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# Dwaraka: An Immersive Storytelling Experience Represented in Virtual Reality Through a Graphic Novel

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Accepted by:
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# Abstract

This thesis showcases the development of a narrative Virtual Reality (VR) experience told in the form of an immersive graphic novel. Virtual reality has the potential to be one of the more intimate forms of storytelling since it puts the user in the center of the story or scene. Similarly the graphic novel is an excellent storytelling device since it relies more on visuals rather than writing, enabling readers to absorb information faster without losing focus. Together they become a visually evocative experience for the audience by enabling them to not just look through the visuals but also jump into each panel and experience the story firsthand. Drawing inspiration from artists and writers like Alan Moore, Hokusai and Shinichiro Watanabe, along with elements from Indian mythology, I have created a graphic narrative based on a poem and present it as an immersive VR experience using the VR 3D painting and animation tool Oculus Quill.

# Dedication

I would like to dedicate this thesis first of all to my parents, who have been a constant source of inspiration and supported me in every step in this journey.

I am also extremely thankful to my grandmother whose stories have impacted me both as a person and an artist, creating the need to tell impactful stories in me.

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# Acknowledgments

This thesis would not be possible without the constant support of my thesis advisor Dr. Eric Patterson who helped me plan out my thesis and gave constructive feedback that was integral for the development of this VR experience. I would also like to thank Mr. Insun Kwon for pushing me to my limits to create the VR environments and for his valuable suggestion regarding the aesthetics of the VR design. Finally I would like to thank Mr. David Donar for enabling me to tell a personal story and helping me to design and develop it for the past one year.

Last but not least I would like to thank all my friends and staff in DPA for all the suggestions, help and teaching all the facets of this amazing field. I shall always remember all the experiences I have learned moving forward in this career and look forward to maintaining a relationship with Clemson and DPA.

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# Artist Statement

As an artist, the goal of my work is to evoke strong emotions in my audience to uplift and bring them to question assumptions about life and other cultures. The world is much smaller and more interconnected than before. I strongly believe it is through the stories that people get to know other cultures and beliefs to gain more perspective. This belief compels me to tell a story in whatever I create, be it 2D art, 3D characters, or even simple texturing elements.

Growing up, the morals and messages I learned through stories told by my grandmother shaped my sense of morality and sense of being. This bolstered the inherent need in me as an artist to tell stories that matter and create positive changes.

Every story needs to have a personal imprint of the author. This is exactly what I would like to impart through Dwarka which revolves around the timeless concept of life and its purpose. It is a story everyone can relate to and undergoes at some point in their lives. Dwarka which is written in the form of a poem illustrated as a graphic novel tells the story of a bounty hunter, searching for treasures and other pleasures in life. His journey to find the fabled city of Dwarka is one of self-realization. The wanderer is crafted from my personal experiences of wrong decisions, career changes, a leap of faith, and starting new journeys. I've always dreamed of being in a position where I can design and create stories from scratch. Over time I realized that the path may not be that linear, never as simple, but beautiful in its way and to enjoy the journey itself.

An avid comic and graphic novel reader, I have always found the experience immersive, taking the reader into the unknown world, everything is only limited by imagination. Dwarka draws inspiration from the multifaceted work of Alan Moore especially Watchmen from the unique panel arrangement and color palette and works of manga/anime creators like Eiichiro Oda and Shinichiro Watanabe for their amazing art, world-building, and unique hero journeys that relate with me and eventually ended in the creation of the character of the wanderer. Some of the other inspirations

for me that affected the visual style of the novel are the mural paintings found in temples in my home town of Kerala and the works of Japanese artist Hokusai. In both the cases, the limited color palette in which all colors symbolize a specific theme and the stylized interpretation of environments inspired me immensely. The graphic novel would further be developed into a VR experience since I believe VR has the potential to be the epitome of the idea of an immersive experience since it puts the user in the scene right in the midst of the comic. Dear Angelic is one such VR experience where a story about a girl and her mother that acknowledged the power of VR narration which can move people.

As an artist I would like to take you all in this journey which is the culmination of everything I love about art and life, from 2D design, new experimental VR painting tools, graphic novels, poetry, and my Indian roots.

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# Chapter 1

# Introduction

Dwaraka - The Journey, is the result of my love for art, literature, personal experiences, comic books and my desire to learn new technologies that help me to create narrative artworks.

Some of my earliest memories as a child is that of my grandmother narrating Indian epics such as Mahabharata and Ramayana and I vividly remember imagining myself to be in the story itself, soaking in all the details. I fought great wars alongside mythical heroes, flew atop of beasts and enjoyed the views of legendary cities and the environment. As I grew up drawing pictures of animals, favorite superheroes, and even while playing with action figures, I had elaborate stories playing in my head with plot twists, action sequences, and epic climactic battles. The morals and messages conveyed through these stories impacted my sense of morality, and perhaps this is the underlying reason for me as an artist to tell stories that have a positive influence on my audience. During this time I also became obsessed with comic books and manga, especially the sub-genres that showcase the hero's journey.

The idea of an immersive VR experience came onto me when I came across the VR tool Quill. The tool seemed like a dream come true since it combines 2d art and 3d modeling but with a very specific watercolor painterly style. The idea then struck me to create a comic book and make it into this immersive VR experience. I decided to try writing a poem called Dwaraka, combining elements from Indian mythology, my own personal experiences and a relatable character whose journey is similar to the journey all of us will have at point or another.

Once I had the idea of the VR experience, I started to figure out how to apply all that I learned in this program. This includes visual narrative, storyboarding, character creation, color

theory, lighting, 3d modeling, surfacing, and new techniques including VR sculpting. I spend the last year creating a story and characters I wanted to resonate with my audience. The story revolves around the timeless concept of the journey of life and its purpose. It is a story everyone can relate to and undergoes at some point in their lives. The story, written in the form of a poem illustrated as a graphic novel, tells the story of a wanderer (And in effect, us the readers) who lives the life of a bounty hunter, searching for treasures and other pleasures in life. He wants to find the lost city Dwaraka and the infinite treasures and fame that come along with it. As he goes along this journey, he goes through many experiences both good and bad. Eventually he finds out that the lost city does not exist and is just a myth. The wanderer, now older and much wiser realizes that it is the experiences and friendships he had along the way that matter in the end and not the journey itself. This story resonates at a personal level for me too. From engineering to an IT job in data analysis and finally, to this amazing program in DPA, life was full of surprises, both amazing and downright crushing. I've always dreamed of being in a position where I am able to design and create worlds and stories from scratch and over time I realized that the path may not be that linear and you've got to enjoy the journey itself and not be obsessed with a final destination.

I also started to think about the composition of characters and color palate. The environment research was based on real places in India and the nature of the environment also changes depending on the mood of the scene of the panel. A lot of thought was put into the color palette since I wanted the color to play a core role in maintaining the atmosphere of the scene. For example, scenes that showcased the negative elements in the character's journey had darker colors like reds and browns while the positive elements had blues and greens. Making the character visually and aesthetically interesting was also a challenge in itself. I wanted to create a main character that changed over time as his values and vision changed and grew both older and wiser.

With all this in my mind, the graphic novel Dwaraka was crafted, with each line of the poem serving as a panel and a key element in the story. Each panel was then meticulously created in VR with the final goal of stitching together a cohesive, comic-book-like structure. I wish eventually to complete the whole story in VR and submit it to film and tech festivals.

# Chapter 2

# Artistic Background

## 2.1 Introduction

Graphic novels and comic strips have been the main inspiration for movies, cartoons and animated series alike. In the section I will talk about graphic novels, especially Alan Moore's work and how it has inspired me crafting the comic book of Dwarka. I shall also in brief discuss C.P.Cavafy's Ithaka which has been a great inspiration for me to attempt to write the poem Dwaraka. I will also discuss how anime especially Shinichiro Watanabe's works such as Cowboy Bebop and its unique characters all were affected by past versions of themselves. Finally I will talk about how the visual style of mural paintings in temples of the state of Kerala in India and paintings of the Hokusai were influences on the visual style of the graphic novel.

## 2.2 Ithaka by C.P. Cavafy

Ever since Odyssey, which is the story of the Greek hero Odysseus, king of Ithaka who is traveling back to his homeland Ithaka after the downfall of Troy, Ithaka has been symbolized as a metaphor for home. A journey that is worth enduring all hardships both physical and emotional. C.P.Cavafy who is a well-renowned poet of the twentieth-century wrote perhaps the most famous poem about the fabled city of Ithaka, aptly entitled 'Ithaka'. The poem addresses Odysseus, or perhaps an imaginary traveler or us the reader itself about the journey home, and however man/woman is looking for their own Ithaka, their own ultimate goal. The poem that does not rhyme and uses

everyday language tells the readers to enjoy the journey of life they are having to the fullest, using all resources of intellect and sense since more than often the goal is likely to be disappointing. [11]

The poem Ithaka by C.P.Cavafy is as follows

As you set out for Ithaka
hope your road is a long one,
full of adventure, full of discovery.
Laistrygonians, Cyclops,
angry Poseidon,dont be afraid of them:
youll never find things like that on your way
as long as you keep your thoughts raised high,
as long as a rare excitement
stirs your spirit and your body.
Laistrygonians, Cyclops,
wild Poseidon, you wont encounter them
unless you bring them along inside your soul,
unless your soul sets them up in front of you.
Hope your road is a long one.
May there be many summer mornings when,
with what pleasure, what joy,
you enter harbors youre seeing for the first time:
may you stop at Phoenician trading stations
to buy fine things,
mother of pearl and coral, amber and ebony,
sensual perfume of every kind
as many sensual perfumes as you can;
and may you visit many Egyptian cities
to learn and go on learning from their scholars.
Keep Ithaka always in your mind.
Arriving there is what youre destined for.
But dont hurry the journey at all.
Better if it lasts for years,

so youre old by the time you reach the island,

wealthy with all youve gained on the way,

not expecting Ithaka to make you rich.

Ithaka gave you the marvelous journey.

Without her you wouldnt have set out.

She has nothing left to give you now.

And if you find her poor, Ithaka wont have fooled you.

Wise as you will have become, so full of experience,

youll have understood by then what these Ithakas mean. [17]

The underlying theme of the poem as discussed is how life is more about the journey than the destination. Rather than an obsession with the past or future, it is better to be in the present and enjoy this journey of life. The poet argues that the whole person, including his mind, spirit, body and soul must be fully engaged in life. He tells that a person must be able to perceive every experience as fresh and new and see the world as a wonder. He finally tells the reader to cultivate intellect and in the journey of life, we would always be learning. To sum it up, one must use everything in one's power to perceive and enjoy the present and not an imagined future nor a tortured past. [11]

This poem and its thoughts on life has been a big inspiration in the creation of Dwarka.

## 2.3   Graphic Novels As a Narrative Medium

The term graphic novel was coined by the writer and illustrator Will Eisner as any form of book-length comic book narrative that contains an entire character arc or storyline as opposed to the traditional, single-issue comic books that were published commonly at the time.[37]

In general graphic novels could refer to any kind of story that is told in the form of artworks. The book containing the story may either be just purely in the form of illustrations, or it may contain texts in the form of speech bubbles or top box narration that tells the thoughts of the characters or tells the overview of the panel in general. One of the main types of graphic novels is the comic book series of Marvel and DC. Japanese black and white manga is another form of a graphic novel that is gaining popularity all over the world. In addition there are many other independent publishers and daily comic strips being daily.

The first kind of comic book dates back to prehistoric times in the form of cave paintings that

were stories told in the form of drawings. In ancient Egypt with the stories of gods and kings were imprinted on papyrus rolls. Similar forms of storytelling can be seen in all different cultures across the world in the form of sculptures and mural paintings in temples and monasteries across India and South East Asia, stained glasses in prominent churches across Europe and beautiful calligraphy filled artworks seen across monuments found in the Middle East.

Traditionally graphic novels and comic books were ignored by critics as a literary art form. The idea is that they were primarily meant for children and adolescents only for entertainment and that they possess little to no literary merit. However in the 1970s to 80s, a growing number of critics and scholars started realizing the potential of graphic novels as innovative and powerful means of storytelling medium. While traditionally graphic novels were targeted primarily at a male audience, as time passed on, they started diversifying to include fiction, non-fiction, autobiographies, adventure and romance that is made for both male and female audiences.

While versions of graphic novels existed since the 1880s, the beginning of modern graphic novels is said to start from the 1980s with the release of many critically acclaimed novels that were released for mainstream audiences. Perhaps one of the most significant of these is Art Spiegelman's Maus: A Survivor's Tale (1986) that relates Spiegelman's father's experiences in the German concentration camps however with main characters are rats. The critically acclaimed novel won the Pultizer Prize in 1992 and became a critical and commercial success that led to critics looking at graphic novels as a serious literary form. Frank Miller's Batman: The Dark Knight Returns (1986) and Alan Moore's Watchmen (1987) are some other major graphic novel releases that deconstructed the superhero trope unlike any other comics before. The popularity and classiness of these novels led to other kinds of writers and artists using this medium to tell more complex nontraditional narratives such as Neil Gaiman's Sandman series and Harvey Parker's Our Cancer Year (1994), in which he and the co-authors recall Parker's struggle with cancer. These diverse forms of narratives led to these graphic novels being adapted to many mediums including films, TV shows and video games. [7]

Many forms of research have been done to determine the proficiency of the graphic novel as a superior medium to convey information and stories. The fact it uses illustrations instead of texts to convey ideas is very important since it is able to hold the attention of readers perhaps better than books filled with only text messages. As they have the potential to facilitate comprehension by combining images with text, they are proved to be helpful particularly for visual learners. All

these factors led to the decision to use the graphic novel as the base for the VR experience. This use of images and texts when used along with the immersive capabilities of Virtual reality has the potential to create truly moving pieces of narration. [38]

In the upcoming section let us take a look at some of Alan Moore's work and its influence on Dwarka.

### 2.3.1 Alan Moore

Few artists are able to create a whirlwind of political and artistic discussions upon the release of each new work. Even fewer artists were able to change the way the public perceives an art form. One such artist is the legendary comic book writer Alan Moore. His amazing works that include Watchmen, V for Vendetta and League of Extraordinary Gentlemen have not only influenced comics but also films and entertainment industry as a whole for the past decade.

Moore's first well-known success was while working for 2000 AD comics and Marvel UK. The 'Ballad of Halo Jones', described as a feminist space opera and another comic book series called 'Marvelman'. He used his signature examination of seeing superheroes as real people with flaws in these comic books too and became the baseline for his later much-acclaimed works. In the mid-1980s, an editor at DC comics called Karen Berger contacted Alan Moore as one of the many writers responsible for bringing back some of the forgotten DC series. This led to the creation of Alan Moore's Saga of the Swamp thing where he handled the story and myth surrounding the characters never as seen before in the history of comic books. He also blended the use of horror elements seamlessly into the storyline too. All these mature content led to the creation of DC's comics targeted at adult audiences called Vertigo Comics.[22]

In 1985 Alan Moore pitched the idea for an original storyline for a superhero comic that was set in an alternate United States where the characters had a much more realistic and political portrayal. This led to the creation of 'Watchmen' in 1986 that is widely considered as the greatest comic book series of all time and one of the greatest novels of the twentieth century. Set in the 1980s alternate United States, Watchmen's political touching and relevant political commentary reached a level of profoundness that is unseen even in other mediums such as films and TV.

The watchmen is also famous for its nine-panel grid that allowed for many more details and exposition than the average comic layout. The panels were also symmetrical and had mirroring so that some of the hard-hitting scenes can have maximum impact. Watchmen also has an amazing color

palette that skillfully showcases the atmosphere of the plot and the moral senses of the characters and the world they live in. While most comic books use primary colors for heroes and secondary color for villains, watchmen was painted all in secondary colors to showcase the tone of the graphic novel. The watchmen novels is also well known for breaking the fourth dimension and is greatly influenced by Cubism and other modern art movements. Examples of this are the portrayal of the breaks in the space-time continuum where characters experience and interact in multiple timelines mostly due to the powers of its god-like character of Dr. Manhattan. [5]



Figure 2.1: Symmetry of watchmen panels [21]

Figure 2.2: Color Palate of Watchmen [21]

## 2.4    Shinichiro Watanabe and Anime

Probably one of my favorite anime directors is Shinichiro Watanabe . Ive always been a fan of Watanabes works such as Cowboy Bebop and Samurai Champloo. The style of Watanabes work along with the recurring theme of his work that includes existentialism have fascinated me and are big influences on my work.

While at the surface the artists work seems to be all over the place ( A space cowboy who is a bounty hunter running away from his past etc) , there is always a recurring message of letting go of the past and living on with life.

Watanabe is expert in mixing genres   Sci-Fi with western and film noir style (Cowboy Bebop) periodic drama piece with modern hip hop influences (Samurai Champloo). The constant search of purpose is one of the signature traits of the characters of Watanabe. His work makes one think that maybe life does not exactly have a purpose but is more about the journey itself and that we are creators of our own destiny, if we are able to let go of the past. The journey the main characters go through is much more important than the end goal. Themes of purpose and isolation are also themes in many of his works.

The main characters are mostly lone wolves fitting the drifter/cowboy archetype and there are definite relation to western movies of the west. Also his work is filled with anachronism - which is the mixing of two timelines - in this case of setting and musical choices. [16]

In the end, finishing Watanabes work is always bittersweet. It is like the end of the journey, but as then you realize, as they say, it is the journey that matters, not the destination.

Again color depends on the series and the settings the characters live in. In Cowboy Bebop, the color scheme is muted, with a lot of blue, black, purple and

Space, western and noir elements in cowboy bebop have the ability to create moodiness, and in contrast, there are other segments in the show that have comparatively brighter colors depending on the situation they are in. Also, music plays an important role in his work. There is a huge world-building, with different kinds of people, organizations and specific feel in terms of colors, aesthetics and even music authentic to different locations and different segments of his work that create a compelling atmosphere.

## 2.5    Mural Paintings of Kerala

Mural Paintings of Kerala are fresco showing scenes from Hindu mythology and legends primarily found in ancient temples in the Indian state of Kerala dating back to 9th to 12th century CE. While it is commonly seen in temples, in recent times it is also drawn in churches and other places of cultural significance. The art form suffered immensely under the British rule in India and even faced the danger of extinction. Ever since the Indian Independence, there is a revival of the art form in all major temples of Kerala.



Figure 2.3: Mural Paintings at Vaikom Temple, Kerala,India [29]

It is unique in its beauty, clarity and symmetry and extremely rich in symbolism. The entire process of mural painting involves the meticulous balancing of various components. The traditional colors used in this are red, green, yellow, white and black. Sometimes blue is also used. They are used in depictions of Vedic verses. Flora and fauna and other aspects of nature are represented as backdrops in a highly stylized manner. The colors are made with natural mineral pigments, lamp soot and vegetable extracts. The colors represent three gunas. Guna is a Sanskrit word that translates as quality, peculiarity, attribute, or tendency. A guna is an element of reality that can affect our psychological, emotional and energetic states. The three gunas were created as an essential component of Hindu philosophy, but the gunas are now a major concept in most schools

of Indian philosophy. The three gunas are described as being constantly influx and interacting with one another, in a playful state referred to as maya or illusion.[27]

Below are the three gunas and their attributes. Tamas is a state of darkness, inertia, inactivity, and materiality. Tamas manifests from ignorance and deludes all beings from their spiritual truths. Other tamasic qualities are laziness, disgust, attachment, depression, helplessness, doubt, guilt, shame, boredom, addiction, hurt, sadness, apathy, confusion, grief, dependency and ignorance. It is represented by the color white. [27]

Rajas is a state of energy, action, change, and movement. The nature of rajas is of attraction, longing, and attachment, and rajas strongly bind us to the fruits of our work. Other rajasic qualities are anger, euphoria, anxiety, fear, irritation, worry, restlessness, stress, courage, rumination, determination and chaos. It is represented by the color yellow.[27]

Sattva is a state of harmony, balance, joy, and intelligence. Sattva is the guna that yogis achieve towards as it reduces rajas and tamas and thus makes liberation possible. Other sattvic qualities are delight, happiness, peace, wellness, freedom, love, compassion, equanimity, empathy, friendliness, focus, self-control, satisfaction, trust, fulfillment, calmness, bliss, cheerfulness, gratitude, fearlessness, and selflessness. It is represented by the color Green. Those figures colored in green are those for whom knowledge is chief characteristic. [27]

## 2.6   Hokusai

Most notable for his The Great Wave , Hokusai is one of the most famous Japanese artist who was a master of fine art painting, wood-block printing, portraiture, landscapes and even book illustrations.[10] Primarily specializing in landscapes, Hokusais use of colors and perspective to portray environment would be the primary visual design to inspire the Quill environment for Dwarka.

The artist's work is mostly about landscapes. He has a distinct style of portraying landscapes by making use of perspective and colors. His work is a bittersweet reminder of the fleeting nature and how in one moment it can portray calmness and in other moments it can be downright terrifying.

While the artist's initial years were filled with classical themes such as that of samurai and courtesans, his prominent works were the amazing landscape art. Overall, his work is an appreciation of Japan's beauty  both its people and nature. Almost like a comic book panel, Hokusai's work is an example of visual storytelling. For example, in The Great Wave, even as the great wave comes

crashing upon the fishermen who are braving it, Mount Fuji sits calmly in the background not affected by any of these. [13]

Hokusai created art when Japan restricted foreigners from entering the country and similar bans were implemented of trade and goods too. Despite this, his works managed to reach western audiences and influence art movements, music etc. [15]

Hokusai's work made waves in the west and had an influence on the impressionist movement. Claude Monet had acquired 23 of the artist's print and Hokusai's art has had an influence on him. Similarly the French artist Edgar Degas also took cues from Hokusai art, especially his many sketches of the human form. [15]

As discussed earlier, the majority of his work is based on Japan and its beauty. On of the most frequent subject of his work is Mount Fuji, which also has a major cultural influence for the Japanese. Not only is it a symbol of national pride , it also has immense cultural and spiritual influence.

Hokusai's work creates a feeling of calmness and tranquility. Perhaps one of the reason think is the topic of artwork , Nature and the use of colors, mostly calming colors such as blue. Also the unique artstyle that conveys some story with still images and the use of perspective, Hokusai art always makes me notice something new every time look I at it. [1]

As discussed earlier the dominant use of cool colors such as blue and green creates a sense of calmness and wonder in the audience. The works are soulful, and the nature subjects strikes a chord with me.

Figure 2.4: Great Wave, Hokusai [12]

# Chapter 3

# Technical Background

## 3.1 Evolution of Virtual Reality

Virtual reality is a computer-generated experience to simulate an artificially generated environment. Unlike traditional user interfaces, VR puts the user in the scene allowing them to be immersed in the environment and be able to interact with it. While virtual reality experience is more of a recent technology, the idea that led to its creation is a long story that has been brewing for some time in history. Below are some of the major milestones in the creation of VR technology

The basic goal of VR is to make the brain believe that something does exist, even when it doesn't. Consider the cimematic legend of the short film L'Arrive d'un train en gare de La Ciotat, or Arrival of a Train at La Ciotat which is a 50 second short film created by Augeste and Louis Lumiere. According to the tale, as the silent black and white image of a moving train was screened on a film theater in Paris, apparently people panicked that resulted in a stampede since the experience was actually shocking to the audience.

While this is more of an urban legend, it defines some of the earliest examples of instances where it is shown that digital media like film and television can influence human senses and perceptions. This is similar to the effects of VR and what it intends to achieve. Keeping this definition that VR is something that attempts to create an illusion of reality, panoramic paintings of the nineteenth century that filled the entire field of vision that made the viewers feel like they were present in the battlefield are perhaps some of the earliest examples of VR.

Figure 3.1: Snapshot from LArrive dun train en gare de La Ciotat [19]

### 3.1.1 Stereroscopy

Stereoscopy is the method of creating an illusion of depth by combining two images, one for each eye since the brain processes both the images differently and together combine them to form a single perception of three dimensions. It is based on Charles Wheatstone's research of 1838 which demonstrated that the brain figures out each image from each eye differently and viewing them both together through a stereoscope can give the user a sense of depth and immersion. [36]

While the earliest stereoscope was a nineteenth-century invention, its principles are even seen today in the 20th century View-master Stereoscope popular for 'virtual tourism' and the 2014 Google released template for the papercraft stereoscope called Google cardboard.



Figure 3.2: View of Boston,1860; an early stereoscopic card setup [30]

### 3.1.2 Link Trainer or Blue Box

The Link Trainer also known as the blue box, is a flight simulator produced in the early 1930s pioneered by the scientist Edwin Albert Link. These simulators were famous during World War 2 were young pilots needed training. The setup is entirely electro-mechanical and was controlled by motors that linked to the rudder and steering column to modify the simulation of flight. Along with it a small motor-driven device mimicked turbulence and disturbances. [30]



Figure 3.3: Link Trainer[30]

### 3.1.3 Pygmalion's Spectacles

In 1935 the American science fiction writer Stenley Weinbaum presented a model for virtual reality in his short story Pygmalion's Spectacles. The story the main character meets a professor who invented a pair of goggles which enabled a movie that gives one sight, sound, taste, smell and touch. You are in a story, you speak to the shadows and they reply. The story is all about you, and you are in it.Weinbaum's description of the goggles that enable the user to experience a fictional world in amazing details is extremely similar to the experience of modern VR headsets making it one of the primary creative influences. [30]



Figure 3.4: Pygmalion's Spectacles Cover Art [30]

### 3.1.4 Sensorama

The Sensorama created in 1962 by Morton Heilig is one of the earliest examples of immersive multi-sensory technology and is considered by many as one of the earliest examples of VR system. Morton's Sensoram is an arcade-style setup with a stereoscopic 3D display, fans, odor emitter and a vibrating chair. It is designed to fully immerse the viewer and to engage in four of the five senses: sight, smell, touch and hearing. Morton also created six short films all of which he directed and produced himself titled Motorcycle, Belly Dancer, Dune Buggy, helicopter, A date with Sabina and Im a coca-cola bottle! [3]



Figure 3.5: Sensorama

His next invention the Telesphere Mask (patented 1960) was also the first instance of a head-mounted display (HMD). Although it did not have any motion tracking nor any interactive film medium.

### 3.1.5    Ultimate Display and Sword of Damocles by Ivan Sutherland

In 1965, Ivan Sutherland created a concept for an HMD system called the Ultimate Display that could simulate reality to the point where one could not tell the difference between the real and virtual world. His concept included an HMD that could emulate a virtual world with realistic graphics and 3d sound and a computer system proficient in maintaining the virtual world in real-time. It also theorized that the users would have the ability to interact with objects in the virtual world realistically.

In 1968, Sutherland along with his student Bob Sproull, developed the Sword of Damocles, the first AR/VR device which constituted an HMD hung from the ceiling. The device was primitive both in terms of realism and user interface. [30]
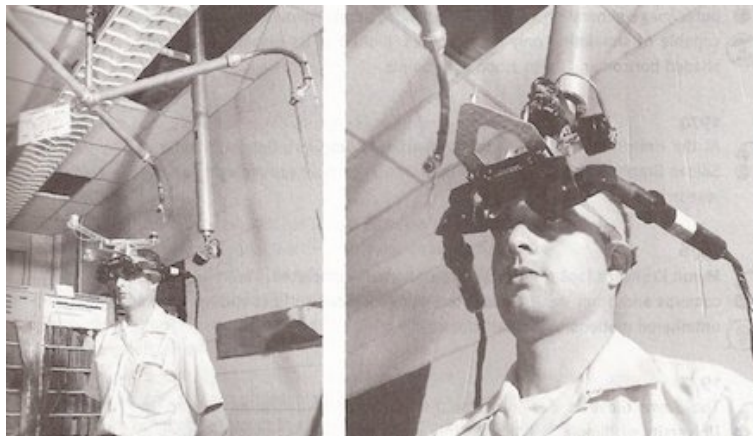


Figure 3.6: Sword of Damocles HMD setup [30]

### 3.1.6    Sega VR Headsets

In the 1990s, while VR devices were commercially available, it was still far too expensive for the general public to access. It is during this time The U.K.-based company Virtuality Group then launched a range of arcade games and machines with which players could wear a set of VR goggles and play on gaming machines with real-time immersive stereoscopic 3D visuals.

Another milestone in making VR sets much more accessible is the announcement of Sega VR set announced at the Consumer electronics show in 1993. The glasses had head tracking, stereo sound and LCD screens in the visor. However due to technical development difficulties, the product has remained in prototype phase despite having 4 games released for it. [3]

Figure 3.7: Sega VR headset

### 3.1.7 Modern VR setups like Occulus and HTC vive

In 2012, Palmer Luckey started developing an idea for a new prototype HMD that was more effective than anything available in the market and but also inexpensive for the general public. To develop this product, he founded the company Occulus VR. Around the same time, he kickstarted a crowdfunding for the HMD display set oculus rift and was able to raise 2.4 million via the crowdfunding. In 2014, Facebook brought the oculus VR company for 2 billion dollars. This is a defining moment in the history of VR technology enabling in its rapid growth and making it easily accessible to the general public.

Some of the notable VR products released during that time frame is Project Morpheaus which is a VR headset made exclusive for Playstation. During this time Google also released Google Cardboard a DYI stereoscopic viewer for smartphones. Similarly Samsung released Samsung Gear VR too, a headset that uses Samsung smartphones as VR viewing devices.

By 2016 hundreds of companies were developing VR products. Many of the HMD headsets that were available during that time frame did not have haptic interfaces. Haptic interfaces refer to systems that allow humans to interact with a computer with bodily movements and touch. This meant that the headsets were always typically button operated. It was during this time HTC released VIVE, a VR HMD headset created by both Valve and HTC that uses 'room-scale' technology that used sensors to move freely around the room.

Virtual reality has significantly progressed and is now being used in a variety of ways, from providing immersive gaming experiences to helping treat psychological disorders, teaching new skills and even taking terminally ill people on virtual journeys for Therapy. VR has many applications, and with the rise in smartphone technology VR will be even more accessible.

20

With large numbers of companies competing, novel controllers are being explored and with lots of uses for VR, this field can only improve. [30]

# Chapter 4

# Related Work

In this section I talk about some of the previous works by artists in VR that demonstrate it as an excellent medium for storytelling. I also discuss the current forms of comic books in VR and an artist whose comic pages are a great source of inspiration for me.

## 4.1 Virtual Reality Experiences as a Story Telling tool

Perhaps the most influential VR related work whose painterly abstract style and seamless storytelling is a major source of inspiration for me is *Dear Angelica* which premiered at Sundance Film Festival in 2017. It is directed by the former Pixar artist Saschka Unseld and illustrated by Wesley Allsbrook, using Occulus Quill, the very tool used for the creation of Dwarka. [28]

Dear Angelica is a story about a young woman named Jessica who writes letters to her late mother Angelica who was a film star. It is a film about grief as Jessica starts to reminiscence the many roles her mother acted in, from an astronaut to a superhero, helping her define the relationship with her mother. What makes Dear Angelica unique in its approach to storytelling is the fact that it is not a static VR experience. Jessica's recollections of her mother drop over the user as fluid paintings. Again from a storytelling point of view this even makes sense since memories are meant to be fuzzy and more abstract. So the team behind *Dear Angelica* abandoned the Pixar-style animations that were initially planned for something else entirely; an Impressionistic art style that reveals itself stroke by stroke.

What struck me most about the style of *Dear Angelica* is the fact the right from the size of

the strokes and the color scheme changes depending on the mood of the story. During the part of the story where Jessica has good memories of her mother, the colors are saturated and the strokes bold. On the other hand in the low moments of her story, the colors become dull and the strokes sparse and thin. *Dear Angelica* is an amazing example that proves that good storytelling experiences can be produced in VR. The compelling tale, moving imagery, soulful music and narration makes the whole experience resonate with the audience.



Figure 4.1: Snapshot from Dear Angelica [34]

Another VR project that is similar in concept to Dwarka is "The Remedy". "The Remedy" is created fully in quill VR by veteran Disney animator Daniel Martin Peixe. It is a 10-minute long comic book-like experience created by stringing together various Quill scenes to create a cohesive narrative.

Daniel used some of the inherent features of Quill like transform and stop to create a comic book-like experience. He made excellent use of the first-person perspective for some scenes while cutting off to large scale third-person perspective for other huge establishing shots. The stop feature gave him complete control over how the audience would be able to see the story progress. For example, in scenes where he wanted the audience to stop and soak in the details of the environment the progress of the environments fading in and out was much slower. On the other hand where the action sequences were much more fast-paced, he made it so that audience would be hit hard with fast-paced action sequences.

Figure 4.2: Snapshot from "The Remedy" [25]

## 4.2 Virtual Reality Comic Books

There are also many established series of VR comic book series with varying degrees of realism and story elements. Some of these are 2D cards placed in 3D environments with sound and effects added to it. Others are 1st person VR comic book experiences with speech bubbles and scenes rotating and revolving around the user.

Madefire adapts comic books and graphic novels for a VR experience. In their own words, Madefire makes motion comic. Madefire immerses viewers in 360-degree panoramic view 2D plates, ambient music, effects and some amount of 3d motion.[2] It is stunning 2D images, with light character animations and sound effects at appropriate moments. This VR style is made to enhance the comic book viewing experience rather than adding anything new to it. Madefire has adapted classic comic book series from renowned publishers/series like Marvel, DC, Archie, Blizzard and many others.

Another notable VR comic book series is Square Enix's project Hikari. Released in May 2018, Project Hikari aimed at adapting the manga genre as a VR comic book experience. The project adapted Tales of the Wedding Rings, a romantic story of a teen named Sato and his neighbor and love interest Hime.

Figure 4.3: Madefire Comics [4]

The developers behind Project Hime wanted to create the black and white aesthetic of mangas but adapted to a VR experience. They understood that the viewers can be overwhelmed with the amount of information thrown at them amidst a VR scene and that they needed to control the amount of information thrown at them. This led them to create and designs manga panels so that views attention is diverted to the required area of the VR environments. [23]

While the majority of the experience is looking at 2D floating panels, there are also instances of fully rendered 3D characters and environments. To create 3D characters while maintaining the black and white 2D manga like effect was challenging to the developers. Project Hikari goes a step further when compared to motion comics like Madefire, making it feel more like a walking simulator video game where the viewer interacts with the environments and discover new panels and progress the story. Another highlight of Project Hikari is how every scene is separated by comic panels whites. This also helps in reducing motion sickness in VR that can be caused by fast jerks and movements in VR.[23]



Figure 4.4: Project Hikari by Square Enix [31]

## 4.3 Inspirational Graphic novels based off poems

The comic book series of Zen Pencils by Australia based comic book artist Gavin Aung Than is a great source of inspiration for the creation of Dwarka. Started in 2012, Zen Pencils creates inspirational comic strips, based on uplifting real-life incidents, quotes, biographies and poems. Zen Pencils has been featured by The Washington Post, The Huffington Post, Slate, Mashable, Upworthy, Buzzfeed, Gawker, The A.V. Club, Brain Pickings, Comic Book Resources, National Geographic, ProBlogger, and The Design Files.

The series has been a highlight for me for many years. The style of the comics with the message it conveys is an amazing way to resonate with readers. I wanted my comic book strip also to leave the readers uplifted and smiling at least at some level.

Figure 4.5: A Page from Zen Pencil Comic [32]

# Chapter 5

# Concept and Design

## 5.1 Story elements and poem

The idea of "Dwaraka, A Journey" has always been brewing inside of me. There was a set of comic book strips by the artist Gavin Aung Than called Zenpencils that used to make my day whenever I read them. The comic strips used to showcase inspirational stories from both real personalities and mythologies mostly in the form of a poem written in the form of a comic strip. The fact that a small comic strip can have such a profound impact on a person led to the idea of creating a small, self-contained graphic novel about the journey of a young man on a quest and how it changes him. The story based on personal experiences has the underlying theme of "It is the journey that matters, not the destination." I decided to use this story for an immersive VR experience. An illustrated idea for this is shown in Appendix B.

The young man's journey is told in the form of a poem. Each set of lines is then illustrated as panels of the graphic novel. The poem addresses the wanderer (Protagonist) and by de facto us, the readers. The protagonist is a drifter whose aim in life is to discover the lost city of Dwaraka. During the initial days of his travel, he believes that all the wealth and fame that comes along with discovering this lost city would be everything he ever wanted. His character arc is the change in this outlook during this journey. As he travels the land in search of it, he has many experiences both positive and negative. While on one hand he faces traps, gets cheated upon, and faces various monsters, on the other hand he experiences adventure, peace, natural wonders and creates friendships that he will never forget. It ends with the note that even if you don't find/reach the destination,

looking back you realize that it's the journey that made all the difference and that he has become a wise, experienced man. The poem, wanderer and story of the graphic novel is discussed in many details in the upcoming chapters.

The Poem named Dwaraka, after the mythical lost city which is the capital of the Indian god Krishna has a four arc story structure.

SETUP: The wanderer travels across ancient India in search of the lost city of Dwaraka. He believes that the wealth and fame that come along with it would grant him peace.

CONFLICT: He has to overcome numerous obstacles along the way that includes traps, being cheated upon, hoards of monsters, and other evil entities.

CLIMAX: He realizes the lost city and its treasures are just a myth. However he is not fazed by this and comes to a profound realization.

RESOLUTION: Over the years, he has grown to be a wise, compassionate and experienced person with everlasting friendships and that is worth more than any fame or treasure.

With all these in mind, the poem of Dwaraka is created and is given below. A version of the initial sketch of the graphic novel is shown in Appendix A

### 5.1.1 Dwaraka, A Journey - The Poem

Dwarka, A Journey

Rising from the remnants of a past unknown,

Striding along a forgotten path,

Wanderer O wanderer,

What do you seek?

Treasures, Bounties, Apsaras*,

Or perhaps Dwaraka*, the Lost City?

As you seek whats dearest to you,

Sweet and delirious road awaits you.

Amidst Pitfalls, traps and bamboozles,

Asuras, Rakshasa and Yakshas

Lies adventure, serenity and Bhumis grace,

Alliance and Kinship youll never forget!

Wanderer O wanderer,

What do you seek?

Looking back, you realise,

Even if Krishnas Abode has eluded you,

Its the Journey that made all the difference,

Not the Destination.

## 5.2   The Wanderer

The protagonist of Dwaraka is the nameless treasure hunter who is called 'Wanderer' for all purposes in the comic. I decided to shroud the character with some mystery since the character of the wanderer is meant to show the journey everyone would experience throughout their life. The character of the wanderer changes both in personality and appearance during his journey. The wanderer we get introduced at the beginning of the story is a young cocky bounty hunter. He travels across the land in search of bounties and treasures. He craves adventures and the adrenaline rush that comes along with it. An expert warrior, he is capable of handling dangerous situations and wields a battleax proudly.

Some of the primary inspiration for the young wanderer are characters like Spike Spiegel from Cowboy Bebop and Han Solo from the Star Wars franchise. The archetype of these kinds of characters is The Rebel archetype. These are the people who travel the road less traveled. They do what they want to do and aggressively help people in need. Spike from Cowboy Bebop is a bounty hunter similar to the wanderer but in a space setting. He is sarcastic, skillful, and lives in the moment. Haunted by his past, while the character appears to not care about his friends and just wants to live in the moment, in reality he cares deeply about the well being of his friends. [24]

In terms of both design and character, the young wanderer is also inspired by Karna, a legendary mythical character in the Indian Epic, Mahabharata. Karna is an amazing example of the 'tragic hero' trope. Despite being born to Kunti, the mother of the 5 Princes who serve as the protagonists of the epic Karna was abandoned and given to a childless couple since she was unmarried at the time. Despite being a demi-god and an extremely talented warrior, he was not given the same opportunities as the main protagonist. Despite all these hardships, Karna grew up to be a kindhearted man eventually becoming one of the prime characters in the famous Mahabharata war. In terms of design, the young wanderer is clad in clothes made of silk signifying some amount

of noble ancestry. He also wears chest and shoulder armor since he is a warrior and bounty hunter who frequently gets into battles with each other.



Figure 5.1: Young Wanderer

As the wanderer moves along his journey and encounters both good and bad experiences, he starts to change both in personality and appearance. He realizes that it is not the destination that matters but the journey. After letting go of the battleax for a staff he realized that not all conflicts need to end in a physical show of strength. He let go of his need for material goods and instead started making friends and companions.

Some of the inspiration of the older wanderer is Dumbledore from the Harry Potter Series and Gandalf from the Lord of the rings series. The archetype of these characters is the Sage archetype. They are calm, composed, yet powerful beings of force. They seek to know the world in analytical ways, mixing logical reasoning and wisdom they have harnessed over their life. They care immensely about the well being of others and wishes to find the truth about the meaning of life. Older wanderer is on his way of becoming a sage-like entity. He has come to some profound realizations in this journey to find Dwaraka, becoming humble and wise in the process.

Some of the other inspirations for the older wanderer from Indian mythology are Parashu-rama, who is one of the avatars of Vishnu and Bhishma, a mentor figure for the Pandavas. Both are known for being legendary warriors yet encompassing qualities such as peace and serenity. They also advocated following your 'Dharma' or duties and responsibilities no matter what. Design-wise he has let go of the extravagant silk clothes he wore into monk's robes. The color scheme of his garments has also changed from aggressively saturated reds and oranges to soothing blues. He has also swapped his battleax to a staff after realizing that conflicts do not require him to swinging his battleax.

Figure 5.2: Older Wanderer

## 5.3 Design and Concept of the Graphic novel

### 5.3.1 Panel 1

Panel one of the Draraka is the establishing shot of wanderer walking along a misty forest. The panel has text boxes that show the first couple of lines of the poem "Rising From the remnants of past unknown, Wanderer O Wanderer, What do you seek? ". The panel shows our main character striding along through a misty forest. The environment in this panel is based on the forests found in the state of Himachal Pradesh in India. The state which is located in the foothills of Himalayas is famous for its lush green mist-filled forests.

The design of the panel is two folds. It is firstly meant to establish that the character is on a journey and that he is seeking something. The bright cool colors of the panels and serene nature of the background are also consciously designed to contrast with the harsh desert environment and reds and browns of the panel 11 which corresponds to the same lines "Wanderer O Wanderer, What do you seek?". The misty background and the general unearthly feel of the environment about how little the wanderer knows about his journey ahead. This uncertainty mirrors our own lives where even if we have a destination or a goal in mind, the path ahead is still blurred and uncertain. The character is seen walking along confidently in this huge expanse of forest, eager to continue forward in his journey.

The mist design is based on the how water/clouds are portrayed in murals paintings seen in Kerala, India. Similar designs can also be seen in many of the well-renowned paintings of the Japanese artist Hokusai. The gradient of green for the landscape, the gradient for the trees and the leaves design are inspired by the same artwork some of which are shown below.



Figure 5.3: Left- Fuji from Gotenyama at Shinagawa by Hokusai [14] , Right - Mural Paintings
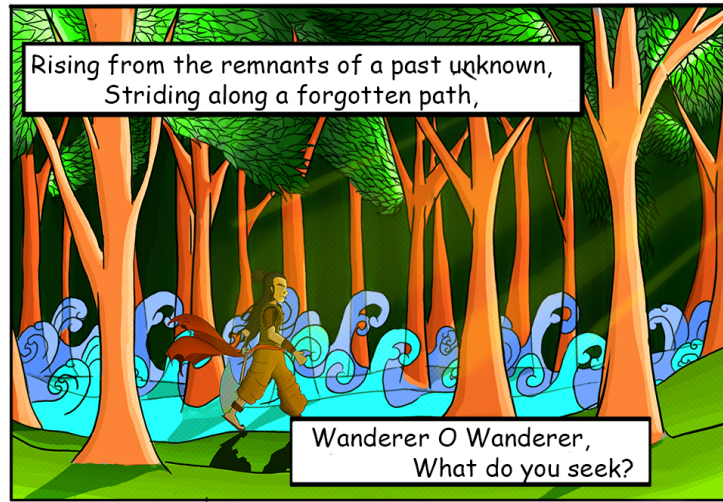
Figure 5.4: Panel 1

### 5.3.2 Panel 2

The 2nd panel of the comic is the one that corresponds to the treasure segment of the poem that goes along the lines of "Treasures, bounties and apsaras." This particular one refers to treasures. These three panels correspond to the material fulfillment that the wanderer seeks in the early days of his journey.

The treasure panel showcases a huge treasure trove with gold jewelry, precious stones and coins scattered around an ancient treasure. These three panels are from a point of view of the wanderer looking directly at the treasure.

### 5.3.3 Panel 3

The 3rd panel of the comic is the one that corresponds to the bounty segment of the poem that goes along the lines of "Treasures, bounties and apsaras". Similar to the previous panel, this panel shows how the wanderer makes a livelihood as a bounty hunter by catching criminals and getting the bounties that come along with it.

A wanted poster of a dacoit flowing in the wind. Dacoits were organized criminals who terrorized northern India during the times of British rule. They often targeted travelers and traveled in groups and had a leader. This is a bounty poster of one such dacoit leader. While the timelines do not exactly match, since our story happens in a much ancient Indian subcontinent, for the purpose

Figure 5.5: Panel 2

of the story this is a generic thug leader who has a huge bounty for his head.

The numerals used in ancient India are used and similarly the wording is WANTED in Sanskrit.



Figure 5.6: Left: Photo of Dacoits, Right: An illustration of Dacoits

### 5.3.4 Panel 4

The 4th panel is the last one of the three-part side by side panels that go along "Treasures, bounties and apsaras". This panel corresponds to the 'Apsaras' segment.

Apsaras are mythical female beings that inhabit the court of Indra the King of Gods. They are singers, dancers, and courtesans and are often known to entice both gods and men alike. In ancient times, the term was also used to describe extremely beautiful and talented dancers.

In the story, the scene shows a brothel. There is a chair in the middle and the room is filled with fumes from essence sticks. The color red has a tendency to bring out strong emotions in the audience, either that of love or that of anger. The room lit with dense red lights and abstract red pattern all around. The colors, fumes, pillows represent a place of sensual activity. In terms of the story, just like panel 2 was about wealth, and panel 3 about the adrenaline rush, panel 4 is about sensual pleasure.

### 5.3.5 Panel 5

After talking about all the material pleasures that the wanderer seeks in wealth, adventure and sensual, we move on to his real ambition and desire which is to discover the mythical city of Dwaraka and all the treasures and fame that comes along with discovering it.

The panel's box lines reads " Or perhaps Dwaraka, The Lost City? ". It shows the throne room of Krishna in all its glory. The gold plated walls, floor and the enormous grand throne with silk draping screams a lost grandeur. It is his imagination of what the throne room would look

Figure 5.7: Panel 3

like. The scene is also shown from a much lower angle to showcase that makes us feel small when compared to the massive throne room.
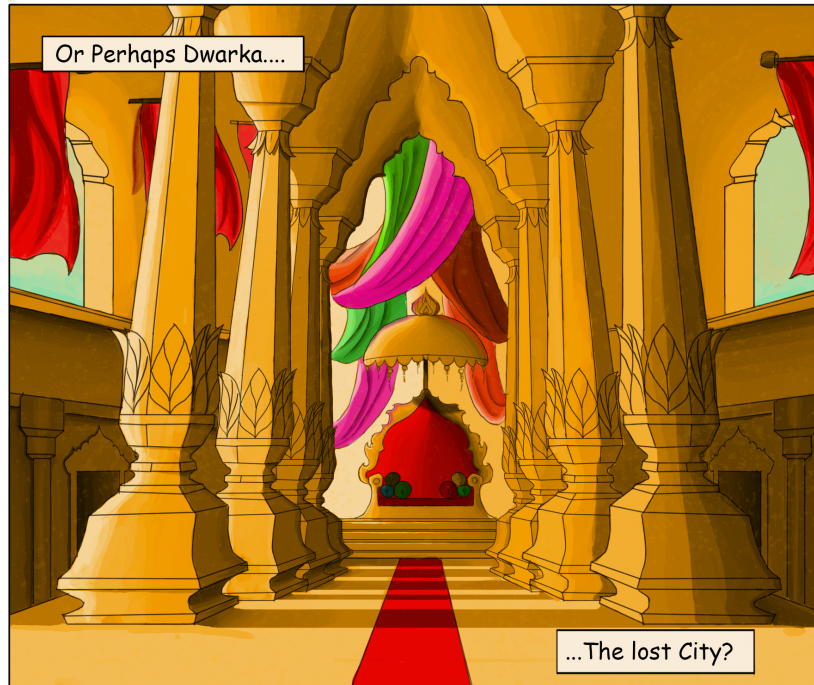


Figure 5.8: Panel 5

## 5.3.6 Panel 6

Panel 6 corresponds to lines in the poem " As you seek what's dearest to you, Sweet and delirious path awaits you". This abstract piece foreshadows the journey that lies ahead for the wanderer, both good and bad. This parallels any journey of us all goes through in the search for our Dwaraka consisting of amazing life-changing experiences and downright life-crushing ones. It is also inspired by the Chinese symbol of Ying-yang which talks about how good and bad, even though seemingly opposite and unrelated both two sides of the same coin, equally necessary and important to build our character and growth as a person.

The right side of the panel represents the dark part of the journey. It a stylized representation of Rakshasas, a mythical demonic creature from Indian mythology. These shape-shifting creatures are most powerful after dark and is in general beings that represent evil. The Rakshasa is shown in an abstract form with the monstrous face looming in the far. The style is shown as dark energy

flowing outwards similar to the style seen in many Japanese Mangas and even in the old manga created by Hokusai himself.

The left side showcases the good part of the journey. This stylized representation of the good parts of the journey is showcased by elements from nature such as flowers, serene scenery consisting of water bodies and surreal clouds. In contrast with the right side which is purely black and white, the left side is vibrantly colored. The crepuscular rays also symbolizes the goodness that can come across in the journey of life.

Just like the concept of Ying Yang, both the good and the bad intermingle into each other, both necessary for the wanderer's growth in the subsequent journey even though he doesn't know that yet. The style of the good side is that of mural paintings while that of the bad side is that of Hokusai's old manga designs. The style of the rakshasa is based on a similar depiction in temples in Thailand.



Figure 5.9: Left and Middle:Ramakein Style Yakshas and Rakshasas [33][35], Right:A page from Chinsetsu Yumiharizuki, Manga written by Hokusai [9]

### 5.3.7   Panel 7

Panels 7 and 8 showcases the dark part of the journey the wanderer undertakes. It corresponds to the lines of the poem ". Panel 7 corresponds to the line in the poem " Amidst pitfall, traps and bamboozle". The scene showcases our protagonist escaping from a ruin/tomb that he was exploring. The color scheme of the panel is full of reds and oranges and is lit by the yellow light from the far back. The whole tomb is crashing down with him escaping the debris, rocks and crushed pillars just in the nick of time. Arrows are also being shot at him.

In the story it refers to the fact that there are going to be downfalls when you try to achieve your goals. You are going to be cheated upon, backstabbed and lied to. However how you react to that is up to us. It is with this thought in my head that I decided to make this still a triumphant

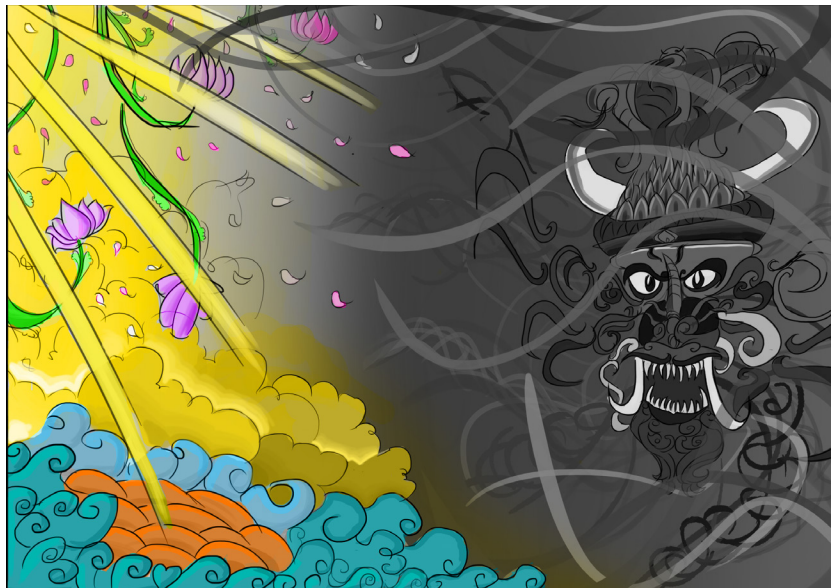Figure 5.10:   Examples of nature in Mural paintings



Figure 5.11: Panel 6

moment for him and even in the darkest moments it is up to us to make sure that we are still graceful.

The structure and design of the destroyed ruins are based upon the infinity corridor of the Ramanathaswamy Temple of Rameshwaram and Chettinad Palace both in Tamil Nadu India. The general design regarding the style and gradient is as usual from the mural paintings in Kerala and Hokusai paintings.



Figure 5.12: Left:Ramanathswamy Temple, Rameshwaram, India, Right: Chettinad Palace in Karaikudi [20] [26]



Figure 5.13: Panel 7

### 5.3.8 Panel 8

Panel 8 corresponds to the line of the poem " Asuras, Rakshasa and Yakshas". Asura, Rakshasa and Yaksha are all mythical evil beings in Indian mythology. The scene represents a battlefield where the Wanderer is battling a hoard of Rakshasas. As we move deeper into the darker parts of his journey, the environments and color schemes become much more darker and claustrophobic. The color scheme is dark blood red and orange with a little bit of yellows lighting up the character.



Figure 5.14: Panel 8

### 5.3.9 Panel 9

After the darkness comes light and for the next couple of panels we get into the good part of the journey. This panel corresponds to the line "Lies Adventure, Serenity and Bhumi's Grace". Bhumi refers to earth in Sanskrit and is considered a goddess. This panel conveys that even after the fact that you might get trapped, tricked and lied throughout your journey there are always upsides that one can look upon. In this case, the wanderer gets to experience peace, serenity and see nature at its finest.

I wanted the colors to be contrasting the earlier panels. While the earlier panels showcased colors like red, orange and brown, this panel has cooler colors like greens and blues.

This panel represents a serene environment and that the wanderer has come across. The focus point of this point is the banyan tree the sits right in the foreground. The banyan tree has a lot of cultural and spiritual importance in Hinduism and Buddhism. The tree is present outside temples in India and in mythology the leaf of the banyan tree is considered the resting place for the god Krishna.



Figure 5.15: Left and Middle Left: Banyan Trees, Middle Right [8] and Right: Hokusai's environmental Art Works



Figure 5.16: Panel 9

### 5.3.10 Panel 10

The second panel representing the good part of the journey shows our wanderer who has by now befriended a companion - A little puppy. The lines corresponding to this panel is "Alliance and Kinship you'll never forget."

By now the wanderer has grown older and wiser. He has let go of his battleax and has taken upon a staff. It is perhaps all the good and bad experiences he encountered throughout his journey. All these led him from changing from a lone wolf from to a compassionate wiser man. Similar to the previous panel the color scheme is full of blues, whites and green. The background trees were based on the coconut trees found commonly in my native place of Kerala, India.



Figure 5.17: Panel 10

### 5.3.11 Panel 11

This panel comes back in a full circle to the same lines "Wanderer O Wanderer, What do you seek? ". Mirroring the first panel, this panel showcases the wanderer walking across a vast desert. While the first panel's environment was a serene surreal forest, this environment is a dessert that is meant to represent a stormy sea.

Hokusais great wave is taken as one of the primary inspirations for this environment design. The real-life inspiration for the desert is based on Thar desert in north India. The ripple formation in the desert can also help draw parallels to the desert  sea comparisons.
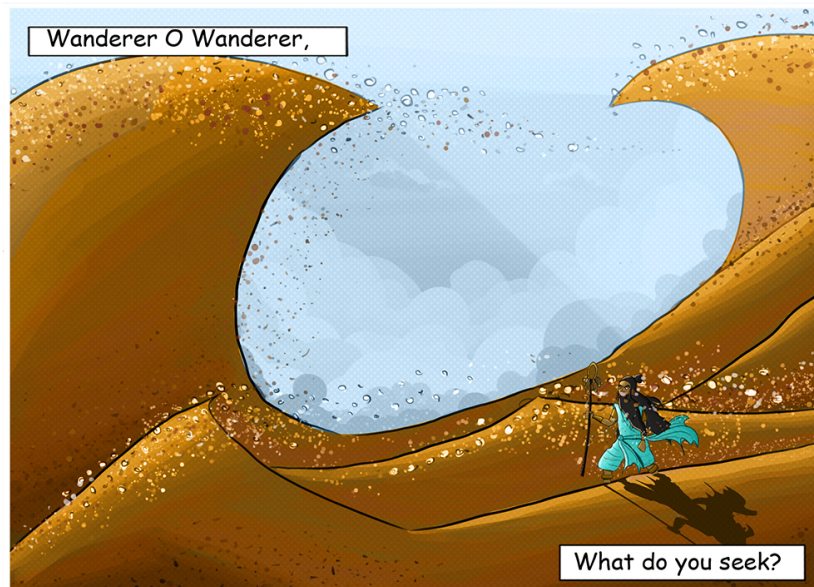
Figure 5.18: Great Wave, Hokusai [12]



Figure 5.19: Panel 11

### 5.3.12 Panel 12

Panel 12 corresponds to the lines "Looking back you realize, Even if Krishna's abode has eluded you". As the wanderer's journey reaches its conclusion, he eventually reaches what he was looking for all along. However he realizes that Dwaraka does not exist but is just a ruin. The intensity of the moment is shown in the scene by the atmosphere and dark color scheme. The wanderer stands across a cliff overlooking the ruins of Dwaraka. There is a thunderstorm looming ahead of him.

The dark blues and purples across the sea is meant to represent the same feeling of disappointment he feels. However far away the sky clears a little bit and the sun starts appearing representing a ray of hope.



Figure 5.20: Panel 12

### 5.3.13 Panel 13

The final panel goes along the lines " It is the journey that makes the difference, not the destination". It shows the wanderer's face lit by the realization that even if what he found out, in the end, was not exactly what he had in mind, he is no longer perturbed about this anymore. He has grown as a person and all the friendships and experiences that he acquired along this journey is all that matters to him.

The panel is lit in such a way that the sun has broken out of the clouds from the earlier panel and is hitting the wanderer directly in the face.



Figure 5.21: Panel 13
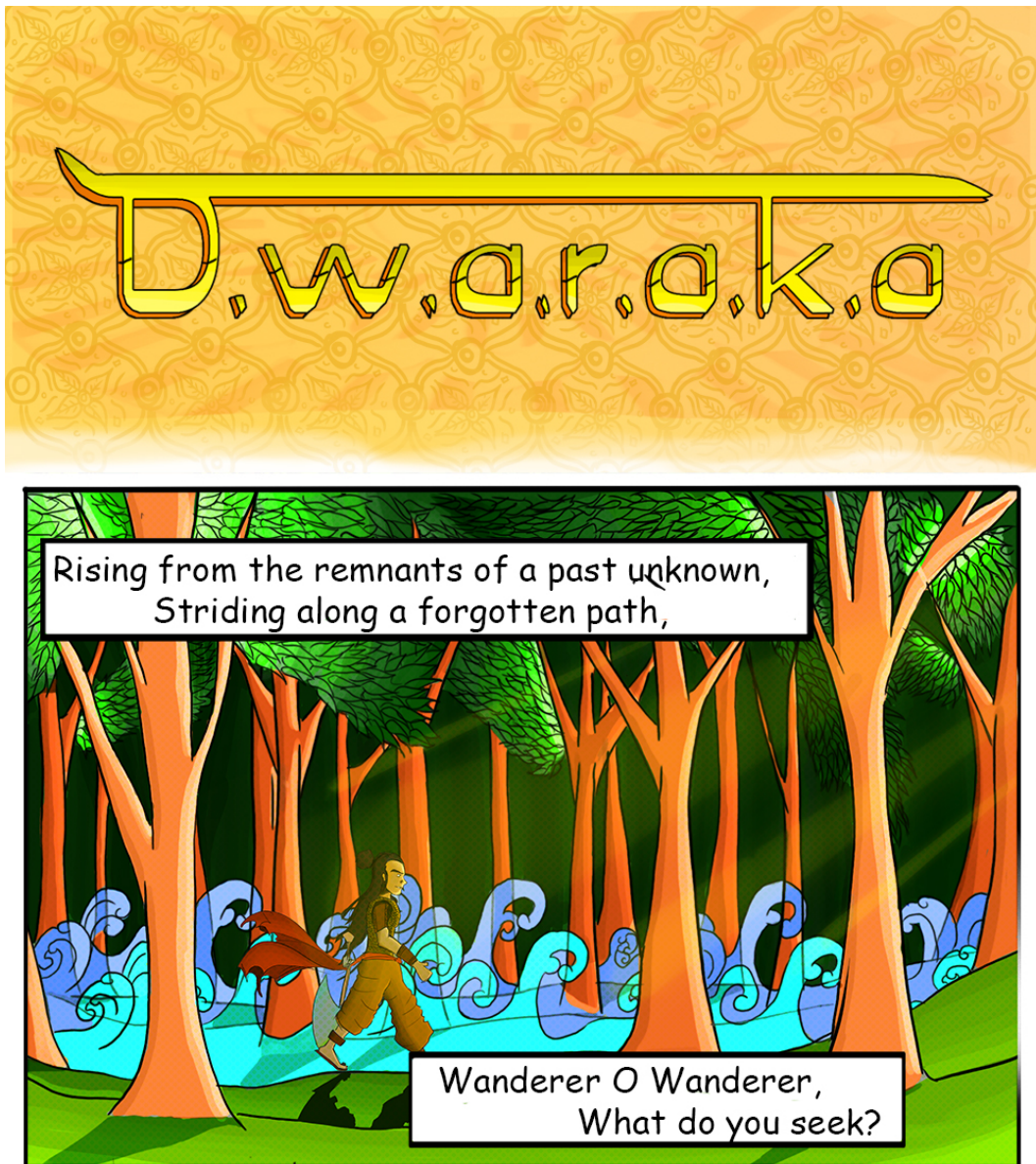
## 5.4 Dwaraka, A Journey
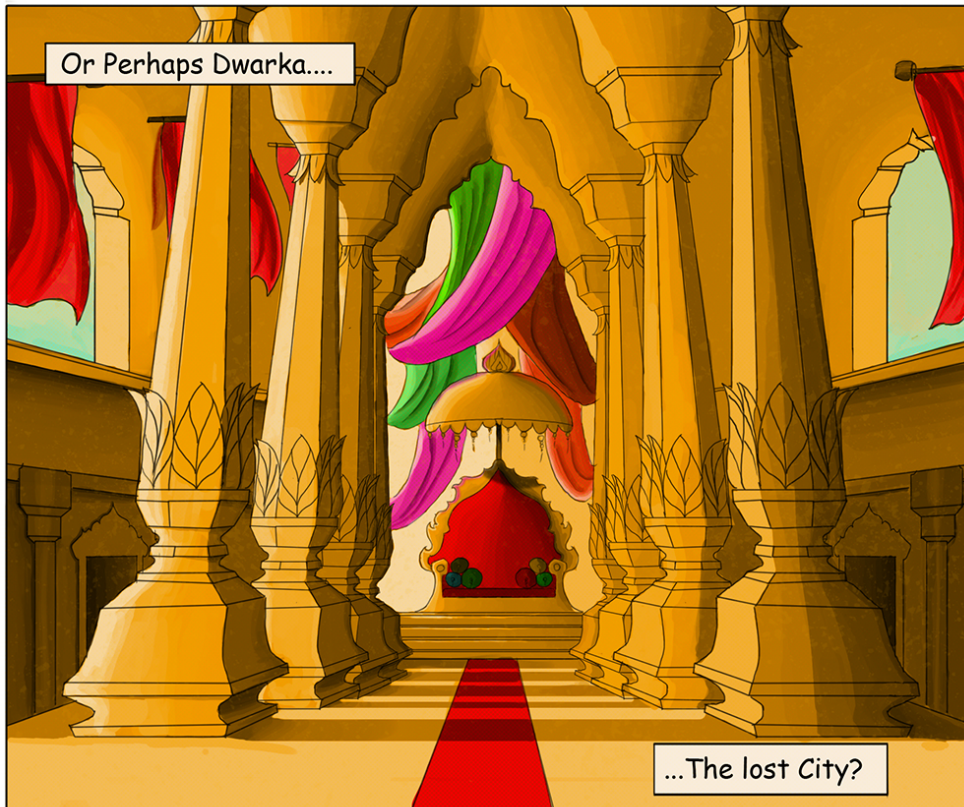


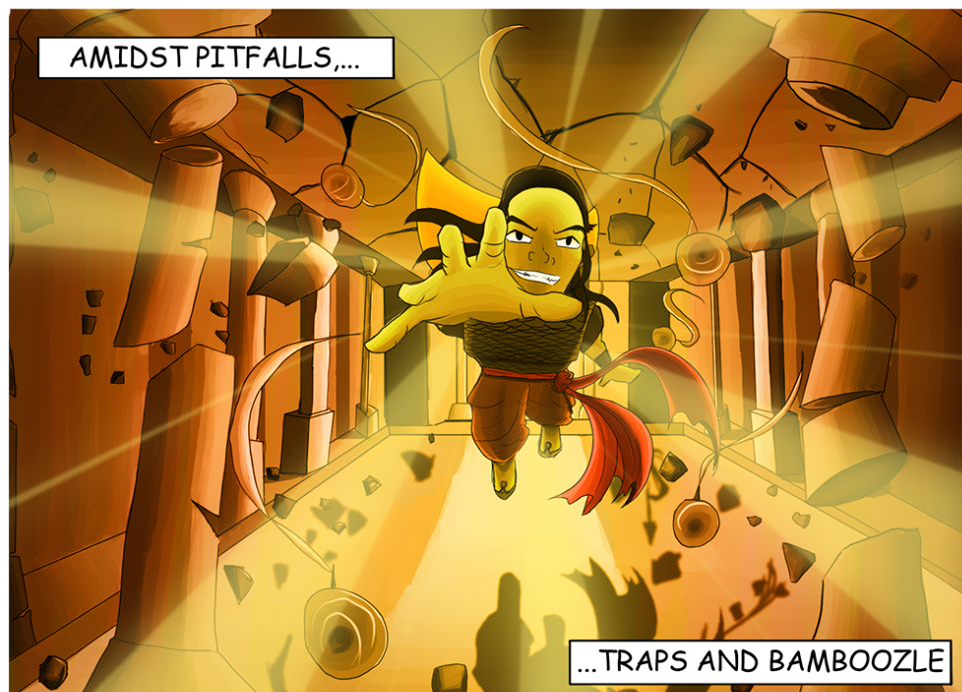Figure 5.22: Dwaraka Page 1

Figure 5.23: Dwaraka Page 2

Figure 5.24: Dwaraka Page 3
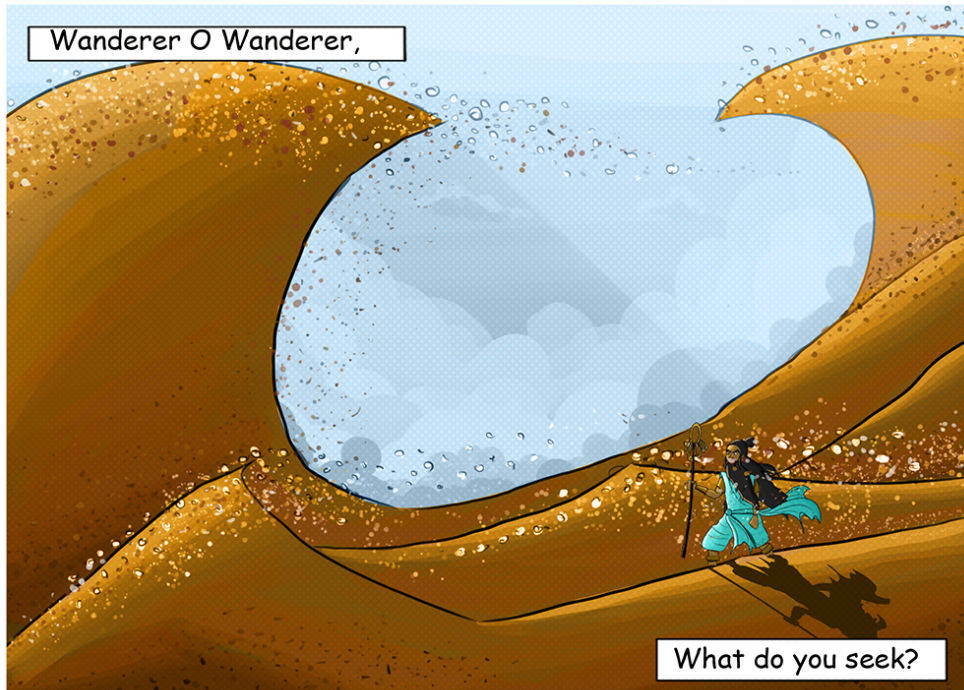
Figure 5.25: Dwaraka Page 4

Figure 5.26: Dwaraka Page 5

Figure 5.27: Dwaraka Page 6

# Chapter 6

# Production

## 6.1   Occulus Quill

Occulus Quill is a VR illustration and animation tool created as a storytelling medium for artists and creators alike. It was created as an in house tool by the Occulus Story Studio for their major project Dear Angelica back in late 2016. [6]

It is a very powerful tool that uses strokes in 3d that creates fluid VR settings that has a painterly style to it. Personally for me as an artist, this is one of the main reasons for me to choose Quill as the main content creation tool in VR. Drawing and painting either traditionally or digitally is my beginnings as an artist and something that will always be close to my heart. Moreover to create a graphic novel in VR, which is basically illustrations, it made sense to use Quill to create characters and environments instead of creating the assets in software like Maya and Zbrush and then importing to a VR setting.

Also some of the amazing VR works created by artists like Goro Fujita and Matt Scheafer and of course "Dear Angelica" certainly are works that have a 2D feel to them.

### 6.1.1   Methodology and Initial Creations

Mastering Quill came pretty naturally for me. The interface of the tool felt like a mixture of Photoshop and Adobe Animate. It had a strokes panel with different kinds of brushes, a straight line tool, colorize tool, and a wide variety of grab, stretch and duplicate tools, all of which that I was

very familiar with using Photoshop. However it was also accompanied by an extensive animation interface very similar to that of Adobe Animate.[18] Given below is the first Quill sculpt I created by just looking up at the basic controls and without diving into much detailed tutorials.



Figure 6.1: Chasing Dreams - Quill VR Sculpt

The fact that Quill was designed to paint 2D like designs in 3D and not exactly create more detailed characters and environments proved to be a double-edged sword. In many cases the abstract nature of the environments in the comic panels worked in my favor since a combination of different brush strokes along with duplicating, colorizing, and transforming helped me to easily create such environments.

However in the case of much more complex characters, I had to look into workarounds to make sure that the surface did not look the sets of stroke placed together with clear gaps in between. I started by creating a set of high detailed primitive shapes that couple be imported into each and every Quill scene. Let us take the example of a plane. To create a well-defined plane, a straight line was drawn on the grid. Then it is duplicated and moved slightly to the left/right making sure that the two-strokes are still on the grid and perfectly right next to each other. Then using the repeat last key, the process is repeated multiple times till the required shape is formed. Similarly to create a sphere a semicircular stroke is drawn on the grid and then it is duplicated and rotated in small angles till we have a sphere.

After creating all required detailed primitives that include sphere, cylinder, cone and plane, I was able to import these into every new scene. Since all these primitives are highly detailed with a lot of strokes preset in them, all of them were able to be colorized to form a nice gradient.

After figuring out how to make both detailed and abstract content in Quill, the next step

was to create a proof of concept of a VR comic scene. For this I decided to recreate a single page from the manga One Piece. The scene contained a huge panel of a ship jumping out of the water and 5 smaller panels below where all the major characters of the story were reacting to the situation. The scene was recreated pretty accurately. I was also able to add in animations for falling rain and thunder. Once I realized this was possible I started to create the environments of the panels of the graphic novels one by one.



Figure 6.2: Left - Original Manga Panel from One Piece, Right - VR version created in Quill

## 6.2 Creating the Environments in VR

The environments are some of the first elements I started creating in VR. The development of the graphic novel was made keeping in mind the possibilities of enhancing the experience in VR too. All the environments in the panels have a multitude of depth to it. There is a very distinct foreground, middle ground, and background.

In some of the environment panels such as panel 3 ( The wanted poster panel) and panel 7 ( The pitfalls and traps panel) some projectiles or protrusions are coming at the viewer. Many of the panels are very deep with at least 10+ layers of environment which makes for a very deep and immersive experience in VR.

One of the best examples of such a deep immersive environment is panel 6 ( The Ying-Yang panel). I have made a set of highly detailed primitives and a comic book outline that is imported into each ad every new quill scene. The reference images are compiled into a single image and taken into the quill scene too. The background is set to a grey tone and the Demon face is drawn stroke

by stroke. The different parts of the face are grouped by layer. The opacity of the strokes can be controlled by the pressure of the Oculus controller trigger. I some of the stokes that is either in the background or in the foreground, the strokes are not opaque but with varying opacity. This gives an illusion that the demon's face is shrouded with mist or smoke and also helps to create an impression of depth. This is shown in Fig.6.3.
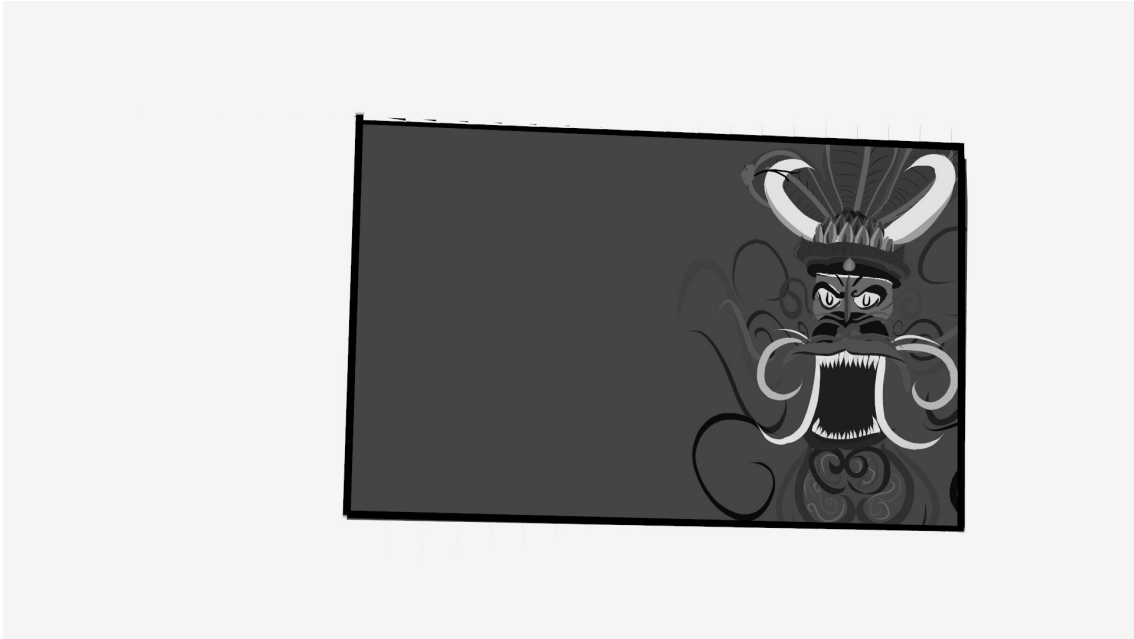


Figure 6.3: Environment creation 1

Each change in gradient is different strokes that are colorized by different colors. Once I was done with the monochrome evil right half of the panel, I started creating different elements in the good left half of the panel which had many more different elements of different sizes and shapes. The clouds were again made with a similar technique as discussed before. After creating the cloud outlines in jet black, the gradient was made with different strokes of each color change. Often whole layers would be duplicated and wrapped to different shapes. The creation of the cloud layers is shown in Fig. 6.4.

The clouds act as a middle ground for the VR environment. It is followed by creating the flowing river and some of the landmasses. All these are created similarly to clouds with first creating outlines from references then filling in with different colored strokes as a gradient. Often I would try placing them at different intervals to create the illusion of depth. It is arranged in such a fashion so that at some far angles it looks flat and most like an illustration but as you move into the scene it
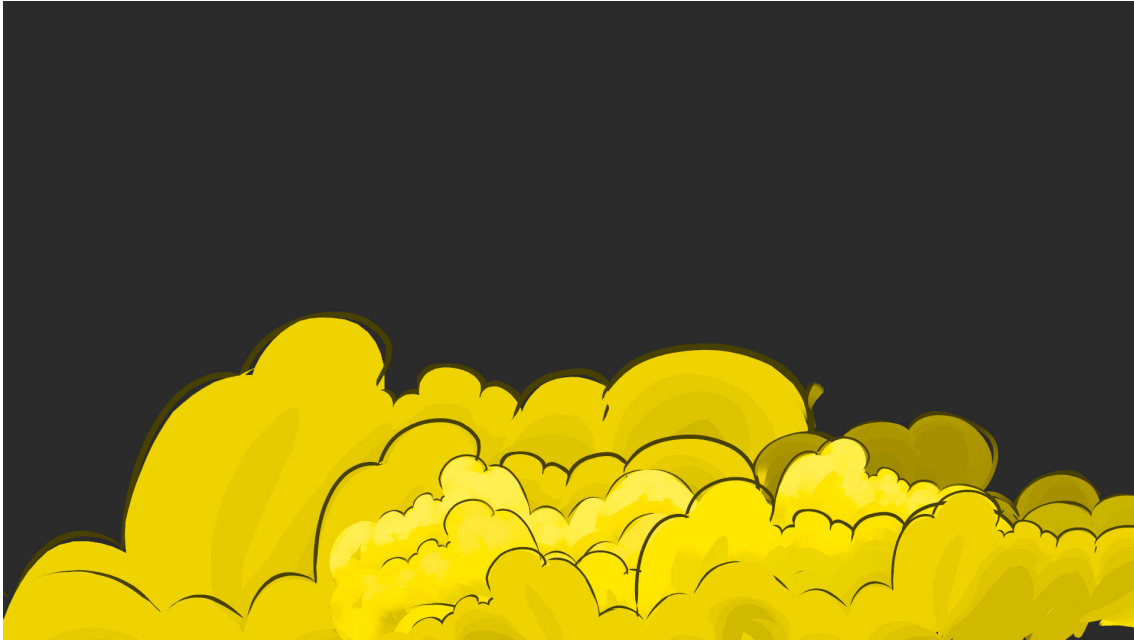
Figure 6.4: Environment creation 2

starts getting deeper and much more immersive. This is shown in Fig: 6.5.

The next process was to create some of the smaller elements like the flowers, stems, floating petals, god rays, etc. Some of these are taken by using a primitive like a sphere and then using the grab tool to shape it to a single petal-like shape. For some of the simpler shapes, they are usually just drawn with different kinds of strokes. The god rays are some straight yellow strokes that have a changing opacity. Quill does not have an inbuilt light system. So all light is simulated by colorizing appropriately. Finally, to give it a comic book feel all around, the comic book dots texture is added by creating a single circle, duplicating and rearranging at different depths. Fig:6.6 shows the final environment of panel 6 that is created.

Using this same approach, the environments of panels 1-4 and panel 10 is created. One of the most important things to consider while creating these environments is to keep track of the stroke count and making sure that the scene is stable. I had to take extreme care about this since eventually I planned to compile each panel into a single quill scene. Making creative choices for asset creation and using the optimization tool to reduce the strokes count diligently.
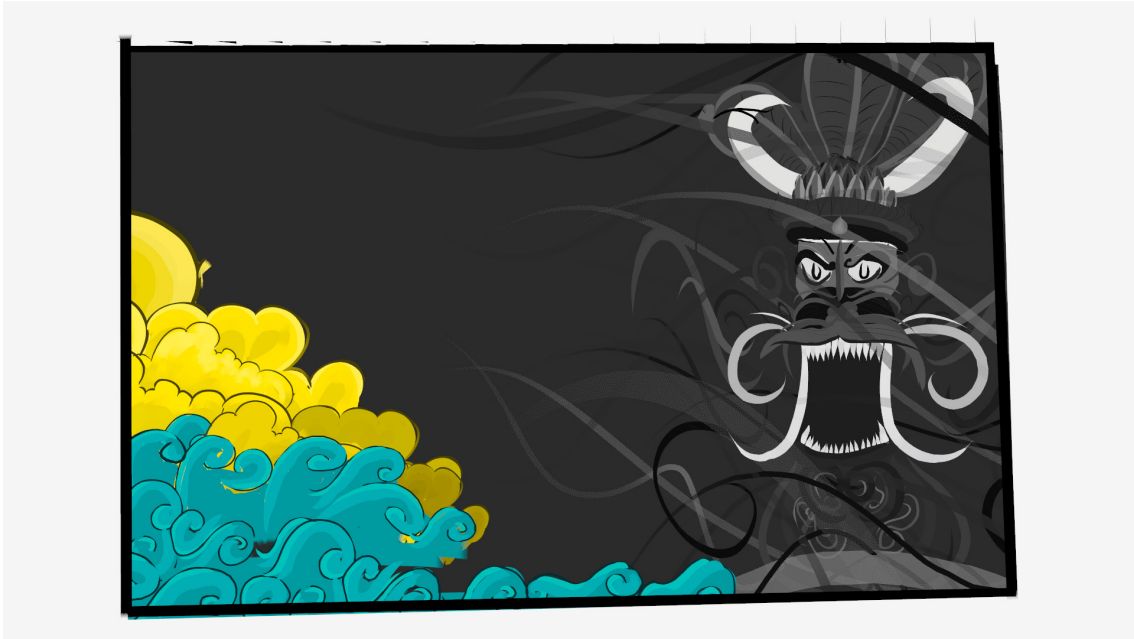
Figure 6.5: Environment creation 3



Figure 6.6: Environment creation 4

## 6.3 Creating a cohesive VR experience

The next challenge is to create a cohesive VR experience. I observed that many first time users and people who were not familiar with working in a VR space had a hard time navigating through the space. So I wanted to have an option of creating a VR ride, which can take the user in and out of environment panels, giving them control and time to look around appreciating the VR contents. The movement through the panels is controlled by clicking the play button on the VR control stick that starts and stops the motion.

While there is no camera and camera movements set by default in Quill, I had to mimic those movements by making use of the extensive animation features that Quill posses. First I decided to make use of the spawn area as a container/seat for the viewer to be in. Spawn areas are the default starting points in the Quill scenes that can be moved around the scene. The camera can be reset to the spawn area by clicking a single button.

I brought in each and every VR environment into a single scene and arranged its position so that they are all in front of the spawn area. Then I started moving entire comic panels towards the spawn area using keyframes and transform tools, giving the illusion that we are moving into the comic panel. One the spawn area is in the panel, after giving ample time for users to experience the panel again I use keyframes and opacity levels to fade out/in one panel to the next one. The whole process is repeated until the spawn area 'moves' through each and every panel.

# Chapter 7

# Results

In this chapter I am compiling all the screenshots from the VR Dwaraka in Quill. It is hard to capture the actually feeling of being in the VR space, but the following screenshots are examples of what a viewer would see during the VR experience. The following screenshots must be viewed along with the Graphic novel to get the full feel of what I intended to convey to an audience with this experience.



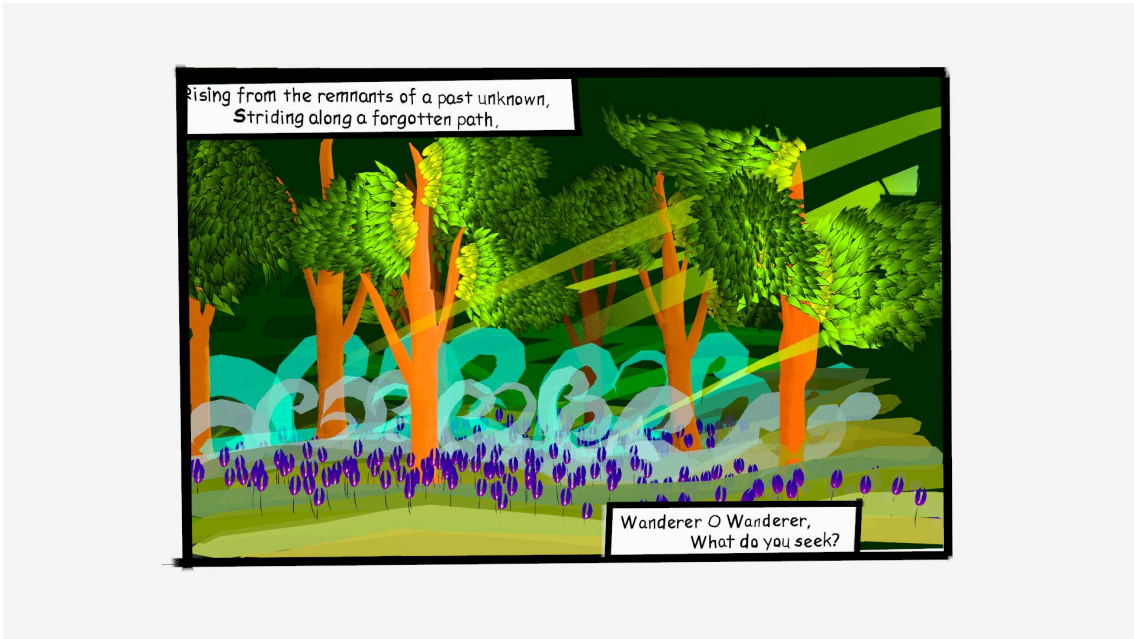Figure 7.1: Dwaraka, Screen Capture 1

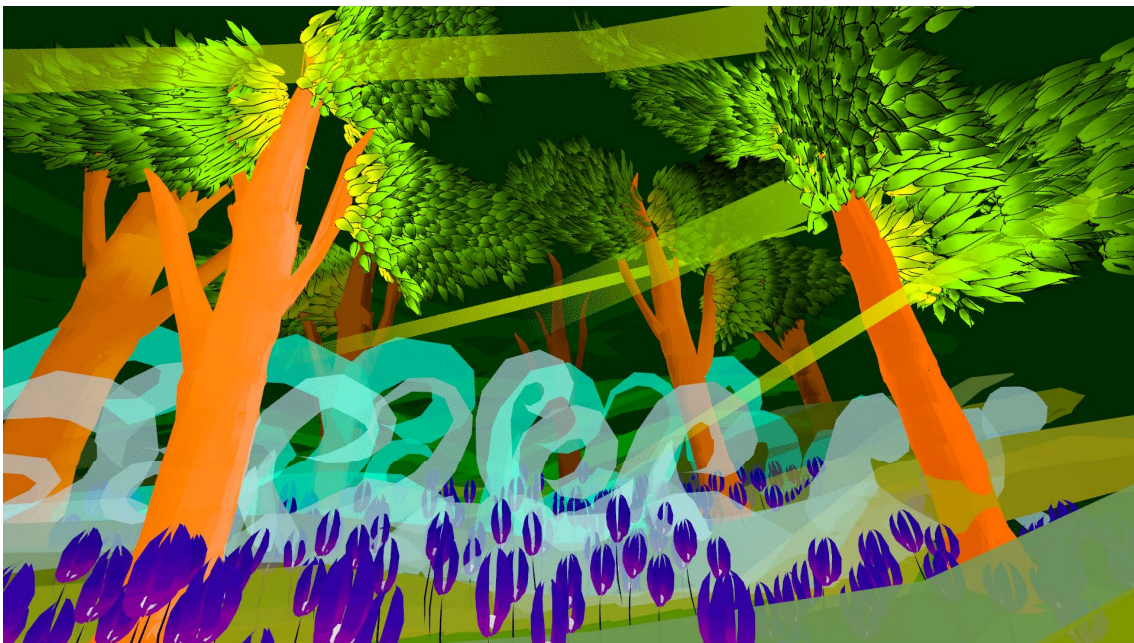Figure 7.2: Dwaraka, Screen Capture 2



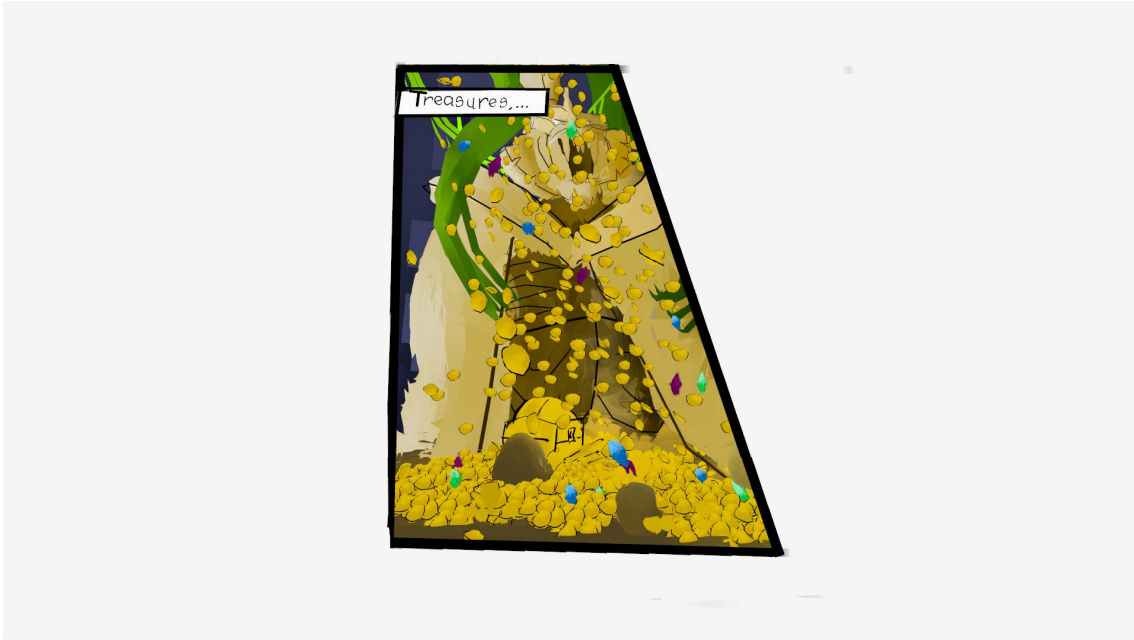Figure 7.3: Dwaraka, Screen Capture 3

Figure 7.4: Dwaraka, Screen Capture 4



Figure 7.5: Dwaraka, Screen Capture 5

Figure 7.6: Dwaraka, Screen Capture 6
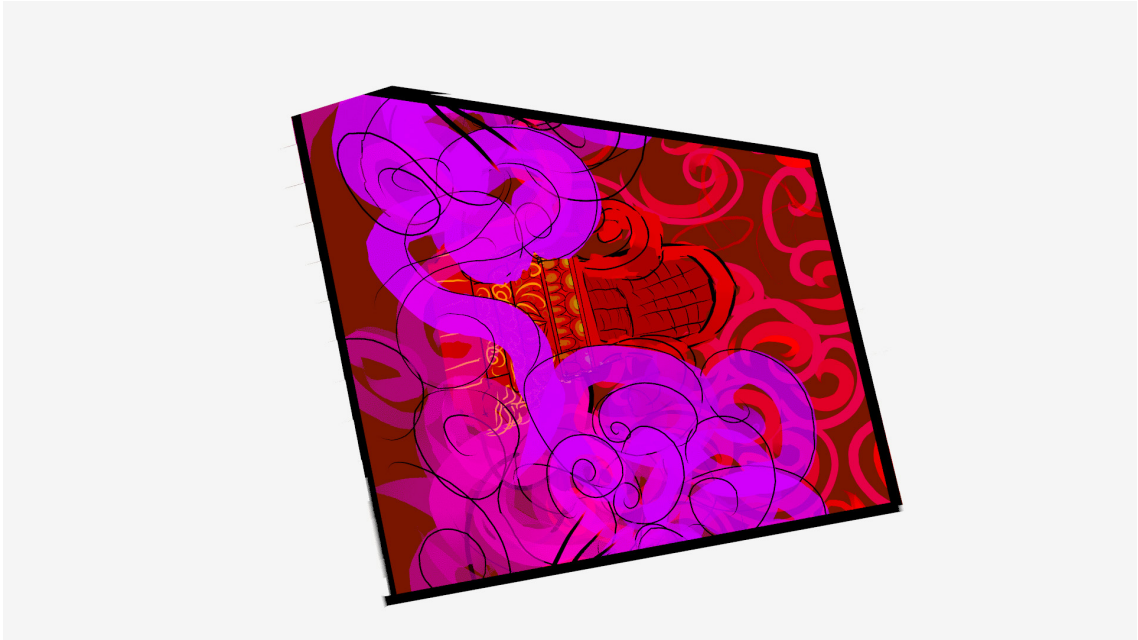


Figure 7.7: Dwaraka, Screen Capture 6

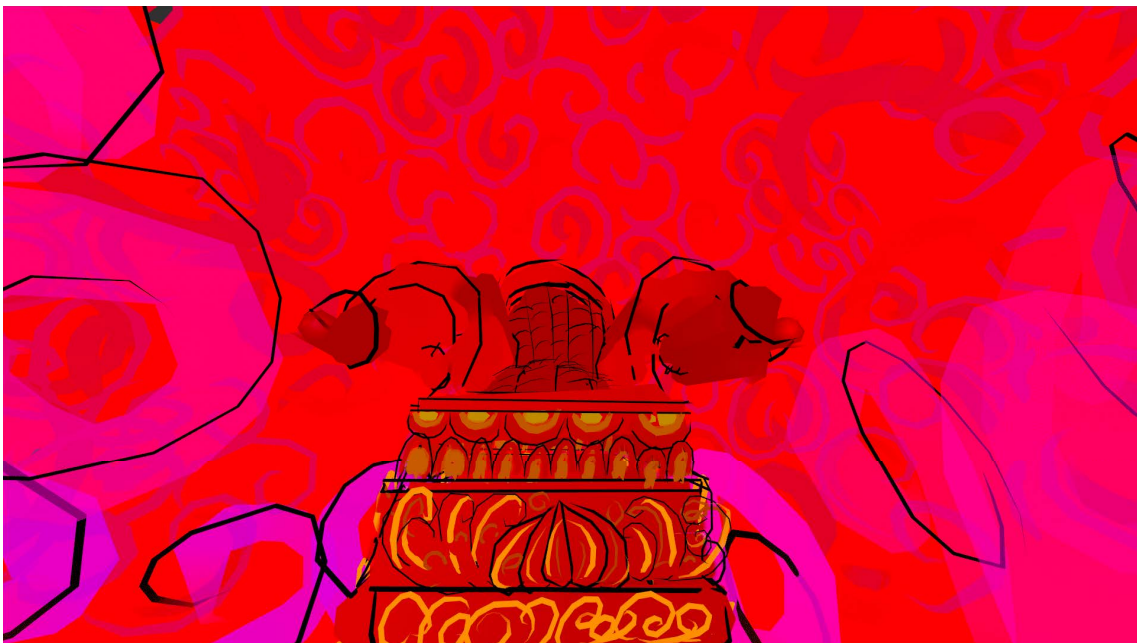Figure 7.8: Dwaraka, Screen Capture 6
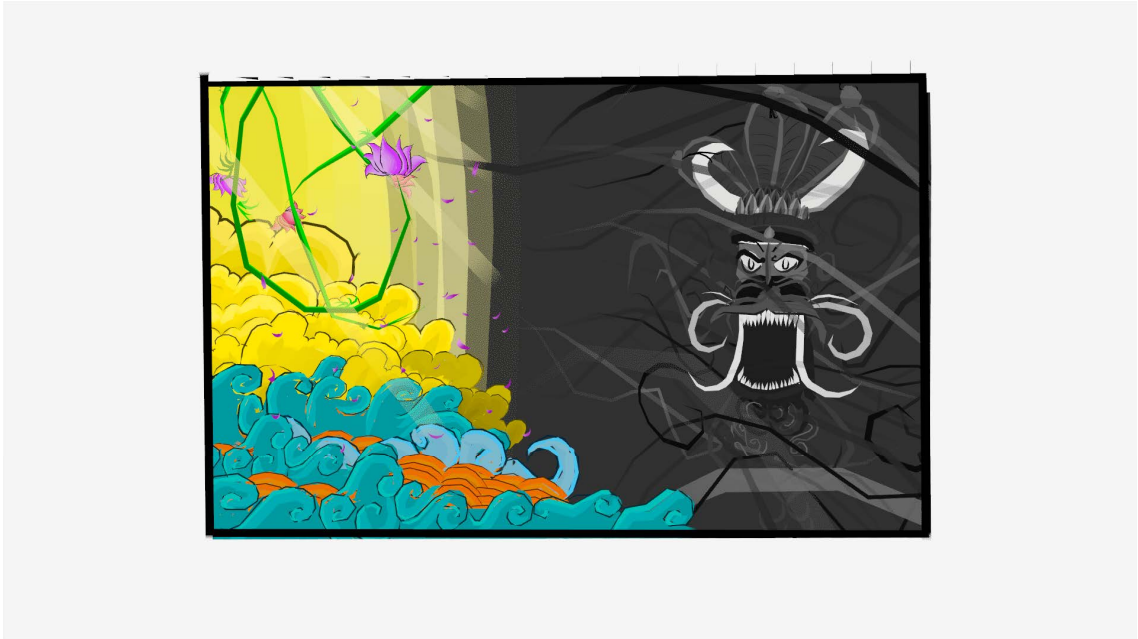


Figure 7.9: Dwaraka, Screen Capture 6

Figure 7.10: Dwaraka, Screen Capture 6



Figure 7.11: Dwaraka, Screen Capture 6

# Chapter 8

# Conclusions and Discussion

This thesis started as a proof of concept of an idea where a user would be able to fully immerse themselves in VR comic book panel. I also wanted to convey a personal story capable of triggering a positive reaction after going through this VR journey. I believe I have crafted a graphic novel which during the production process started to develop a distinct style of its own. The final VR product came fairly close to the initial proposed idea of telling the story where the environments and characters were changing around the users to move the story forward.

The project helped me to expand my skillset and push whatever I learned to its limits. It made me think about what my priority as an artist is and create a story that is personal for me. Reading many of the acclaimed graphic novels as a part of research also was an eye-opener about how important the layout, scene composition and color scheme to create an intended response in the readers. Writing a poem and a personal story was a challenge in itself too. It made me go back to those childhood stories I heard and the anime and cartoon series I've seen during my teenage years. Crafting this story of purpose and life I believe, has bolstered the storyteller in me. It certainly made me think about life and my journey for my Dwaraka whose ending seems like a blur now. I've learned to embrace this uncertainty and trust in the process. If works can convey even an iota of this feeling to others that would a success to me.

Dwaraka is my first project fully created in VR. Sculpting in VR and seeing the environment and characters unfold in front of me was a surreal experience of its own. The initial feedback I received from friends and colleagues about the VR experience was incredibly positive. They found the style and environment fascinating. Similarly the graphic novel too triggered the response I was

expecting from my readers.

There are some aspects of the production that I believe could have been better. Creating such detailed environments fully in VR was a challenging task for a single person alone. Due to time constraints, I was only able to finish half the panels of the graphic novel in for the VR experience. Also some of the environments I have created are for some of the later panels which because of the missing VR panels in between couldn't have been added to the cohesive VR experience that stops at the half waypoint. I also believe that animations could which is very basic right now could be pushed to another level.

Overall the Dwaraka was indeed a wonderful journey of self-discovery and mastery to me. I was able to work with amazing new technologies, learn new software and tools and even discover inherent skills in myself like literature that I didn't even know existed. I would like to eventually make the whole graphic novel into a VR experience. I would also like to spend ample time animating the environments, even as small as movements of trees. Eventually I plan on submitting the polished VR experience in film and tech festivals.

# Appendices

# Appendix A   Pre Production - Graphic Novel

The first version of Dwaraka.



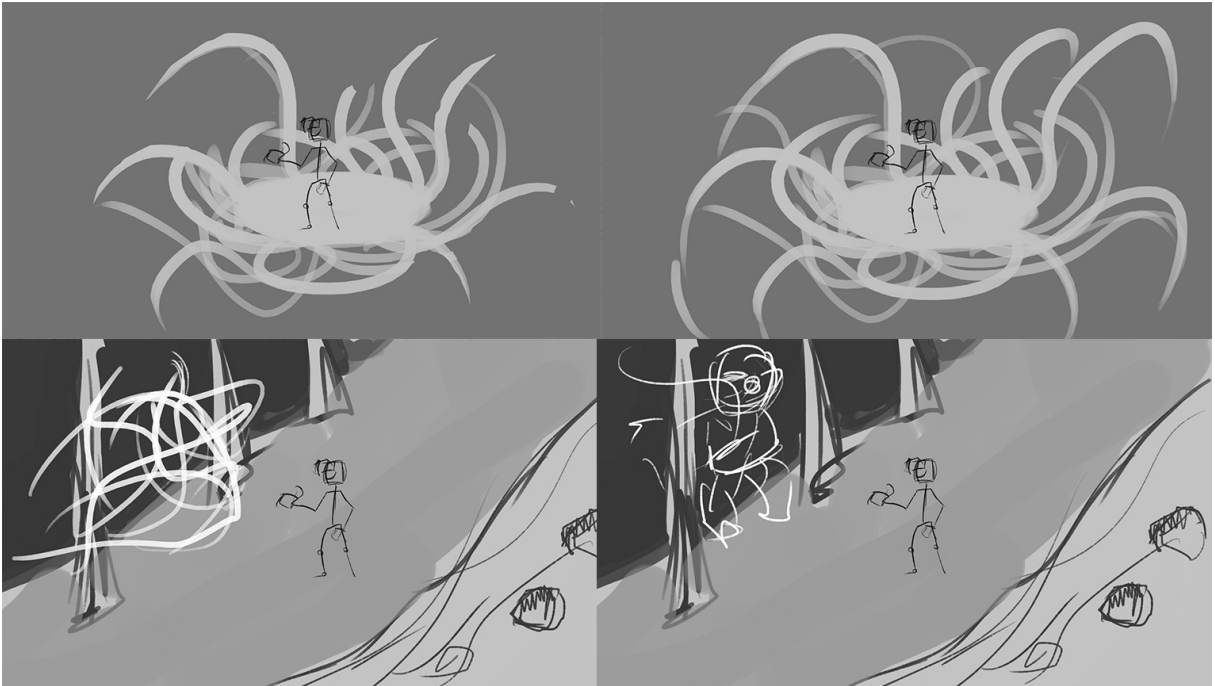Figure 1: Initial Version of Draraka

# Appendix B  Pre Production - VR



Figure 2: Initial Concept for the VR experience

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