Design For Inclusion 6

Stefania Camplone
Claudia Porfirione *Editors*

Design for All and the Future of the Planet

Proceedings of EIDD 2024 Annual Conference, June 6–7, 2024, Vila Nova de Gaia, Portugal

EIDD DESIGN FOR ALL EUROPE

OPEN ACCESS

Springer

Design For Inclusion

Volume 6

Series Editor

Giuseppe Di Bucchianico, Department of Engineering and Geology, University of Chieti-Pescara, Pescara, Italy

The book series “Design for Inclusion” publishes studies aimed at untangling the complex relationships between design and society, especially with regard to human diversity and inclusion. The series cover the classical fields of industrial design, such as product design, interior design, service design and communication design, with a special focus on their interactions with other disciplines, such as the physical and social sciences. In particular, the series reports on the latest developments, both theoretical and practical, concerning different approaches to “Design for Inclusion”: Universal Design, Inclusive Design, and Design for All. It shares insights into their multiple, interdisciplinary relationships with both the human sciences and the transversal frameworks and approaches typical of Human-Centered Design (HCD) and Design for Sustainability. “Design for Inclusion” addresses a very broad readership, including designers, engineers, architects, social scientists and stakeholders, who deal with any of the topics mentioned above and their various implications. It publishes volumes fostering scientific advances, as well as books devoted to supporting education and professional training. These include monographs, edited books and conference proceeding. Outstanding PhD theses on emerging topics, if properly reworked, may also be considered for publication. This book series is published with the support of EIDD—Design for All Europe.

Stefania Camplone · Claudia Porfirione
Editors

Design for All and the Future of the Planet

Proceedings of EIDD 2024 Annual Conference, June 6–7, 2024, Vila Nova de Gaia, Portugal

EIDD DESIGN FOR ALL EUROPE

Springer

Editors
Stefania Camplone
INGEO Department
University of Chieti-Pescara
Pescara, Italy

Claudia Porfirione
Architecture and Design Department
University of Genoa
Genova, Italy

ISSN 2662-5644 ISSN 2662-5652 (electronic)
Design For Inclusion
ISBN 978-3-032-21768-4 ISBN 978-3-032-21769-1 (eBook)
https://doi.org/10.1007/978-3-032-21769-1

This work was supported by EIDD—Design for All Europe.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Multisensory Experience in Cultural Heritage Museums: Experimentation with More Inclusive Itineraries in Florentine Museums

Francesca Tosi, Ester Iacono, and Alessia Brischetto

Abstract

Museums, traditionally designed to preserve cultural heritage, have evolved to meet the needs of a changing society. Despite progress in removing physical barriers, many visitors still face challenges related to sensory, cognitive, and emotional needs. Current initiatives often focus on specific physical or sensory disabilities, neglecting a broader, integrated approach to inclusivity. Optimizing User Experience (UX) in museums is essential to offer engaging, personalized pathways that address diverse needs. Multisensory engagement—encompassing sight, touch, hearing, smell, and taste—is crucial for enhancing learning and interaction. Research shows that sensory involvement deepens understanding and emotional connection with art. The XALL project, conducted in three museums in Florence (Palazzo Vecchio, Museo Stefano Bardini, Museo Nazionale del Bargello), aims to make cultural heritage accessible to all, using Inclusive Design and Human-Centred Design principles. A participatory approach engaged disability associations and museum professionals to create inclusive sensory solutions. The methodology included user profiling, interaction analysis, prototype design, and usability testing. The project developed multisensory stations and customizable video guides integrating tactile descriptions, audio, and olfactory stimuli. Results showed increased engagement, improved understanding, and stronger emotional responses, particularly among visually impaired visitors. Tactile stations with 3D models and textured surfaces allowed direct interaction with artworks, enriching the experience for blind or visually impaired individuals. In conclusion, the XALL project demonstrates how multisensory approaches can transform the museum experience, making it accessible and engaging for all. The integration of advanced technologies and inclusive design principles can help create cultural spaces that cater to diverse audiences, fostering a deeper connection with cultural heritage.

Keywords

Inclusive design · Human-centred design · Design for cultural heritage · Digital design · Design for all

F. Tosi · E. Iacono (✉) · A. Brischetto
Laboratory of Ergonomics & Design (LED), Department of Architecture (DIDA), University of Florence, Florence, Italy
e-mail: ester.iacono@unifi.it

F. Tosi
e-mail: francesca.tosi@unifi.it

A. Brischetto
e-mail: alessia.brischetto@unifi.it

S. Camplone and C. Porfirione (eds.), *Design for All and the Future of the Planet*, Design For Inclusion 6, https://doi.org/10.1007/978-3-032-21769-1_10

1 Introduction

Museums, originally conceived to preserve and enhance cultural heritage, have undergone profound transformations to adapt to the needs of a constantly changing society. In recent decades, the theme of inclusion has taken centre stage, recognising access to culture as a universal right. However, despite progress in eliminating physical barriers, many visitors still face challenges related to sensory, cognitive, and emotional needs. Current initiatives often focus on specific physical or sensory disabilities, such as visual, auditory, or motor impairments, overlooking a broader and more integrated approach to inclusivity. To overcome these limitations, optimising User Experience (UX) in museums is essential. An effective museum experience must go beyond basic accessibility, offering intuitive, engaging, and personalized pathways capable of meeting the diverse needs of visitors. Multisensory engagement, understood as the integration of stimuli that engage all senses, represents a key element in fostering learning and interaction. As Falk and Dierking (1992, 2018) highlighted, sensory involvement enhances understanding and retention of exhibition content. This is influenced by situational factors, such as sociocultural, physical and visitor context, which impact how visitors engage with exhibits. When these factors are optimized, they enhance sensory experiences and facilitate deeper connections with the content.

The integration of multiple senses—sight, touch, hearing, smell, and even taste—has been recognised as an effective strategy for building meaning in the museum experience (Christidou & Pierroux, 2019; Harada et al., 2018; Levent & Pascual-Leone, 2014), moving beyond the exclusive use of sight, which has historically dominated museums (Pallasmaa, 2024; Howes, 2014). For example, tactile routes for blind and visually impaired visitors, immersive audio guides, and the use of innovative technologies are transforming the museum experience into something more inclusive and engaging. Studies such as those by Bacci and Melcher (2011) and Luo et al. (2024) emphasise that a rich sensory interaction not only improves the understanding of artworks but also stimulates personal and emotional connections with the displayed objects.

Howes (2014) emphasised the return of touch in contemporary museums, after centuries during which it had been marginalised, and reintroduced senses such as smell and taste, often ignored in traditional museum settings. In the 17th and 18th centuries, tactile interaction with objects was everyday and served scientific, aesthetic, and therapeutic purposes. However, by the nineteenth century, touch was progressively excluded, relegating visitors to passive observers. Today, programs like the British Museum's "hands-on desks" demonstrate that multisensory engagement can enrich understanding and create a deeper emotional connection with cultural objects.

A key role is played by digital technologies, such as haptic interfaces and multimedia installations, which facilitate sensory exploration. Howes stresses that these innovations transform museums into participatory spaces where visitors can actively engage their senses and experience personalized interactions. Technologies such as Augmented Reality (AR), Virtual Reality (VR), and Extended Reality (XR) further amplify this transformation, offering powerful tools to make the museum experience dynamic and accessible to all. Recent research (Waern & Løvlie, 2022; Vaz et al., 2020) highlights how interactive and immersive technologies can enhance engagement and understanding, enabling more direct and participatory interaction for all visitors.

Applying UX principles in museums also aims to optimize the interactions between visitors and cultural spaces, with the goal of creating meaningful, intuitive, and memorable experiences. According to Norman (2004), good UX is based on understanding users' expectations and meeting not only their practical needs but also their emotional ones. This principle has been adapted to the museum context to design visitor pathways that are not only accessible but also engaging and easy to navigate. Research by Pekarik et al. (1999) identifies four key dimensions of the museum experience: cognitive,

emotional, social, and personal. Each dimension contributes to a fuller experience, ensuring that the visit is not merely a passage between objects and explanations, but an opportunity for reflection, interaction, and emotional engagement. The integration of advanced technologies and multisensory approaches allows museums to respond to these dimensions, offering meaningful and engaging experiences for every visitor.

The *XALL* project centres on three prominent museums in Florence: *Palazzo Vecchio*, *Museo Stefano Bardini*, and *Museo Nazionale del Bargello*. By applying **Inclusive Design** (Dong et al., 2012) and **Human-Centred Design** (ISO 9241-210: 2019), the project strives to ensure that cultural heritage is accessible to all visitors, regardless of their abilities. Through participatory design, the project actively involved several disability associations—such as **ENS (Italian Association of the Deaf)**, **UICI (Italian Union for the Blind and Visually Impaired)**, and **HABILIA Onlus (Paratetraplegic and Motor Disabled Association)**—as well as museum professionals. This approach ensured that the design solutions addressed the specific needs and expectations of both museum visitors and the professionals who manage these institutions. The project aims to shift this paradigm by offering inclusive museum experiences that encompass a broad range of sensory needs, focusing on multisensory and multimodal approaches.

2 Methodology

The methodology for this project was based on a robust framework rooted in the principles of Inclusive Design and Human-Centred Design. The process was structured into distinct operational stages, each utilizing participatory and evaluative research methods to ensure that the solutions developed addressed the diverse needs of the target audience. Both qualitative and quantitative research were employed to provide comprehensive insights into how users experienced and interacted with multisensory museum environments.

2.1 Defining User Profiles

The first stage focused on identifying and understanding the diverse needs of museum's visitors, including individuals with visual, auditory, and motor disabilities, as well as the elderly and people from various cultural backgrounds. This phase was critical in ensuring that the design process was informed by the real-world needs of the target population (Dong et al., 2012). Interviews, focus groups, and discussions with representatives from disability organizations (ENS, UICI, HABILIA) facilitated the creation of detailed user profiles that guided subsequent design phases. These profiles addressed sensory limitations and considered aspects such as technological proficiency and personal preferences, following human-centred design guidelines (ISO 9241-210: 2019).

2.2 User/Museum Interaction Analysis

The second phase involved analysing existing museum interaction models, with particular attention to how users with sensory impairments engaged with exhibits. Observational studies and literature reviews on visitor behaviour in museum spaces (Brischetto et al., 2023) were conducted. This analysis aimed to understand how individuals perceived cultural heritage, especially how multisensory engagement influenced learning and emotional connections with exhibits (Falk & Dierking, 1992). Insights from this phase informed the development of sensory interventions that enhanced interactions between users and museum environments.

2.3 Design Development and Prototyping

Based on the insights from user profiles and interaction analysis, the third phase focused on creating design solutions and prototypes

for multisensory interventions. These included tactile reading stations, interactive touchscreens, and audiovisual guides integrating verbal descriptions, sound effects, and tactile feedback. An iterative prototyping approach (Brown, 2009) was adopted, wherein prototypes were tested, modified, and improved through feedback from users and museum professionals. This phase heavily incorporated co-design principles, actively involving users in the development process to ensure that final solutions met their needs and expectations (Muller & Druin, 2012).

2.4 Evaluation and Testing

The fourth phase evaluated the developed interventions using usability testing and user satisfaction surveys. Evaluation methods included:

- **Usability Testing**: Observing user interactions with multisensory installations and recording metrics such as task completion time, errors, and ease of navigation. This included evaluating the effectiveness of customizable video guides in facilitating navigation through the museum spaces and its alignment with the designed visitor journey. The study identified interaction barriers and assessed whether the interventions met user needs (Nielsen, 1994).
- **User Satisfaction Surveys**: Designed to capture emotional reactions, cognitive responses, and overall satisfaction through Likert-scale items, open-ended questions, and visual analog scales (Dillman et al., 2014).
- **Semi-Structured Interviews**: Conducted with select users to explore experiences and gather detailed feedback on the installations. These interviews provided deeper insights into user perceptions and improvement suggestions (Kvale, 1996).

2.5 Data Analysis and Interpretation

The final stage analysed data from usability testing, surveys, and interviews using qualitative and quantitative methods. Qualitative data was thematically analysed to identify patterns and insights, while quantitative data was statistically evaluated to measure intervention effectiveness. This mixed-methods approach offered a comprehensive understanding of how multisensory design impacted the museum experience, particularly in terms of accessibility and engagement.

3 Results

Through a comprehensive literature review and research into the state of the art in inclusive museum design, as well as an analysis of user needs, the *XALL* project developed a set of guidelines for inclusive design in museums. These guidelines formed the foundation for the design of the following interventions:

1. **Six multisensory stations and three tactile tablets** were created in collaboration with three museums in Florence: *Palazzo Vecchio*, *Museo Stefano Bardini*, and *Museo Nazionale del Bargello*. These stations offered tactile reading of works of art, verbal descriptions, and olfactory stimuli. By engaging multiple senses, these installations aimed to make the museum experience accessible to visitors with a variety of sensory and physical needs, ensuring a more holistic approach to cultural engagement (Fig. 1).
2. **Customizable video guides** were developed through a mobile application, allowing visitors to tailor their experience to meet individual needs. These guides provided auditory and visual content that could be adjusted for various levels of engagement, ensuring that

Fig. 1 Some of the multisensory stations and tactile tablets designed in collaboration with Tactile Studio. Specifically, the image illustrates some details: **a** 3D tactile reproduction of the work "Charity" inside the lapidary room of the Stefano Bardini museum; **b** 2D tactile reproduction of the work "The fruits of the earth offered to Saturn" inside the elements room of the Palazzo Vecchio Museum; **c** 2D reproduction of the tactile map to orient oneself inside the Stefano Bardini museum; **d** tactile tablets depicting "Bacchus" by Michelangelo Buonarroti and "David" by Donatello inside the Bargello National Museum

people with different sensory abilities could explore the museums in a way that suited them best.

3.1 Focus on the Tactile Dimension for Visually Impaired Visitors

One of the primaries aims of the *XALL* project was to enhance accessibility for visually impaired individuals, a group that is often underrepresented in cultural experiences. To achieve this, a specific focus was placed on the **tactile dimension** of the multisensory stations. Research indicates that the sense of touch can significantly enhance the understanding and appreciation of art for individuals with visual impairments (Cavazos Quero et al., 2021; Schiff & Foulke, 1982). By incorporating tactile elements into the exhibition design, such as 3D-printed replicas of sculptures and textured surfaces that mirror the visual characteristics of the artwork, the *XALL* project enabled visually impaired visitors to engage with the pieces in a more direct and meaningful way. Studies have shown that the tactile exploration of art can activate

different cognitive processes, allowing for an increased understanding of the artwork's form, texture, and structure (Bleau et al., 2023). In the context of the *XALL* project, the tactile tablets and multisensory stations provided a rich, hands-on experience that was complementary to the verbal descriptions offered via audio guides. This integration of touch, sound, and smell allowed for a more immersive experience, fostering a deeper connection to the artwork and making the museum environment more inclusive. Furthermore, the project's design also addressed the need for **reliable navigation** for visually impaired visitors. The development of **audio-descriptive guides** ensured that these visitors could independently navigate the museum spaces, understanding the layout and specific information about each artwork through auditory descriptions. This combination of tactile exploration and auditory information is crucial for creating an environment where visually impaired individuals can gain a greater sense of autonomy and empowerment within the museum space.

3.2 Features and Prerequisites of Multi-sensory Stations

In phase 2 of the *XALL* research project, we focused on identifying the most effective methods for presenting artworks in ways that are both accessible and engaging for individuals with diverse sensory abilities. This phase involved analysing the optimal techniques for graphic representation, the materials and technologies used, and the construction methods that would best support the tactile, visual, and sensory dimensions of the museum experience. The project focused on designing multisensory stations that address different senses, particularly touch, while incorporating visual and auditory elements to create an inclusive visitor experience. Through collaboration with disability associations and museum staff, the team developed concepts based on the specific needs of individual museum routes and stages of the visitor journey (Tosi et al., 2024). A key aspect of the stations was the integration of tactile and visual elements. The inclusion of 2D and 3D models allowed visitors with sensory disabilities to engage with artworks and artifacts more effectively. For example, blind visitors could explore tactile models or tactile paths to feel the structure of objects, while those with partial sight benefited from enhanced graphic elements designed to improve contextual understanding. Haptic feedback, such as raised patterns and vibrating elements, added another layer of sensory engagement by providing additional cues during tactile exploration. Technology played a crucial role in enhancing the user experience of the multi-sensory stations. Voice-assisted descriptions and adjustable audio guides offered an accessible way to understand the exhibits. Additionally, olfactory sensors were introduced to engage the sense of smell, providing a deeper sensory connection to the context of the artifacts and artwork on display (Verbeek et al., 2022). These technological innovations went beyond traditional visual methods to ensure a more comprehensive and inclusive experience for all visitors. This collaborative and multi-faceted approach highlights the potential of multi-sensory design in making museums more accessible to diverse audiences, aligning with best practices in inclusive design.

3.2.1 The Three "Senses" of Tactile Perception

The effectiveness of tactile stations hinges on their ability to engage the **three essential "senses" of touch**, each of which plays a crucial role in how visitors interact with the objects and exhibits:

1. **Line Recognition (Sensory Recognition Capabilities of the Fingertip)** Visitors with visual impairments often rely on their fingertips to trace the outlines and details of objects. The ability to **follow a line**—whether the outline of a statue, the contour of an archi-

tectural element, or the edges of artwork—is a fundamental component of tactile interaction. This aspect of tactile perception ensures that visitors can navigate the shape and structure of an artwork by simply following its tactile representation.

2. **Haptic Ability (Positioning and Movement Awareness)** The **haptic ability** refers to the visitor's capacity to perceive and recognize the position of their hand in relation to the tactile device. It involves understanding the spatial dimensions of the object and being able to move around it with confidence. The design of multi-sensory stations must, therefore, account for the need for users to comprehend the spatial relationships of various elements within the exhibit, such as depth and orientation. This type of interaction enhances the visitor's ability to understand the full form of the artwork or artifact, even in the absence of visual input.
3. **Surface Recognition (Texture Perception)** Recognizing and differentiating the **roughness of surfaces** is another key tactile ability. By feeling variations in texture, individuals can gain information about the material properties of an object, such as whether it is rough, smooth, or intricately detailed. Texture is crucial for distinguishing between different materials and forms, which is particularly relevant when interpreting sculptures, pottery, or textiles.

4 Conclusions and Discussion

The design solutions developed in the XALL "Tutta un'altra Guida" project were implemented and tested in three major museums in Florence, with significant outcomes regarding accessibility and visitor engagement. The results demonstrated that multisensory interventions markedly enhanced the museum experience, making it more inclusive for a wider range of visitors. Key findings from the evaluation include: (1) Increased Engagement. The tactile stations and multimedia guides played a crucial role in increasing visitor engagement, particularly for individuals with sensory impairments. These features allowed users to experience artworks beyond the visual domain, fostering a more immersive and memorable visit (Tosi et al., 2024; Vikmane et al., 2024); (2) Improved Learning and Retention. Visitors reported improved understanding and retention of exhibit content when engaging with multisensory features. This aligns with the existing literature that suggests multisensory experiences promote deeper learning (Falk & Dierking, 2018); (3) Positive Emotional Responses. Visitors, especially those with visual impairments, expressed heightened emotional responses to the exhibits. The tactile experiences combined with soundscapes were cited as particularly impactful, further enhancing emotional engagement with the artwork.

Future research should focus on expanding the use of **multimodal and multisensory approaches** to accessibility, particularly in the context of museums and cultural institutions. There is a need for further experimentation with new technologies and design strategies that engage multiple senses, allowing for more dynamic and inclusive experiences for people with disabilities. Additionally, ongoing user feedback and usability testing will be essential to refine these interventions and ensure that they continue to meet the needs of diverse audiences. The results of the XALL project provide valuable insights for future initiatives aimed at improving the accessibility of cultural institutions. As museums continue to innovate and expand their offerings, creating environments where all visitors—regardless of their sensory or physical abilities—can experience and appreciate cultural heritage is essential.

Acknowledgments The authors would like to thank: the TIM Foundation, which financed the research; the polytechnic of Milan, Department of Electronics, Information and Bioengineering with professor Lanzi Pierluca and dr. Paolo Boffi subsequently developed the computer system; the Association MUS.e Musei Civici Fiorentini, Florence, Italy (Palazzo Vecchio and Stefano Bardini Museum) and the Bargello National Museum, Florence, Italy; the associations: ENS (Italian Association of the Deaf), UICI (Italian Union of the Blind and Visually Impaired) and

HABILIA Onlus (Paratetraplegic and Motor Disabled Association).

Author Contributions Conceptualization, A.B. and F.T; methodology, A.B., E.I; writing-original draft preparation, E.I.; writing-review and editing, E.I., A.B. (Writing–Introduction and Methodology: E.I.; Result and Conclusion and Discussion: E.I, A.B.). Supervision, F.T. and A.B.; project responsible, F.T.; funding acquisition, F.T. All authors have read and agreed to the published version of the manuscript.

References

Bacci, F., & Melcher, D. (Eds.). (2011). *Art and the senses.* Oxford University Press.

Bleau, M., van Acker, C., Martiniello, N., Nemargut, J. P., & Ptito, M. (2023). Cognitive map formation in the blind is enhanced by three-dimensional tactile information. *Scientific Reports, 13*(1), 9736.

Brischetto, A., Iacono, E., Becchimanzi, C., & Tosi, F. (2023). Enhancing inclusive experience in museums: Results from a field study. *AHFE International*, 132–144.

Brown, T. (2009). *Change by design: How design thinking creates new alternatives for business and society.* Collins Business.

Cavazos Quero, L., Iranzo Bartolomé, J., & Cho, J. (2021). Accessible visual artworks for blind and visually impaired people: Comparing a multimodal approach with tactile graphics. *Electronics, 10*(3), 297.

Christidou, D., & Pierroux, P. (2019). Art, touch and meaning making: An analysis of multisensory interpretation in the museum. *Museum Management and Curatorship, 34*(1), 96–115.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method*. John Wiley & Sons.

Dong, H., Clarkson, J., Coleman, R., & Cassim, J. (2012). *Design for inclusivity: A practical guide to accessible, innovative and user-centred design.* Gower Publishing, Ltd..

Falk, J. H., & Dierking, L. D. (1992). *The museum experience*. Whalesback Books Washington.

Falk, J. H., & Dierking, L. D. (2018). *Learning from museums.* Rowman & Littlefield.

Harada, T., Hideyoshi, Y., Gressier-Soudan, E., & Jean, C. (2018). Museum experience design based on multisensory transformation approach. In *DS 92: Proceedings of the DESIGN 2018 15th international design conference* (pp. 2221–2228).

Howes, D. (2014). Introduction to sensory museology. *The Senses and Society, 9*(3), 259–267.

ISO 9241-210. (2019). *Ergonomics of human-system interaction-human-centered Design for Interactive Systems*. International Organization for Standardization.

Kvale, S. (1996). *InterViews: An introduction to qualitive research interviewing.* Sage.

Levent, N., & Pascual-Leone, A. (Eds.). (2014). *The multisensory museum: Cross-disciplinary perspectives on touch, sound, smell, memory, and space.* Rowman & Littlefield.

Luo, D., Doucé, L., & Nys, K. (2024). Multisensory museum experience: An integrative view and future research directions. *Museum Management and Curatorship*, 1–28.

Muller, M. J., & Druin, A. (2012). Participatory design: The third space in human–computer interaction. In *Human computer interaction handbook* (pp. 1125–1153). CRC Press.

Nielsen, J. (1994). *Usability engineering.* Morgan Kaufmann.

Norman, D. (2004). *Emotional design: Why we love (or hate) everyday things.* Basic books.

Pallasmaa, J. (2024). *The eyes of the skin: Architecture and the senses.* John Wiley & Sons.

Pekarik, A. J., Doering, Z. D., & Karns, D. A. (1999). Exploring satisfying experiences in museums. *Curator: The Museum Journal, 42*(2), 152–173.

Schiff, W., & Foulke, E. (Eds.). (1982). *Tactual perception: A sourcebook*. Cambridge University Press.

Tosi, F., Brischetto, A., Iacono, E., & Becchimanzi, C. (2024). XALL-Tutta un'altra guida. Design per l'inclusione: strategie e strumenti per musei inclusivi. In *Design per la Diversità. Atti della Conferenza Nazionale SID 2023* (pp. 270–280). SID Società Italiana Design.

Vaz, R., Freitas, D., & Coelho, A. (2020). Blind and visually impaired visitors' experiences in museums: Increasing accessibility through assistive technologies. *The International Journal of the Inclusive Museum, 13*(2), 57.

Verbeek, C., Leemans, I., & Fleming, B. (2022). How can scents enhance the impact of guided museum tours? Towards an impact approach for olfactory museology. *The Senses and Society, 17*(3), 315–342.

Vikmane, E., Ņikitina, M., Brutāne, L., & Cērpa, L. K. (2024). Multisensory approach to museum accessibility and experience enhancement. *Culture Crossroads, 25*, 21–32.

Waern, A., & Løvlie, A. S. (2022). *Hybrid museum experiences: Theory and design* (p. 198). Amsterdam University Press.