

How Physical-Digital Experiences are Designed

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Appendix (available online via <http://link.springer.com>)

Interview protocol

THE PHYSICALITY OF IMMERSIVE SYSTEMS: HOW AFFORDANCES OF PHYSICAL AND VIRTUAL REALMS CREATE A PHYSICAL-DIGITAL TRANSCENDENTAL EXPERIENCE

Version 1

01/20/2023

Introduction

In recent years, more and more commercial experiential consumer offerings (e.g. escape rooms, city tours, culinary tastings) have been offered with immersive digital elements for entertainment, fun or playful team building. However, the development of an adequate digital design for these experiences is anything but trivial: analog experiences are based on the interaction of numerous sensory stimuli (e.g. smells, visual impressions, taste stimuli or haptic stimuli), the abundance and harmonious composition of which shape the value of the experience for the participant. Participation in such an experiential activity thus offers a holistic sensory experience that often cannot be fully reproduced in the digital space, even if it is supported or mediated by immersive systems technologies (especially AR and VR).

Catalogue of Interview Questions

Part 1: Introduction to the context, information about the interviewee and their work

- 1) What is your role/position in the company?
- 2) To what extent are you involved in designing the digital experience activity? How long have you been involved?
- 3) What are your tasks and responsibilities?

Part 2: The current digital design

The **(digital) design process** of the experiential consumer offerings refers to the measures that have been and will be taken to configure digital elements (from the field of VR and AR) and possibly also physical components in such a way that participants are offered a self-contained experience in which they actively participate for a limited time.

Immersive experiential consumer offering: An experience (e.g., an escape room or a city tour) that consists entirely computed or is partially enriched by virtual elements (e.g., through AR overlays). The weighting and role of the physical and digital elements in the context of participation can vary depending on the type of experiential consumer offering.

Physical experiential consumer offering: The purely analog counterpart to the respective immersive experiential consumer offering (e.g. escape rooms or culinary tastings), in which participation takes place entirely without digital mediations.

- 1) What are your customers' main motives for taking part in your experiential consumer offering?
- 2) What would you describe as the focus of the physical experiential consumer offering? Is it the spatial, atmospheric experience? the social interaction with other participants or an experienced guide? Or is it specific physical objects or products that your experiential consumer offering revolves around?
- 3) Please tell me about the design of your immersive experiential consumer offering as you offer it today. When did you start the development, what were the fundamental and groundbreaking decisions in the design process?
- 4) Did your experiential consumer offering previously exist in a purely analog form? If so, please explain how this differs essentially from your current XR experience activity.
- 5) Were there or are there creative role models for similar experiential consumer offerings, both in purely physical and digital form, which you used as a guide for the design? If so, please tell me about them.
- 6) How has the design of the immersive experiential consumer offering changed over time and why?
- 7) What are the current challenges in maintaining/further developing the design?
- 8) What do you think works particularly well about the current design?
- 9) What doesn't work so well?
- 10) To what extent do you evaluate the participants' feedback and what implications does this have for digital design?
- 11) How would you describe average participants in your experiential consumer offering? Do certain groups of participants dominate?
- 12) Imagine there were no resource constraints. How would you change or optimize your experiential consumer offering?
- 13) Why do you think the immersive systems technology [AR or VR] you are using for your experiential consumer offering is best suited for your experiential activity?

- 14) What purpose should the purely digital design (through VR) or the addition of digital elements (e.g. from the field of AR) fulfill in your experience activity? (For example, is it intended to faithfully reproduce physical reality or is it intended to represent something that cannot be experienced in analog participation due to limitations of physical reality)?
- 15) In your opinion, what added value do the digital [AR/VR] elements offer for the participation experience?
- 16) What was the biggest challenge in the development process when you started integrating the immersive systems technology used?
- 17) What prompted you to integrate [AR/VR] elements into your experiential consumer offering?
- 18) What does the digital design/the use of immersive systems technologies enable participants to do or experience that was/is not possible before or without its use?
- 19) In your opinion, what cannot be adequately reproduced or conveyed by digital technology?
- 20) Is multisensory stimulation, i.e. the simultaneous and comprehensive appeal to several senses, an aspect that you consciously took into account in the design process?
- 21) Have you deliberately designed and used certain design components (e.g. certain background noises, smells, haptic stimuli) to convey certain sensory impressions? Please explain this aspect.
- a. Were or are these components purely digital or did you also specifically design and use physical components?
 - b. Please provide an insight into the considerations that went into the design of these components.
- 22) Did the number of sensory stimuli (per sense and in total) play a role in the digital design of your experiential consumer offering?
- 23) Did the quality (e.g. fidelity, sharpness) of the stimuli (e.g. computed VR or AR elements) play a central role?
- 24) Is there a conscious strategy to digitally reproduce central „authentic“ sensory stimuli from the physical world (e.g., individual visual stimuli or sounds that are formative and archetypal for analog participation such as background noises of a bar in a gin tasting)? Please tell me the reasons why you do or do not pursue such a strategy.

- 25) Can you tell me about any physical or digital components that you have designed and used that have no physical counterpart in the analog experiential consumer offering?
- 26) Do you think it is necessary to present sensory stimuli associated with theme of your experiential consumer offering so that participants can make an association with the physical experiential consumer offering?
- 27) Do you think that the current design should be revised or enriched with sensory stimuli associated with the focus of the physical world? What could this look like?
- 28) Have you made a conscious effort to design and integrate several sensory stimuli per sense (sight, hearing, touch, taste)?
- 29) Have you tried not only to consider the sensory stimuli individually, but also to coordinate them so that they fit together logically and do not contradict each other (e.g., avoiding rock music during a wine tasting)?
- 30) Do you think that the existing sensory elements should be redesigned to make them even more harmonious or should more sensory elements be added for this purpose? Please explain how this could be done.
- 31) Do you think that your experiential consumer offering should be designed to mimic/represent the authentic setting (consisting of a variety of individual sensory elements)? Or do you think that this is not necessary for a qualitative experience or that the digital design should even go beyond what can be sensory experienced in physical reality due to physical limitations (e.g. superimposing a historical AR simulation on today's cityscape to make the past tangible)?
- a. If you believe that the most authentic reproduction possible is crucial for an adequate participation experience, what do you think is the biggest problem in implementing such a feature? Is it a problem of know-how, technical feasibility or resources?
 - b. What role could digital and physical elements play in this context?
- 32) Does your current experiential consumer offering provide or encourage social interactions (e.g., interaction between participants or audiovisual input from a guide) or audiovisual elements that originate from human actors? For what reasons are such interactions included or not included?
- 33) Is participation accompanied by a guide?
- a. If so, what were the main reasons for using a person to accompany the experience physically and live?

b. If not, how do you justify your decision?

34) Do you think it is important for the quality of your experiential consumer offering to integrate social interactions? If yes or if not, why?

Part 3: Additional questions and conclusion

35) Is there any documentation of your design decisions (e.g. in project documents/sketches, models etc.) and if so, would you be prepared to give us an insight into this?

36) Would it be okay if I contact you again if there are any questions or open points (in person, via Zoom, phone or e-mail)?

37) Would you like to receive the recording for review once I have transcribed it?

38) Would you also like to receive the relevant part of the report for review?

39) Are you interested in the final research results?

Interview protocol

THE PHYSICALITY OF IMMERSIVE SYSTEMS: HOW AFFORDANCES OF PHYSICAL AND VIRTUAL REALMS CREATE A PHYSICAL-DIGITAL TRANSCENDENTAL EXPERIENCE

Version 2

02/27/2024

Objective

Our goal for this wave of interviews is to deepen our understanding of how an experiential consumer offering that features immersive systems technology (e.g., an AR or VR mediated city tour, wine tasting, or time travel experience) to fuse elements of both the physical and virtual realms can generate user experiences that exceed those possible in either realm alone or through their mere combination.

In this phase of the study, we aim to understand (1) the specific affordances (action possibilities for participants) inherent in each realm, (2) the existing or intentionally designed physical or virtual elements within the experiential offering that facilitate these affordances, and (3) the unique characteristics of the physical-digital experience and how experience design considering both realms facilitates such an experience that transcends what can be encountered in either the physical or digital realm alone.

Semi-structured interviews in this round will help to substantiate or modify the affordances we have identified for each realm and the characteristics of the physical-digital experience, based on empirical evidence from the first round of interviews and our participant observations.

Interview Protocol

Interviewees:

Interviews are to be conducted with **key personnel involved in the design, development, and provision of the physical-digital experiential offering**. Roles include but are not limited to (excerpt):

- CEO / CDO
- Developers
- Extended reality designer / specialist (for AR, VR, Mixed Reality)
- UX designer or developer
- Systems designer

- External service providers that cover these roles (if design has not been developed in-house)

OVERVIEW OF INTERVIEW SETUP

<State appreciation that interviewee took time to participate>

<Introduce myself>

<Give study background: why are we here today, what we do>

Topic: Fusing Digital and Physical Affordances towards Digital-Transcendental Experiences

Semi-structured in-depth interview

Name:

Company:

Context/background of interviewee:

Interviewer:

Location: onsite, via Zoom, or a similar videoconferencing solution

Date and time:

Actual time of interview:

Interview code:

INTERVIEW CONDUCT

Initial clarifications:

<Give participant information sheet to read, check understanding, and obtain written consent>

<Ask again concerning recording, anonymity>

<Begin with Questionnaire and note down time>

QUESTION CATALOGUE

Part 1 (in case of first-time interviewee): Introduction to context, interviewed person, and work

- 1) What is your role/position?
- 2) What is your involvement with the design of the physical-digital experiential offering?
How long have you been involved?
- 3) What are your duties and responsibilities in your daily work?

Part 2: Significance of the physical and virtual realm for the experiential offering

Intro of both realms and their variants to the informant:

Virtual realm (a computationally-generated world that exists only digitally, as in virtual reality):

- **Distant realm:** places that people in real life cannot physically visit or experience because of time or (geographical) space constraints.
- **Fantastic realm:** a world of places, objects, or scenes that are made up and do not exist in the real world (e.g., dragons).

Physical realm: The real world that exists naturally, without computation:

- **Natural realm:** The real world around us that we can see, hear, smell, touch, and taste.
 - **Curated realm:** Real world environments that are a mix of natural elements and artificially introduced sensory elements (e.g., smells, objects, sounds) that have been amended or added.
- 4) Do your design efforts primarily target the physical realm, the virtual realm, or both?
Please explain.
 - 5) Why did you decide against a mere virtual (e.g. VR mediated, video) or purely physical experience?
 - 6) What are the limitations of the physical and virtual realm alone? Where do you think it is necessary to use features or leverage strengths of the other realm to complement it?

- 7) How do you integrate stylistic elements such as actor cues (e.g., characters moving through the experience, special interaction situations), spatial cues (using locations in the physical realm as key backdrops), temporal elements (e.g., historic overlays), or objects and physical cues (e.g., haptic artifacts, smells) to unite physical and virtual spaces?
- 8) What unique experiences does the merging of physical and virtual realms offer participants that neither can provide on its own? Can you give examples?
- 9) Can you identify key elements or scenes that blend different layers of representation and meaning, such as different historical periods or the blending of fantasy and reality? How is this be achieved in the design of the experiential offering?
- 10) How do you ensure coherence and harmonization between the virtual and physical elements? How do you align the m in time and space? Are there digital or physical reference points or anchors? Please tell us more about this.
- 11) What strategies or cues do you use to seamlessly guide participants through the experience (for navigating through space and time)?
- 12) Do you use narrative strategies to facilitate transitions between realms or phases of participation? For example, do you use recurring themes, motifs, or characters to create a seamless narrative flow? tell me about it please.
- 13) do you intentionally create gradual transitions between different realms? How do you ensure that these transitions are both smooth and intuitive? Are these transitions important to the experience?

Part 3: The Virtual Realm:

- 14) Does your AR/VR system backend rely on algorithmic logics that respond to the user's physical movements as a trigger to adjust or manipulate the audiovisual content? Tell us about those or other algorithmic logics.
- 15) What role does the computed representation of fantastical elements or scenes that have no real-world equivalent play in your experiential offering?

- 16) Does your experiential offering support social interactions (such as conversations or gesture-based interactions with virtual characters)? Please describe the design, purpose, and technical or narrative limitations of these interactions.
- 17) What forms of movement (e.g., walking, illusion of flying) do participants use in your VR/AR experiential offering? Do they use virtual vehicles or other means of transportation? Is the speed of movement realistic? Is the choice of speed intentionally realistic or unrealistic? Why?
- 18) How restricted or unrestricted is user navigation within the virtual realm? What are the defined or conceptual limits of movement or perspective?
- 19) What specific digital audiovisual sensory cues (e.g., sharp sounds, music, visual elements) have you designed and integrated to enhance the experience, and what role do they play?

Part 4: The Physical Realm

- 20) Have you designed or incorporated any physical elements or sensory cues beyond audiovisual ones, such as tangible objects, scents, or flavours, in the real-world environment that features your experience? If, how and why were these design decisions made and implemented? Could you please elaborate?
- 21) What kinds of social interactions did you want to be facilitated in the physical realm? How did you physically design for social interaction?
- 22) What do these interactions look like, which real actors are involved, and what purposes do they serve? How are they structured and by what are they bounded?
- 23) What role does the natural spectrum of sensory cues (ambient sounds, light, etc.) play in your experiential offering? Do you intentionally design these or simply integrate them from the environment that exists? Do you use specific methods to control, heighten, or reduce their importance?
- 24) How have you determined or set the path/route for physical movement or bodily interaction (e.g., walking, grasping, turning around)? Have you included moments for rest, such as sitting down?

- 25) Does your experiential offering involve grasping or physically manipulating objects? If yes, how have you incorporated this aspect and why?

Part 5: Opportunity for Final Remarks and Conclusion

- 26) Are there any aspects that seem important to you that I have not covered in this interview?

<thank for time and insights>