Research on Immersive Art Exhibition

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Executive Summary

The immersive art exhibition is defined as using scientific and technological equipment to create sound, light, electricity, and other elements to bring the audience an immersive effect. The following three cases are from American mechanical hallucination, Japan's team lab, and Shenzhen Zhizheng culture company.

Shenzhen Zhizheng: They use the IP of Van Gogh and use technology to rebuild his work. They have to use animation and interactive technology to make Van Gogh’s painting alive.

Team lab: A Japanese company with rich experience in curating exhibitions. They are good at using a variety of interactive means to increase the audience's sense of experience and contain profound artistic thinking.

Mechanical Hallucination: A joint exhibition of individual artists and galleries. AI technology is used to show the change in New York City.

This report will discuss the technical and commercial aspects of immersion art exhibitions. We will take companies in three different countries as examples, analyze the laser projector, interactive device, photon film, 32 channel sound, and other elements. This report will detail these technologies and explain how they are used in our project.
1. **Introduction**

Our project is an immersive art exhibition called "The Ocean." Space will be divided into five small black boxes to show the landscape of different depths of the ocean, and promote the concept of protecting the ocean, so as to bring people visual, auditory, and sensory immersion experience.

When people enter the room, the range of sight they can see will be covered by the projection, giving people a sense of being in the sea. When the fish start to swim on the screen, the distance between people and nature will be narrowed, more like observing the world through the glass of a submarine than in front of a glass box in an aquarium. We create an immersive experience through the stereo, surround projection, and a variety of sensors. We will create an immersive effect from sound, light, and electricity. For example, in the exhibition hall on the beach, we will lay sand on the ground, and the thermal fan will give people an immersive effect. At the same time, we will have a linkage with the novel "Twenty Thousand Leagues Under the Sea" and display the Nautilus as part of the sea bottom elements. At the same time, the emerging garbage in the ocean will highlight the environmental protection topic of this exhibition.
2. **Cases1 Mechanical Hallucination**

Mechanical Hallucination is an immersive art exhibition using artificial intelligence created by Turkish artist Refik Anadol in Los Angeles. In 2019, this large-scale art installation exhibition was held in ARTECHouse, which caused a sensation. The artist likes to use all the tiny things like the material of his artistic creation and uses computer science and technology to process his huge material library. This is an avant-garde art form completely different from the traditional, which can inspire the audience to think about the contemporary information society. Simultaneously, the exhibition hall is equipped with 32 channels of stereo sound and laser projectors, which is committed to creating the most immersive lighting and sound effects.

**2.1 Business Model**

Unlike the other two exhibitions, this exhibition is designed and hosted by a personal artist. It has not formed a complete commercial form, and its artistic nature is more than its commercial nature, and its main purpose is not to make profits. The ticket price is Adults- 24$ Children- 17$ and Special Crowd- 20$. The price is much lower than in other exhibitions.

The organizers of the other two exhibitions are profit-making companies. The creation of art installations and the design and layout of the exhibition hall are all created by the team. And this exhibition is a cooperation between artists and the art museum to put their works into this exhibition hall.

**2.2 Technology**

The use of technology in this exhibition is particularly special. Artists do not focus on how to display art through technology but on how to create art with
technology. The immersive experience of the exhibition is embodied by omni-directional projection. Photography technology is embedded in the machine. The simple use of technology in the exhibition does not affect its charm. The excellence of this exhibition lies in its unique artistic thinking, through the use of technology to arouse people's thinking about technology. The construction of the relevant sound system brings some inspiration to our project.

2.2.1 L-ISA Immersive Hyperreal Sound System

![Image of L-ISA system](image_url)

L-isa system sound and image positioning accurate, clean sound, simple operation can reduce the installation, debugging time, to solve the system equipment between the consistency, compatibility, and a series of problems. Such a system reduces the operator's operational difficulty and can reduce the time and labor cost in the exhibition layout. Thirty-two channels mean that there are more points of simulated vocalization. The more channels there are, the more clearly the audience can distinguish where the sound is coming from. In the listening process, it is more similar to the specific situation in real life, giving people an immersive feeling. We will use its surround system to create an immersive experience for the audience. Overhead speakers and surround speakers will be deployed above and around the viewing area to enhance the front system.
2.2.2 Laser projector

The ARTECHOUSE Pavilion features 16K ultra-clear resolution, 150-megapixel laser projection technology. The laser projector uses the light source as the laser, the light intensity is stronger, picture brightness and color effect are better than ordinary projector. The gamut is wide, which is about two times the gamut of ordinary projectors. Laser projectors make up for the shortcomings of ordinary projectors, even if the long hours of work are difficult to cause the light source dimming. The laser beam is about 10 billion times brighter than the sun's rays and is highly concentrated and energetic. The projector using a laser light source because of the low attenuation characteristics of the light source, so that its output image quality for a long time to maintain high brightness, saturation, and contrast, the picture color is always clear and bright. In "The Ocean," we plan to use laser projectors to achieve immersive visual effects.
3. **Case 2 Team Lab**

Team lab art team started activities in 2001. They have created many avant-gardes and profound immersive art exhibitions. Through art, we can explore the new relationship between human beings and nature, ourselves, and the world. As the world's top team in the production of immersive art exhibitions, team lab has gradually transformed from a small team into a team of hundreds of people. The best part of this team is to use various kinds of technological devices to express the concept of art and to arouse the audience's thinking through interaction. The art exhibition of the team lab is a typical representative of magnificence and profundity. They are very bold in color and production. The concept of expression is grand and shocking, which pushes the art to a new height. This article takes "Borderless" as an example to show the charm of the immersion art exhibition.
3.1 Business Model
First of all, for a specific exhibition, tickets and peripheral products sales are undoubtedly an important way to make profits. Weekdays- 229RMB and Weekends- 249RMB, compared with the same kind of exhibitions, the price of the team lab exhibition is relatively high, but due to its high quality, it still attracts numerous visitors. They cleverly use social media to promote the flow of online audiences to offline. With the increase in ticket sales, this revenue can gradually support part of the cost of the exhibition. (Liu, 2019, p18) At the same time, the team lab team not only produces its own exhibitions but also undertakes business externally, which is a significant source of income. This business model has achieved a win-win situation for high-quality exhibitions and profits.

3.2 Technology
Team lab as the world's leading art team, they used in the works of interactive technology is very clever. This article will focus on team lab's extraordinary interaction technology and how they express their concepts through interaction technology.

(https://borderless.team-lab.cn/shanghai/)
3.2.1 Interactive Technology- Kinect depth camera

The interaction technology of the team lab is mainly divided into three parts: interaction between audience and artworks, the interaction between audience and audience, and interaction between art and technology. The team uses algorithms and transformations to create random effects while using projectors, sensors, and lights to create interactive visual effects. They are skilled in creating grand pictures, and at the same time, they interact with the audience and arouse their philosophical thinking and reflection. In our project, we also plan to use a variety of sensors to enhance the visitor experience. If an infrared sensor is installed at the entrance, the all-black space will slowly light up when visitors enter the room, revealing the different ecology of the ocean floor. We designed this pavilion of the bathypelagic zone, using light sensors to increase the sense of interaction. Only when participants turned on a flashlight did the deep-sea view appear in the darkness.

Kinect, as a depth camera that can track motion, can greatly improve the interactive experience of the exhibition. Kinect is Microsoft’s new Xbox 360. The RGB and depth information of the target can be obtained by using it. It uses a standard camera and an infrared camera to work together to provide a depth map of a three-dimensional scene. This can better locate how people act in a space so that the sensor can obtain a more sensitive sensing effect and enhance the interactive experience of the audience.
4. Case 3 Shenzhen Zhizheng

Shenzhen Zhizheng Culture Communication Co., Ltd. was established on September 11, 2018. Its business scope includes cultural and art exchange activity planning, large-scale performance activity planning, marketing planning, exhibition planning, etc. This case is selected by the company's "pursuit of light - Van Gogh" immersion art exhibition. The pursuit of light: Genius Van Gogh's dream exhibition is sponsored by Shenzhen Zhizheng Cultural Expo Group and wonder art management of the United States and organized by Zhizheng culture and Macao design center. It will be exhibited in the art gallery of the China Resources Building Art Center from May 28, 2019, to September 28, 2019.

4.1 Business Model

The first thing to see is that the company spent much money and human resources on IP purchase and site setting. With limited budgets, this means they have to make trade-offs in some areas. The tickets for this exhibition range from 128 to 188rmb, and there are regular profit models, such as peripheral sales. It is worth noting that Shenzhen Zhizheng uses Van Gogh IP to unite with different enterprises, such as Marriott Hotels and IKEA, to create immersive art space for them. At the same time, in Sina Weibo, the number of topics read for this exhibition reached 177000, with 173 people participating in the discussion. With less investment in commercial publicity, the exhibition is still popular only among a relatively small number of fans. As for the peripheral products, in our interview, the audience also said that they were very conventional products and did not make people feel impressed.
4.2 Technology

Van Gogh's art exhibition is a typical domestic immersion art exhibition that uses traditional technology solutions such as immersive projection and various interactive systems and develops a corresponding app as an additional tool for the audience to watch exhibition. The following two representative scientific and technological means will be selected for specific analysis.

4.2.1 Annular stereoscopic projection

A multi-channel circular screen (stereo) projection system refers to a multi-channel extensive screen display system composed of multiple projectors. In this case, many such techniques are used to create a sense of being in the presence of a large picture. A visitor also expressed that she was very shocked by the full-frame starlight projection in the exhibition. Using this type of technology can show more details of the picture while creating a dreamlike effect of light and shadow in the field.
The whole sky scene layer is as high as 7.8 meters. It covers an area of 400 square meters. In order to ensure the quality of the projection, they must carry out a series of processing on the wall to ensure that the quality of the projection is clear enough for audiences to appreciate. In order to avoid the projector group in the center of the room from affecting the overall atmosphere and effect, they creatively set up a lighthouse-like device in the center to place multiple projectors, which is an ingenious way to learn from.

### 4.2 Holographic photonic film

Established in June 2015, Shenzhen optical holography Technology Co., Ltd. has developed and produced world-leading optical thin films based on photonic
crystal metamaterials. This type of film has been widely used in this exhibition. The application of photonic film in the field of the display will not be affected by light intensity. It can protect people's eyesight in dark space and can also be displayed in intense natural light. The cost is low, which can effectively reduce the cost. At the same time, it can support 24K ultra HD resolution, forward support projection, back projection of two different imaging methods. Due to its strong ductility, it can support a cambered surface, curved surface, and a variety of different sizes, with strong flexibility. We plan to use photonic film as a projection medium in the project to create an immersive effect of surrounding projection in a small space. We are going to use its flexibility to build a circular screen to cater to the visibility of the human eye.

5. Analysis

The three exhibitions use the combination of sound, light, and electricity to create a brand-new visiting experience. The setting of large scenes and interactive technology are the main ways of immersive exhibition to create an immersive experience.

Before we started our survey, we sent a questionnaire to the university students of Xi'an Jiao tong Liverpool to investigate their views on the immersion art exhibition. The results surprised our team. Only a quarter of the students have ever been to the immersive art exhibition. In our survey, we will also be students' views, and we summed up the characteristics of one-to-one correspondence.

The first is the application of large-scale projection. With the development and progress of technology, projectors' quality is getting higher and higher, and
there is a low-cost and high-quality projection screen such as photonic film. High-quality projection image has laid the most basic technical foundation for the continuous development of immersion art exhibition. This also appears in three cases, as an essential form of artistic expression, to bring shocking visual effects to the audience. However, in the questionnaire survey, most students also pointed out that the large area projection effect is easy to cause dizziness and aesthetic fatigue, and because this technology is too popular, it is no longer fresh to some extent. This form of art is also limited to the details and pictures, only focusing on the excellent effect of the picture, ignoring the significance of the work of art. In our questionnaire survey, many students also reflected that too many repeated projections to create immersion would cause aesthetic fatigue, even a lazy behavior as an organizer. To a large extent, the projection means that these exhibitions are only scenic spots for taking photos and punching cards, rather than an in-depth exhibition. The expression of visual effect is significant in an exhibition, and it is an essential embodiment of the combination of art and technology. However, the art team still needs to reflect on the necessity of this form in the exhibition.

Secondly, the application of interactive technology in the exhibition. The use of infrared sensors, sound sensors, tactile sensors, and various sensors enhances the sense of interaction. In the future, there may be more sophisticated and technological sensors, such as vision sensors, laying the foundation for a new form of interaction. Whether there is a strong sense of interaction is an important indicator to judge whether an art exhibition meets immersion requirements. Appropriate interaction technology is conducive to the audience to understand and integrate into the emotion of the work. Foreign experienced art teams are better than the Chinese ones. Their artistic expression is more profound and more creative. At present, China's immersive art exhibition is still in the stage of purchasing or introducing IP for transformation and has not yet possessed mature self-development ability. Most of the interactive devices are
only for tourists to have a novel experience, and the help for the improvement of art level is limited. In the other two examples, interaction is an essential part of art shaping.

Third, the three exhibitions show a different understanding of the combination of art and technology. Creating art with science and technology and displaying art with science and technology are two utterly different expression methods. Chinese exhibitions use new scientific means to make traditional artworks come to life. The other two cases focus on creating art with science and technology and making technology a part of the art. In the questionnaire survey, numerous students also said that some exhibitions in China lack connotation and just show off their skills blindly. This is the reason for the combination of art and technology is rigid. Let technology become a part of art is conducive to immersive art exhibition more artistic charm.

In terms of business model, the business activities carried out by individual curators, and team curators are different due to different purposes. Companies and teams need to make profits, and the cost of large-scale exhibitions is higher, so the prices of tickets and peripheral products are higher than that of individual artists' exhibitions, which has more obvious commercialization characteristics. Shenzhen Zhizheng is also relatively innovative in its business model of combining with other enterprises through IP. The commercial nature of the other two is less obvious.

We thoroughly considered the necessity of using various technologies during our design process. We chose the small room as the exhibition's theme to bring the immersive effect to the audience on a small scale, showing the ability of technology to transcend the limitations of space and give people a grand impression. Secondly, in the exhibition design, we chose to make the exhibition itself more meaningful, interspersed with environmental protection-related
elements in the beautiful and magnificent picture, so that the exhibition is fascinating and has social value.

6. Conclusions and recommendations

We divided the exhibition hall into five small rooms, and according to the intensity of the light through the sun, we will show the beach, the upper ocean, the middle ocean, the bathyal layer and the deep ocean layer respectively.

(Venue design)

We designed the pavilion to be five small rooms of the same size, each with a different view of the sea at different depths. Our field curator, with a width and height of four meters, uses a photonic film as the projection medium to cover the range of the viewer's line of sight. At the same time, we use the laser projector to carry out the back projection so that the audience cannot see the
projector in the auditorium, more immersive feeling.

In fact, what the human eye can see is not only a plane with coincident angles of view, but also a 188-degree circular plane. Because our space is very small, when people enter the room, the projection screen can easily cover all people's perspectives, bringing the experience of immersive.

(back projection principle)
Besides, we plan to use various sensing devices to reflect the interactive feeling of the exhibition. Using a photonic film that can be seen at any intensity of light, coupled with photosensitive sensors, the viewer lifts a flashlight to explore the ocean floor as an explorer. We choose the photonic film as the projection medium instead of the LED screen to display directly, which effectively reduces the cost, but touch sensing technology to interact is not feasible. Therefore, we mainly use infrared recognition, light sensors to create interactive effects. We will use depth cameras such as Kinect to capture the audience's dynamic and realize the interaction between the audience and the screen. When people wave, the fish on the screen will fly away.
In terms of business model, we use selling tickets to make profits and launch well-designed peripheral products to make profits. We will focus on the social media platform, invite industry KOLs to experience it in advance by producing beautiful live pictures, and focus on promoting the interactive and immersive elements in it, and plan to exhibit them globally or nationally. Our main profit model is ticket sales and peripheral sales. When our exhibition has a certain influence, we will consider the sale of copyright.

7. Acknowledge

First, thanks to my teammates, we supported each other to help each other finish this assignment. They all completed their work efficiently and with high quality.
Secondly, thank our teacher for his essential advice.
Finally, I would like to thank the lady I found on the Internet who has been to the Van Gogh art exhibition. After I wrote to her, she replied quickly and told me her views on the exhibition. Her views provide a very important reference for our case study.

8. References

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Appendix:

An interview with a visitor who have been to the Light chaser----Van Gogh

Q: What do you think of the overall experience of the exhibition? How do you feel?
Overall, it's not bad, equivalent to the simplified version of the van Gogh exhibition in France.

A: You can not only see several of Van Gogh's representative paintings, but also integrate them into the paintings and take photos with them. The effect of taking pictures is very good~

Q: Is the combination of art and technology appropriate? What do you find surprising?
A: Most of the paintings are projected onto the background in the form of projection. In addition to the flower paintings, some scene works have better performance.
The surprise is that some paintings can interact with each other. For example, when you clap your hands, there will be birds flying by. If you wave your hand in the wheat field, you can see a sickle, like cutting wheat, and so on.

Q: What technologies were used in the exhibition that impressed you?
A: What impressed me was the 360-degree projection of the exhibition hall on the night of stars and moons. The visual effect was particularly powerful as soon as you went in.

Q: How attractive are the derivatives offered in this exhibition for your consumption?
A: The type of derivatives is relatively conventional, with no characteristics, and the price is not low, so the overall attraction is not high.

Q: What is the main reason for you to go to this exhibition?
A: I like Van Gogh’s paintings and know that there is a van Gogh exhibition in France, but it's a pity that I can't go there. After knowing about this exhibition, I was still satisfied after watching it.