Immersive Sustainable Food Experience Design

Hotel Management / Taste Lab

May 2023

Breda University OF APPLIED SCIENCES

About the Authors

Dai-In Danny Han, PhD

Senior Researcher & Lecturer
Academy for Hotel & Facility, BUas
han.d@buas.nl

Professor Future of Food
Hotel Management School Maastricht, Zuyd
danny.han@zuyd.nl

Prof. Dai-In Danny Han is professor at the Future of Food research centre at Zuyd University of Applied Sciences and a senior researcher at Breda University of Applied Sciences (BUas). He holds a PhD in the area of mobile augmented reality user experience design and has been involved in numerous projects studying the user experience for immersive technologies in hospitality and tourism contexts. His research primarily focuses on the design and application of augmented reality, virtual reality and mixed reality enhanced experiences and the impact on consumer psychology and behaviour. Danny serves on the board of the Global Food and Beverage Association (GFBA), Las Vegas and at the European Federation of Hospitality and Tourism Educators (EuroCHRIE) as well as on editorial boards of various journals. He is a founding member of the Creative Augmented and Virtual Reality Hub and the International Association of Immersive Technology Innovation (IAITI). He has published and regularly reviews articles in the fields of hospitality and tourism, as well as business, marketing, and human-computer interaction journals.

Frans Melissen, PhD

Professor of Sustainable Experience Design
Academy for Hotel & Facility
melissen.f@buas.nl

Prof. Frans Melissen is Professor of Sustainable Experience Design at Breda University of Applied Sciences. He holds a PhD in the area of sustainable consumer psychology. He is involved in a range of research collaborations and projects related to sustainability in tourism, hospitality and leisure. He has also published extensively on this topic and is a recognised public speaker, especially on the topics of promoting sustainable behaviour and decision-making in a range of settings and transformative education. Frans is on the Graduate Committee for the Dutch Professional Doctorate pilot in Leisure, Tourism and Hospitality and a founding member of the BUas SDG Support Hub. Finally, he is a leading member of the Dutch HBO SDG Coalition.

Mata Haggis-Burridge, PhD

Professor of Creative & Entertainment Games
Academy for Games & Media
haggis.m@buas.nl

Prof. Mata Haggis-Burridge (he/they) is Professor of Creative & Entertainment Games at Breda University of Applied Sciences, and has several other posts related to this field in government, education, and enterprise. They are involved in many research collaborations, including the topics of storytelling, immersion, diversity and ethics, AI, virtual production, and the social impact of entertainment games, as well as consultancy activities, including writing for commercial video games. They are active in national and international games development networks and media events, including being a founding board member of the Breda Game City foundation, a member of the video game committee for the Writers' Guild of Great Britain, and a member of the Graduate Committee for the Dutch Professional Doctorate pilot in Arts and Creative Research.

Index

1 Context

We live in a society that is increasingly dominated by technology-mediated interactions and consumption of experiences. It has opened pathways towards innovating concepts in the food and dining context - opening up possibilities to promote a sustainable consumption-oriented society at the same time.

Interestingly, awareness among consumers and businesses of their own unsustainable behaviour and practices is increasing and several businesses have adjusted their products and offerings to lower their carbon footprint and waste, responding to the changing demands of consumers and wider society. However, it remains a challenge how to encourage consumers to make conscious choices leading to more sustainable food and dining behaviours and decision-making, even though many initiatives to support sustainable development in the industry have already been taken.

Extended Reality (XR) technologies are offering innovative ways to facilitate experiences in immersive environments. Han and Tom Dieck (2019) revealed that XR technology allows users to feel spatially immersed with the potential to affect future behavioural intentions. However, 'immersion' in the hospitality, tourism and leisure context has so far been largely limited to 'spatial immersion', neglecting the full scope of immersive tools available. It thus remains fairly unclear how immersive environments should be designed or tested in the food and dining context to achieve consumer-oriented outcomes that are desired and measurable.

This project focused on designing and testing XR technology-mediated immersive experiences in the food and dining context to promote sustainable food choices. Key learnings are summarised in this handbook that aims to support industry professionals in their consideration of embracing immersive technologies and capitalising on their potential to create food experiences for consumers. Food experiences that are not only enjoyable but can also encourage consumers towards preferred food choices from a sustainability perspective.

2 Current State of XR in the Food Context

To date, much interest in XR in the food context evolved around the consumer market, with early use cases emerging to use XR for the enhancement of marketing activities. For instance, Anheuser-Busch's Budweiser St. Louis used virtual tours in VR to engage consumers in an immersive experience during the sales process (Encore Research, 2019). QReal (2023), formerly known as Kabaq, is among the companies that have contributed significantly to the development of XR in the food context through their lifelike realistic 3D food visualisations and augmentations. Multiple collaborative studies have shown that such XR implementations could increase consumer expenditure and positive word of mouth. While consumers can currently interact with 3D visualisations through handheld mobile devices, such interactions are expected to become increasingly natural and unobtrusive through wider adoption of hands-free Augmented Reality Smart Glasses (ARSGs). While previous applications have focused on consumer spending by making 3D visualisations attractive, such an approach could also prove to be a useful tool in tackling food waste by assisting consumers in developing a realistic perception of food items and their sizes.

@kabaq.io

An alternative approach to engaging consumers was applied by Dinner In Motion (Dinnerinmotion, 2023), which offers a restaurant experience using 3D projection mapping in the dining setting. Consumer engagement through projected narratives and scenarios turned out to be a popular way to stimulate all senses in an immersive dinner. Such examples, as provided by Skullmapping (2023) or Ultraviolet by Paul Pairet (2023) are among the first to commercialise XR experiences in restaurants. As the entire space is augmented, these experiences can be enjoyed together, rather than being limited to individuals through VR headsets. By allowing a group of people to engage in the same experience through multiple projectors and speakers to create an immersive space, such solutions offer XR experiences that can naturally incorporate the social component, a crucial aspect in food and dining experiences. The following sections will summarise key outcomes from this project that offer insights into the conceptualising, designing, and measuring of immersive experiences through XR in the food and dining context.

@DinnerINmotion

3 Understanding Immersive Experiences through XR

The first step in this project was to dive deeper into the definition of the term 'immersive experience'. While it has been used in various contexts including psychology, education, tourism, and games and media, it was evident quite early that a clear understanding of and consensus on the term was still lacking. Based on an initial study that involved ten experts in designing and testing immersive experiences in relevant contexts, the following definition was generated:

An 'Immersive Experience' is

"The acceptance of one's involvement in the moment that is conceived through multiple senses, creating fluent and uninterrupted physical, mental, and/or emotional engagements with a present experience, with the ability to attain a lasting mental and emotional effect on the user post-experience." (Han et al., 2022a)

In this definition, the design of experiences that are immersive to consumers do not necessarily involve the use of immersive technologies but can be generated focusing on alternative tools that can stimulate physical, mental, and emotional processes for consumers. Key design criteria need to be present to build such immersive experiences, as outlined in Figure 1. It is evident that different immersive experience facilitators can be activated (systems, spatial, social/empathic, narrative/sequential) in the experience through various means. Recent advances in immersive technologies provide promising opportunities to facilitate the staging of immersive experiences through technological solutions. Many of the cases in current immersive technologies that aim to offer immersive experiences have focused on facilitating escapist experiences, predominantly using spatial immersion. However, the full scope of immersive experience facilitators – systems immersion, spatial immersion, social/empathic immersion, narrative/sequential immersion - remained largely unexplored.

SPATIAL IMMERSION

Definition: Emotional connection with actors in the experience and relatedness to the user's social context

Design Criteria:

1) Contrast between current environment and the immersing environment
2) Reduction of potential unrelated interruptions
3) Coherence within the space/environment
4) Content stability and fit to device
5) Verisimilitude of content
6) Smoothness of interactivity
7) Environment that can be explored
8) Sensory alignment
9) Balance between detail and coherence in the environment

NARRATIVE / SEQUENTIAL IMMERSION

Definition: Compulsion to continue the progression of the storyline or sequence of events in the experience

Design Criteria:

1) Clarity of purpose and tasks
2) Individuals that are worth learning about
3) Enticing storyline through narrative arc
4) User involving storyline development
5) Unexpected but logical sequence of events
6) Variety of characters
7) Active engagement with individuals
8) Insight into backgrounds of individuals
9) Narration matches user's communication style

IMMERSIVE EXPERIENCE

SYSTEMS IMMERSION

Definition: Physical and mental engagement in the mechanics and activity of the experience

Design Criteria:

1) Reduction of potential unrelated interruptions
2) Sense of influence in the experience
3) Increasing complexity of task/activity
4) Clarity of purpose and tasks
5) Predictability of the system
6) Ease/convenience to get into the set experience
7) Integrated and clear user interface
8) Content stability and fit to device
9) Technological embodiment
10) Smoothness of interactivity with the system
11) Technological consistency
12) Unambiguous, immediate feedback
13) Audiovisual alignment
14) Functional alignment
15) Matching physical accessibility

SOCIAL / EMPATHIC IMMERSION

Definition: Emotional connection with actors in the experience and relatedness to the user's social context

Design Criteria:

1) Insight into backgrounds of individuals
2) Individuals that are worth learning about
3) Ability to experience together/share experience with others
4) Meaningful interactions
5) Variety of characters
6) Facilitation of emotional safety
7) Environmental artifacts match user's social context
8) Relatability of individuals to user's context

In this project, an immersive experience offered through Microsoft HoloLens 2 was tested with the aim of creating an interactive narrative based on design criteria aimed at facilitating immersive experiences. These facilitators occur simultaneously, and it is challenging to isolate one facilitator from another as they are often experienced together. While one facilitator may be more dominant than another in a specific scenario or context, the hierarchy can naturally shift over time across the experience's duration, especially if the experience provided affords multiple touchpoints. When introducing new products into the market, one of the key considerations is the relevance and benefits of a new product or features that will enhance the consumer experience. In the case of immersive experiences, this project found that key consideration should be given to the role of empathic/social immersion: consumers relate not only through empathy to characters in a narrative that they can identify with (e.g. the hero's journey in stories), but also empathise with the immersive environment by relating it to their own personal environment and life situation. This psychological mechanism suggests opportunities in the design of food environments that are perceived authentically, but that consumers can also relate to. In particular, triggering curiosity amongst consumers was revealed to be highly effective in activating consumer interest and encouraging them towards certain choices over others that consumers perceived to be familiar. This project uncovered that such effects cannot only be measured through self-reports but are also observable in participants' physiological measurements. Figure 2 shows the physiological readings of one participant's galvanic skin response (GSR) over the duration of engaging with the interactive narrative in this project. The entire narrative is divided into key scenes, illustrated as boxes across the timeline.

Figure 2: Illustration of GSR data output (Han et al., 2022b)
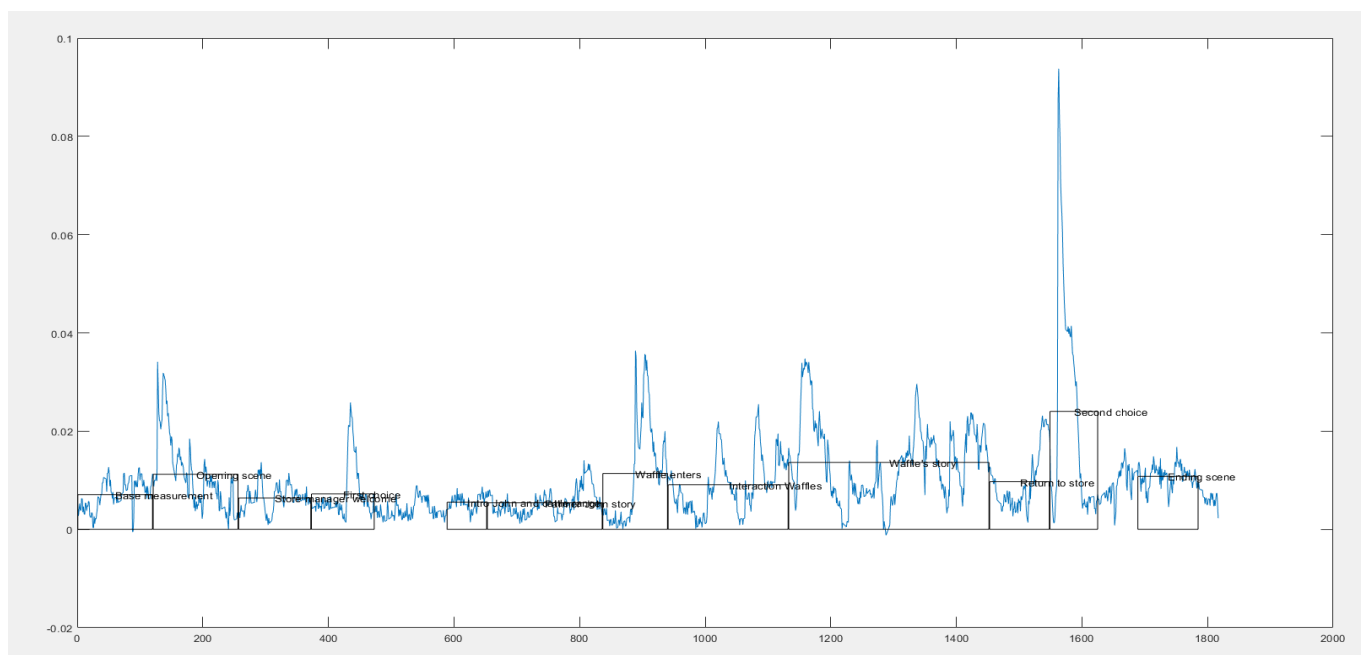
4 Designing Meaningful Immersive Experiences for Consumers through XR

Co-creative processes in collaboration with consumers have proven to be a promising design approach in service design. It allows consumers to be part of the process of determining and highlighting valuable aspects in the final design. Likewise, co-creative narrative designs appear to be a valuable approach to designing immersive experiences. However, such processes need to allow for sufficient freedom of consumer acclimatisation to the context and characters of the narrative to avoid framing consumers too early in the process, which will profoundly limit the scope of the narrative. A common risk involves the framing of aspects in the final design too early in the process (e.g. the use of specific technology). This carries the risk of developing narratives that are suitable for the tool but might prove less relevant to the consumer. Multiple design approaches and tools exist that can be used as guidelines in the co-creative process. However, a consumer-driven co-creative approach comes with the fundamental challenge that consumers often have limited expertise regarding potential technological solutions. For instance, in immersive technologies, it needs to be recognised that the media context changes fundamentally across individual steps, thus potentially creating friction between the initial narrative design and technological tools that support the narrative. A stepwise validation process not only facilitates a structured design approach with consumers, but also allows each individual design step to be validated to increase the transferability of results towards each next step and the final outcome. This is interesting for immersive narrative experiences that integrate technological tools as part of the experience. For a co-creative design process for immersive narrative experiences, we propose the use of a nested approach that includes a stepwise and back-loop validation cycle *(*Figure 3).

Figure 3: Framework for consumer participatory co-creative narrative design for immersive narrative experiences: A nested approach of a stepwise and back-loop validation cycle (Han et al., 2022c)
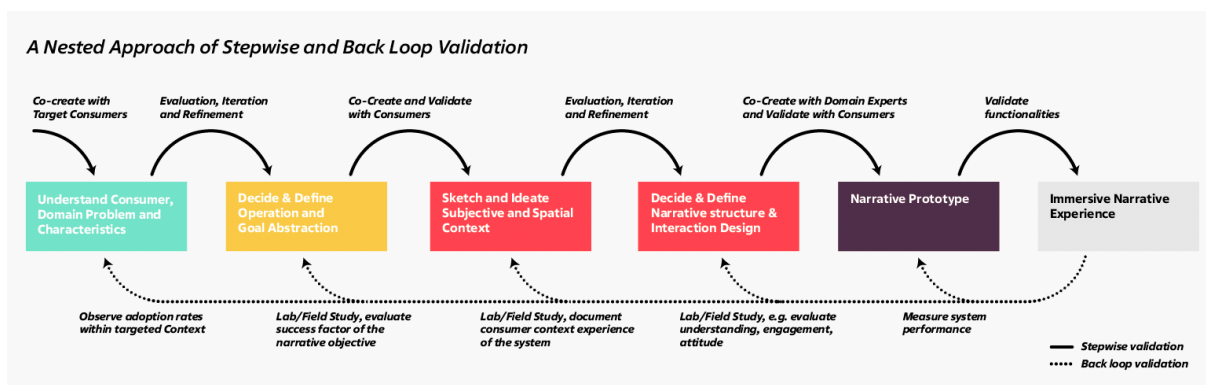
5 Opportunities of XR in the Food and Dining Context

Consumer Value

Our studies have shown that XR provides promising avenues for creating immersive experiences to educate consumers by making abstract concepts, such as sustainability considerations and related choices, more 'real' and tangible to grasp. Current use cases in this context illustrate that XR is a tool that can blend entertainment value for consumers with meaningful interactions to add value to the dining experience (potentially extending to experiences in other realms, e.g. tourism and leisure). For consumers, we expect to see an increasing number of use cases emerge that use virtual artifacts in the physical surroundings to add to the narrative. This is particularly appealing for consumers that are dining individually. However, it is expected that the novelty factor of XR applications will wear off and considerations need to be given to designing possibilities to provide new types of narratives and experiences to retain the curiosity of consumers and encourage repeat visits. To address this aspect, interactive narrative designs provide possibilities to adapt the narrative based on consumer choices. There is much debate in this approach on the true freedom of consumer choices if the sequential development of the narrative is preset. Arguably, this may affect the degree of receptiveness that consumers will have towards the narrative and repeated engagement with the narrative will likely be driven only by curiosity. Alternatively, keeping an open end in narratives has commonly been used in video games and entertainment to prompt the audience to complete the narrative in their own imagination and interpretation (Simons, 2008).

Business Value

Future use cases are unlikely to be reserved for consumers only. Use cases from QReal (2023) demonstrate that 3D virtual objects can be designed to a realistic level of detail, allowing industry professionals to visualise and work with future scenarios to enhance stakeholder collaboration. For instance, sustainable food production methods can be visualised for stakeholders in the agribusiness industry to assist in the understanding and discussion of potential solutions that are part of a complex food system. Through the interactive narratives designed in this project, it became clear that characters in narratives have the potential to build new connections by engaging consumers with the business. The project revealed that empathic/social immersion is a dominant factor in character and environment design, which can be closely related to the core of hospitality. Being able to capitalise on background information of consumers could open up new opportunities to address them differently and adapt the offerings to enhance the hospitality feeling that consumers might receive. In this regard, the environmental context and design thereof needs to match consumers' intention and context, as different consumers will be engaging with the business for different reasons. In the context of HR, VR provides opportunities to learn about a profession through the eyes of a professional. Fostering empathy through VR to see the world through the eyes of others has been an avenue for research at Stanford's Virtual Human-Interaction Lab (2023). Relatability to others and their respective contexts can be challenging. However, we believe that empathy principles can be applied to 'spending a day in the life of a chef or restaurant manager' experiences, assisting not only prospective employees but also – in the choice of their profession - young adults.

References

Dinnerinmotion (2023). Dinner In Motion – the most amazing restaurant in the Netherlands. https://www.dinnerinmotion.nl/?lang=en

Encore Research (2019). Designing transformative experiences using Virtual Reality at corporate events. Amazing Examples of Virtual Reality in Events. https://www.encore-anzpac.com/amazing-examples-of-virtual-reality-in-events

Han, D. I. D. & tom Dieck, M. C. (2019). Calling for user-centric VR design research in hospitality and tourism. Hospitality & Society, 9(2), 237-246.

Han, D. I. D., Melissen, F., & Haggis-Burridge, M. (2022a). Immersive Experience Framework: A Delphi Approach. Available at SSRN: https://ssrn.com/abstract=4084598 or http://dx.doi.org/10.2139/ssrn.4084598

Han, D. I. D., Boerwinkel, M., Haggis-Burridge, M., & Melissen, F. (2022b). Deconstructing Immersion in the Experience Economy Framework for Immersive Dining Experiences through Mixed Reality. Foods, 11(23), 3780.

Han, D. I. D., Abreu e Silva, S. G., Schröder, K., Melissen, F., & Haggis-Burridge, M. (2022c). Designing immersive sustainable food experiences in augmented reality: a consumer participatory co-creation approach. Foods, 11(22), 3646.

QReal (2023). Use Cases – Food. QReal. https://www.qreal.io/use-cases

Simons, J. (2008). Complex narratives. New review of film and television studies, 6(2), 111-126.

Skullmapping (2023). Projects. Skullmapping. https://skullmapping.com/

Ultraviolet (2023). Story. https://uvbypp.cc/

Virtual Human-Interaction Lab (20230. Empathy and Perspective Training. Projects. https://stanfordvr.com/projects/2020/empathy-and-perspective-taking/

Games

Leisure & Events

Tourism

Media

Data Science & AI

Hotel

Logistics

Built Environment

Facility

Mgr. Hopmansstraat 2
4817 JS Breda

P.O. Box 3917
4800 DX Breda
The Netherlands

PHONE
+31 76 533 22 03
E-MAIL
communications@buas.nl
WEBSITE
www.BUas.nl

DISCOVER YOUR WORLD

Breda
University
OF APPLIED SCIENCES