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Developing a Virtual Reality-Aided Learning Space for Secondary Education: The Service Design Approach

Presenter name: Zhiyuan Yu

Author: Zhiyuan Yu, Cheng-Hung Lo*, Mutian Niu

China, Suzhou

Xi'an Jiaotong Liverpool University

School of Film and TV Art

What is the problem?

- Virtual Reality (VR) has re-gained its popularity in recent years. Educational applications are an important agenda among the recent developments.

- Most related studies focused on the VR content design for course delivery.

- The physical learning space, where the VR devices and its related equipment are installed, is also a critical factor in developing such type of courses.

Conclusion

Current design of VR-aided learning spaces is still lack of a design strategy that is systematic, user-centered, and service-driven.

Our Solution

Using Service Design (SD) approach to design a teaching-oriented VR Laboratory for secondary education.

Service design thinking is an iterative process.

EXPLORATION   CREATION   REFLECTION   IMPLEMENTATION
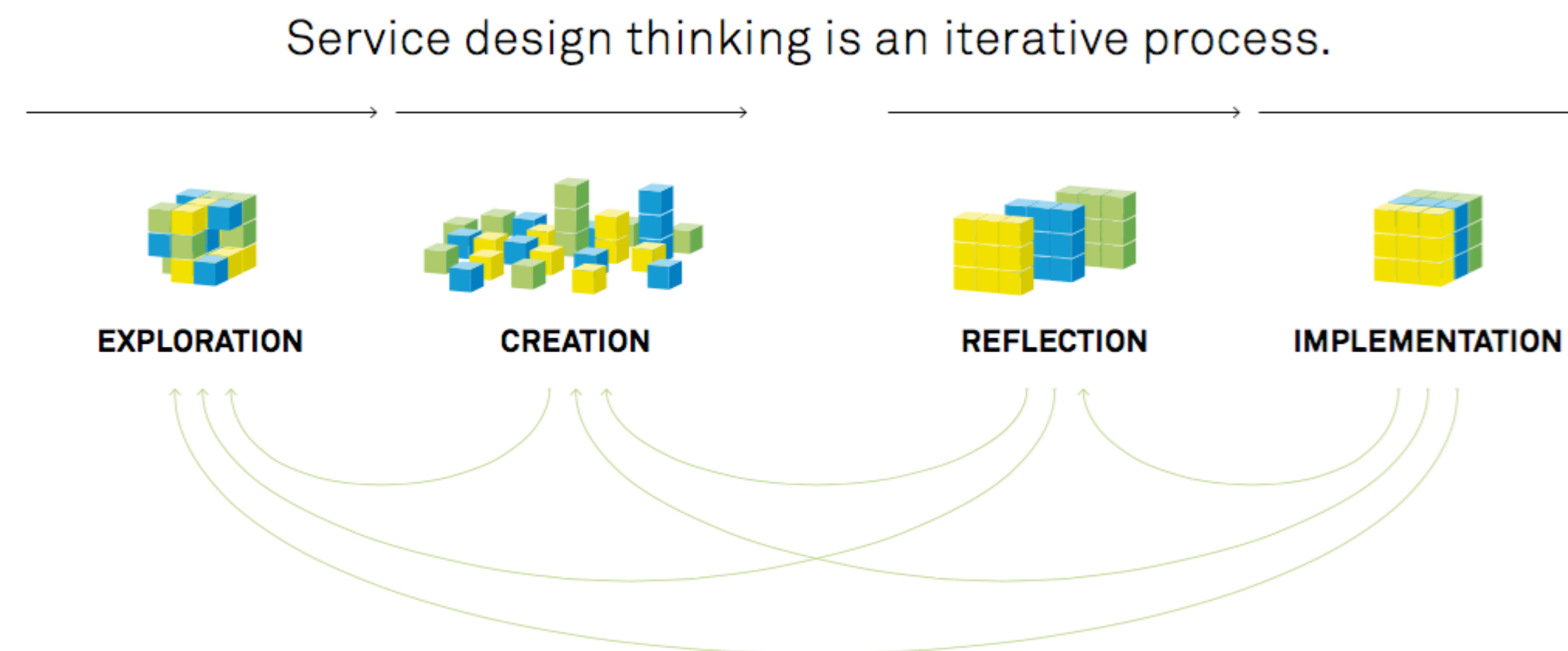
Service design process by Antonia Cramer, https://www.smaply.com/blog/service-design-process

The SD approach ensured a user-centered design process and considered the interests of multiple stakeholders.

Case study

Current existing VR classroom solutions

These cases could give a general indication on what would be in concern in designing a VR learning space. which are:

- **Comprehensive classroom**

- **Maker classroom**

- **Experimental classroom**

- **Interactive scene classroom**

- Children's interest classroom

- Innovation classroom

Several initial concerns for our project:

• This classroom needs to consider the **purpose and objectives** of using VR for and in the teaching

• A VR classroom can be equipped with both **desktop and mobile-based VR solutions**.

• The **quality of VR devices** is critical factor to reach a better learning experience.

• MR and AR technologies can be incorporated for building a more holistic study scope.

Service Design Process   -Exploration

Persona 1

Secondary school students:
Yan Luo

Name: Yan Luo
Age: 15
Grade: 7
Location: Suzhou
Archetype: Junior school student

Character: Yan Luo did not hear virtual reality before; the pre-testing was the first time they experience virtual reality. They are curious about how virtual reality technology applies to media to watch stars' performance immersing in the home. They think using virtual reality HMD is exciting because it is more visualized than a book, TV, or computer. In general, they accept this tech and willing to understand it.

Feedback:
1. They hope there be more students join in a game same time, they could interactive with each other
2. Require larger space for operating devices. which without shape things nearby
3. They hope there will be more games to experience with high precision render texture format.
4. When one student using the devices, allow several students to guard, watch how the operator handle because not all of them willing to try VR or AR
5. They hope a larger screen to show the lecture material, have a podium

Persona 2

School Principle:
Zhong Shen

Name: Wen Shen
Age: 53
Titile: Principle
Location: Suzhou
Archetype: Sponsor

Character: He is the principal of the school, only knowing little about virtual reality. He worried about this school's lack of advanced technical education. To create a more diverse and characteristic learning environment, this school willing to bring virtual reality into educational activities. The school agreed to build a VR educational space.
During the research and design process, the author discussed the design concept, research process, and design process in touch with the sponsor.

Feedback:
1. They require one executive summary
2. Testing students behavior
3. Provide feasibility plan
4. Revised twice and present to a board of directors
5. Examine and approve
6. Needed market research
7. Prepare design proposals

Persona 1-Junior school student & Persona 2-Sponsor

A persona serves as a coherent collation of feedbacks elicited during the research stage of a design project.
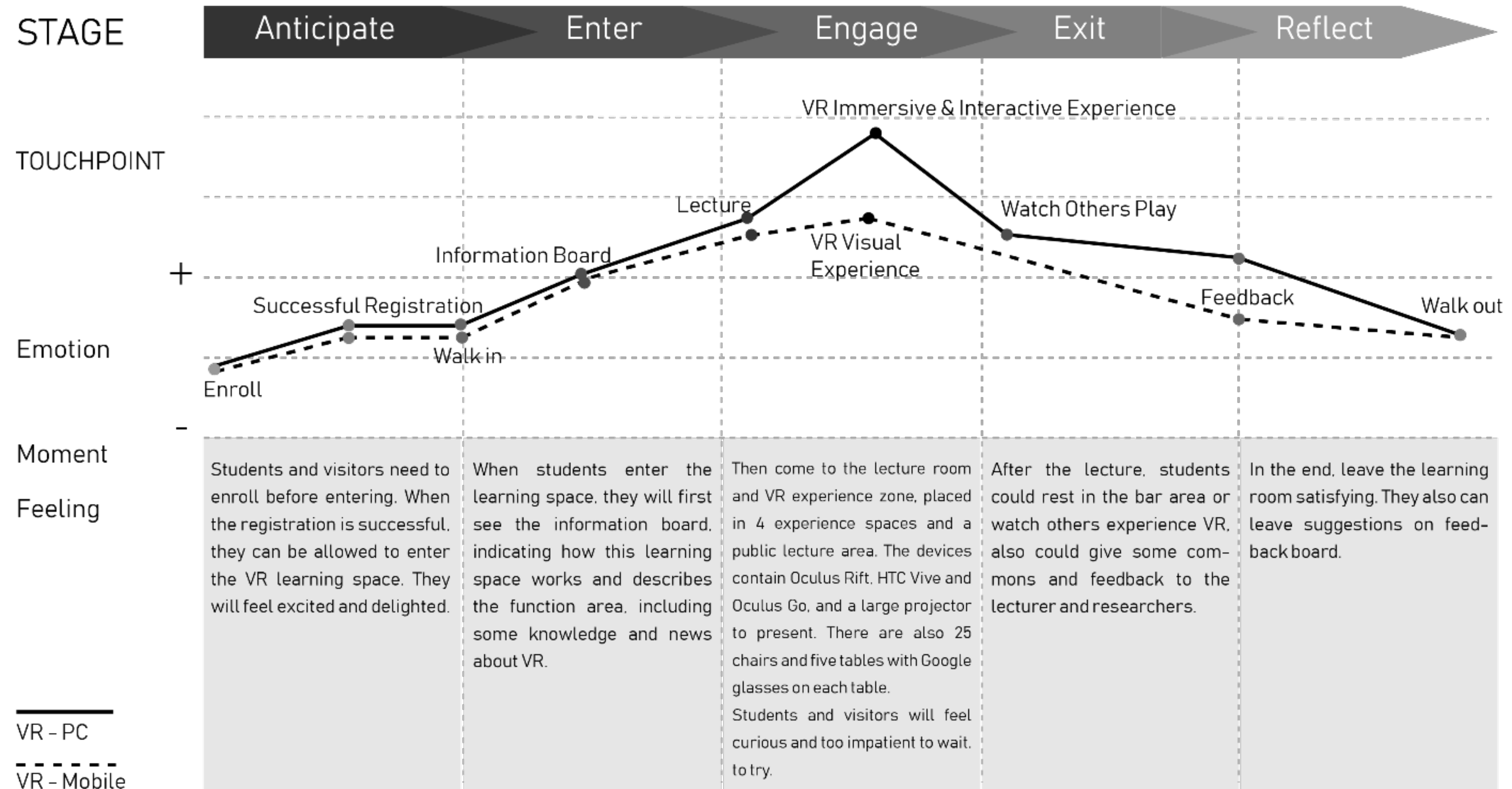
Service Design Process
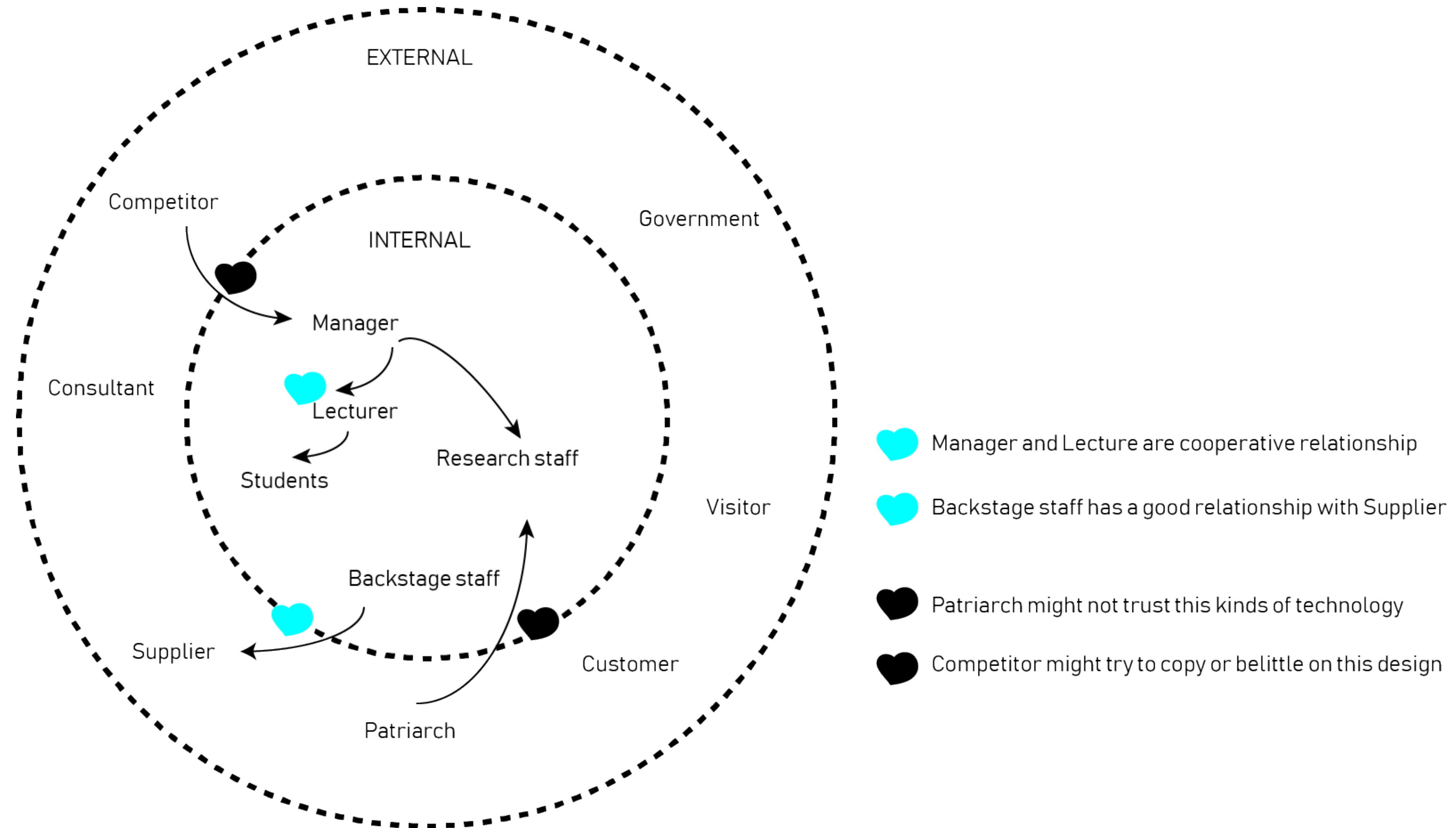
Stakeholder map

According to importance and influence, the following stakeholder map categorized the related stakeholders and visualized the complex situations surrounding this education service.

Service Design Process

STAGE

| Anticipate | Enter | Engage | Exit | Reflect |

TOUCHPOINT

VR Immersive & Interactive Experience

Lecture

Watch Others Play

Information Board

VR Visual Experience

Successful Registration

Feedback

Walk out

Emotion

Walk in

Enroll

Moment

Feeling

Students and visitors need to enroll before entering. When the registration is successful, they can be allowed to enter the VR learning space. They will feel excited and delighted.	When students enter the learning space, they will first see the information board, indicating how this learning space works and describes the function area, including some knowledge and news about VR.	Then come to the lecture room and VR experience zone, placed in 4 experience spaces and a public lecture area. The devices contain Oculus Rift, HTC Vive and Oculus Go, and a large projector to present. There are also 25 chairs and five tables with Google glasses on each table. Students and visitors will feel curious and too impatient to wait. to try.	After the lecture, students could rest in the bar area or watch others experience VR, also could give some commons and feedback to the lecturer and researchers.	In the end, leave the learning room satisfying. They also can leave suggestions on feedback board.

VR – PC

- - - - -
VR – Mobile

Customer journey map

Customer Journey Maps provides a vivid but structured visualization of a service user's experience and arranging the touchpoints within a service system.

Service Design Process -Co Creation & Reflection
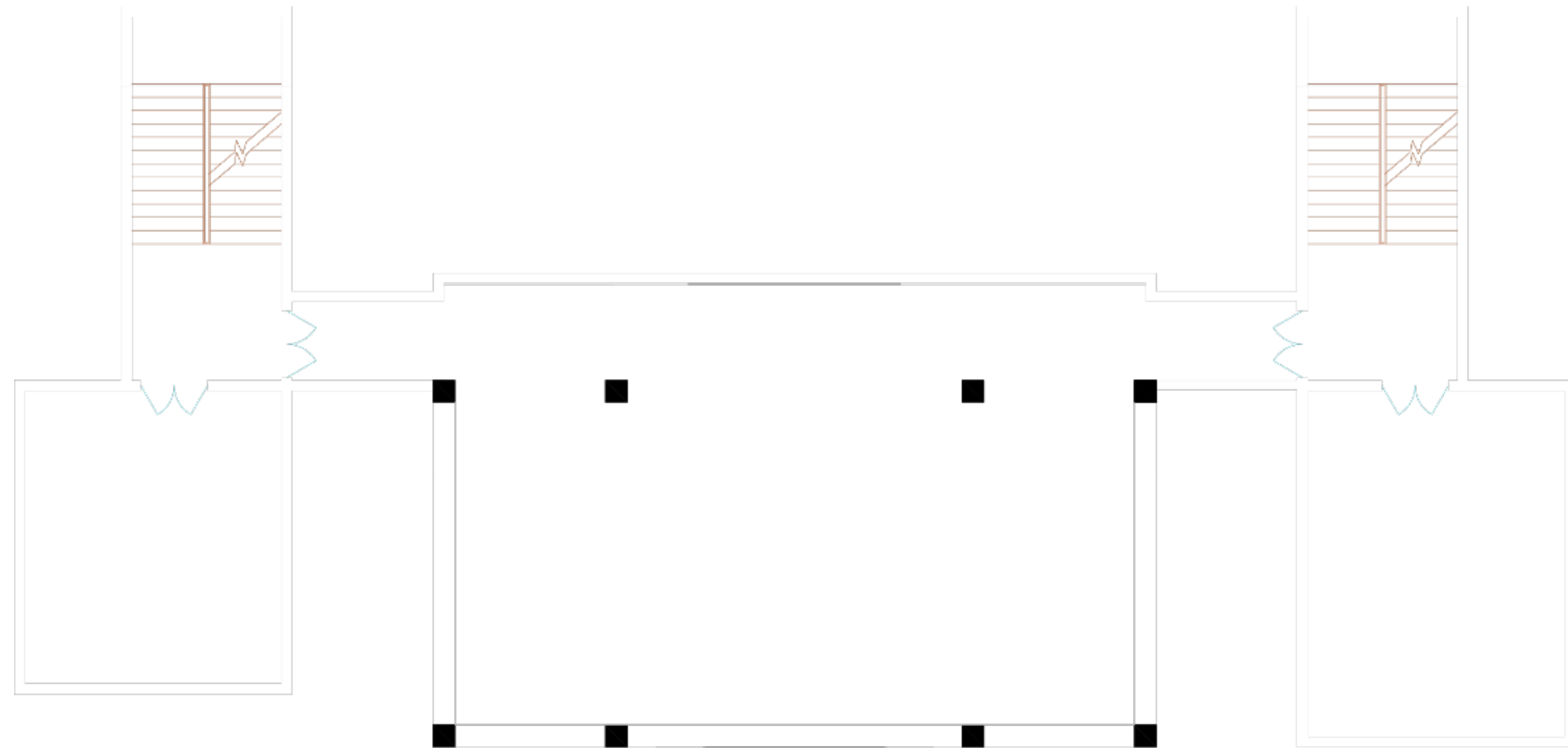
Layout of the given space

We then devised a design brief:

- Have a **strong sense of technology**

- Serve well to group **lectures and individual experience**

- Identify sub-spaces with apparent **visual features** such as colors

- Have **flexible lighting shields and fixtures**

- Have tables and chairs for **group discussion or other activities**

- **Sufficient lighting** in the lecture area

We list the most significant students' lecture feedback:

- They hope there will be more people join in an online game, in which case **more interactions** can happen among the participants.

- They expect to have a space sufficient for **operating the device** so they will not worry about colliding with physical obstacles.

- When one student using a device, the other students can **observe how the operator handles** them.

- They desire **a larger screen** to show the lecture material and a podium to show the device;

- They wish to experience games with a **higher rendering quality**.

Co-creation involving possibly anyone from an investor, executives, service designers, and students in a project
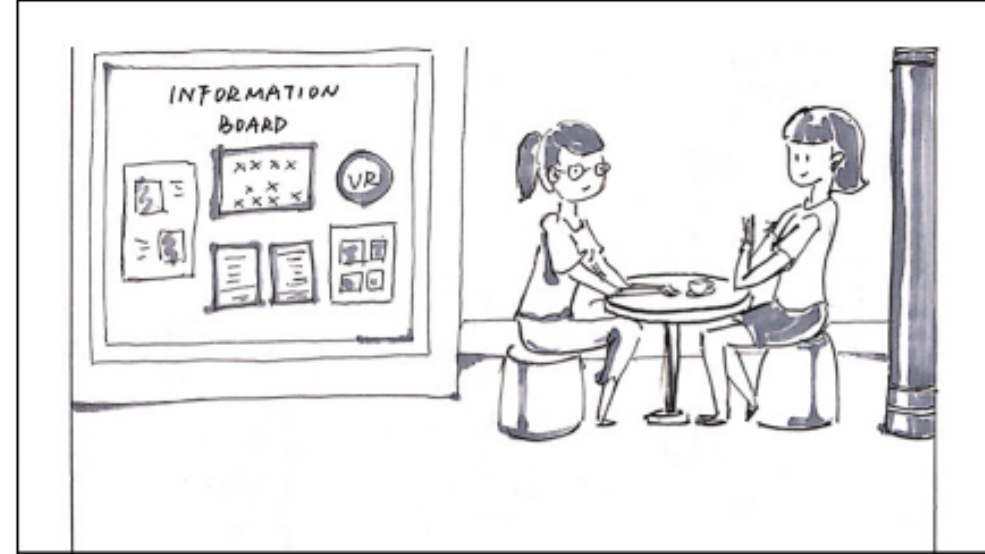
Service Design Process

Desktop Walkthrough

A Desktop Walkthrough is considered a service design technique using a collaboratively built miniature environment to construct specific service knowledge.
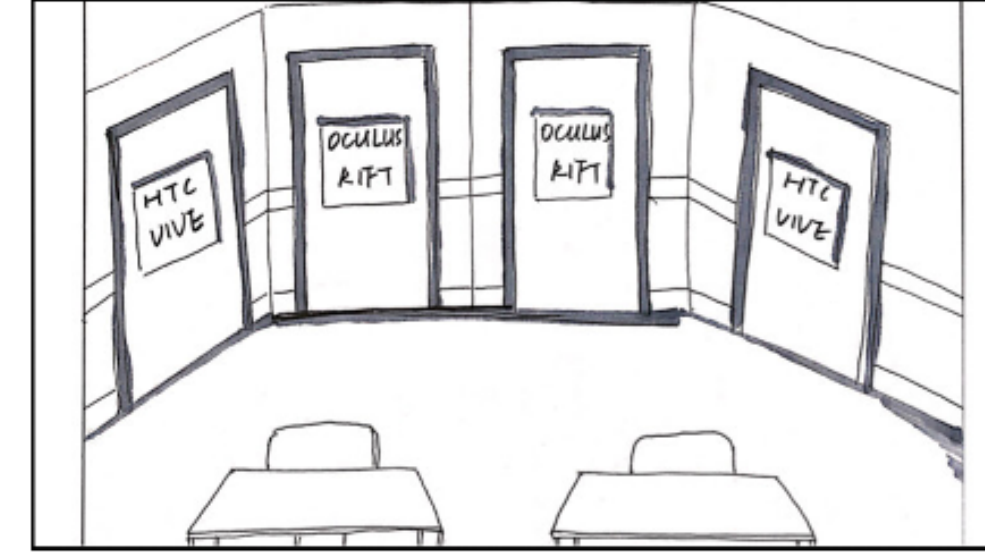
Service Design Process

When the students need to enter the VR teaching lab, they are required to be registered at first.
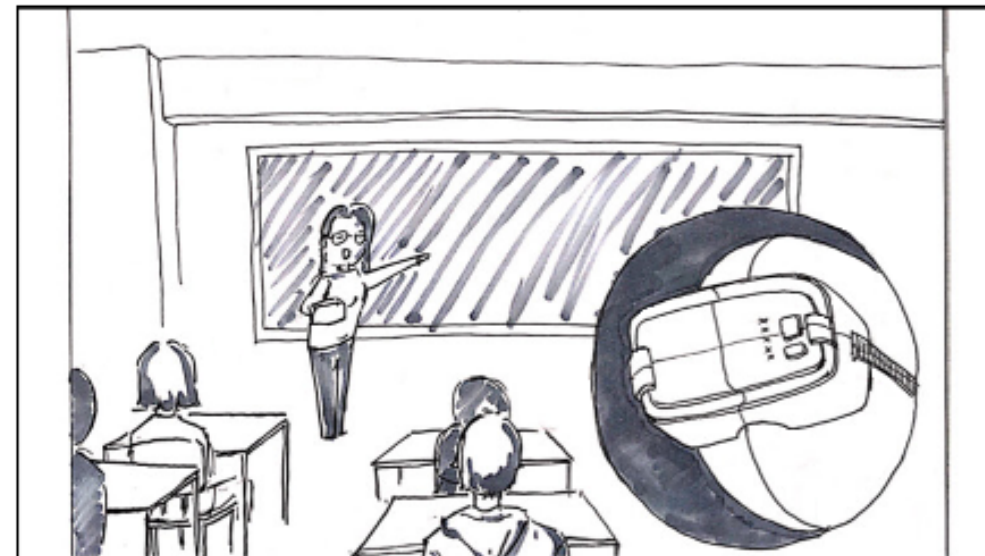

After registration, they willl see the information board if they enter the lab. The board consists of the VR information and news.

The learning space is seperated in two part, the public teaching space and 4 VR room.

The VR rooms have 2 kinds of device, HTC VIVE and Oculus. The students have the immersive experience in this area.

The students will have a lecture about the VR knowledge and some related information in the teaching space.
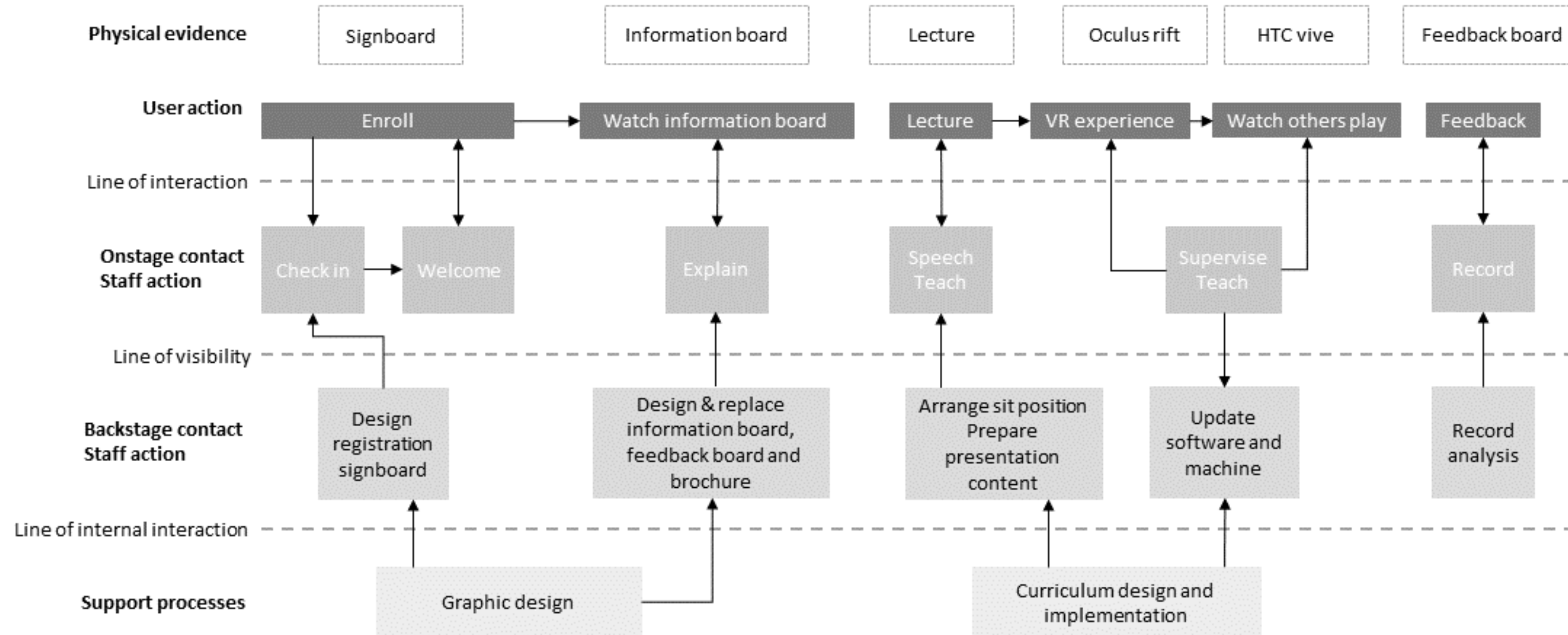

After the class, the students may give a feedback and leave the teaching lab.

Storyboard

A Storyboard is a series of drawings or pictures that visualize a particular sequence of events.

Service Design Process   -Implementation

Physical evidence	Signboard	Information board	Lecture	Oculus rift	HTC vive	Feedback board

User action
- Enroll → Watch information board → Lecture → VR experience → Watch others play → Feedback

Line of interaction

Onstage contact Staff action
- Check in → Welcome → Explain → Speech Teach → Supervise Teach → Record

Line of visibility

Backstage contact Staff action
- Design registration signboard
- Design & replace information board, feedback board and brochure
- Arrange sit position Prepare presentation content
- Update software and machine
- Record analysis

Line of internal interaction

Support processes
- Graphic design
- Curriculum design and implementation

Service blueprint

Service blueprint is a model to detailed specify each aspect of a service.

Results & Discussion

Results and Discussion

Stakeholders	Interests
Students	The richness of the curriculum, The comfort of the learning environment
Lecturers	Curriculum development and equipment operation
Lab manager	Equipment maintenance
Sponsor	Publicity

semi-structured interviews

Question 1: *Based on your current use and observation, what do you think of this VR Learning space?*

The following agendas have been elicited from the collected feedbacks:

- The *VR learning space has a good collection of VR devices made by the representative manufactures, including HTC Vive, Oculus Rift, Oculus Go, Pico box...etc., The students can experience PC-based VR and Mobile-based VR solutions.*
- *The teaching includes both lecture and practical sessions. This delivery pattern also helps in the rotational use of spaces with different functions. While a student group is having lectures, another group can operate the VR system in the individual experience room.*
- *It works well for having the distinct colour separation of different spaces. The colour scheme helps convey the sense of modern technology.*
- *The shades and sound absorption materials work well in isolating one group's VR operation from the others.*
- *The individual VR experience compartment has sufficient space and an external display let non-operating students observe.*

Question 2: *If we build another VR-aided learning space, what design features do you wish to remain or remove?*

We attempted to stimulate the participants to come up with the ideal design without thinking too much on the possible constraints. The following expectations have been shared with us:

- *It is generally agreed that the existing space is still somewhat limited. It would be better to add one or two separate compartments, each of which can accommodate 4 to 5 people.*
- *The independent compartments can have improvements on the degree of privacy to ensure the least disturbance from the groups working in the other compartments.*
- *The configuration of motion sensors of VR devices can be a significant factor to a user's experience.*
- *The shades and sound insulation of the independent compartments should remain, for which the immersive experience would be better protected.*
- *They look forward to having courses that have more diverse and rich content.*

Results

Contact

Cheng-Hung Lo

\+ 86 0512 81883289

CH.Lo@xjtlu.edu.cn

Thanks