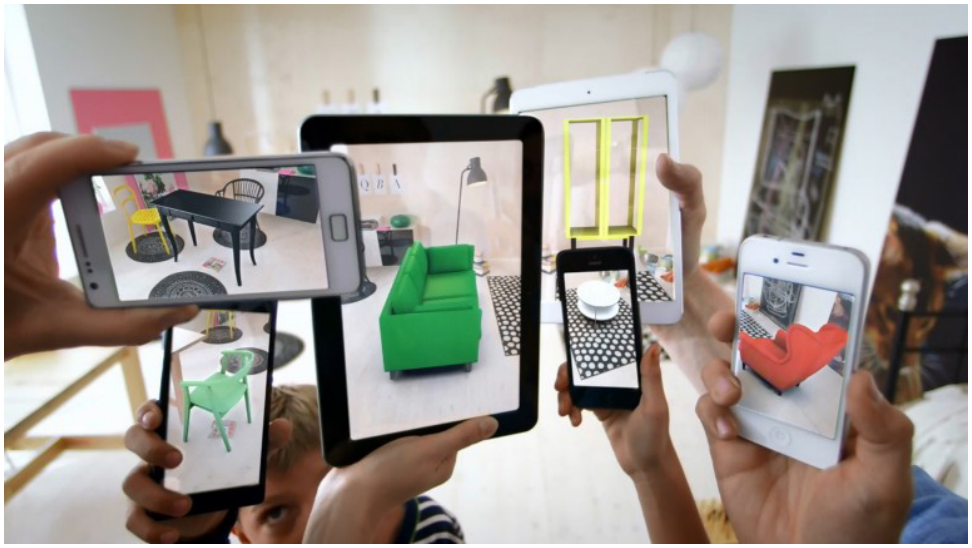
24 "Layar Creator sees an interactive future for print media via augmented reality (video) Mobile." Engadget. N.p., n.d. Web. 13 Nov. 2013. <http://www.engadget.com/2012/06/05/layar-creator-printed-media-augmented-reality/>.

25 Perdue, Tim . "Applications of Augmented Reality." About.com New Tech. N.p., n.d. Web. 3 Dec. 2013. <http://newtech.about.com/od/softwaredevelopment/a/Applications-Of-Augmented-Reality_2.htm>.

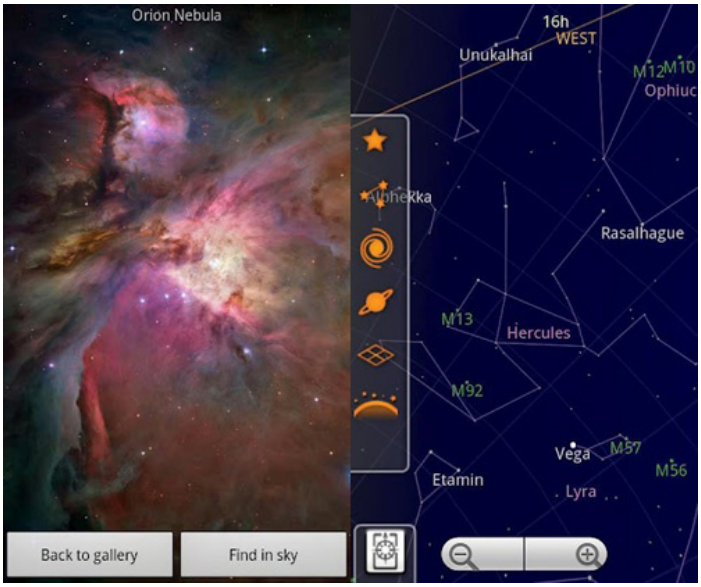
Avatar AR Toy [26]

26 "the GLOBAL SOCIAL MEDIA CASE STUDY DATABASE." My Buzz Depot. N.p., n.d. Web. 13 Nov. 2013. <http://mybuzzdepot.com/CaseDetails/CaseDetails?id=Mattel-AvatarARToys_5b26532b-9a73-413c-a640-05fc6da2b102>.

Other Companies that have used AR apps:



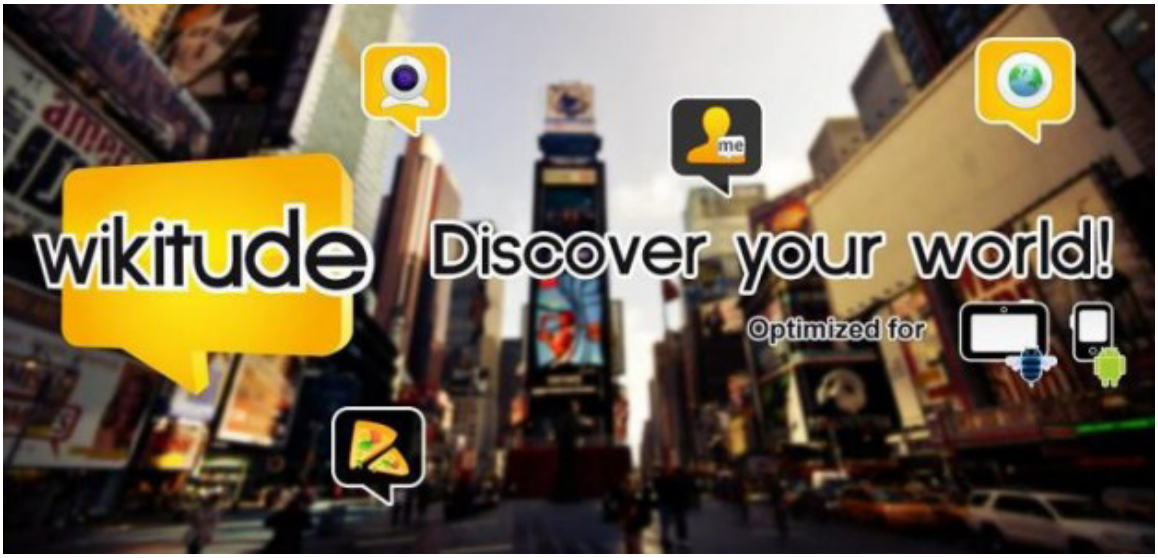
IKEA [27]



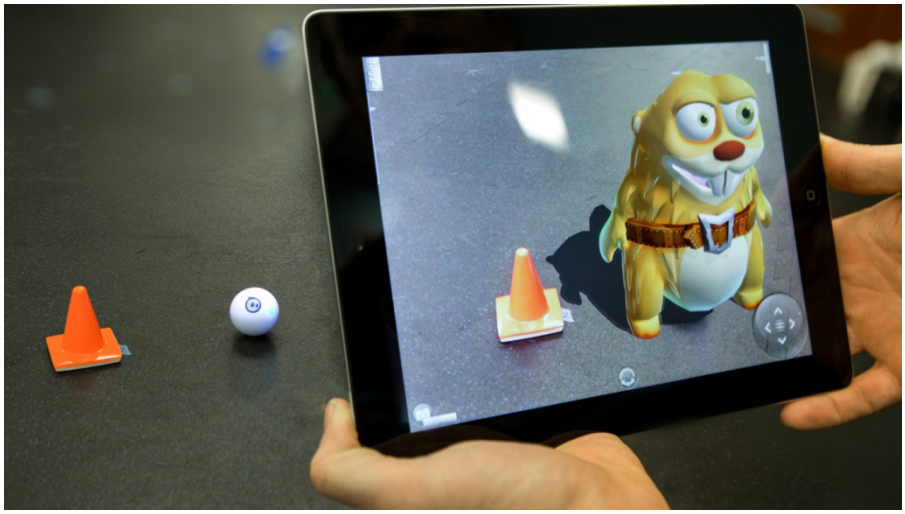
Google Sky Map[28]

27 "IKEA catalog uses augmented reality to give a virtual preview of furniture in a room." - Images. N.p., n.d. Web. 13 Nov. 2013. <http://www.gizmag.com/ikea-augmented-reality-catalog-app/28703/pictures>

28 "hongkiat.com." Hongkiatcom RSS. N.p., n.d. Web. 13 Nov. 2013. <http://www.hongkiat.com/blog/augmented-reality-apps-for-education/>



Wikitude [29]



Sphero Robotic Ball Gaming System[30]

29 "Best Augmented Reality Apps." Digital Trends. N.p., n.d. Web. 13 Nov. 2013. <http://www.digitaltrends.com/mobile/best-augmented-reality-apps/>.

30 "Sphero Robotic Ball Gaming System - White." Iwoot International UK. N.p., n.d. Web. 13 Nov. 2013. <http://www.iwantoneofthose.com/gift-gadgets/sphero-robotic-ball-gaming-system-white/10663861.html>.

6.3 – OTHER THESIS PROJECTS ON AUGMENTED REALITY

AUGMENTED REALITY BASED INTERACTIVE STORYBOARD – JUN PARK

Abstract

In early stages of production, storyboards are used for visually describing the story and the script. In this paper, an Augmented Reality based interactive storyboard system is introduced. Proposed system provides intuitive and easy-to-use interface for stage item placement and camera pose/motion control. Using AR-based interactive storyboard, non-experienced users could compose 3D scenes for a storyboard using interfaces in his/her real environments. Preliminary studies showed that AR-based interactive storyboard system was intuitive and convenient by interactively updating scenes through user's control over the stage items and camera viewpoints.[31]

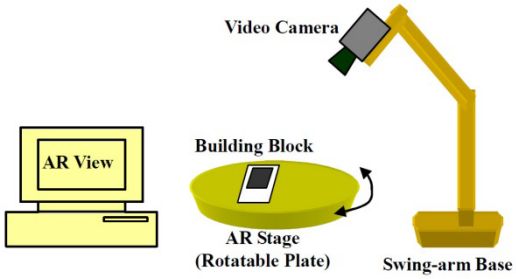


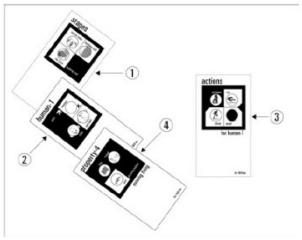
Figure 1. Hardware Components of the AR-based Interactive Storyboard System

What is this thesis about? Experiment? Findings?

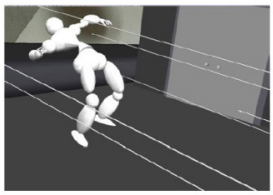
In this thesis, Jun Park's main objective is to develop a storyboard composition tool to help users of all experience levels develop a storyboard using 3D scenes and the real environment. As indicated in the picture above, to utilize the AR-based Interactive Storyboard System, a user would need a computer, a video camera on a swing-arm, building blocks for the set, and a rotatable AR

31 Park, June. "Augmented Reality Based Interactive Storyboard." PDF File

stage. The following pictures show Jun's experiment developing a cut scene from the film "The Matrix." The process used demonstrates that a user could capture the desired still images of composed animations while still controlling the position of the camera. The experiment was a success but one drawback was found: the ARToolKit had a limited tracking range. While it didn't affect the experiment results, Jun acknowledges that, "to allow freedom of camera motion, advanced tracking technology is required."[32]

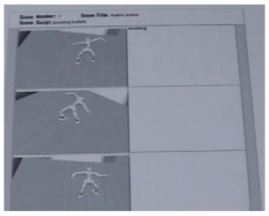


(a) Building block placement



(b) A composed scene

(c) Scene arrangement and editing



(d) Printout of the composed storyboard

Figure 4. An example of storyboard composition: a roof scene from the film "Matrix"

32 Park, June. "Augmented Reality Based Interactive Storyboard." PDF File

COENO–STORYBOARD: AN AUGMENTED SURFACE FOR STORYBOARD PRESENTATIONS – MICHAEL HALLER, DANIEL LEITHINGER, JAKOB LEITNER, AND THOMAS SEIFRIED

Abstract

In this paper, we present Coeno-Storyboard, an around-the-table application designed for presenting a storyboard using tabletop technology in combination with augmented content. The demonstration is based on the Coeno-framework, a flexible plug-in framework that allows fast development of tabletop applications. The goal of the presented prototype was to present new ways of interaction and communication for the next generation working in spaces by using projection based AR technology.[33]

Figure 1: Participants can join the discussion session and move their scribble notes from the laptop to the augmented tabletop projection surface. Intuitive interaction metaphors (e.g. laser pointer metaphor) should support users to have a very intuitive and immersive presence feeling.

What is this thesis about? Experiment? Findings?

The group who co-wrote and conducted this experiment took the approach of developing a more collaborative working environment. They felt digital data was mostly utilized by single us-

33 Haller, Michael; Leithinger, Daniel; Leitner, Daniel; Seifried, Thomas. "Coeno- Storyboard: An Augmented Surface for Storyboard Presentations." 2005. PDF File

ers. Therefore, if a group of people was working on a table, it wouldn't feel collaborative because everyone would be writing on his or her own computer or mobile device. Their solution was "an infrastructure that allows an easy integration of digital data to allow face-to-face collaboration around a digitally augmented tabletop interface."[34] To conduct this experiment, they used a projector above the table, a projector for the wall, a server for processing information, a table, a webcam, and computers. They implemented the Coeno-Storyboard through face-to-face interaction using tabletop technology with projected augmented digital information to create the next generation working space.

34 Haller, Michael; Leithinger, Daniel; Leitner, Daniel; Seifried, Thomas. "Coeno- Storyboard: An Augmented Surface for Storyboard Presentations." 2005. PDF File

STORYBOARDING WITH AUGMENTED REALITY - DUSTIN HARRIS

Abstract

Augmented reality allows us to superimpose digital information upon the real world. In creative environments, this information can change as your ideas take shape. Storyboards allow designers to piece together different elements of a story and consider alternative storylines. The same board could be used to deliver additional experiences by overlaying other content types. Using Argon, an augmented reality web browser, I have prototyped a storyboarding system and demonstrated three sample applications: storyboarding, daily comics, and a puzzle game.[35]

What is this thesis about? Experiment? Findings?

Dustin Harris, wrote this thesis as a way to modify the traditional method of storyboarding. He mentions that storyboarding currently has two limitations: it's hard to make changes and they are static images. To compensate these limitations, he uses augmented reality to add digital content which can be easily manipulated and retain numerous copies. He mentions, "by superimposing these dynamic digital artifacts upon a real storyboard, users can manipulate the content physically but also update this content in ways that would not be possible with a static image."[36]

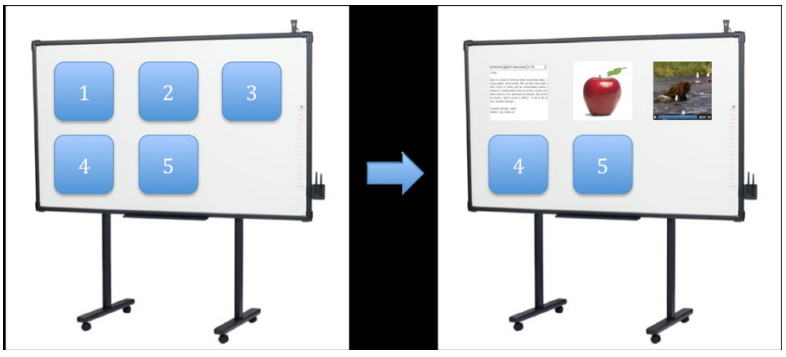


Figure 4. Left, the physical environment. Right, a view of the storyboard using augmented reality.

35 Harris, Dustin. "Storyboarding with Augmented Reality." 2012. PDF File

36 Harris, Dustin. "Storyboarding with Augmented Reality." 2012. PDF File

CONCLUSION

Augmented reality is becoming a more widely used technology and it will continue to become integrated into our daily lives. The capabilities of augmented reality seem endless and they will continue to help improve the human condition. The ability to superimpose digital information on the real world using a device like a smartphone makes unseen information seen. This technology which was once science fiction will one day be second nature just as smartphones are now.

As mentioned earlier, this type of technology paired with storyboarding can be utilized throughout an entire project design process. However, there are certain design phases in which each tool can be best utilized, which will be discussed in the next chapter.

While the potential uses of augmented reality are vast, for the purpose of this thesis, it is used in a minimalistic way. The use of augmented reality is such that one can replicate this thesis' process currently. However, that is not to say that this process of storyboarding and augmented reality won't one day evolve even further.

In fact, it's my hope that this process will one day be utilized and further developed to incorporate more sophisticated uses of augmented reality with technologies like Google Glass. Augmented reality is trending and it will soon be integrated in our built environment and daily lives. Hopefully, this thesis can help to start the process of incorporating an old tool and a new tool in the development of present and future projects.

CHAPTER 7 - DESIGN AND RESEARCH PROJECTS

7.1 – Disney Imagineering

7.2 – Augmented Reality Tests

7.3 – Relationship Analysis of Storyboarding and Augmented Reality

7.1 – DISNEY IMAGINEERING

DESIGN COMPETITION

As stated earlier in this thesis, architecture and film have some similarities. A major difference is the storyboarding process, which architecture currently does not utilize. In order to understand and see if storyboarding actually helps the design process and end result, the 2012 Disney ImagiNation Design Competition will be the testing ground for this analysis.

There are several reasons for utilizing the Disney ImagiNation Design Competition. Firstly, as mentioned in the storyboarding chapter of this thesis, the first credited person who invented storyboarding was Walt Disney. What does being the first one to invent storyboarding have to do with picking a design competition? It's not about who the first person to invent storyboarding was but rather how it was developed. As Disney was the first company to develop the storyboarding process for animations, they had a head start in working out its flaws. And to this day, storyboarding is utilized by not only Walt Disney Studios, but also Walt Disney Imagineering.

So what is Imagineering and how did it affect my choice of the ImagiNation competition?

> Walt Disney Imagineering is the unique, creative force behind Walt Disney Parks and Resorts that imagines, designs and builds all Disney theme parks, resorts, attractions, cruise ships, real estate developments, and regional entertainment venues worldwide. Imagineering's unique strength comes from the dynamic global team of creative and technical professionals building on the Disney legacy of storytelling to pioneer new forms of entertainment through technical innovation and creativity.[6]

As the competition is held by Walt Disney Imagineering, it encourages contestants to cre-

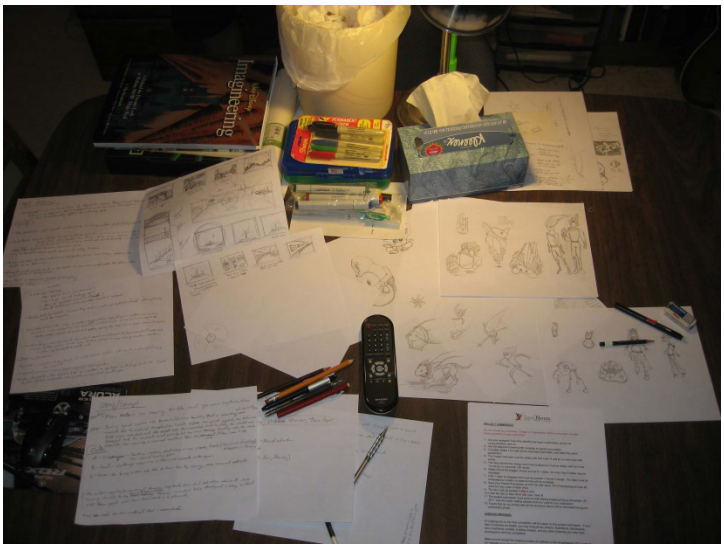
6 "Project Challenge." Disney Imaginations Project Challenge Comments. N.p., n.d. Web. 3 Dec. 2013. <http://disney.go.com/disneycareers/imaginations/AboutImagiNations.html>.

ate and deliver strong stories with immersive environments. Disney is all about creating a story for their guests to experience. This is accomplished by developing every aspect of the story from the large spaces people will experience to the minute details of a door. Whatever the design challenge may be, everything always refers back in some way to the story.

A nice feature of the Disney ImagiNation Competition is feedback. The ImagiNation Competition panel of judges sends comments on the strong and weak points of each entry. Receiving feedback from the competition judges will help further my doctorate thesis. I will use the criticism to determine what truly worked or didn't work in the storyboard process.

PROCESS

After clarifying the objective for the competition and establishing a background story, a workflow was developed to learn how to storyboard and utilize it as a design tool. We determined that a total of eight boards needed to be developed. The first two boards were set requirements from the design competition and text only. These comprised the background story, the story behind the design, and the guest experience. These two boards took a while as everything was text based and it was hard to come to a consensus on a particular story. Due to communication issues, it was decided that the team should just start sketching any ideas and objects on the competition's objectives.



Pictures of the random concepts sketched that helped to generate the final idea

Eventually, we agreed on the story and were inspired by a couple of the sketches that were just thrown on the table. The following two boards are the final submissions that were a requirement for the design competition. They went through several iterations to get to the final story and idea, but it all started from sketching out ideas.

IMAGINATIONS
DREAM • DESIGN • DIVERSIFY

Team38

ORION

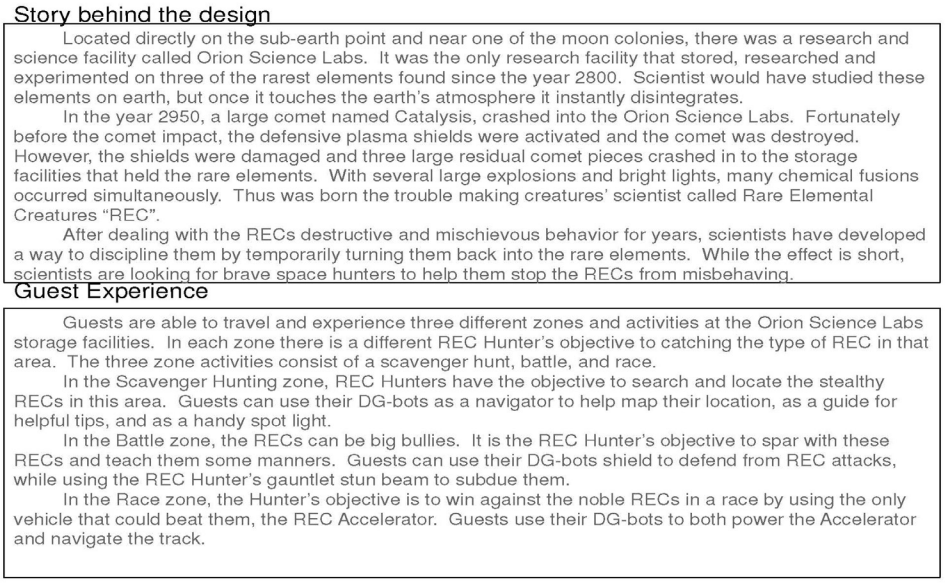
Focusing on the storytelling aspect of our attraction, we want to immerse guests in a fantastic and engaging narrative. In this attraction, guests are REC hunters helping the Scientists capture and turn the Rare Elemental Creatures also referred to as "REC" back in to the elements. A personal DG-bot, short for Digital Gadget Robot, help guests along their hunting adventure to supply tips, gadgets and protection, while recording the whole experience as a special memory for each adventure.

In the attraction, guests arrive at the Science tower where they learn about the narrative and modern day science gadgets to complete their mission. Guest then head to the REC Hunter Training Center. During this time guest are informed how to capture the REC monsters and to be careful of their aggressive behavior. A key note REC Hunters should remember is that the Rec's aggressive behavior changes according to the 8 moon phases. Upon completing the training, guests are given the title "REC Hunter" and handed their own personal DG-bot. Now they can begin their mission by exiting the Training Center where guests are able to access the three science storage facilities.

At the Science Storage Facilities, guests are given three scenarios: scavenger hunt, battle, and race. In each scenario, guests use different gadgets to help them capture RECs within a cycle of fifteen minutes. After the allotted time is completed, the number of RECs captured are tallied up and guests can see how they rank as a REC hunter.

Team Member	Major/ Minor	Contribution
Participant #1	Architecture	Research, Concept, Environmental and Character Design, Renderings, Layout
Participant #2	Animation	Research, Concept, Character and Environmental Design, Renderings, Layout
Participant #3		
Participant #4		

Board 1



Story behind the design

Located directly on the sub-earth point and near one of the moon colonies, there was a research and science facility called Orion Science Labs. It was the only research facility that stored, researched and experimented on three of the rarest elements found since the year 2800. Scientist would have studied these elements on earth, but once it touches the earth's atmosphere it instantly disintegrates.

In the year 2950, a large comet named Catalysis, crashed into the Orion Science Labs. Fortunately before the comet impact, the defensive plasma shields were activated and the comet was destroyed. However, the shields were damaged and three large residual comet pieces crashed in to the storage facilities that held the rare elements. With several large explosions and bright lights, many chemical fusions occurred simultaneously. Thus was born the trouble making creatures' scientist called Rare Elemental Creatures "REC".

After dealing with the RECs destructive and mischievous behavior for years, scientists have developed a way to discipline them by temporarily turning them back into the rare elements. While the effect is short, scientists are looking for brave space hunters to help them stop the RECs from misbehaving.

Guest Experience

Guests are able to travel and experience three different zones and activities at the Orion Science Labs storage facilities. In each zone there is a different REC Hunter's objective to catching the type of REC in that area. The three zone activities consist of a scavenger hunt, battle, and race.

In the Scavenger Hunting zone, REC Hunters have the objective to search and locate the stealthy RECs in this area. Guests can use their DG-bots as a navigator to help map their location, as a guide for helpful tips, and as a handy spot light.

In the Battle zone, the RECs can be big bullies. It is the REC Hunter's objective to spar with these RECs and teach them some manners. Guests can use their DG-bots shield to defend from REC attacks, while using the REC Hunter's gauntlet stun beam to subdue them.

In the Race zone, the Hunter's objective is to win against the noble RECs in a race by using the only vehicle that could beat them, the REC Accelerator. Guests use their DG-bots to both power the Accelerator and navigate the track.

Board 2

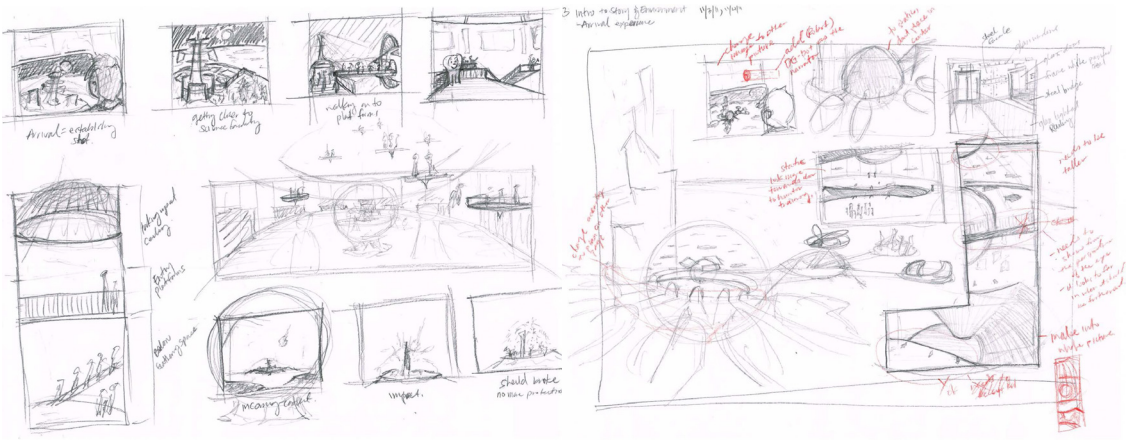
Out of the eight boards that were allowed, six were used to showcase the idea visually. These boards had to clearly and effectively communicate the story on boards 1 and 2. As contestants are unable to verbally present their submissions to the judges, the last six boards were a testament to our ability to visually convey the idea.

During the development of this project, it was decided that we should work backwards. We knew that we needed six boards; therefore, we started off by storyboarding what the final boards would look like. First, we wanted to show the overarching background image as both an eye-catcher and to set the environmental scene. Then, we would illustrate the user's experience on top of that background image. As time was of the essence, we split the six boards into two different types. Boards 3, 4, and 6 maintained the storyboarded original design while the other

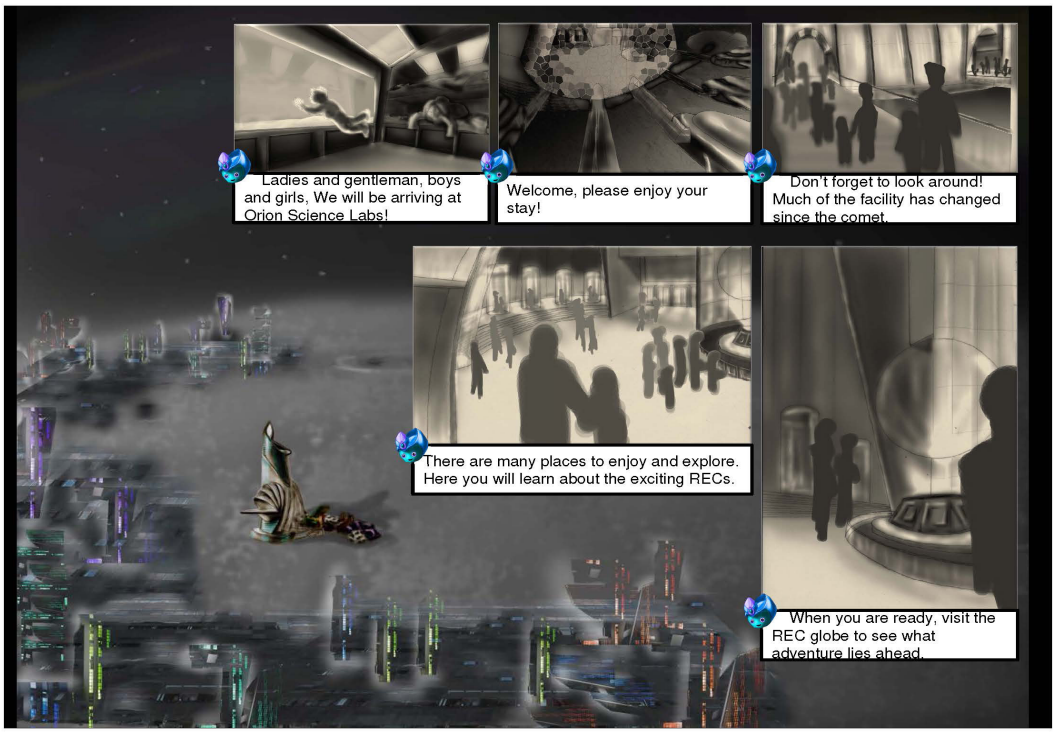
three were presented with only one overall image. This was both a strategic and experimental switch because it saved time but also tested how much information could be condensed into a single image. In the following explanations, I will talk about the two board types using board 3 and board 5 as examples.

Board 3 developed from a succession of several designs. It was the first board to be developed and the first to set the standard of the following boards. During the beginning design phase, we immediately knew that this board needed to set the establishing shot of being on the moon and the experience of entering into the building.

At first, we decided to sketch out the experience of the user. We went through several drafts of how we thought it could look. However, the main problem that we encountered was the fact that we tried to do the whole project with perspective sketches without the use of floor plans, sections, and elevations. This was extremely difficult because even though we communicated using sketches, without at least a floor plan, we were both trying to connect spaces in our own way. Eventually, we had to come up with a rough spatial diagram.



Rough/draft sketches of board 3

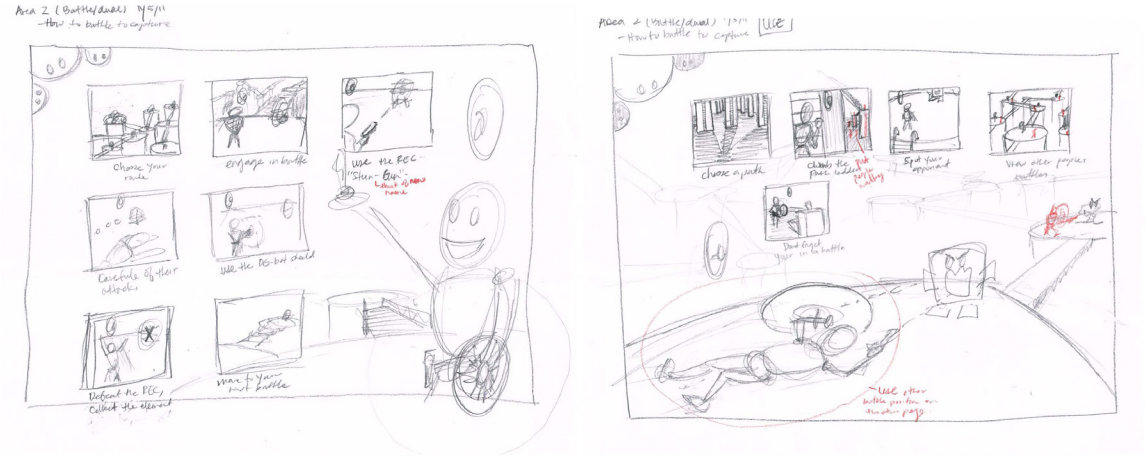


Final submission of board 3

After several storyboarded sketches and iterations of what the board would portray and how it would look, it was time to render the sketched images. The final development made me realize that storyboarding during the final phases of design is not really practical for the architectural profession unless there is time. We had to render more than 20 images by hand in just a couple of weeks. Towards the end of the competition, I was exhausted from working on these refined storyboards, which are usually used for marketing purposes. While this process is part of storyboarding, I find it that it contradicts the quickness of the beginning design process.

Due to the fact that there was limited time, as mentioned above, three boards deviated from the original storyboard idea. Board 6 was developed with the alternative presentation. As a team we were becoming exhausted. Therefore, we decided to illustrate a whole board of six images as a single image. Instead of illustrating the user experience through different shots, the

thought was that we could capture the experience by illustrating the most important part of the idea. The results are as follows.



Rough/draft sketches of board 6

Final submission of board 6

Throughout the design process, we attempted utilizing the pinup method. We tried to switch images around on a pinup board, but found it mostly useful during the final stages of design in determining the order of the final product. Generally, we liked working on a large table where we could spread the sketched images out. This process gave me insight into what works well in storyboarding and what doesn't. Going through both the quick and not-so-quick design phases of storyboarding and from the general idea to detailed information gave me real perspective on how storyboarding could be applied to an architect's design process.

RESULTS

Devin and I entered this competition as a team of two. It was a joint effort and many of the tasks were split between us. The main point of participating in this competition was to understand what it takes to storyboard. Ultimately, we were selected for the second round as semifinalists, but did not make it to the finals. However, the judges at Disney ImagiNation did give us some feedback on what needed work and our overall submission.

Disney's Comments:

- Very nice renderings
- Did a great job explaining the story and setting
- What was going to happen and what the guest would experience was very clear
- Images could have used more details
- Did a good job at explain what the idea is, but not how the idea works
- It would have been helpful to have at least a floor plan

With the feedback from Disney and my research, I have learned a great deal about storyboarding. As mentioned in both the storyboarding chapter and in the appendix, storyboarding has numerous pros and cons. However, there are a few key ideas that I found through this process that make it a great design tool for many design professionals.

First, there is the inherent design editing process. I found that it was very easy to quickly mark up images and draw directly on the paper when communicating as a team. Not only were we able to quickly correct and edit images, we were also able to reorder the images. Going back and forth and deciding on what stayed, what got thrown away, and what should be added was easy and simple. The drawback was that it required lots of space. Devin and I were working on a large dining room table but still needed more space. With all of the accumulated papers, it can get chaotic and disorganized. However, if the papers are kept organized (for example, by numbers or date), this method works well when trying to figure out the sequencing of images through which one wants to present an idea.

The second key asset that makes storyboarding a great tool is that it is an efficient way to visually communicate to a group of people without confusion. Whenever Devin or I had an idea and we discussed it verbally, we imagined the idea(s) differently about 80% of the time. When we drew out our ideas and then presented what we were thinking, we got on the same page much faster. Then, we didn't have to backtrack or ask the question, "I thought you meant this?" It also helped to prevent statements like, "I got the impression you were thinking this, not that." Storyboarding made the workflow much more effective, and I feel we were able to develop an idea much quicker through the drawn images.

The last key point that makes storyboarding a strong took is that it's a quick way to sketch design ideas. Before digital technology and 3D models came into play, architects had the ability to draw quickly in front of a client. While many new generations of architectural students don't place as much emphasis on hand drawn sketches as our predecessors, it's still a great method. Hand drawn quick sketches are great for communicating an idea, working out a design problem, and developing a project. This is especially true when working in a group, as an architect does on a daily basis. While my hand drawing skills are not as proficient as Devin's, I was still able to communicate my ideas more effectively through fast sketches.

Storyboarding was not all perfect of course and I face did have a number of problems. The first thing that I realized was that storyboarding captures the essence of an idea but not the fine details. Therefore, when Devin and I started to complete the final boards for submission, there were details that we both were unclear about because we never had to think about or present those ideas. Second, I realized that the interaction between storyboards and the viewer is limited. It's more about presenting a sequence of images that tell a story. The storyboards lack the ability to interactively engage the viewer with more critical information. Lastly, while storyboarding definitely helped in the beginning phases of design, the lack of details and having to refine the quality of each sketch into a satisfactory hand-rendered image was very time consuming.

Note: Refer to the appendix for more information about the competition that includes the program, project submission, development process, and an analysis of the 20 experiential images.

7.2 – AUGMENTED REALITY TESTS

DEFINING TOOLS FOR THE EXPERIMENT

Testing out storyboarding and understanding the ins and outs of the design tool was a much simpler process than testing augmented reality. For one thing, I had no idea how to implement anything in AR. After researching how to create something digitally in augmented reality, I realized that there are many different software programs available. Below is a list of some of the more popular AR companies that offer their Software Development Kit (SDK) for augmented reality. This list comes from an article on prlog.org.[7]

- *Metaio*: Metaio has been recognized for its research in AR and its mobile SDK kit. Recently, at AR summit 2013, the company was praised for its commendable AR engine. 'Junaio,' a product of Metaio is free and downloadable from Google's play store.

- *Wikitude*: The consistent winner of the AR browser category, Wikitude also offers a multiplatform SDK for developers. With a great community base and support,Wikitude is the creator of the world's first AR browser on all platforms. Wikitude has a hands-free utility which means it can also be used with Google's Glasses and other AR glasses.

- *Vuzix*: Vuzix Corporation is a privately held company and the pioneer in manufacturing Video Eyewear and personal display devices for the mobile video, entertainment, defense, and commercial markets. Lately, its model M-100 has created some buzz. Winner of AR summit 2013 in the category of best hardware innovation, it claims to be the best in the smart glass category.

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7 "Top Rated Augmented Reality companies." Free Press Release Distribution Service. N.p., n.d. Web. 3 Dec. 2013. <http://www.prlog.org/12179623-top-rated-augmented-reality-companies.html>.

- *Layar*: Layar is a comprehensive AR browser well-known for simple arrangement of data in separate layers. An AR browser praised for its design and simplified data organization, it's also among the top contenders in the category of best AR browser.

- *Vuforia*: Vufoira is a product of Qualcomm Technologies, Inc. A vision-based image recognition technology, it offers a platform with several capabilities and features. Praised at many AR events, Vuforia SDK is a multiplatform, advanced product of Qualcomm Austria Research Centre GmbH.

- *DIOTASOFT*: Diotasoft is company specializing in interactive technology and 3D graphics, virtual, and augmented reality. This French company, started in 2009, specializes in AR systems dedicated to motion sensing.

- *Blippar*: Blippar is one of the first augmented reality browsers to use prints like magazines, newspapers posters, etc. Started in the UK in 2011, Blippar is growing rapidly in its popularity.

- *Adstuck – SDK 'multiplatform'*: Adstuck consulting has been an augmented reality company since 2008. Areal is a multiplatform SDK fromAdstuck. Areal's unique UI and its powerful AR engine allow multi-functionality in designing. It also covers all utilities of AR across all media. Very popular in promotional campaigns, Adstuck has also invested extensively in developing and researching innovative AR hardware.

- *Aurasma*: One of the freshest among augmented reality platforms, Aurasma has quickly become a favorite app. Aurasma is downloadable for free.

- *Total Immersions*: t-immersion has been an augmented reality company since 1999. Its products include the D'Fusion software solution and an interactive 3D graphics generator in AR environments.

For this thesis, I used the following programs and hardware to conduct my experiment.

- Unity: "Unity is a fully integrated development engine that provides rich out-of-the-box functionality to create games and other interactive 3D content." [8]
- Vuforia – AR SDK – see above
- Android SDK – In order to develop and test anything on an android device, one has to download this development kit.
- 3DsMax – Autodesk's 3D modeling software is great at rendering high quality models and materials.
- Revit – Building Information Modeling (BIM) software that is used by architects throughout the development of a project
- Computer – I used a Windows operating system to develop on Android. If I were to develop on iOS devices I would need an Apple iOS computer.
- Android Tablet – Kindle Fire HDX 8.9 with rear-facing camera

I choose these particular programs because they are free to experiment with and they have numerous comprehensive tutorials. However, while there are tutorials on how to utilize each program, it still took a considerable amount of time to learn how to create a workflow from one program to another program. Eventually, I found a workflow that meets current needs. As architects utilize Revit for their design tool of choice, I decided to learn a workflow that was accessible to architects who use Revit.

In order to get an AR project working in Unity using Revit, I first had to set up my workspace to meet the requirement of an Android developer. Everything took a bit of time to set up,

8 "What is Unity and what can I do with it?." Unity. N.p., n.d. Web. 30 Oct. 2013. <http://unity3d.com/pages/create-games>.

but I had clear instructions on how to set up a workspace for Unity Android developers. Once the workspace is set up, it's a bit easier to work from each program. [9]

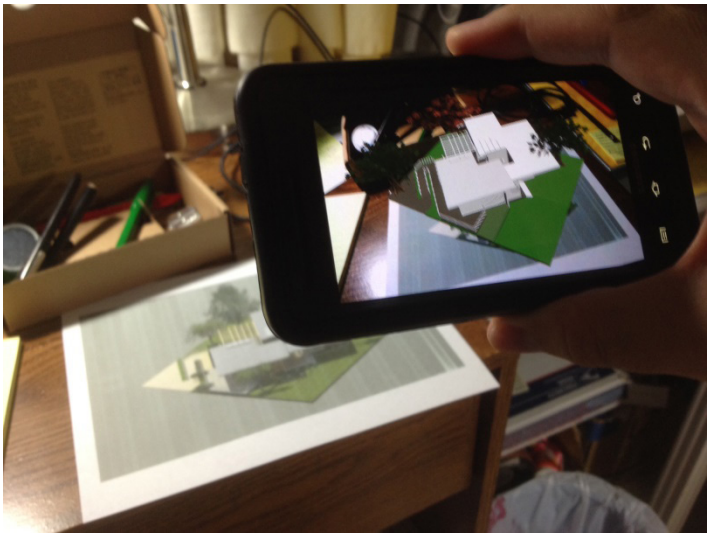
EXPERIMENT

For this experiment the main goal was to understand how to utilize augmented reality technology to complement and supplement storyboarding's limitations. The idea is to show how a storyboarded image can transform from the beginning stages of design to a more completed 3D rendered model. The transition to a 3D model would allow for more detailed information to be visually communicated to a viewer.

To do so, I utilized a Revit model which I then saved as an FBX file. I imported and did touch ups to that file in 3DsMax. Then, I exported it from 3DsMax as an FBX file to import into Unity. Once the model was imported into Unity, I imported the program Vuforia, which is an addon program that allows the development of AR in Unity. Upon completing everything in Unity and then building and running the program to an Android device, for this instance, the Kindle HDX, I had the chance to see firsthand how AR works and looks.

This process was not extremely difficult nor was it easy. It took lots of trial and error and time to transfer a model into the device. However, once completed, it was clear that AR has the ability to compensate for storyboarding's limits.

9 Here is the link: Unity's Guide - http://docs.unity3d.com/Documentation/Manual/android-GettingStarted.html



Picture of experiment process

RESULTS

While testing how augmented reality works, there were a number of problems that occurred. The first is that it's a slow and tedious process. Having to first set up a workspace on the computer and making sure the specific device used would connect was quite a hassle. It also took a while to get a Revit model into Unity as it has to go through 3DsMax first. The materials often failed to transfer from Revit and had to be applied in 3DsMax. However, once the initial workflow was established, everything went a bit quicker.

The second problem is that it is difficult to show only a specific part of a model using augmented reality. AR has the capacity to show the entire model and other detailed information, but has difficulty focusing on anything in particular. I have found that when showing the model to most people, they are fascinated by the entire concept of AR and are amazed that they can see the 3D model. However, because they are constantly moving around the model and seeing the whole thing, the concept and ideas that I want to portray are diminished by too much information.

Finally, the third problem is the fact that AR is a fairly new technology that is still in its infancy. While mobile devices and computers can now handle the processing power of augment-

ed reality, it is still necessary to reduce the size of the 3D model's content. As of now, there are several AR companies that have AR web browsers that allow products to be marketed with AR, but often through links to websites, videos, and other images. I feel that this is because it still takes a while to develop a product in a 3D modeling program and then transfer it through several programs to get it to the device. Personally, I feel that the technology needs to evolve to the point where we can directly augment storyboarded images on the device.

Overall, augmented reality is a great tool for visually showing lots of information. It helps when trying to understand the whole concept and idea of a project in a more finished form. A viewer also has the ability to experience the space. If the image marker (the storyboarded image) were to be blown up to the size of a room's wall, one could also use it as a method of experiencing the space. AR is a great way to visually communicate a more cohesive and developed project, but lacks in its ability to concentrate a viewer's attention on the idea or concepts behind the visually stimulating 3D experience.

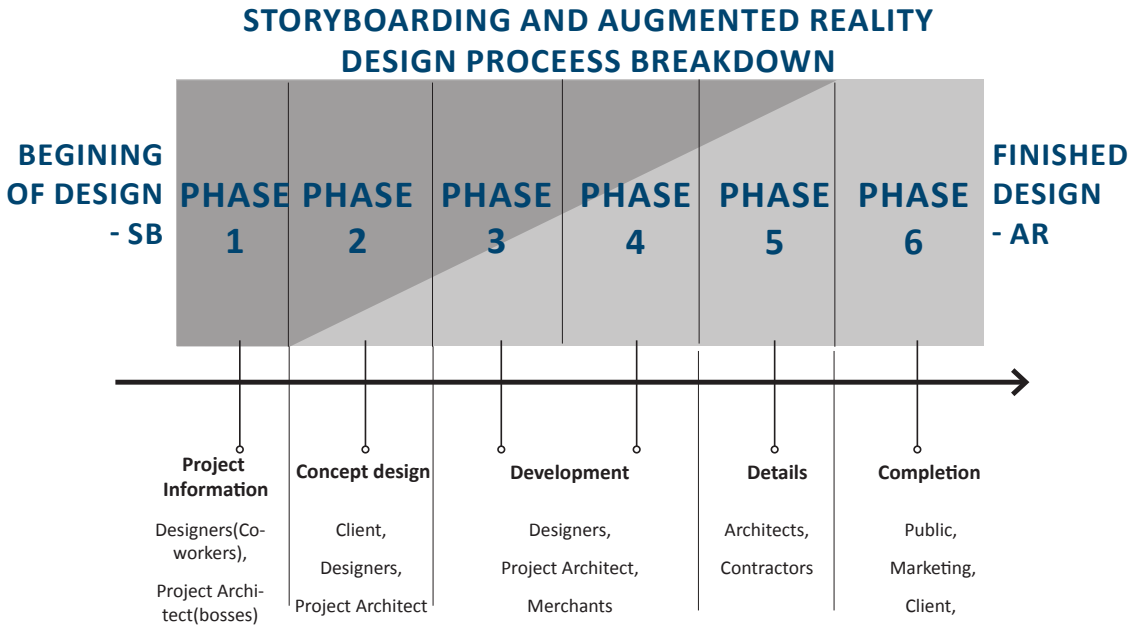
Another picture of experiment process using a downloaded model from turbosquid.com of the Farnsworth Building

7.3 -RELATIONSHIP ANALYSIS OF STORYBOARDING AND AUGMENTED REALITY

After experimenting with both storyboarding and augmented reality, I have come to the conclusion that these tools do not necessarily work well together at the same time. Each tool has its strengths and weaknesses, and each tool is insufficient for the entirety of the design process. I found that the best solution is a transition between the two tools.

Storyboarding is great for quick sketches, fast concept sharing, and visually communicating ideas to a group of people. Typically, these processes can be found in the beginning phases of design. On the other hand, augmented reality is great for communicating more detailed information through 3D models. This type of information sharing occurs towards the end of the design process.

Taking the strengths of both tools into account, I came up with the idea of transitioning from storyboarding in the beginning phases of design to augmented reality in the end phases of design. This methodology allows for a brand new process of visual communication that can cohesively cover all the design process phases. Below, to better explain the transition from storyboarding to augmented reality, is a simplified graphic of the process.



APPENDIX :

DISNEY IMAGINATION COMPETITION

Competition Program/Project Challenge

Development Process

Final Board Submission to Competition

Conclusion _ Pros and Cons

20 Image Analyses

Process Sketches

DISNEY IMAGINATION COMPETITION

PROGRAM/PROJECT CHALLENGE

The Disney ImagiNations Design Competition was a key contributor to my research on storyboarding. Upon completing the requirements for the competition, I analyzed each image to evaluate its success in fulfilling the objective and how it evolved. For this team competition, I partnered with my brother Devin who is majoring in Animation in hopes of gaining insight into how an animator views storytelling and space.

Listed below are the project parameters, objective, submission requirements, and the judging process, which were taken directly from the ImagiNation Design Competition website [6]

Walt Disney Imagineering challenges you to get together with your team to design…

Imagine it's the year 3011, Disney has entertainment experiences all around the world, many of which don't even exist today. The human race is finally living on the moon and Walt Disney Imagineering wants to be the first one to provide entertainment and/or recreation to the new citizens there.

What would you imagine that this new Disney experience could be?

PROJECT SUBMISSION

Upon qualification, you will be provided a Microsoft Powerpoint® template to submit your project:

- Submission must include:

6 "ImagiNations | Dream Design Diversify." ImagiNations: Dream Design Diversify| Disney Careers | Disney.com. N.p., n.d. Web. 8 Dec. 2011. <http://disneyimaginations.com/ImagiNations2012.html>

    - Overview of your project
    - Story behind your design
    - What the guest experience will be
    - Project images, photos and/or video
    - Team members' roles & project contributions
- Submission may not exceed 8 slides
- Submission may include only one video, not to exceed 1 minute in length
- All images and photos should include a description
- Do not include your college, university or organization name on any image, photo or video
- You may create your own characters or use our existing Disney characters
- Your project submission needs to be mailed on a CD or flashdrive and received by the project submission deadline
- If selected as a finalist team, you may bring all the artwork, illustrations, storyboards, story treatments, models, building designs, and any other materials you may have developed to the final competition
- Project submission must not exceed 10MB in size
- Projects, entries and/or ideas may not be posted or displayed on the internet until the culmination of the competition. Doing so will automatically disqualify the team.

Your submission should be fun, original and innovative.

Make sure to create a project that:

- ...recognizes our evolving marketplace
- ...is not limited to what people already experience at our parks and resorts
- ...considers the business aspects

In addition, make sure that your submission demonstrates:

- Team members' mastery of skills
- Appeal to a diverse audience
- Ability to tell a compelling and engaging story
- Knowledge and passion for the Disney brand and Walt Disney Imagineering
- Ability to collaborate as a team

Keep in mind that Disney is the leader in family entertainment, and that Imagineering tells stories through immersive experiences.

JUDGING PROCESS

All project submissions will be judged by Imagineers from around the world.

Finalist teams will be selected based on, but not limited to the following:

- Mastery of skills & talents
- Team collaboration
- Guest experience
- Diversity/ market perspective
- Uniqueness

Finalist teams will compete for top awards during the final competition event at Walt Disney Imagineering (WDI) in Glendale, California.

At the final competition, finalist teams will present their project in person to Imagineers. In addition, finalists will get the opportunity to interact with Imagineers, participate in behind-the-scene tours of WDI, visit the Disneyland® Resort, and interview for internship opportunities.

DEVELOPMENT PROCESS

At the outset of my doctoral thesis research, my concentration was on the pin-up process used for storyboarding. The idea was to understand and create a design process based on the idea that the act of pinning up can develop the best possible results. I imagined a large pin-up tree diagram that would help in determining the outcome and possible solutions.

The pin-up process would be about seeing everything that was either spoken or thought of in one place. This would allow the viewer to process information visually instead of mentally. The act of pinning up would relieve people of having to process too much information at one time. Being able to see what is in front of you can help clearly identify problems and solutions.

Further research revealed the prominence of the pin-up process in group sessions, even in other professions that have adapted storyboarding. As mentioned earlier, Walt Disney used the pin-up process not only to display his work in a manageable manner, but to also communicate his work effectively to his colleagues. It is for the same reasons that other fields like fashion use the pin-up process.

My research unveiled a clear understanding of how effective the pin-up process can be in promoting communication in group activities. However, while developing work for the design competition, the subject of my thesis started to change. In the beginning of the development process of the project, there was an attempt to utilize the pin-up board. As the project progressed, however, the pin-up board wasn't being utilized nearly as much as anticipated. The focus shifted to the development of the project's story and vignettes, and the objective in terms of the relationship between storyboarding and architecture shifted to asking how storyboarding for films and animations portrays spatial sequences. Instead of concentrating on how the pin-up board process could help the architectural design process, I wanted to focus on utilizing the development process and techniques of storyboarding, particularly for early spatial exploration through vignettes

during the design and development phase of architectural projects.

Currently, architecture doesn't or rarely illustrates sequences of space during the design phase. Usually a 3D walkthrough is developed at the end of a design project that has been fully developed. The architectural design process generally goes as follows: research, floor plan(s), sections, elevations, details, construction documents, and perspective and 3D renderings. As a result, the perspective is usually just a view of the space extracted from a floor plan. Therefore, the spatial quality is not understood or developed until the very end of a project. However, what if the process was reverse engineered and architects started with the development of perspectives and renderings? Would space be understood from the beginning, thus enhancing the design and the spatial experience?

This thesis is about determining how storyboarding will be able to help the architectural profession through a new design approach. Storyboarding could greatly help architects design space by starting with the experiential quality of space through vignettes of spatial sequences. The bottom line is that storyboarding can help architects understand the spatial quality they are designing, understand the space through the eyes of a visitor, and develop a compelling spatial story with the sequencing of space.

PROCESS AND DEVELOPMENT OF THE DESIGN PROJECT

Through the development of the design project, the thesis topic changed to the exploration of designing vignettes with storyboard techniques. Due to the understanding that the pin-up board wasn't going to be utilized much, the focus quickly changed course to the development and design of the competition illustrations. We wanted the story, spatial quality, atmospheric quality, and guest experience to be clearly illustrated through these vignettes.

The early design phase started, like many projects, with brainstorming. Gradually, a general process emerged. Below is that process, which developed as a result of the requirements of the Disney ImagiNations Design Competition. With that said, another process could have been used with different design challenges. However, for the sake of this thesis, the process used for the ImagiNations Competition will be analyzed.

The project completion process:

1. Identify a design competition
2. Understand the project challenges
3. Research and brainstorm potential ideas
4. Define the story behind the whole design
5. Brainstorm ideas from the story
6. Determining what idea(s) best describe the project story
7. Develop the idea(s) through perspective vignettes
8. Analyze vignettes to improve what is shown and seen

a. Enhance atmosphere, perspective, etc.

9. Revise
10. Repeat steps 8 and 9 as needed and within time constraints
11. Develop the final product
12. Submit end result

The overall process may seem self-explanatory, but it is worth mentioning what worked and what didn't. As the Disney ImagiNation Competition didn't have any technical or limiting challenges, contestants could develop the project however they wanted to and they could create anything they wanted to create. The only challenge was for the design to take place on the moon in 3011 and for it to be some form of entertainment for the residents living on the moon.

With the design challenge in mind, the next step was to conduct some preliminary research and brainstorm ideas. In the first couple of brainstorming sessions, we wrote down all of our ideas, mimicking the technique that the Imagineers use in their "Blue Sky" brainstorming sessions. During the "Blue Sky" phase, there was no good or bad idea, just ideas that may be further developed into great ideas.

While we offered up many ideas, there was one that we fixated on at first—that the moon has two sides, a light side that always faces earth and a dark side that never faces the earth. We thought of this without doing any research prior to brainstorming and armed with only our initial knowledge of the moon. This idea came to an end when we researched the moon and learned that it has no dark side but instead what is called the far side.

In many development procedures, research is always done first so that there is a solid understanding of the topic. However, we wanted to try something different and to brainstorm ideas without a deep knowledge of the moon so that our imaginations would be unfettered. When we did research the moon though and found that our initial idea was no longer plausible, we had to come up with a new idea.

During the next brainstorming session, I noticed that our ideas had started to become limited to what we had just learned about the moon and the project parameters. We started to unconsciously add limitations and disregard some ideas. However, after a few brainstorming sessions and some frustration, we came up with an idea that blended several ideas. Thus, while the

brainstorming session went through several stages, it ultimately led to an idea .

The next step was to develop a narrative. This step is not necessarily needed in the development of architecture. When architects articulate stories for a project, it's normally what guests would experience within a space. For example: as a guest enters a hotel lobby, guests are immediately astonished by the vast ceilings and large glass walls that generate an ethereal atmosphere of light. However, for this design project, we developed a narrative that expanded on the decided idea. With the help of the narrative, we determined further details about guest activities and what could be illustrated to portray the story clearly.

The Disney ImagiNation Competition emphasizes telling a clear story. Thus, the first two slides in our submission provided an overview: the story behind the design and the guest experience. While a narrative was not necessary, I found that having one helped the development of the project. The narrative was helpful in understanding the background of the project we were developing, which in turn helped us make design decisions. It allowed us to figure out who our guests were, how they used the space, and how they proceeded through space.

On the other hand, while creating the narrative was both fun and helpful in understanding what the design project should be, it also posed several challenges. The narrative gave us a notion of what we wanted, but didn't specify exactly how the space looked, how guests moved from one space to the next, or details such as how large the facility was. This posed many problems in terms of deciding what should be illustrated, how buildings looked, and how the space felt. Normally, when facing a problem like this, the architectural process drafts out floor plans to understand the space, progression, and size. However, this thesis is not about designing through floor plans; it's about designing and developing a project based on vignettes of spatial experiential sequences.

To get past this problem, we moved on to the next step in the project completion process, which was to brainstorm and draft images based on the story. While we did not have a description

of the building, there were general clues within the story that helped start the design process. For example, there was mention of a main science tower, a training center, and three storage facilities. It was then up to us to design and organize the type of building that would have these spaces.

First, we created a rough storyboard. The first six images illustrated the guests' arrival at the science tower. The next four illustrated the narrative, and following these were two more images of the interior space. These rough sketches were a tremendous help in understanding what the space and atmosphere could feel like. However, the thought of storyboarding every single thing a guest might experience or see was incomprehensible for this project. It would have been more like the development of a film or animation, and it would have taken much longer than the allotted time. Therefore, we needed to come up with a new method of designing and developing the project.

After an initial thumbnail storyboard, we opted to take a slightly different approach to the development of the project. We decided to work backwards by determining the end goal and then starting from there to design every image, determine how many images there should be, and make sure they all portrayed the story.

Storyboarding every aspect of this project was not feasible. Therefore, we sketched thumbnail layouts, which were more efficient and manageable. By selecting specific moments and guest experiences, we determined which images should be illustrated. However, we still wanted to portray the story in a manner that flowed well from one image to the next. Therefore, we decided, these moments needed to somehow reference the images before and after them.

After brainstorming, creating rough thumbnail sketches, and drafting the slide layouts, we knew what each slide should encompass. The next step was to take each thumbnail drawing and refine it. This meant critiquing the rough thumbnail sketches and determining how they could be improved. How the images could be more dynamic, what views should they be drawn from, and

whether they expressed spatial and atmospheric quality effectively were but a few questions used to refine these images.

Upon defining what aspects could be improved, each image went through several more rough sketches. The refinement stage varied from image to image depending on how well they portrayed the story, time, and difficulty. As there was a deadline and many images that needed to be illustrated, time management was critical. However , schedules rarely went according to plan. A major issue that wasn't considered while creating the schedules was the difficulty and time it would take to complete the renderings.

Before rendering the images, we refined and redrew them as clean line drawings. Then they were scanned to the computer. The next phase of project completion involved rendering the images using Photoshop. While we had planned for this to take two to three hours per image, it took much longer.

Photoshop was the medium chosen to illustrate light and shadows, manipulate images, and present our final submission. While both Devin and I have used Photoshop before, it wasn't to the degree of painting an entire image. However, while we knew it would take a while to render an image, we didn't expect one image to take a whole day or more to finish.

As it was basically my first time using Photoshop and a computer pen tablet to paint an image, it took a while for me to adjust to the new medium. This was a factor that I should have taken into consideration when making the schedule. However, as the project progressed, each rendering took less time. By the end of the project, the estimated time it took to complete one image was about five hours.

Due the time it took to render each image, we decided to reduce the number of illustrations. In the original rough thumbnail sketch, slides three, four, and five looked like the others.

However, due to time restraints and a desire to take the opportunity to try a new method of portraying the same idea, the slides changed. Before, there were several images to portray an idea; now, there is only one.

While there was only one image, the main ideas were still portrayed. Illustrating just one image helped to create a unique and dynamic image for viewers to look at. However, the portrayal of the spatial quality becomes less noticeable. Now the focus is more on the activity rather than the sequences of spatial moments.

After all of the images were fully rendered, we discussed them to determine if any corrections had to be made. Once given the okay, we were able to arrange everything easily due to the very beginning stage of laying out the thumbnail sketches although the layouts did change to fit the changes in the designs and images.

Through the project completion process, I was able to understand and analyze the strengths and weakness of this design process. As a recap, this process goes as follows: research → brainstorming → thumbnail sketches → refinement → rendering → presentation layout. We sent the results of this process to the Disney ImagiNation Competition.

FINAL BOARD SUBMISSION TO COMPETITION

Below are the submissions for the competition. It is broken down into 2 informational boards and 6 project boards following the presentation format provided by the design competition.

During the planning stage of developing rough layout sketches of the project boards, it was decided that each board needed to portray a specific idea(s) from the story. In board one, the images needed to portray the guests experience approach and first impression. In board two, the images illustrate the excitement and reason for coming to this facility. In boards three, four and five, they were developed as one image each to express the activities of each zone and the atmosphere of that area. In board six, the layout for boards one and two were utilized to conclude the overall experience and tie all the boards together.

IMAGINATIONS
DREAM • DESIGN • DIVERSIFY

Team38

ORION

Focusing on the storytelling aspect of our attraction, we want to immerse guests in a fantastic and engaging narrative. In this attraction, guests are REC hunters helping the Scientists capture and turn the Rare Elemental Creatures also referred to as "REC" back in to the elements. A personal DG-bot, short for Digital Gadget Robot, help guests along their hunting adventure to supply tips, gadgets and protection, while recording the whole experience as a special memory for each adventure.

In the attraction, guests arrive at the Science tower where they learn about the narrative and modern day science gadgets to complete their mission. Guest then head to the REC Hunter Training Center. During this time guest are informed how to capture the REC monsters and to be careful of their aggressive behavior. A key note REC Hunters should remember is that the Rec's aggressive behavior changes according to the 8 moon phases. Upon completing the training, guests are given the title "REC Hunter" and handed their own personal DG-bot. Now they can begin their mission by exiting the Training Center where guests are able to access the three science storage facilities.

At the Science Storage Facilities, guests are given three scenarios: scavenger hunt, battle, and race. In each scenario, guests use different gadgets to help them capture RECs within a cycle of fifteen minutes. After the allotted time is completed, the number of RECs captured are tallied up and guests can see how they rank as a REC hunter.

Team Member	Major/ Minor	Contribution
Participant #1	Architecture	Research, Concept, Environmental and Character Design, Renderings, Layout
Participant #2	Animation	Research, Concept, Character and Environmental Design, Renderings, Layout
Participant #3		
Participant #4		

Board 1

Story behind the design

Located directly on the sub-earth point and near one of the moon colonies, there was a research and science facility called Orion Science Labs. It was the only research facility that stored, researched and experimented on three of the rarest elements found since the year 2800. Scientist would have studied these elements on earth, but once it touches the earth's atmosphere it instantly disintegrates.

In the year 2950, a large comet named Catalysis, crashed into the Orion Science Labs. Fortunately before the comet impact, the defensive plasma shields were activated and the comet was destroyed. However, the shields were damaged and three large residual comet pieces crashed in to the storage facilities that held the rare elements. With several large explosions and bright lights, many chemical fusions occurred simultaneously. Thus was born the trouble making creatures' scientist called Rare Elemental Creatures "REC".

After dealing with the RECs destructive and mischievous behavior for years, scientists have developed a way to discipline them by temporarily turning them back into the rare elements. While the effect is short, scientists are looking for brave space hunters to help them stop the RECs from misbehaving.

Guest Experience

Guests are able to travel and experience three different zones and activities at the Orion Science Labs storage facilities. In each zone there is a different REC Hunter's objective to catching the type of REC in that area. The three zone activities consist of a scavenger hunt, battle, and race.

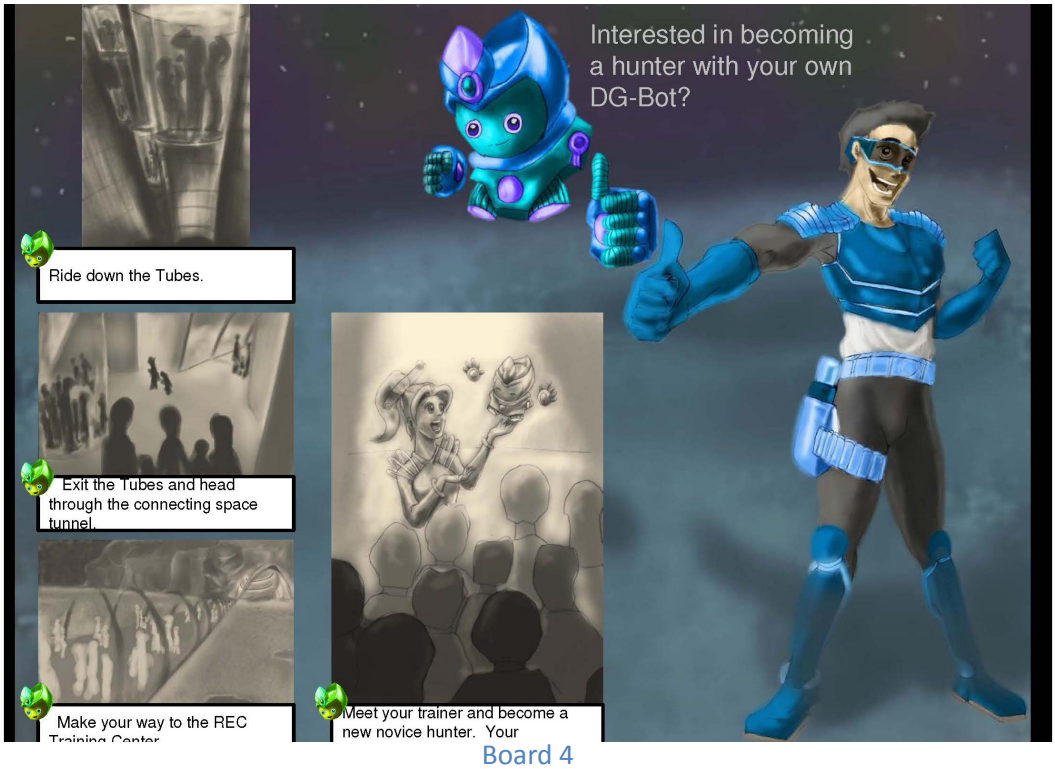
In the Scavenger Hunting zone, REC Hunters have the objective to search and locate the stealthy RECs in this area. Guests can use their DG-bots as a navigator to help map their location, as a guide for helpful tips, and as a handy spot light.

In the Battle zone, the RECs can be big bullies. It is the REC Hunter's objective to spar with these RECs and teach them some manners. Guests can use their DG-bots shield to defend from REC attacks, while using the REC Hunter's gauntlet stun beam to subdue them.

In the Race zone, the Hunter's objective is to win against the noble RECs in a race by using the only vehicle that could beat them, the REC Accelerator. Guests use their DG-bots to both power the Accelerator and navigate the track.

Board 2

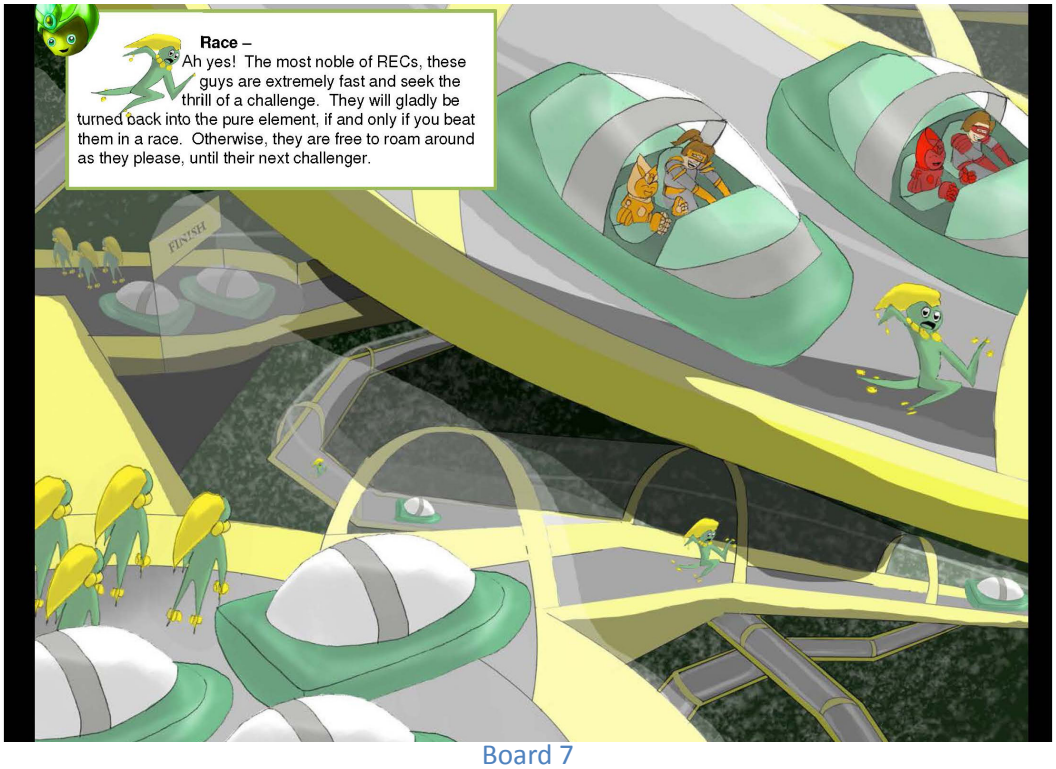
Board 3



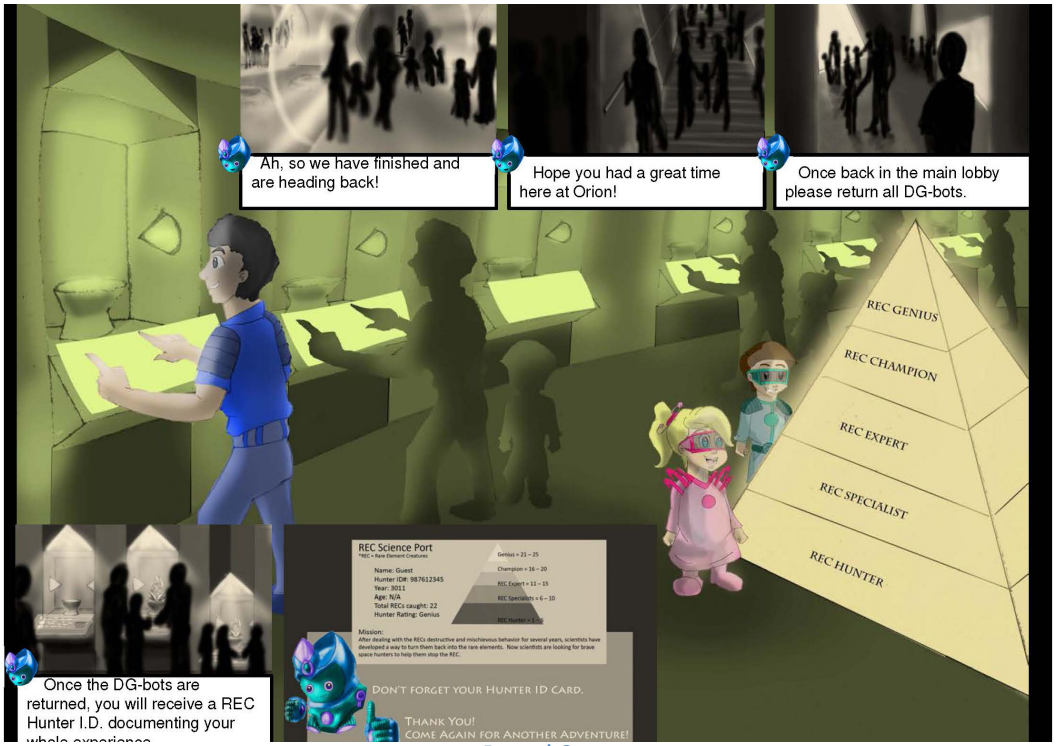
Board 4

Board 5

Board 6



Board 7



Board 8

CONCLUSION - PROS AND CONS

With the competition of both the design project submission and the analysis of the submission there are several arguments on the effectiveness of storyboarding for architecture and the process that was taken. A list of Pros and Cons are presented below. As for the research, the focus was on the background, principles and process of storyboarding because the thesis's original topic was about the pinning-up process of storyboarding. However, during the design competition the topic of this thesis changed to the techniques used in storyboarding images. Therefore while the area has been discussed, further detail on the actual techniques and creation of the drawings for storyboards need to be broken down and analyzed.

PROS

- Great for illustrating architectural spatial concepts
- A great marketing style to potential clients
- Understanding of the space is developed early
- Spatial experiences are developed through storytelling which can help the spaces transition smoothly
- Improves drawing technique and skills
- Gain a better understanding of the composition of an image which could reflect in the spatial experience
- Could be a great tactic to involve the client during the storyboarding phase of the spatial experience a guest should feel, see, smell, touch and hear
- Great for brainstorming, predesign, and final product
- Understanding spatial sequencing of experiential moments will improve skills as a designer
- Utilizing the different film shots could create unique architectural experiences

CONS

- This process can be difficult to use if someone:
- Doesn't have an understanding of general perspective
- Only designs using floor plans, elevations, and sections
- Doesn't like storytelling
- Doesn't have basic understanding of art concepts like lighting and shadows
- A challenge to create innovative compositions for each image while maintaining the flow of the narrative
- Not as effective for designing and developing the exterior of a building as it is for the interior spatial and atmospheric quality
- Can be confusing during the phase of developing floor plans, elevations and sections due to issues in size, where each spatial experience takes place, and how its constructed

20 IMAGE ANALYSES

Following this brief explanation is an analysis of each image that was used for the project submission to the ImagiNations Design Competition. For the analysis of each image, the conceptual images and the evolution of these images are placed after the individual image analysis. The reason for analyzing the images is to understand how each image evolved from the original sketch. It's to understand how the storyboarding techniques were either used or could be used to better the image. By understanding how the images developed and what the images are portraying, will help provide useful evidence on the effectiveness of storyboarding for architecture. In developing a new design process with a focus on storytelling and the spatial sequencing of moments, this analysis is crucial. Upon the conclusion of the design competition, the panel of judges will send the teams feedback on their submission. With the criticism received, I plan to make a correlation of my analysis to the feedback about the strong and weak points in the project submission.

Disney ImagiNation Competition
DOCUMENTATION/EVALUATION ANALYSIS

Architecture 546
University of Hawai'i School of Architecture

Board #: 1 **Picture #**: 1

Narrative: Ladies and Gentleman, boys and girls, we will be arriving at Orion Science Labs!

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This image was to define a starting point to our story that illustrated: location, mode of transportation, and a sense of arrival. The picture illustrates a boy and a girl traveling on a spaceship in an open room concept with beds on the side. The boy is floating while looking out the window, while the girl is lying down on the bed looking out. This image shows how the guests are able to look out the large windows in their rooms and be able to see the Orion Science Labs as they approach it closer. For this vignette we wanted to express the excitement of the children. The boy looking out the window is the most prominent feature of the picture due to the contrast of light on him and the window. Also as the boy is centralized, the focus goes toward him. To lead the attention away from the boy, the window above and the lights above the bed help to draw help to lead the eyes away. The picture is balanced with darks and lights from both the right to left and top to bottom. The space has large windows that allow lots of light to filter in. Additional lights atop the beds are used to add a warmer feel to the sleeping quarters. We wanted the space to be open but have stark walls and floors to illustrate the modern clean future. The angles used for the walls help to create a space that is

not a flat box where it doesn't feel claustrophobic. It was also to convey that the spaceship was conformable and not just used for transportation to the Orion Science Labs.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, this was part of the illustrations that were done in black and white to illustrate more of an atmospheric quality with the use of lights and shadows.

How did it evolve from the original sketch?

This image had several development stages. The idea was to get the perspective of the guests in a spaceship on their way to the Orion Science Labs. Therefore the first sketches were designed with a guest near a window looking outside toward the science labs. However, while it clearly illustrates the objective of the image, it felt a bit too usual and static. Therefore instead of doing a close up shot of the guest looking out the window, a further perspective was developed. This meant the development of the spaceships room. To make the space feel more appealing a large glass window was used and a one point perspective. This created a more dynamic look. However to show that it was in space the character was designed still looking out the window but now floating. Also further development for the interior of the ship help to create the atmosphere it has in the final rendering.

Were there any problems, conflicts, or issues?

This was the first image that I fully painted in Photoshop and it took a very long time to finish it. Figuring out the shortcuts and learning how to paint on the computer with a tablet is very different from real painting. It took a while when first beginning to use both the tablet and Photoshop, which cost us valuable time.

What are the next steps to improve the vignette? What details could be added?

More definition for the girl and sleeping quarters needs to be defined by using higher contrast to show more definition. Move the boy more toward the left side of the image to reduce the central focus. While there is a good balance of lights and shadows it can sometimes make the picture feel too static. Reduce the symmetry of the lights and darks.

Clearly delineate role in the development of the illustration

I drew the sketches, clean drawings, developed and rendered the picture. Devin did the character designs.

Disney ImagiNation Competition Architecture 546
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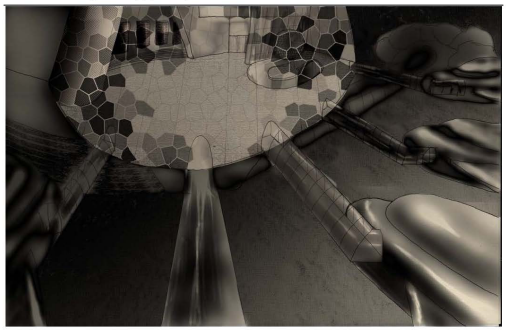
Board #: 1 **Picture #**: 2

Narrative: Welcome, please enjoy your stay!



What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

After image one, the view on the spaceship, this picture was supposed to illustrate the appearance of the approach. Therefore the idea was to illustrate the docking station where people arrive, like an airport. This illustration shows the perspective of the guests view from the window waiting for the ship to dock. It's very similar to that of the current day traveler who gets excited about landing at the destination. In the picture one can see five docking ports connecting to the building as well as docked spaceships. It was meant to show crowdedness and excitement and impatience. It's the moment when travelers get impatient as they see their destination right outside their windows but have to wait longer because the ship needs clearance to land. This image also illustrates the shadows that are made on the moon which are higher in contrast to that of earth. The building is the most dominant feature along with the bottom right spaceship which helps to create some tension between the two objects. A one point perspective was used to draw the attention to the building as that is the main destination for the guests. This also affected the architectural decision to design the space port with a radial layout.

Board 1 Picture 2

Disney ImagiNation Competition Architecture 546
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Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, as part of the scenes of the black and white images this was meant to show how stark the moon could get and how bright the building would look due to the darkness of the moon.

How did it evolve from the original sketch?

The general process like most of the images created for this design competition was first thumbnailed, second roughly drafted out and third finalized and rendered. This image started off with the idea that you could see the whole facility in this picture. However, as the background image (discussed later) was going to show the whole facility, this image needed to change. This image was decided to show a closer view of part of the building and the spaceport. Through the development several drafts were drawn. First was the image on the thumbnail board that illustrated a round individual dome. As the overall building changed so did this image to match the design. Another draft showed many spaceships flying around, but due to time and efficiency it was changed. While the different ship designs were neat and could have made the whole image more dynamic, it made the image feel too crowded and chaotic. Ultimately a more organized approach was taken by creating a default ship appearance and a closer view of the building and space port tunnels.

Were there any problems, conflicts, or issues?

When rendering the image in Photoshop, it took a lot longer because I didn't know exactly what materials were used. Also creating the materials by painting it in Photoshop was difficult as this was only the second image I ever painted in Photoshop. The other image I painted was the first image on this board.

What are the next steps to improve the vignette? What details could be added?

The image is blurred and hard to read and the objects need more definition. More light needs to be used to define the objects. Overall the composition is ok but a different angle might have been more dynamic and interesting.

Clearly delineate role in the development of the illustration

The whole image was developed by me with the consultation of Devin.

Board 1 Picture 2

Disney ImagiNation Competition Architecture 546
DOCUMENTATION/EVALUATION ANALYSIS University of Hawai'i School of Architecture

Board #: 1 **Picture #**: 3

Narrative: Don't forget to look around! Much of the facility has changed since the comet.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

After image two, to follow along with the storyline as if it were through the eyes of a guest, this image is about leaving the spaceship to enter the Orion Science Labs. Therefore this image shows the bridge that connects the spaceship to the building of Orion labs, the destination for our guests. The composition was developed through the perspective of a guest coming off the ship and now walking toward the entrance of the Science Labs. In this image we wanted to convey a sense of anticipation. The bridge creates yet another obstacle to finally get to the activities inside the building. The bridge builds up anticipation as one would be able to see not only the door ahead but other bridges and people entering. This also creates a sense of urgency to be the first through the doors. A one point perspective was used as it's a good perspective to show directional movement. First what captures the viewer's eyes is the larger person in the middle of the image. Then the view looks backwards towards the door entrance as the glass railing moves the eyes in that direction. As the eyes wander towards the entrance door they notice the abundance of people. Once the eyes reach the door on the left it moves right because of the building lines. This helps the view end up looking at the other bridge in the far off distance.

Board 1 Picture 3

Disney ImagiNation Competition Architecture 546
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Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, color was not used to show more intimacy between the light and shadows. Also if color was used it may have distracted the eyes with too many things to see.

How did it evolve from the original sketch?

This image did not change much from the original. In the development of this image it went through the process of thumbnail images to larger rough sketches to the final rendering. The basic idea and layout is about the same, however, the design had changed minimally. Along with the change of the building design, the image changed from all bridges converging in a central location to enter, to all bridges having their own entrances. This changed the whole atmosphere of the space as it wasn't about hoarding people in to one central point but about the personal space one has while traveling. The image composition was also from the point of view of the guests which helped create a more intimate and personal experience

Were there any problems, conflicts, or issues?

This picture did not have any issues or challenges other than a few minor design changes due to the changing building design.

What are the next steps to improve the vignette? What details could be added?

Adding in details like the type of material on the walkway may help to improve the whole image.

Clearly delineate role in the development of the illustration

Most of the picture was done by me except the people in the final rendering, it was done by Devin.

Board 1 Picture 3

Disney ImagiNation Competition Architecture 546
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Board #: 1 **Picture #**: 4

Narrative: There are many places to enjoy and explore. Here you will learn about the exciting RECs.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

While in the narrative we wanted to express what the function of the space was, the objective of this image was meant as the climatic arrival shot. As you first step through the door, one can see an array of things going on at the same time. Guests are able to see many people and activities. This illustration was meant to show an exciting first impression. S you come from the long and narrow bridge and then pass through the entrance doors; the space is immediately opened up. This picture illustrates stepping through the entrance door and being able to view the wide open space looking left to right.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, the black and white helps to create a more atmospheric quality with the play of lights and shadows.

How did it evolve from the original sketch?

The first image was drawn with the intention that a person would be greeted by some character and would then go down a flight of stairs to get to the activities. However as the building design changed the image morphed with it. The second image illustrates that the guests no longer walk down a flight of stairs. This decision was made to lessen the

Board 1 Picture 4

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anticipation and create more functionality. It also illustrates the threshold through the entrance doors to the inside. However this changed as the second image was illustrated in a very static composition and the interior design changed. In the final clean drawing, the interior design was developed along with the composition of the image. Now instead of seeing the whole doorway in the center, there is a slight notation of the doorway to the left of the image. This allowed the image to focus on the interior design and layout of the space. In developing this illustration it helped to eliminate unnecessary images that portrayed the same things. By creating a small indication of the doorway it continues the flow from the previous image. This also allowed a larger area to convey the important interior designs attractions and spatial quality. Before the image had a central focus as the interior design had a centralized core, but that changed to open up the space. However, we wanted to keep the centralized core as it was part of the whole attraction. Therefore it was moved to the sided, thus opening up the space. The centralized core is still part of the big picture as it was moved closer to the entrance where it's the first attraction guests' visit.

Were there any problems, conflicts, or issues?

Without any idea as to what the interior looked like it was very difficult to design the image. After further development of the building and interior layout the best choice was an open spaced layout.

What are the next steps to improve the vignette? What details could be added?

I think overall the image is well done but more detail could be added. For example, more people, maybe something small in the middle, and adding more shadows.

Clearly delineate role in the development of the illustration

Most of the picture was done by me except the people in the final rendering, it was done by Devin.

Board 1 Picture 4

Disney ImagiNation Competition Architecture 546
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Board #: 1 **Picture #**: 5

Narrative: When you are ready, visit the REC globe to see what adventure lies ahead.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

The objective was to show the progression from picture 4 to 5. The picture illustrates a glass sphere that is floating as the main attraction. In the distance there are other cylindrical objects followed by an angled wall. It was about following the ideal path one would take after entering into the space. The REC globe is the first area that one would travel towards as it is the nearest attraction. As this project is future based the globe is a glass floating sphere that has an image projected with in the sphere of the information about the narrative and facility. It could be thought of as a similar to that of a directory for a mall. Like in the final rendering demonstrates, people would navigate toward the sphere not only because it would be the first and nearest thing from the entrance but because of how it appears from the rest of the objects. As a floating sphere, it becomes a central focus and a point of interest because everything else is vertical in this space, making it more pronounced. To convey depth and keep the image more interesting, the cylindrical vertical objects in the back, also known as the Tubes in this project, are used to show how large this space really is. The image was designed vertically to illustrate this space as being very open with vast ceiling that one can't see unless looking upwards. While the space is supposed to feel expansive, it was also illustrated to feel comfortable on a human scale.

Board 1 Picture 5

Disney ImagiNation Competition Architecture 546
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Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, to illustrate a more dramatic style of illustration only lights and shadows were used. To draw the attention toward the sphere, a light source is beneath it. The path way also curves toward the sphere further indicating where the eyes should travel.

How did it evolve from the original sketch?

The original sketch started out as an L shape image. In the earliest design the space had high ceilings and a central core. Within the central core was the REC globe. Below the globe was a space that was accessible by walking down a flight of stairs. The way this image was drawn was supposed to portray a different type of perspective view. Instead of creating just one perspective view, I wanted to create two, a view that looks upwards and a view that looks downwards. I was inspired from learning about what film does in creating Tilt shots. While the original image was quite compelling, it didn't match the style of the other images and therefore it was changed back to a rectangular image instead of an L shape. Upon completing image four, I had already figured out the interior of the building and how it was laid out spatially. I wanted to then illustrate how to convey the expansive height of the space and keep it human scale at the same time. Therefore I stuck with keeping the image in a vertical position and choose a view that would express the verticalness of the elements inside the space. In order to provide spatial depth I used the Tubes in the background as a gauge to show what is nearer and further by using a vanishing point to show perspective. In creating the rendering to show depth darkness was used while light was used to highlight the front.

Were there any problems, conflicts, or issues?

In going through different drafts on how to design this image I felt I have lost some of the wow factor along the way. Right now it seems a bit static and it lost the two different points perspective that I would have liked to keep. Also from analyzing this picture, using the darkness to show depth may not have been the best thing to do. When looking at the picture the darker background makes the image feel compressed. I think some the liveliness was not shown in the final rendering as it was in the rough drafts.

What are the next steps to improve the vignette? What details could be added?

I would want to add back the two different perspective views and create a livelier atmosphere. It should illustrate more of what the guests would be doing. The background should be tested with lighter and darker contrast to see which way could create more spatial depth.

Clearly delineate role in the development of the illustration

Most of the picture was done by me except the people in the final rendering, it was done by Devin.

Board 1 Picture 5

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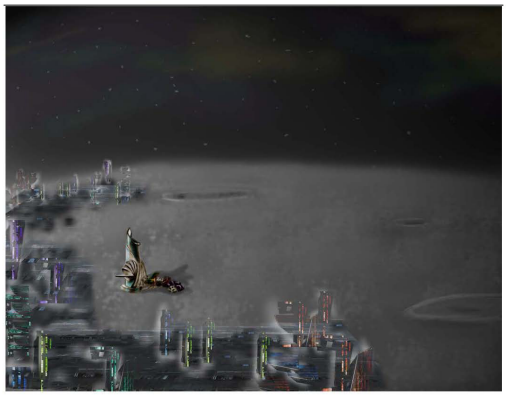
Board #: 1 **Picture #**: 6 Background

Narrative: N/A



What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

For the background image, the purpose was to showcase the main feature of board one. The whole board for board one describes the Orion Science Labs and the experience near and within it. However, there was no inkling of how it appeared on the outside. To showcase the building was going to be the main concept so that there was a brief image of how it could look like to viewers. To keep with the story the building was placed near the city on the moon. It's isolated but still near the future moon city. While the city appears to be a bit blurred, the science labs are clearly defined in shape and color. This helps to clearly delineate that it is the Orion Science labs that guests will be heading towards. In this picture, the idea was to create a futuristic city that was quite expansive and slightly surrounded the Orion Science Labs. This illustrated that the labs were the most important aspect of the city and image layout.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

Board 1 Picture 6 Background

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Yes, this background is the first image that introduces color into the images. It was meant to show a contrast of what was the main feature and what was the story. In boards 1, 2, and 6 the background images are colored to create that difference. The idea was to also add a bit more interest with not only lights and shadows but with color.

How did it evolve from the original sketch?

This image was rather a tricky image and probably took me the longest of all due to the design changes. This was the first drawing that I really worked on so that I could get a clear idea of how the outside looked like. From the first image I knew I wanted the building to be more towers like and rather large. First it started out as if it were just a tall hallow skyscraper and the entrance would be at the top of the tower. I liked this idea a lot but to me it felt like it had already been done, so I decided to make a new type of form that would take many different designs and a lot of frustration to get the final result. The frustrating part was not so much designing the building but the question, "what am I designing?" I had no idea how the outside would look. I could do the other experiential images because I knew what exactly I wanted a guest to feel when in that space. However, it was very different in designing the exterior as I didn't know exactly what I wanted guests to feel or experience. Also without a floor plan, I couldn't just extrude the floor plan and then add and subtract spaces to create interests. While I had all the imagination in the world to design it the way I wanted it to look, it was rather hard just designing in perspective without a plan. There were no rules or regulations that I need to abide to and there was no particular topic to base my design on. Without restrictions it makes it rather difficult to make a design decision with the vast number of options one can come up with. I went from the cylindrical skyscraper to numerous designs. I tried to design a building that was like the impact of a comet. Then it went to domes, which I felt was over utilized in futuristic cities. Another design was of a rabbit because of the Asian culture of a rabbit pounding mocha or beating a drum, but this was more of a fun and frustrated idea. Another idea was about designing everything like they were science equipment, which I found to be a rather interesting concept that could have worked. However, in the end I ultimate had to make an ultimatum. I decided based on time constraints the other ideas that were developed were not helpful at all. If my main objective was the design of this building then I would need to thoroughly work it out, however, the main goal was not the building but the experience with in the facility. Therefore I decided to go back to the original design of a skyscraper type of building but instead of a cylindrical shape I stretched it out and just started to draw shapes that could be spaces. The resulting image was the product of several drafts of this particular design. While I wanted to create a very unique and futuristic building, the main objective wasn't the design of the building, it was the experience. Ultimately the design of the building was compromised to accommodate more time on the experience of space within the building.

Were there any problems, conflicts, or issues?

While the goal of this project was not on the design of this exterior of this building, I can't help but wonder if it were how I could have used the storyboarding process more effectively to design the building. The lack of limitation was very problematic as there was no goal or end result that the design was trying move towards. Having no floor plan made it more difficult to plan things and develop the building.

What are the next steps to improve the vignette? What details could be added?

Board 1 Picture 6 Background

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The final image was changed thanks to the suggestion of my committee chair to add the city in. This made the whole picture look more complete and not isolated and alone. Therefore, the image and composition is much better now than before and doesn't need to be touched. However, I would like to further test out how to design the building more uniquely by creating rules with the storyboarding process to develop not only the interior but the exterior as well.

Clearly delineate role in the development of the illustration

The whole image was developed by me with the consultation of Devin.

Board 1 Picture 6 Background

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Board #: 2 **Picture #**: 1

Narrative: Ride down the Tubes.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This image is about riding one of the neat attractions at the Orion Science Labs, the Tubes. It's a transportation device that allows guests to travel from the main lobby area to the Training Center. It's a new and unique transportation device as it works on magnetic propulsion in a vertical motion. There are four large tubes that take the guests down to another area of the facility. In the tubes one can see all the other tubes that are going up or down, as the sides are made fully of glass. This feature allows guests to feel excited and not be isolated like how elevator shafts are. These tubes feature no cables making the tubes feel suspenseful and exciting. In this image we wanted not only to show that this used as transportation but that I was part of the experience. It's like a unique ride in itself.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, color was not used as a continuation with the storyboarding of black and white image on board one. Using the black and white technique helped to create more dynamic motion and movement. As the lights and darks are more vertically prominent, it creates a feeling of motion.

Board 2 Picture 1

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How did it evolve from the original sketch?

In the original sketch the intent was to view the image straight on as if it was a section of an elevator with people in it. The image turned out fine as a rough sketch to get an idea out, but the composition was static and unappealing. To create a more dynamic image and express the actual feel of riding the Tubes, a different approach was taken. Looking at different shots in storyboarding, the inspiration for this dynamic image was from a low-angle shot. The original though process was that one would be viewing the Tubes as they were traveling downwards. Unlike the original sketch where it was flat and head on, this image was meant to show the dynamic quality and movement from one place to another. To achieve that quality this image was composed by using a one point perspective. As mentioned in other analyses a one point perspective can be helpful in creating a dynamic directional motion. In the case of this picture, it was a perfect choice. Upon drawing the image as a low-angle shot, something felt awkward about the image. It was supposed to show dynamic motion yet it didn't really convey it. Then Devin made a suggestion, he saw me draw the image but was looking at it from a different perspective, he told me to turn the image upside down. When I turned it around it was like magic. It worked out perfectly and became the final image. Ultimately it was no longer a low-angle shot, but now a high-angle shot. Now the image appeared more dynamic and matched the proceeding images.

Were there any problems, conflicts, or issues?

It's always a challenge to come up with dynamic images to entice a viewer to look at it for a while. While this image came across as more dynamic than other images, it can be a challenge to visually see and understand what it takes to make it appealing.

What are the next steps to improve the vignette? What details could be added?

The image does a good job with showing a dynamic quality that leads the eyes downwards. However, as the objects in the background get smaller they are starting to become less visible and are starting to blend in to the darkness. While this in fact should happen, for illustration purposes, the objects further away should be more clearly defined so it's still visible for the views. The image should show all the Tubes and not just one. Also more definition on the curved room should be further emphasized.

Clearly delineate role in the development of the illustration

I drew the sketches, clean drawings and developed the picture. Devin rendered the image on Photoshop.

Board 2 Picture 1

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Board #: 2 **Picture #**: 2

Narrative: Exit the Tubes and head through the connecting space tunnel.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This image is about arriving at the bottom of the Tubes. It's a lobby area that leads to the next stage of the attraction at Orion Science Labs. While the image of the Tubes expressed the dynamic motion of the ride down, this image shows more of a static and clam atmosphere. It is the end of the Tubes where guests get off and can linger around to socialize. However, this space is not about socializing, as it is a pivotal point in the experience of the facilities. As in many of the Disney rides, there is an entrance point where the line starts, an intermediate point where one stands in the line, the main attraction and the end. This image is the intermediate point where it seems slower. The Tubes in the earlier image was the key to ignite the excitement of being in this place. Now in this image it prolongs the excitement and creates a tension of anticipation for the entertainment further ahead at the Orion Science Labs Storage Facilities. This space slows down the fast pace of the Tubes to present a calmer atmosphere. It leads guests to a narrow passage which is the only other way out of this space beside the Tubes back up.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, sticking to the black and white tones continues the story and the continuity of the images.

Board 2 Picture 2

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How did it evolve from the original sketch?

Developing this image was very straight forward. In fact from the original sketch it didn't change at all. The main object for this image was to create continuity with in the story and space shown. It both illustrates the end of the Tubes and the beginning of the next image, while continuing the narrative and spatial story. In the development of this space, there was already the notion that it was an intermediate point of space. While this space was not the most important in design development, it was a crucial piece for the narrative and spatial sequence. If this image was deleted, the continuity of the story would be gone. Then a viewer would get lost and wonder how they got from the Tubes going vertically down to a tunnel going horizontal to the right.

Were there any problems, conflicts, or issues?

There were no problems that existed.

What are the next steps to improve the vignette? What details could be added?

While this images purpose was fulfilled as intermediate image and space it still lacks fluid continuity. I think in this case using the "L" shape could really work in this images favor. It would show a bit more of the Tubes coming to an end in this space. While extending and emphasizing the tunnel and its directional influence. It would then show a fluid motion of storytelling.

Clearly delineate role in the development of the illustration

I drew the sketches, clean drawings and developed the picture. Devin rendered the image on Photoshop.

Board 2 Picture 2

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Board #: 2 **Picture #**: 3

Narrative: Make your way to the REC Training Center.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

After reaching the bottom of the Tubes and entering into the small lobby area, there is a space tunnel connected to the lobby area. In this picture it illustrates the journey to through the space tunnel towards the REC Training Center. As I mentioned in the previous analysis, this facility was designed similar to that of a themed ride at Disneyland. In this picture it still illustrates the intermediate phase. The long passage is a way that builds up the anticipation. To illustrate the journey, a one point perspective was used. Thus, it gives a directional inclination and a goal. Most people would normally view this image from the bottom left and see the space tunnel with the guests because it's the foreground. Gradually their eyes would run along the lines of perspective created by the tunnel, which leads the background. In the background is the REC Training Center. As the eyes are fixated on the Training Center, it begins to wander off by looking at the rest of the image. Further behind the training center, in the far background are the broken-down storage facilities that guests would be able to see. The storage facilities are the ultimate goal as it contains the entertainment. For guests, being able to see the ends goal while traveling through the tunnels further builds the excitement.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, sticking to the black and white tones continues the story and the continuity of the images.

Board 2 Picture 3

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How did it evolve from the original sketch?

Like the last image, this image didn't change much from the original sketch. For this image the idea was clear and was quickly drawn up. However, unlike the last image this image did change a bit, but not much. In the original design, this image had the space tunnel in the same place as the final design but the view was placed with in the tunnel. By placing the view in the tunnel it shortened it's appeared. This made it feel as if the journey through the tunnel to the training center was very short and insignificant. This clearly did not illustrate what we wanted the space tunnel to feel like. In the final image, the view was placed outside the tunnel to express the long journey. As the view was outside, the perspective changed making it appear much longer. This was the feeling we wanted to express. Also in the final, the training center was reduced in size to illustrate the goal and how grand it really is to the space tunnel. By designing the features as it appears in the final design, the image portrays not only the long journey, but also spatial depth.

Were there any problems, conflicts, or issues?

There were no problems that existed.

What are the next steps to improve the vignette? What details could be added?

While the idea was to create spatial depth and a long journey, the way it was portrayed could be fixed still. Right now it appears to almost go on forever, and make the journey feel less inviting and warm. It almost feels isolated. Therefore, the perspective should be changed. Instead of having the tunnel meet at a point on the image the tunnel should become larger towards the end near the training center. This makes the tunnel feel a bit shorter and a journey worth taking. Overall, the composition works well, it's just the minor adjustment to the tunnel that I feel needs to be fixed.

Clearly delineate role in the development of the illustration

I drew the sketches, clean drawings and developed the picture. Devin rendered the image on Photoshop.

Board 2 Picture 3

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Board #: 2 **Picture #**: 4

Narrative: Meet your trainer and become a new novice hunter. Your Adventure begins!

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

After the journey through the space tunnel, the guests are able to enter the training center. For this image we purposely did not showcase any other spaces. In this case we didn't need to know what or how the REC Training Center looked like in the interior. To progress the story along and to make it more appealing, this image illustrates the immediate contact with the REC Trainer. In this image the REC trainer is showcasing how to use the DG-bot to a group of guests in a room. To highlight the presentation of the REC trainer, spotlights are cast on her. Here the guests are also shaded differently to illustrate depth to the hunter trainer. The whole idea for this image was to express the excitement of the guests to become a REC Hunter and receiving their own DG-bot.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, sticking to the black and white tones continues the story and the continuity of the images.

Board 2 Picture 4

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How did it evolve from the original sketch?

The image went through a couple of stages. In the original sketch, it looks very similar to the final rendering but the way the hunter trainer was expressed changed. In the second draft the image was design to be more interactive and therefore the composition of the guests and the trainer were changed. However, for the end result it became more of a combination of the two rough drafts. The main idea was to illustrate the Hunter Trainer giving the instructions and showcasing the DG-bot. Therefore the audience was drawn just as silhouettes, while the trainer was drawn to appear more interactive and exciting. In this board the idea was to showcase more on the achievement of receiving a DG-bot. Instead of illustrating the trainer looking at the audience, the trainer was drawn to showcase the DG-bot to the guests.

Were there any problems, conflicts, or issues?

There were no pressing problems or issues. There were some concerns about certain things like if the image was going to be a close-up or a far shot. This concern was answered when the decision was made to how the space was going to be like. We wondered if it should be in a large auditorium like space but decided it should be more personable and intimate. Therefore, the space was designed smaller and the image was drawn as a close up shot.

What are the next steps to improve the vignette? What details could be added?

The overall composition and lighting was done well to create an atmosphere that shows excitement and joy. The only thing that maybe considered is to illustrate how the auditorium space might have felt. Then compare the two spaces to see how it affects the atmospheric quality of the image. My guess, by illustrating more of the space it may distract and disrupt the atmosphere it currently exudes.

Clearly delineate role in the development of the illustration

This was all developed by Devin with my consultation.

Board 2 Picture 4

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Board #: 2 **Picture #**: 5

Narrative: Interested in becoming a hunter with your own DG-Bot?

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

The objective for this illustration was to create an inspiring and motivating selling point. The whole point was to illustrate the achievement of receiving your own DG-bot after meeting with a REC trainer. This image was also used as the background image to the black and white narrative images. In this picture there is teen boy who has received his own DG-Bot along with the training to go off on his hunting adventure. The background that the boy is illustrated with is the surface of the moon and space to demonstrate that this attraction is only offered on the moon. This picture was developed to entice the viewer with the thought of how remarkable it would be to become a REC hunter with your personal DG-Bot. Almost like a Hero.

Board 2 Picture 5 Background

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Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

Yes, like the first background, this background was also colored. By using color we wanted to show how the characters attire looked like along with the DG-bots. As mentioned in the other colored image, it was meant to show a contrast of what was the main feature and what was the story.

How did it evolve from the original sketch?

This image evolved quite a bit. It went from a kid, to a teen and to several renditions of poses. At first it was about the moment of receiving the DG-bot, but as the design gradually changed the idea was about how amazing it would be to become a REC hunter. As an example, it's like joining a club of some sort. This club advertises how neat it would be to become a member and then offers an additional attention grabber to seal the deal. In essence, this image illustrates by becoming a REC Hunter you then receive a DG-Bot which is the newest thing available for entertainment.

Were there any problems, conflicts, or issues?

To make the character appear likeable was an issue. Determining how the character looked like and what position they would be in was difficult. However, once it was decided to make the character more of a hero like figure and to aspire guests to be like, it became easier to develop.

What are the next steps to improve the vignette? What details could be added?

As there features only one character, a few more characters with their DG-Bot might attract more people.

Clearly delineate role in the development of the illustration

This was all developed by Devin with my consultation.

Board 2 Picture 5 Background

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Board #: 3 **Picture #:** 1

Narrative: Scavenger Hunt – Of the three types of RECs, these RECs are quick and cunning. They are experts at being stealthy but often their curiosity becomes their weakness. Search for the RECs by looking for their footprints, entice them with shiny objects, and spot them with your DG-bot. Catch them quickly otherwise you may miss your chance.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This image is a representation of one of the three storage facilities that were damaged by the comet. This area is known as the Scavenger Hunt zone where guests who have completed their REC hunter training now have access to. In this area, the comet had disrupted all the electrical appliances and the only thing that can work with in this environment are the DG-bots. The area is almost pitched black with some outside light from cracks on the walls and windows. Guests are able to use their DG-bots to illuminate the area around them to search for these creatures. The image demonstrates the actions the guests would take in order to capture the RECs. The different characters help to illustrate the wide variety of methods one could search for the RECs. The image portrays a curious atmosphere with in a dark environment. Within the environment large boulders and building debris creates the REC habitat. Like the immersive environments

Board 3 Picture 1

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that are typical in anything built by Disney, this image along with boards four and five are the illustrations that create the immersive environments for guests at the Orion Science Storage Facilities.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

Yes, color was utilized. Unlike the black and white images that show the spatial narration, this image along with boards four and five are illustrated for the purpose of demonstrating the activity and actions of the guests. Using color create a visually appealing image that responded to the atmosphere that was trying to be conveyed. As there are many different things happening within the image color helps to delineate everything. For the RECs the habitat is dark and their stealthy creatures, therefore, the colors blue and purple are used for these characters. Even the environment has a bluish hue to the whole image to help create the stealthy, night like and curious atmosphere.

How did it evolve from the original sketch?

This board changed quite drastically. When the development of this board first began, it was like all the other boards that were created before. There was a layout of how the board should look with a large image as the background and the smaller vignettes in black and white. However, that changed upon how much time each image consumed. The idea was to make all the board look cohesive by applying a similar layout. However, when time becomes limited, certain decisions need to be made. In the development of this board we decided that instead of developing a bunch of smaller images that would illustrate just one thing, just one image that illustrates everything. So from the small thumbnail images, the development of just one image arose to create an illustration board. All the ideas of the smaller vignettes were kept but altered to fit the composition of the one image.

Were there any problems, conflicts, or issues?

Due to time constraints and how long each image takes to draw and then render, a new method of completing the board needed to be arranged. Therefore upon careful consideration and looking over the boards, we made a decision to create illustration boards with just one detail image. The technique and style that was used looks very different to the style of boards one, two and six. This was also a decision based on time. However, even if the main factor for making the decision was based on the time factor, we wanted to try a new technique to see if this could portray the same effect and atmospheric quality with less time. The technique used in this illustration along with boards four and five is a more comic based style of coloring. Instead of creating smoother transitions of color, light, and shadow, this technique utilized the stark differences of the three.

What are the next steps to improve the vignette? What details could be added?

As the image appears very different in style to that of boards one, two and six, the next best thing is to redo this image in the same style as the other boards. By creating two unique styles it breaks up the continuity of the boards and story. However, because of the stark transition between board techniques it does make this image standout. Otherwise it

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would be interesting to see the other boards done the same way as this image. But already with this image, the conceptual and atmospheric quality that boards one, two and six have are not as strong.

Clearly delineate role in the development of the illustration

Devin did this whole board with my consultation.

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Board #: 4 **Picture #**: 1

Narrative: Battle – "1-2-3---1-2-3" is what you might typically hear from these RECs. They are strong and love physical fitness, especially sparing with someone else. While they may look mean and are very inconsiderate, all they want is to have a good sparring partner, particularly REC Hunters.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This image follows the ideas that were mentioned for board three. The illustration shows the Battle zone where guests can get some physical activity through dueling with the RECs that inhabit this zone. In this area the comet devastated the inside of the storage facility and created a very arid environment. Lots of debris from the building is scattered. However, the debris is now used to create paths and bridges to different platforms. Guests are able to use their DG-bots to create shield for protection and assistance in statistics of the RECs. In this image it shows that this environment, while it is arid and full of building debris, is very unique and fun to explore and have challenges. The atmosphere is full of courage and adrenaline. Like what was mentioned for board three "the immersive environments that are typical in anything built by

Board 4 Picture 1

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Disney, this image along with boards three and five are the illustrations that create the immersive environments for guests at the Orion Science Storage Facilities.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

Yes, color was utilized. This image was constructed the same way that was described in board three. "Unlike the black and white images that show the spatial narration, this image along with boards four and five are illustrated for the purpose of demonstrating the activity and actions of the guests. Using color create a visually appealing image that responded to the atmosphere that was trying to be conveyed. As there are many different things happening within the image color helps to delineate everything." However in this illustration these RECs don't live in a dark habitat like the RECs in board three. In this image the RECs live in a harsher environment. The habitat is arid and the RECs are tough creatures, therefore, the colors red and orange are used for these characters. The environment has a reddish hue to the whole image to help create the arid, harsh like landscape and atmosphere.

How did it evolve from the original sketch?

This image started off like all the other boards but changed due to time. Like mentioned for board three this image first started out with thumbnail images and a board layout. It was then rearranged and developed into an illustration board that showcased only one image. By taking a few of the elements from the thumbnail images, this image was composed.

Were there any problems, conflicts, or issues?

As mentioned for board three "Due to time constraints and how long each image takes to draw and then render, a new method of completing the board needed to be arranged. Therefore upon careful consideration and looking over the boards, we made a decision to create illustration boards with just one detail image. The technique and style that was used looks very different to the style of boards one, two and six. This was also a decision based on time. However, even if the main factor for making the decision was based on the time factor, we wanted to try a new technique to see if this could portray the same effect and atmospheric quality with less time. The technique used in this illustration along with boards four and five is a more comic based style of coloring. Instead of creating smoother transitions of color, light, and shadow, this technique utilized the stark differences of the three." One major problem that occurred for this particular image was how to create it to look active, fun and entertaining without it being too violent. The composition of the characters and the landscape background was quite complicated and took many rearrangements to get the final product.

What are the next steps to improve the vignette? What details could be added?

While the background and depth of the image looks interesting, I don't think it turned out as effective as it could have been. In one of the original sketches the background wasn't added into the picture and the characters were closer together. It created a more dynamic and fun atmosphere. I think the image needs to be readjusted and cut off part of the background. Right now the space feels too expansive and very unappealing to travel that far. The image should be

Board 4 Picture 1

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more like board three. Then it would show some of the environment and characters in action without a huge distraction that you can't even see.

Clearly delineate role in the development of the illustration

The whole image was developed by me with the consultation of Devin.

Board 4 Picture 1

Disney ImagiNation Competition Architecture 546
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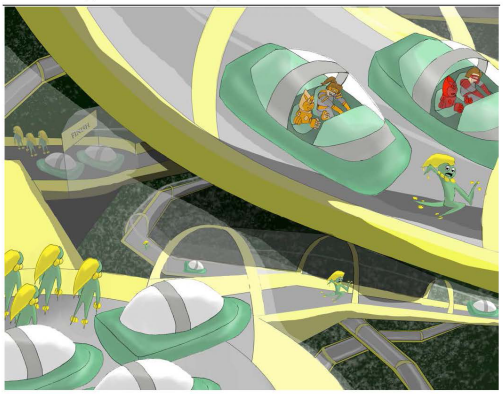
Board #:5 **Picture #**: 1

Narrative: Race – Ah yes! The most noble of RECs, these guys are extremely fast and seek the thrill of a challenge. They will gladly be turned back into the pure element, if and only if you beat them in a race. Otherwise, they are free to roam around as they please, until their next challenger.



What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

Following the technique and style of boards three and four, this image creates a more exciting and dynamic atmosphere. The illustration shows the Race zone where guests can race against the RECs in unique future cars called REC Accelerators. In this area the comet hit the storage facility but all the debris flew upwards and fused together to create a race track that twists and turns. Guests are able to use the DG-bots as a navigator. In this image it shows that the environment and atmosphere as being playful and exciting. Viewers and guests can feel the immersive environment that this image portrays.

Board 5 Picture 1

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Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

Yes, color was utilized. This image was constructed the same way that was described in board three. "Unlike the black and white images that show the spatial narration, this image along with boards four and five are illustrated for the purpose of demonstrating the activity and actions of the guests. Using color create a visually appealing image that responded to the atmosphere that was trying to be conveyed. As there are many different things happening within the image color helps to delineate everything." However in this illustration these RECs don't live in a dark habitat like the RECs in board three nor do they live in an arid environment like board four. In this image the RECs live in a freer environment. The habitat is unlike the other two boards, it's freer yet confined in a racing tube track. These RECs are fast creatures; therefore, the colors yellow and green are used for these characters. The environment has a yellowish hue to the whole image to help create a more vibrant and exciting landscape and atmosphere.

How did it evolve from the original sketch?

Just like boards three and four, this image was developed the same way. However, this image was produced a lot quicker. The design didn't need to be completed, nor did it need to be completely shown to make the image appear dynamic and fun. By creating different angles of the track and illustrating the start an end clearly demonstrated what the activity was. The rest of the track could then be filled in by the viewer's imagination.

Were there any problems, conflicts, or issues?

The same thing mentioned in both boards three and four

What are the next steps to improve the vignette? What details could be added?

The overall composition came out well but their needs to be more definition and detail to make it really appealing.

Clearly delineate role in the development of the illustration

Devin did this whole board with my consultation.

Board 5 Picture 1

Disney ImagiNation Competition Architecture 546
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Board #: 6 **Picture #**: 1

Narrative: Ah, so we have finished and are heading back!

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This illustration is the start of the ending journey. It shows the familiar space tunnel, but this space is located on the backside of the training center. Also instead of just one space tunnel there are three. The view is located within the central space tunnel through a guest's perspective. Guests are able to see through the tunnels and see other guests leaving or arriving. These tunnels are very short and are used as another type of intermediate point. While the training center is not the main event and entertainment, it serves as an important side journey that severs as the entertainment hub. Connecting the training center (hub) to the main entertainment is these intermediate tunnels. These tunnels allow arriving guests to become further excited with anticipation as they get closer to playing the games. While the guests who are leaving have some time to gather their thoughts from their exciting journey.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, this image goes back to the black and white tones to continue the story and the continuity of the images from boards one and two.

Board 6 Picture 1

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How did it evolve from the original sketch?

For this image and most of the images on board six, the development of the image was limited in time. Most of these images were quickly drafted out as thumbnail drawings. This image went through three thumbnail phases. The first was a high-angle shot that showcased the three tunnels back to the training center. The second was a lower high-angle shot of the previous image. After drawing the second rough thumbnail, it still didn't hold any significant meaning to how a person could feel. Therefore in the final thumbnail that was used for the final rendering, it was an inside shot of the tunnel through the guests experience.

Were there any problems, conflicts, or issues?

There were no problems that existed, other than time. With limited time, the development of the picture was greatly reduced and quick decisions needed to be made.

What are the next steps to improve the vignette? What details could be added?

In the rendering the three tunnels are lost due to the washing out of the illustrated glass. To improve this image and to clearly see the elements of the other two tunnels, the rending of the glass needs to be decreased. Currently the glass makes it feel very enclosed but that is not what it is supposed to represent. The glass was used as a way to show the freedom of looking outside of the tunnel but in the rendering it no longer has that atmosphere.

Clearly delineate role in the development of the illustration

The whole image was developed by me with the consultation of Devin.

Board 6 Picture 1

Disney ImagiNation Competition Architecture 546
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Board #: 6 **Picture #**: 2

Narrative: Hope you had a great time here at Orion!

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This image was meant to show how the guests would proceed after they finished playing the games. From the tunnels they would then travel up stairs. The stairs are more dimly light and creates a more mental type of space. Like a themed ride at Disneyland, at the end of the ride there is another passage that one must take to exit the attraction. These stairs are exactly like the Disneyland's passage way to the exit. Its main goal is to help guests reflect on what they just went through. By walking up the stair to another area of the training center it give the guests a sense of pride and accomplishment. The stairs are also dimly light so that the following area appeared brighter and the end of the journey is solidified.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, this image adheres to the black and white tones to continue the story and the continuity of the images.

How did it evolve from the original sketch?

This image didn't change much from the original sketch. As stated earlier all the pictures on this board were done in a very limited time frame. This particular image was almost exactly like the original sketch. In the original sketch the

Board 6 Picture 2

Disney ImagiNation Competition Architecture 546
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drawing illustrated the act of climbing stairs to head towards the exit and that of incoming guests. The image also showed the frame of the tunnel that guests enter and exit from. For the final image and rendering, the tunnel entrance was taken out as it minimized the amount of space needed to portray more important information. The image was redesigned to predominantly show the staircase and the process that the guests were moving upwards as they exit. There was a wall that also separated the guests exiting to that of the entering guests.

Were there any problems, conflicts, or issues?

There were no problems that existed, other than time. With limited time, the development of the picture was greatly reduced and quick decisions needed to be made.

What are the next steps to improve the vignette? What details could be added?

In the rendering the left side where the guests are shown entering is illustrated to dark and it almost looks like a wall instead of a space. While the image could work if the left side of the wall was another plain wall, I think if the space was lightened up to define another space behind the wall it would add another spatial depth to the image. It would also create a sort of parallax view of two spaces that is separated by the staircase wall.

Clearly delineate role in the development of the illustration

The whole image was developed by me with the consultation of Devin.

Board 6 Picture 2

Disney ImagiNation Competition Architecture 546
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Board #: 6 **Picture #**: 3

Narrative: Once back in the main lobby please return all DG-bots.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

Upon reaching the top of the staircase the next space is hidden by a wall. In this picture the guests arrive at the top of the stair to an open area of social congregation. There are directional lights on the walls that help to illuminate the room and lead guests to the next and final space. This space is only used to create anticipation and curiosity of what is behind the wall. The atmosphere is also very lively with lot sof socializing.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, this image adheres to the black and white tones to continue the story and the continuity of the images.

How did it evolve from the original sketch?

In the original sketch it showed the guests coming-out of the staircase and into a larger space. However, the dramatic conclusion is then ruined if the guests are automatically able to view the last activity. Therefore the image was redesigned to create a space before the final space. This space is rather small so that guests don't linger around to long and are encouraged to enjoy the next area. While the original sketch showcased how guests look coming out of

Board 6 Picture 3

Disney ImagiNation Competition Architecture 546
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the staircase, the revised image was drawn through the guests experience of the space. This way it feels more intimate and follows the same pattern of the other two images on this board.

Were there any problems, conflicts, or issues?

There were no problems that existed, other than time.

What are the next steps to improve the vignette? What details could be added?

I think this image could be a very strong image but the perspective is off and needs to be clearly defined. In this image it's hard to see what the activity the guests are doing in this space.

Clearly delineate role in the development of the illustration

The whole image was developed by me with the consultation of Devin.

Board 6 Picture 3

Disney ImagiNation Competition Architecture 546
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Board #: 6 **Picture #**: 4

Narrative: Once the DG-bots are returned, you will receive a REC Hunter I.D. Documenting your whole experience.

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

After traveling through the tunnel, walking up the stairs, and then finally turning the corner past the wall, guests will arrive at the final stage of the science facility. In this picture, it illustrates the act of returning the DG-bot to receive the Hunter ID. Illustrated are three stalls. The central stall is being utilized by a family of three, while to the right is a stall utilized by only children (in this case three children). To the left is an open stall which a person is walking towards. The whole idea was to highlight and showcase the stalls for retuning the DG-bots. Therefore the idea was to create a design that illuminated each stall with a downward facing light source. The image was also supposed to feel more intimate and non-dynamic as this marked the end of the journey.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, this image adheres to the black and white tones to continue the story and the continuity of the images.

Board 6 Picture 4

Disney ImagiNation Competition Architecture 546
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How did it evolve from the original sketch?

The picture began as a point of view shot where the guest was placing the DG-bot into the return stall. However, this didn't flow well with the rest of the images and it became a full long shot taken at an angle. Now the illustration showed more of the activity and the guests, but now it showed people standing in lines. This presented a problem because having people wait in lines did not portray the intimate and exciting feeling when receiving the Hunter ID. Therefore the shot was placed straight on to show just a few stalls and a couple of people at each stall. Then it was the rendering of the lights and shadows that needed to portray the atmosphere.

Were there any problems, conflicts, or issues?

There were no problems that existed, other than time.

What are the next steps to improve the vignette? What details could be added?

The people in the image seem to block the main attraction of the image which is the returning stalls. This is supposed to happen but the people seem to be excessively dark therefore it flattens the image. The people should be lighted up and highlights should be added around their body. It will help to liven up the atmosphere while maintaining the intimate quality of the space.

Clearly delineate role in the development of the illustration

The whole image was developed by me with the consultation of Devin.

Board 6 Picture 4

Disney ImagiNation Competition Architecture 546
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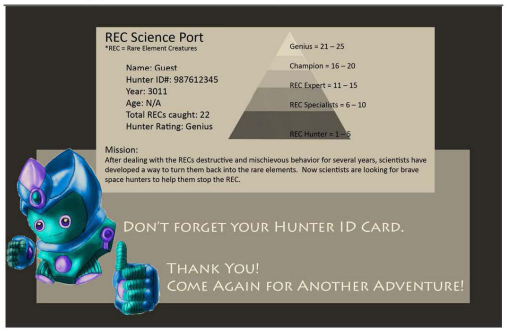
Board #: 6 **Picture #**: 5

Narrative: Don't forget your Hunter ID Card. Thank you! Come again for another adventure!



What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This was the ending picture for the narrative of black and white images. It was an end screenshot of what guests would receive at the end, the Hunter ID Card. This was the last shot as it was another feature for coming to the Orion Science Labs. The Hunter ID Card does not only show the statistics of how well a guest has done in the games, but it's also the video documenting the guest. This ID card stores the video taken by the DG-bot of a guest's adventures at the Orion Science Storage Facilities.

Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

No, this image adheres to the black and white tones to continue the story and the continuity of the images.

How did it evolve from the original sketch?

Instead of creating another shot of a guest picking up the Hunter ID from the returning stall, the decision was made to just show the ID card. If the image was illustrated with a guest picking it up it would seem as if the story would just continue on. However, by just showing the ID card with the DG-bot narrator saying the closing lines, it clearly illustrates the end. It's similar to that of the credits at the end of a film. While it's like

Board 6 Picture 5

Disney ImagiNation Competition Architecture 546
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the end of the credits it's also like a promotional movie poster. Like the background image of board two, this image is a way to promote what happens when you complete the Hunter Challenges.

Were there any problems, conflicts, or issues?

There were no problems that existed, other than time.

What are the next steps to improve the vignette? What details could be added?

The card could be illustrated more to look more futuristic and appealing. It looks like any ordinary statistic card one could get in this day and age. As this project is based in the future it should look more futuristic and high tech.

Clearly delineate role in the development of the illustration

The whole image was developed by me with the consultation of Devin.

Board 6 Picture 5

Disney ImagiNation Competition Architecture 546
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Board #: 6 **Picture #**: 6

Narrative: N/A

What was the objective? What is being illustrated? What is the point for what is shown? What feeling/atmosphere is being conveyed? Why are certain elements used?

This is the last image designed in color. It portrays the end of the story and the end activity. Here guests are able to view what rank they are according to how many RECs they caught. In this space guests turn in the DG-bots to receive their Hunter ID card that documents their whole experience. The space is a curricular room that surrounds the central ranking pyramid. This allows the focal point to be the pyramid. By creating that focal point it almost stress on the ranking system of the game at the end. Therefore it creates another challenge to guests leaving. If a guest wants to become the highest rank "REC Genius" then they must come back as many times as they can to reach that goal.

Board 6 Picture 6 Background

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Was color used? [Y/N] If yes, why was it used? If no, why wasn't it used? What was the intention?

Yes, this is the last colored image that showcases the atmospheric quality of the space. The coloring on this image has two types of coloring. There is the background and the foreground. In the background the image represent the atmospheric integrity of the space. The space is lit by the lights from the return stalls and the ranking pyramid. A yellowish color wash was added to dull the stark contrast of the lights and shadows and to create a cohesive picture. The foreground is the pyramid with the boy and girl next to it and the man to the left by the return stall. To make them appear more important they were rendered with more color and detail.

How did it evolve from the original sketch?

This image remained basically the same throughout its development. The only changes that were made are the positions of people and return stalls. However, even these changes were minimal.

Were there any problems, conflicts, or issues?

The only problem that occurred was how to layout the whole board with this image as the background. We didn't want to have anything important blocked by the black and white images. After going through several drafts, we decided that instead of keeping the black and white images together like boards one and two, we would split the images. This image was originally intended to be the fourth image of the black and white series to illustrate the layout of the space. Upon the decision of splitting the black and white images, the decision was then to make it the colored background. Out of all the other black and white images this image made the most sense to convert to color and enlarge.

What are the next steps to improve the vignette? What details could be added?

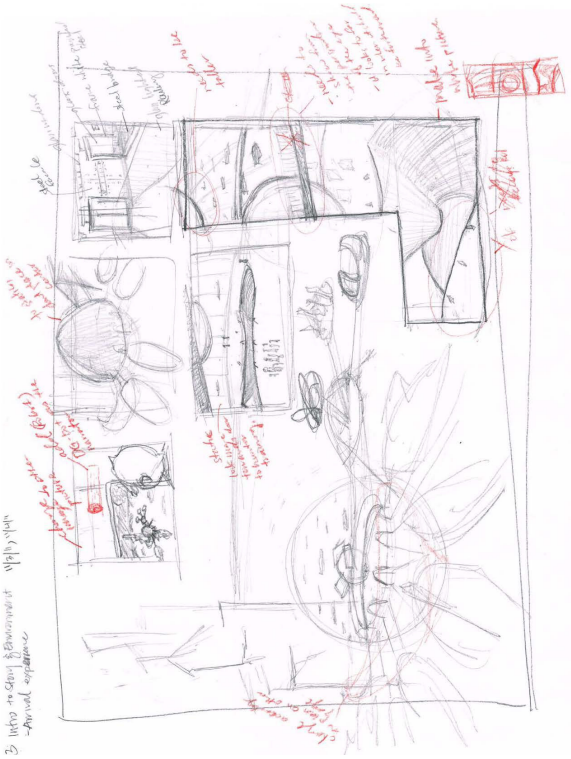
The color difference from the background and the foreground are too different and should be matched to show more cohesiveness. I think a yellowish wash over the colored foreground characters would help to blend the whole image together.

Clearly delineate role in the development of the illustration

I drew the sketches, clean drawings and developed the picture. Devin rendered the image on Photoshop.

Board 6 Picture 6 Background

PROCESS SKETCHES



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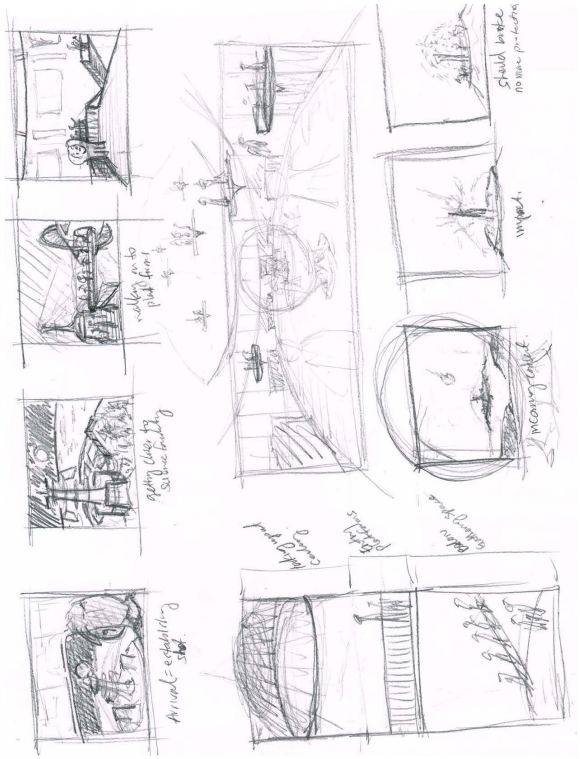

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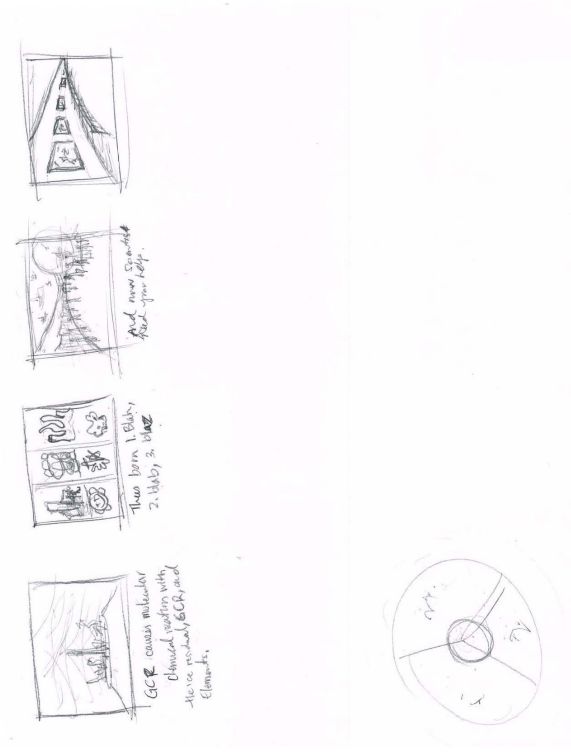

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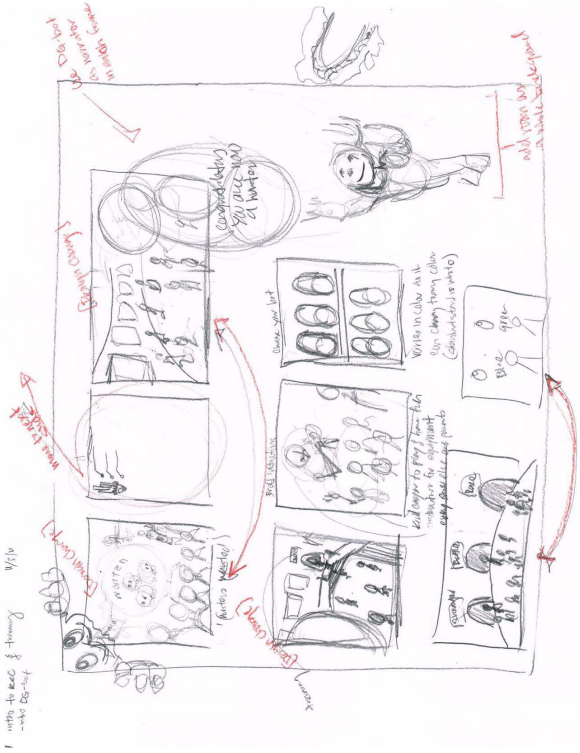

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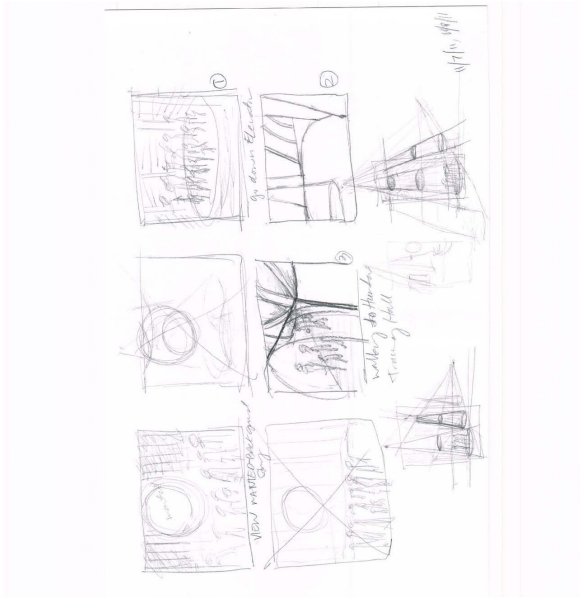
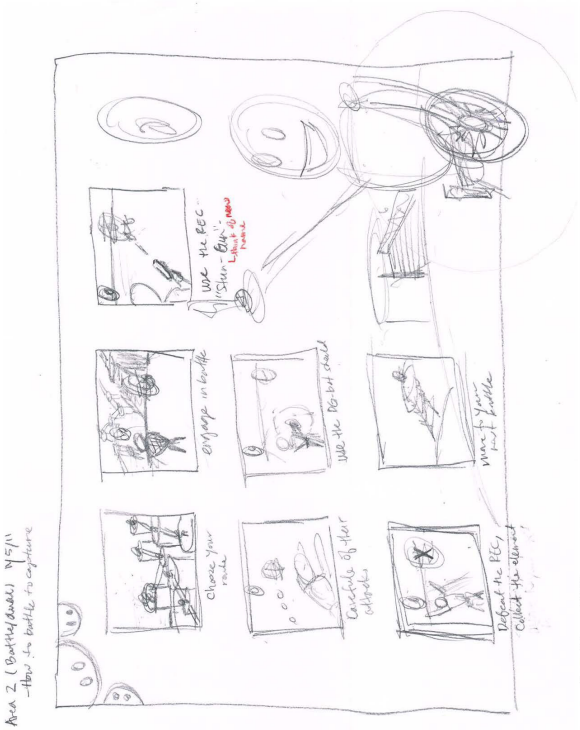


Board 2

Board 3



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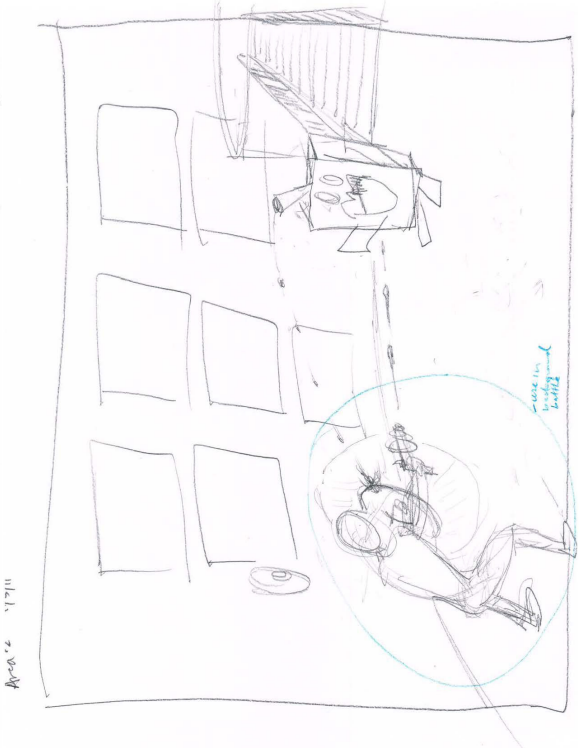

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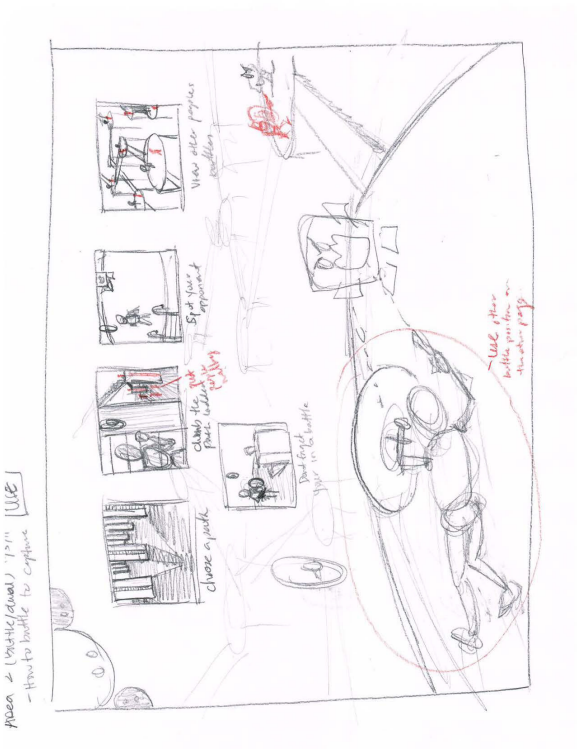

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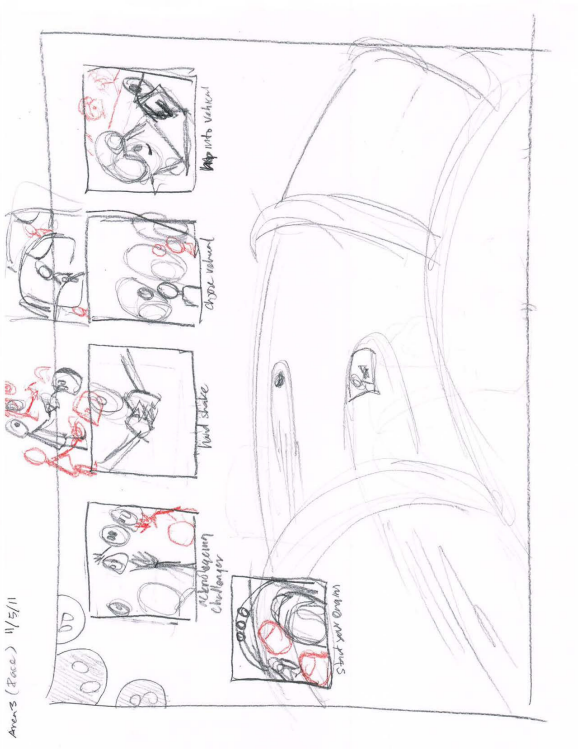

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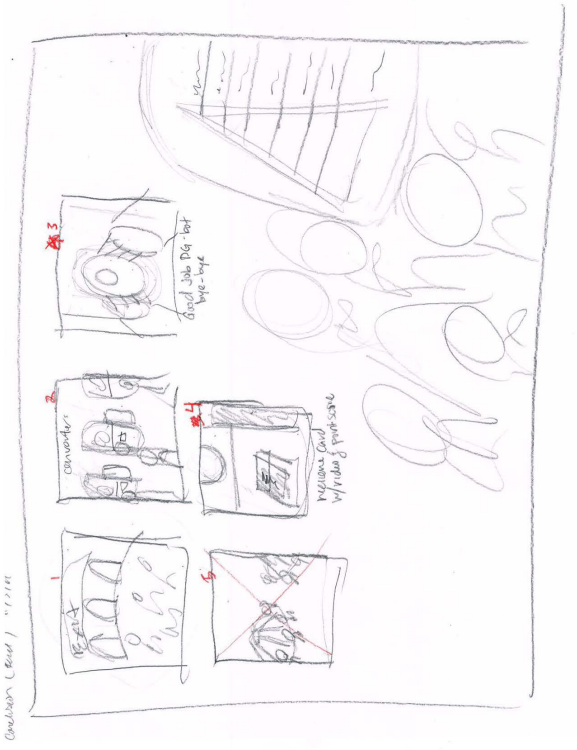

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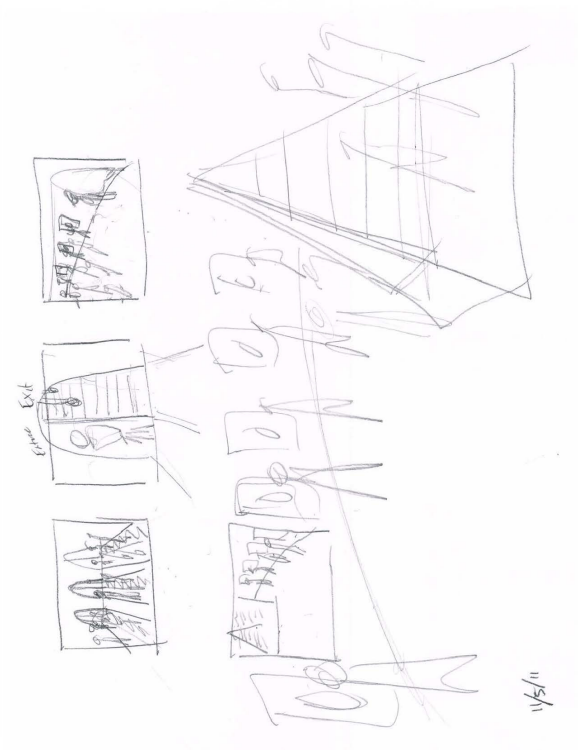

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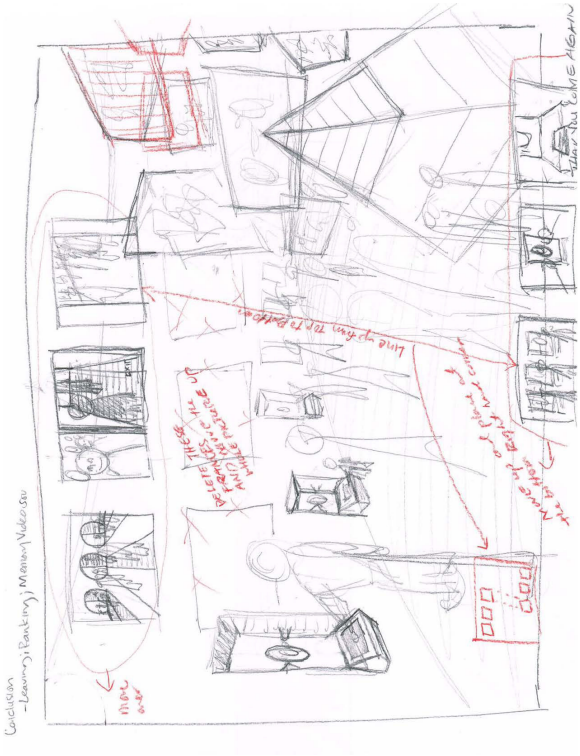

Board 6

BIBLIOGRAPHY

Ramirez, Juan Antonio. 1986. *Architecture for the Screen, A critical Study of Set Design in Hollywood's Golden Age*. Ed. Moffitt, John. Jefferson, North Carolina, and London: McFarland & Company, Inc.

Palermo, Gregory, Patrick J. Sullivan, and Barry Wasserman. *Ethics and the Practice of Architecture*. 1 ed. New York, NY: Wiley, 2000.

Lobrutto, Vincent. *The Filmmaker's Guide to Production Design*. New York: Allworth Press, 2002.

Bergfelder, Tim, Sue Harris, and Sarah Street. *Film Architecture and the Transnational Imagination: Set Design in 1930s European Cinema (Amsterdam University Press - Film Culture in Transition)*. Amsterdam: Amsterdam University Press, 2007.

Bruno, Giuliana. *Atlas of Emotion: Journeys in Art, Architecture, and Film*. New York: Verso, 2007.

Lamster, Mark. *Architecture and Film*. 1 ed. New York: Princeton Architectural Press, 2000.

Schleier, Merrill. *Skyscraper Cinema: Architecture and Gender in American Film*. Minnesota: Univ Of Minnesota Press, 2009.

Janser, Andres, and Ruegg, Arthur. *Hans Richter: New Living*. 1 ed. Baden, Switzerland: Lars Müller Publishers, 2001

Bacher, Hans. *Dream Worlds: Production Design for Animation*. Amsterdam: Focal Press, 2007.

Shonfield, Kathe. *Walls Have Feelings: Architecture, Film and the City*. 1 ed. New York: Routledge, 2000.

Canemaker, John. *Paper dreams: the art & artists of Disney storyboards*. New York: Hyperion, 1999.

Glebas, Francis. *Directing the story: professional storytelling and storyboarding techniques for live action and animation*. Amsterdam: Elsevier/Focal Press, 2009.

The American heritage college dictionary. 3rd ed. Boston [etc.: Houghton Mifflin, 1997.

Simon, Mark. *Storyboards: motion in art*. 3rd ed. Amsterdam: Focal Press, 2007.

Cristiano, Giuseppe. *Storyboard design course: principles, practice, and techniques: the ultimate guide for artists, directors, producers, and scriptwriters*. Hauppauge, NY: Barron's, 2007.

Begleiter, Marcie. *From word to image: storyboarding and the filmmaking process*. 2nd ed. Studio City, CA: Michael Wiese Productions, 2010.

Torta, Stephanie, and Vladimir Minuty. *Storyboarding: turning script to motion*. Dulles, Va.: Mercury Learning and Information, 2011.

Malmberg, Melody. *Walt Disney imagineering: a behind the dreams look at making MORE magic real*. New York: Disney Editions, 2010.

Tumminello, Wendy. *Exploring storyboarding*. Australia: Thomson/Delmar Learning, 2005.

Bacher, Hans P.. *Dream worlds: production design in animation*. Burlington, MA: Focal Press, 2008.

Kagan, Jeremy Paul. *Directors close up: interviews with directors nominated for best film by the Directors Guild of America*. 2nd ed. Lanham, Md.: Scarecrow Press, 2006.

Kent, James. Augmented reality: the Augmented reality handbook - everything you need to know about Augmented reality. S.i: Kent James, 2011. Print.

Furht, Borko. Handbook of Augmented Reality. 1. ed. New York, NY: Springer New York, 2011. Print.

"Storyboard - Definition and More from the Free Merriam-Webster Dictionary." *Dictionary and Thesaurus - Merriam-Webster Online*. N.p., n.d. Web. 8 Dec. 2011. <http://www.merriam-webster.com/dictionary/storyboard>.

Schmidt, Wayne. "Bulletin Boards."*AELE Monthly Law Journal* ISSN 1935-0007 (2010): 201-202. http://www.aele.org/law/2010all06/2010-06MLJ201.pdf (accessed December 6, 2011).

"DC Comics." *DCComics.com, The Official Site of DC Comics*. N.p., n.d. Web. 6 Dec. 2011. <http://www.dccomics.com/new_to_comics/index.html>

"What is a Mood Board?." *wiseGEEK: clear answers for common questions*. N.p., n.d. Web. 8 Dec. 2011. <http://www.wisegeek.com/what-is-a-mood-board.htm>.

"ImagiNations: Dream Design Diversify| Disney Careers | Disney.com." *Disney | Official Home Page for All Things Disney*. N.p., n.d. Web. 8 Dec. 2011. <http://disney.go.com/disneycareers/imaginations/AboutImagiNations.html>

"ImagiNations | Dream Design Diversify." *ImagiNations: Dream Design Diversify| Disney Careers | Disney.com*. N.p., n.d. Web. 8 Dec. 2011. <http://disneyimaginations.com/ImagiNations2012.html>

"*History of Communication From Cave Drawings To The Web.*" Retail Displays - POP Merchandise Displays | Creative Displays Now. Web. 7 Mar. 2013. <http://www.creativedisplaysnow.com/articles/history-of-communication-from-cave-drawings-to-the-web.htm>.

"*The Use and Capture of Images for Computer-Based Learning II - Section 1.*" AGOCG - Index. Web. 7 Mar. 2013. <http://www.agocg.ac.uk/reports/graphics/c apture2/sect1.htm>.

Lester, Paul. "*Syntactic Theory of Visual Communication*." Syntactic Theory of Visual Communication. Web. 7 Mar. 2013. <commfaculty.fullerton.edu/lester/writings/viscomtheory.html>.

"*Presenting Effective Presentations with Visual Aids*." Occupational Safety and Health Administration - Home. Web. 7 Mar. 2013. <http://www.osha.gov/doc/outreachtraining/htmlfiles/traintec.html>.

Switzer, Christine. "*What Are The Benefits Of Visual Communication Over Verbal?*." LIVESTRONG.COM - Lose Weight & Get Fit with Diet, Nutrition & Fitness Tools | LIVESTRONG.COM. Web. 7 Mar. 2013. <http://www.livestrong.com/article/157920-what-are-the-benefits-of-visual-communication-over-verbal/#ixzz2MWl5jIw3>.

"augmented reality." Merriam-Webster. Merriam-Webster, n.d. Web. 2 Dec. 2013. <http://www.merriam-webster.com/dictionary/augmented%20reality>.

"*1: An introduction to workplace learning (part 1)"* Centre for Learning & Performance Technologies. Web. 7 Mar. 2013. <http://c4lpt.co.uk/social-learning-handbook/an-introduction-to-workplace-learning/>.

Hassan, Tauqeer. "*Short History of Technology.*" ezinearticles. Web. 7 Mar. 2013. <ezinearticles.com/?Short-History-of-Technology&id=4135881>.

Maio, Emma . "*Smarter Interactive discover demand for improved workplace training at the annual Learning Technologies conference*." Press Release & News Distribution | Cision Wire. Web. 7 Mar. 2013. <http://news.cision.com/smarter-interactive/r/smarter-interactive-discover-demand-for-improved-workplace-training-at-the-annual-learning-technolog,c9367804>.

Williams, Troy . "*To empower students, let's bring interactive learning tools into the classroom*." VentureBeat Tech. People. Money. Web. 7 Mar. 2013. <http://venturebeat.com/2012/10/30/interactive-learning/>.

Cassella, Dena . "What is Augmented Reality (AR): Augmented Reality Defined, iPhone Augmented Reality Apps and Games and More." Digital Trends. N.p., n.d. Web. 2 Dec. 2013. <http://www.digitaltrends.com/mobile/what-is-augmented-reality-iphone-apps-games-flash-yelp-android-ar-software-and-more/>.

"What is a Mood Board?." Wisegeek. N.p., n.d. Web. 2 Dec. 2013. <http://www.wisegeek.com/what-is-a-mood-board.htm>.

"Top Rated Augmented Reality companies." Free Press Release Distribution Service. N.p., n.d. Web. 3 Dec. 2013. <http://www.prlog.org/12179623-top-rated-augmented-reality-companies.html>.

Bilton, Ricardo . "VentureBeat | News About Tech, Money and Innovation." VentureBeat. N.p., n.d. Web. 3 Dec. 2013. <http://venturebeat.com/2013/09/10/deaf-magazine-uses-augmented-reality-to-teach-readers-sign-language/>.

"Elements 4D Interactive Blocks." Kickstarter. N.p., n.d. Web. 12 Nov. 2013. <http://www.kickstarter.com/projects/daqri/elements-4d-interactive-blocks>.

Perdue, Tim . "Applications of Augmented Reality." About.com New Tech. N.p., n.d. Web. 3 Dec. 2013. <http://newtech.about.com/od/softwaredevelopment/a/Applications-Of-Augmented-Reality_2.htm>.

"Project Challenge." Disney Imaginations Project Challenge Comments. N.p., n.d. Web. 3 Dec. 2013. <http://disney.go.com/disneycareers/imaginations/AboutImagiNations.html>.

Hewlett-Packard Development Company,LP. "*The Power of Visual Communication*." 2004. PDF File

Wilson, Max. "*Augmented Vitality*." 2012. PDF File

Park, June. "*Augmented Reality Based Interactive Storyboard."* PDF File

Haller, Michael; Leithinger, Daniel; Leitner, Daniel; Seifried, Thomas. "*Coeno- Storyboard: An Augmented Surface for Storyboard Presentations."* 2005. PDF File

Harris, Dustin. "*Storyboarding with Augmented Reality."* 2012. PDF File

American Film Institute. "*American Film Institute – 21st century educators handbook."* 2006. PDF File