KB nationale bibliotheek

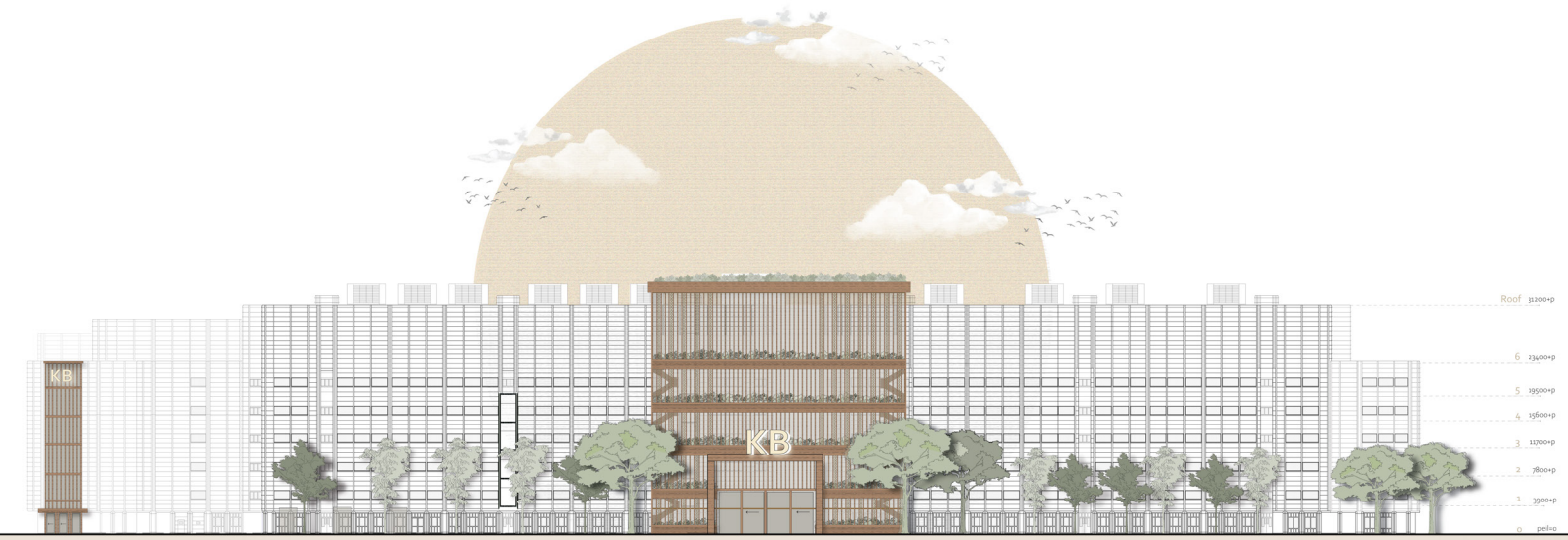
Elisabeth
Veldkamp

UNIVERSAL INCLUSIVITY

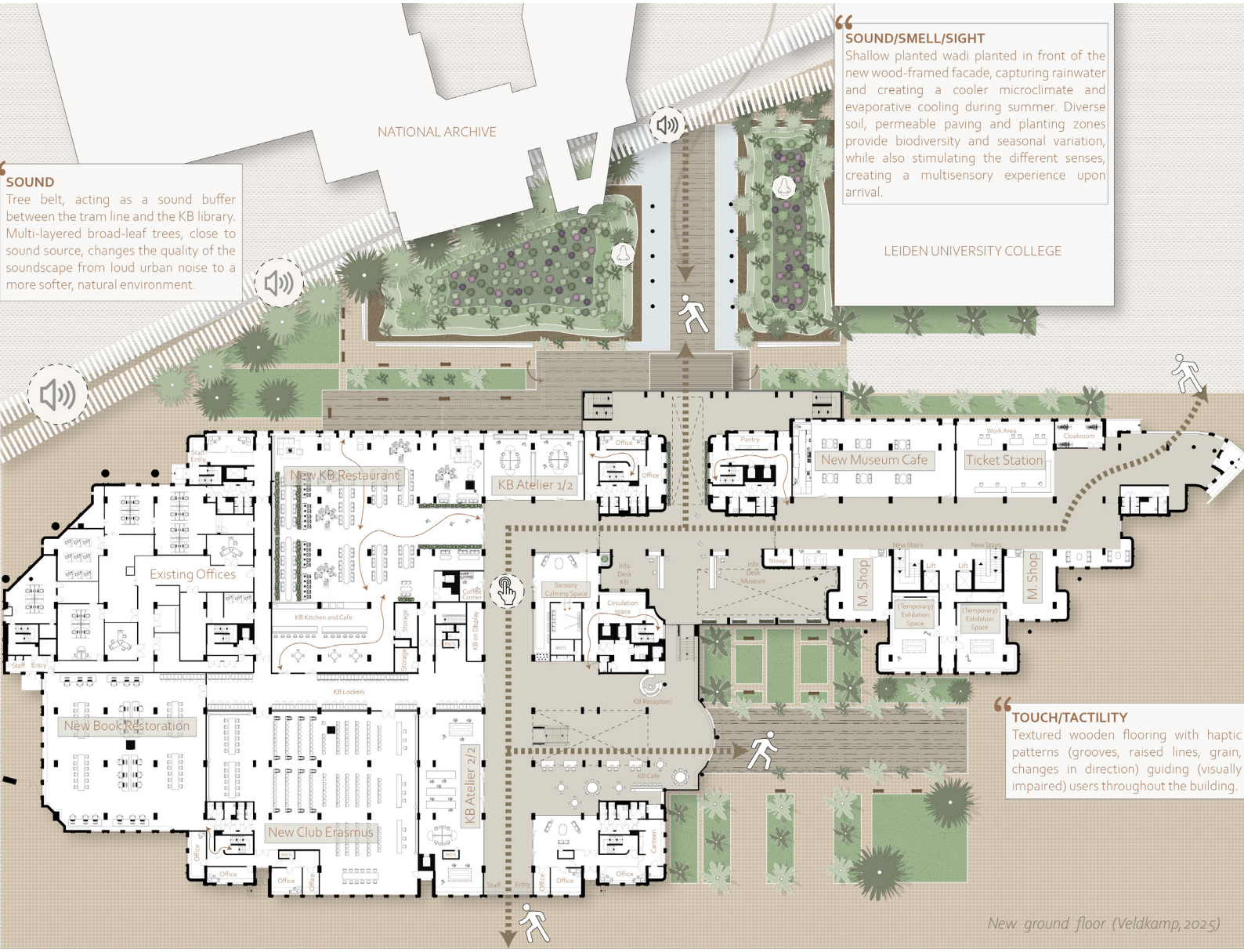
Designing for Senses

BEYOND SIGHT, BEYOND BARRIERS:
Reimagining Library Spaces through Multisensory Accessibility

REDESIGN OF THE NATIONAL LIBRARY OF THE NETHERLANDS (KB)



New southwest elevation (Veldkamp, 2025)



New ground floor (Veldkamp, 2025)

TU Delft

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January 9th, 2026
Spring - Fall Semester

REVITALISING HERITAGE
Sustainable Libraries Studio

Reflection
AR3AH115

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1 INTRODUCTION

This study explores how multisensory accessibility can be integrated into library design to better accommodate diverse sensory needs. Although libraries have increasingly embraced user-centered design principles in recent years, the focus has predominantly remained on visual elements, often limiting the inclusivity of these environments. Multisensory design strategies- including tactile, auditory, olfactory, and spatial elements-offer valuable opportunities to engage a broader range of users, particularly individuals with sensory impairments. Despite growing interest in this field, a notable gap persists in both academic research and design practice regarding the effective implementation of multisensory experiences in library environments. Research shows that in the field of architecture and design the primary focus lies on designing for one sense: the visual- grand structures esteemed for their exterior design, accuracy and visual harmony. However, behind these facades, the sensory and interpersonal aspects of space remain neglected. By way of example, a shading mechanism may present an aesthetically pleasing rhythmic composition externally, while internally it may produce glare and cause discomfort. These scenarios expose a fundamental disparity between the visual representation of architecture and the tangible reality of inhabiting it. Can a library be truly inclusive if it only speaks to your eyes? To welcome all users, it must become a space you can feel, hear, and move through intuitively. In this way trying to create buildings that are not only seen, but experienced.

In response to this, the study contributes to the future redesign of the Koninklijke Bibliotheek (KB), the National Library of the Netherlands in The Hague, by proposing evidence-based design strategies that integrate multisensory elements to enhance both user experience and accessibility. By fostering an environment that actively engages multiple senses, the KB can evolve into a more accessible, navigable, and socially engaging public space for a wide and diverse audience, with particular attention to the needs of blind and visually impaired users. The research aims to address the existing gap in library design discourse by offering practical frameworks for incorporating multisensory accessibility, ultimately repositioning the KB as an inclusive, and culturally significant landmark within the city of the Hague. It intends to answer the following research question: **How can libraries be redesigned as resilient environments that foster social inclusivity and user engagement by integrating multisensory accessibility into their physical spaces?**

2 RELATIONSHIP BETWEEN PROJECT AND MASTER PROGRAM

What is the relation between your graduation project topic, your master track (A, U, BT, LA, MBE), and your master programme (MSc AUBS)?

This graduation project titled, *Universal Inclusivity: Designing for Senses*, is embedded in the Heritage and Architecture track of the master Architecture, Urbanism and Building Sciences program, within the studio Revitalising Heritage. It examines how modern-day perspectives might be introduced to the Koninklijke Bibliotheek (KB) by means of adaptive reuse that integrates multisensory accessibility and universal inclusivity. This research coincides with the studio's approach to linking architectural interventions with the tangible and intangible heritage values. Through an extensive analysis of the heritage values assigned to both the interior and exterior building blocks, an assessment was made for potential transformation and reinterpretation. The results of this analysis determined which building parts could be preserved, adapted and which heritage values held greater significance for creating a meaningful, resilient interventions. In doing so, the field of architecture becomes a bridge between historical continuity and future use, fostering user comfort while also contributing to the integrity of heritage through adaptive and inclusive design.

3 RESEARCH AND DESIGN

How did your research influence your design/ recommendations and how did the design/ recommendations influence your research?

The design assignment addresses the challenge of revitalizing the Koninklijke Bibliotheek (KB), the National Library of the Netherlands in The Hague. The core problem is the building's accessibility barriers for (visually) impaired users. Through the lens of heritage and adaptive reuse, this project investigates how multisensory design strategies, such as the integration of tactile, auditory, and spatial features, can enhance accessibility, intuitive navigation, and overall user experience. The transformed KB could offer a radical change: from a closed, confusing, and visually dominating institution to an open, navigable, and multisensory cultural landmark. This shift is based on the notion that space should communicate not only through sight but also through all senses, providing significant, inclusive experiences for all users, particularly those who are visually impaired, or neurodiverse. The objective is to create a design strategy that preserves vital heritage values of the KB, while integrating a new program and spatial strategy, that reflects the evolving role libraries in society. The research that was conducted served as the foundation of the design strategies (Figure 2), integrating and translating theoretical notions about multisensory design into new spatial interventions within and outside the Koninklijke Bibliotheek (KB). However, research never completely concludes: it is in continuous dialogue with the design, changing and expanding with each decision and design iteration. To organize this process a WHAT–HOW–WHY framework was used (Figure 1), that synthesizes findings by identifying the problem (WHAT), defining the proposed spatial reaction (HOW),

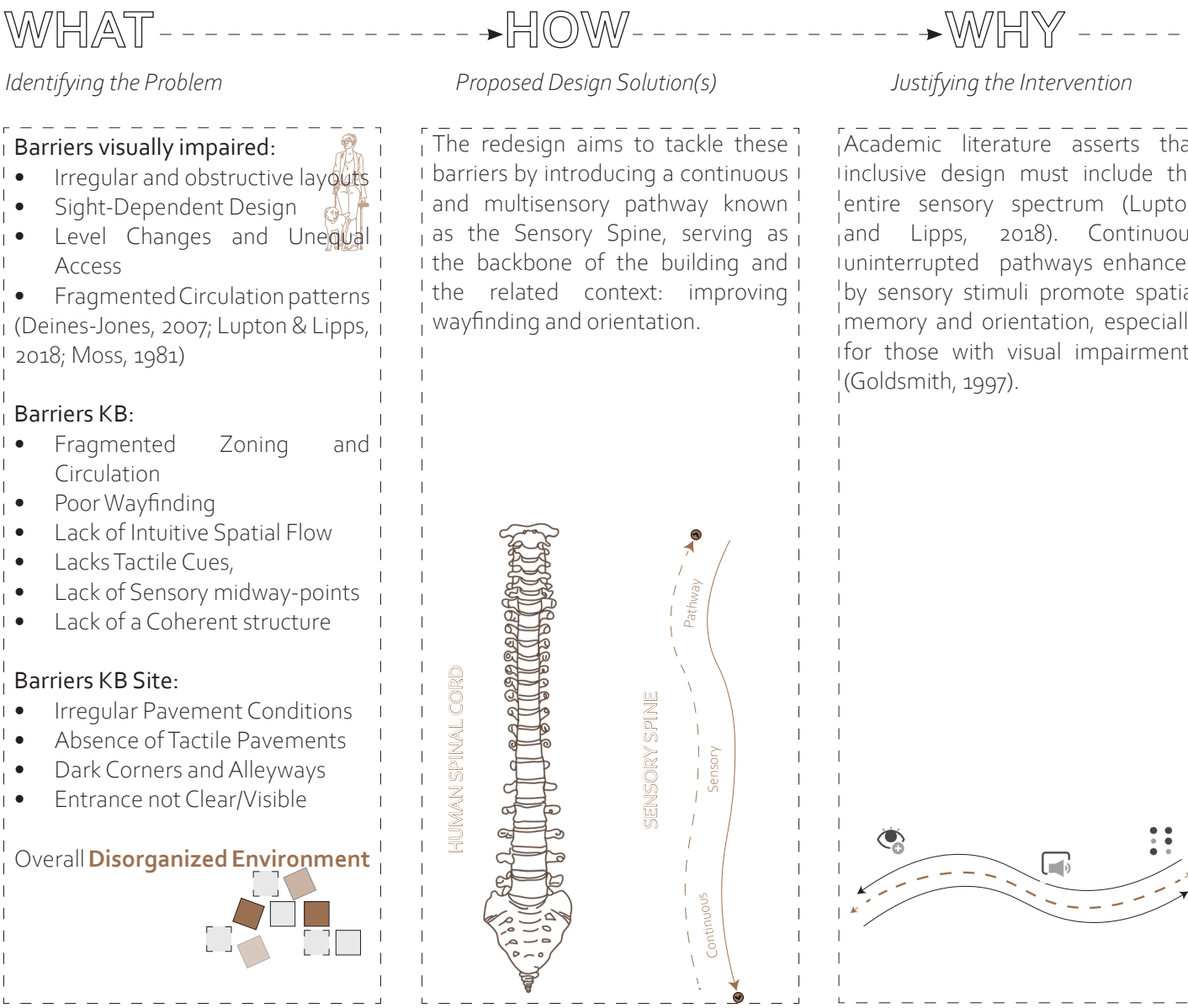


Figure 1. WHAT-HOW-WHY framework. Compiled by author (Veldkamp, 2025).

and establishing its relevance within academic literature on inclusive and multisensory design (WHY). This strategy guided the creation of a multisensory design toolbox, which aided in significant considerations and interventions related to the KB site and building. The toolbox focuses on tactility, visual legibility, and multisensory elements (Figure 3). It brings together essential design principles, such as material transitions, tactile guidance, shading and contrast, controlled lighting, greenery, soundscapes, and material expression, that all together foster the development of sensory rich, perceptually accessible, and socially inclusive library spaces. Although the complete effects of these measures can only be validated through future implementation and post-occupancy evaluation, the research indicates that incorporating multisensory accessibility provides a strong approach to libraries that not only support inclusivity but also encourage various forms of user engagement and a sense of belonging. This research highlights how designing can be utilized as a form of research, and how research can be utilized as a constant driver of design.

3 RESEARCH AND **DESIGN**

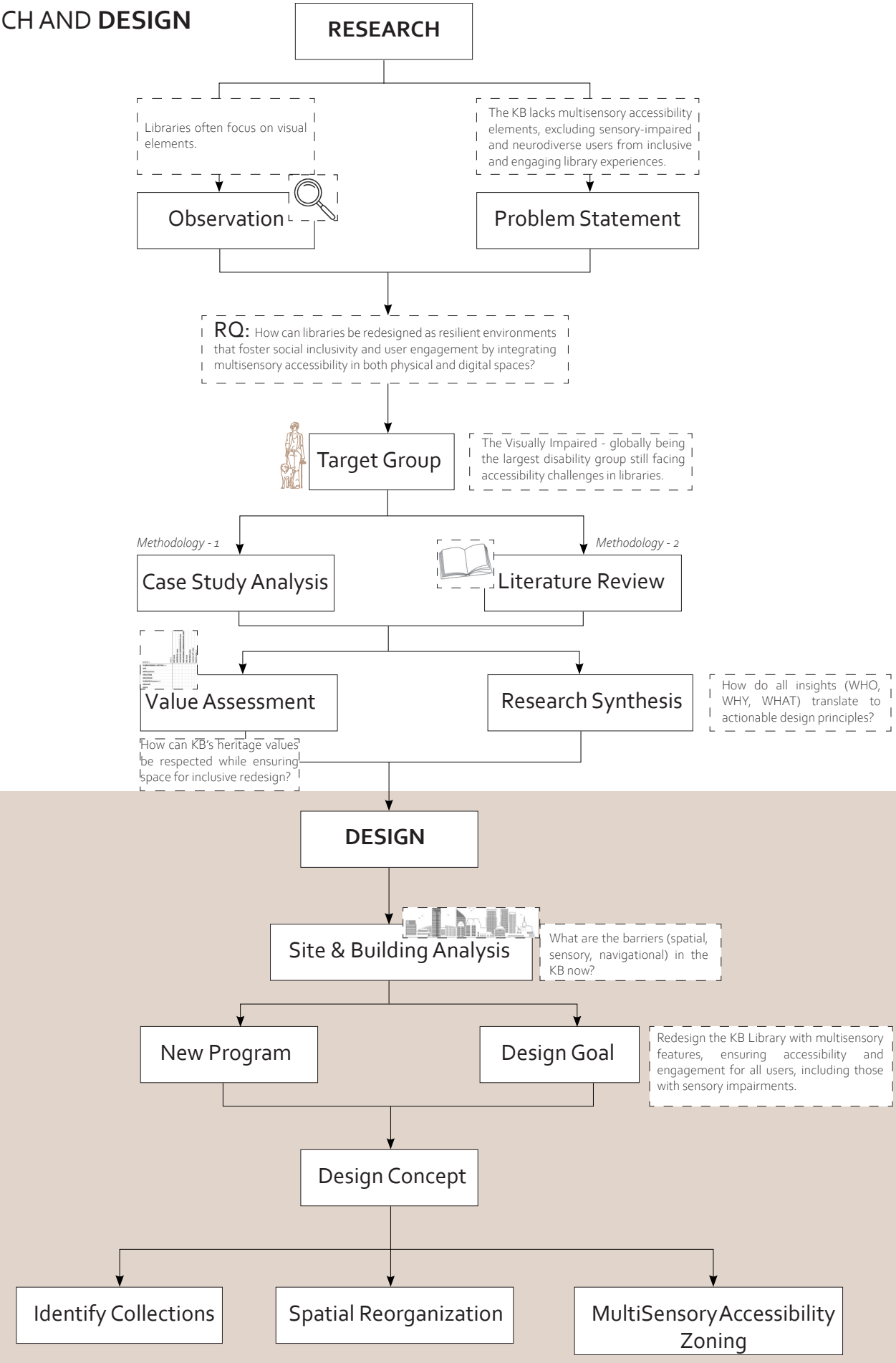
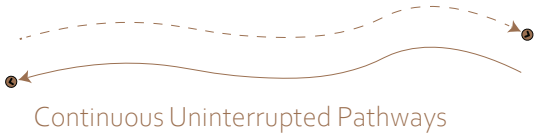


Figure 2. Research-Design diagram. Compiled by author (Veldkamp, 2025).

FROM RESEARCH TO DESIGN: STRATEGIES

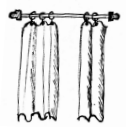
Category 1: Touch - Tactility

1.1 Surfaces of Movement

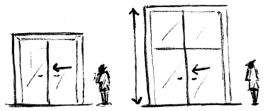


Continuous Uninterrupted Pathways

Material transitions

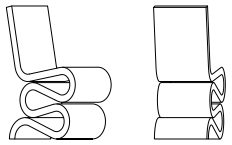


Soft partitions

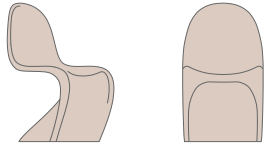


Higher entrance: spatial anticipation

1.2 Surfaces of Rest

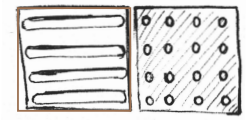


Soft furnishings with rounded corners



Warm materials, tactile-friendly finishes

1.3 Surfaces of Orientation

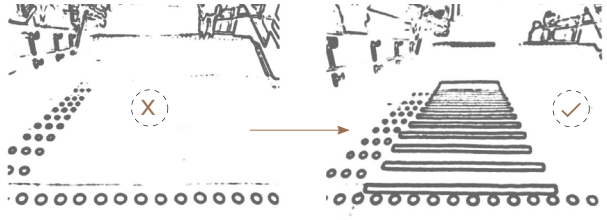


Tactile floor markers guiding movement

Continous rounded railings and tactile wall markers

Category 2: Visual Legibility

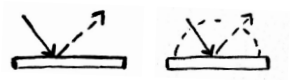
2.1 Tactile Contrast



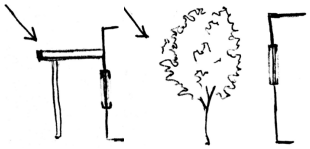
Jordans et al., (2012)

Continuous tactile markers on stair treads enhance tactile and visual legibility

2.2 Controlled Light



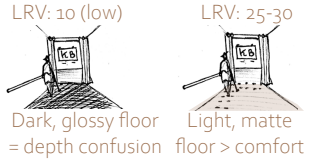
Matte/textured surfaces help diffuse reflected light



External shading devices help reduce glare

2.3 Color and Contrast

Secondary doors Main entrances



Dark, glossy floor = depth confusion

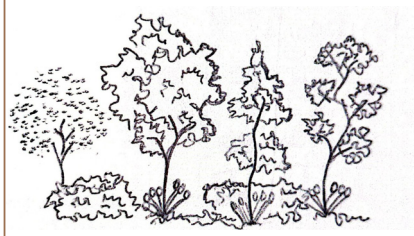
Light, matte floor > comfort

Highlight important areas through controlled use of color, contrast,reflection

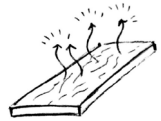
Matte, light surfaces create clear, comfortable paths

Category 3: Multisensory Elements

3.1 Greenery and Scent Expression



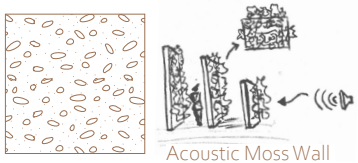
Biodiversity in greenery with subtle aromas enhance sensory richness and microclimate conditions



Ensure fragrance-free zones for allergies

Natural scent sources in materials (e.g., wood, bamboo, soil)

3.2 Sound and Comfort



Acoustic Moss Wall

Sound-absorbing materials and surfaces for acoustic comfort

Soft rustling of leaves

Natural auditory cues to create calm sound layers

3.3 Materiality and Resilience

Lausselet et al., (2023)

Renewable, tactile materials: age gracefully, durable and enhance long-term sensory comfort

Modular and demountable system for flexible reconfiguration and reuse

Figure 3. Research-Design Toolbox. Compiled by author (Veldkamp, 2025).

4 VALUE OF THE WORK

How do you assess the value of your way of working (your approach, your used methods, used methodology)?

This study made use of a qualitative methodology, which included an analysis of case studies, a comprehensive review of the relevant literature, site observations and an expert interview with Kimberly Brinkhuis (researcher digital accessibilty at the KB).

The case study analysis consisted of examining three public libraries that have incorporated multisensory design elements into their architectural frameworks.

1. Openbare Bibliotheek (OBA) in Amsterdam, The Netherlands by Jo Coenen & Co Architekten – with emphasis on multisensory accessibility through tactile design features, soundscapes for wayfinding, sensory relief rooms, and interactive multimedia rooms.

2. Helsinki Central Library Oodi in Finland by ALA Architects – with emphasis on multisensory accessibility through sensory installations, tactile surfaces, wayfinding systems, and navigation through textures.

3. Durham County Library in North Carolina, USA by Vines Architecture – with emphasis on multisensory accessibility through multisensory environment rooms, assistive technologies, calming spaces, and flexible usage areas.

4. School for the Blind and Visually Impaired in Ahmedabad, India by SEALAB – with emphasis on inclusive design through tactile pathways, textured surfaces, acoustic zones, sensory pathways, spatial clarity and a sensory-oriented courtyard that supports intuitive wayfinding and spatial orientation for the visually impaired.

The literature review established a theoretical framework and design toolbox by examining existing research on multisensory accessibility within cultural institutions, including libraries and museums. Topics included multisensory environments, obstacles faced by people with impairments, and physical accessibility. Given the limitations in time and scale, it was unrealistic to include the full spectrum of impaired and neurodiverse users in this study or for the proposed library redesign. Thus, those with visual impairments were the main representation for the user groups, as they represent the most prevalent demographic among people with impairments. Additionally, alongside the literature review and case study analysis, observational studies were performed at the Koninklijke Bibliotheek and its adjacent urban environment to ascertain barriers to spatial and sensory accessibility.

The on-site investigations offered empirical insights into circulation patterns, architectural barriers, and user movement, thereby anchoring the re-design proposal in real-life spatial conditions.

To further contextualise the accessibility barriers identified in this research, a short expert interview was conducted with Kimberly Brinkhuis, researcher in digital accessibility at the Koninklijke Bibliotheek. The interview focused on the barriers impaired users face within public institutions, including the KB, along with feedback on the proposed design interventions.

Overall, it is important to note that while the chosen methods provided a strong foundation for the design, additional interviews with experts and institutions such as schools for the blind could have strengthened the understanding of specific user needs. Certain design decisions that favoured one sensory experience or user group occasionally clashed with others, highlighting the difficulty of balancing inclusivity across all senses. It is about finding a balance between designing for one group and designing for all. This underscores the notion that inclusivity is not merely an endpoint but an ongoing pursuit requiring a continuous dialogue between users' needs and design interventions.

5 ACADEMIC AND SOCIETAL VALUE

How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?

This project makes an academic contribution by broadening the ongoing discourse on inclusivity within a heritage setting, while positioning multisensory accessibility as both a research framework and a strategy for (re-)design. Societally, it aims to reimagine libraries as resilient civic spaces that promote inclusivity, sensory richness as well as equitable experiences for all, regardless of sensory needs.

6 TRANSFERABILITY

How do you assess the value of the transferability of your project results?

While the concept of a sensory spine originated from research and was designed for the Koninklijke Bibliotheek (KB), its core principles are in fact transferable, just like the multisensory design toolbox: it serves as a model for reinterpreting existing structures through different senses, not just the visual, to enhance the sensory experience and orientation of its users. In connecting preservation and transformation, the project emphasizes that inclusivity within the heritage realm is a continuous practice of adaptation and care, rather than a fixed product.

7 PERSONAL TAKEAWAY

What is the value of designing more inclusively?

A significant personal insight gained from this project is the significance of inclusive design, especially considering that more than 330,000 individuals in the Netherlands experience visual impairments. Designing beyond sight addresses specific user needs while also reflecting a wider commitment to creating environments that foster autonomy, comfort, and accessibility for everyone. Design enhancements, like ongoing tactile pathways or more distinct spatial transitions, show that initiatives aimed at assisting visually impaired individuals ultimately improve comfort, confidence, spatial orientation and ease of movement for ***all users***, regardless of impairment.

What can be learned from this project?

This project illustrates how designing beyond sight serves as a significant design approach, one that enhances spatial quality, emotional depth, and societal worth. Exploring multisensory principles uncovers the profound reliance individuals have on subtle environmental cues that frequently escape attention: the shade and cooling provided by trees, the gentle rustling of leaves, or the soothing presence of chirping birds. Such qualities often go unnoticed until they are gone, yet they significantly impact comfort, orientation, and well-being in ways that defy economic valuation. The project emphasizes the wider possibilities of integrating sensory-inclusive strategies in architectural design, demonstrating how this approach can improve environments not just for users with impairments, but for the entire community.

Additionally, the research approach indicated that prioritizing touch as a primary sensory topic could have offered a more concentrated framework, especially considering its universal perceptibility and its status as the second-most relied-upon sense after vision. The study initially examined accessibility from a comprehensive multisensory perspective, but the hierarchy of the senses became more evident over time, indicating that a touch-centric approach could have enhanced the coherence of the design strategy. Even so, the results of this research indicate that designing beyond the sense of sight can be accomplished through various sensory modalities, each offering unique kinds of inclusivity and engagement within the library setting.

8 HERITAGE INTEGRITY AND SOCIAL RESILIENCE

How do you see the heritage integrity (building as a whole) issue?

This research defines heritage integrity as the ability of the National Library (The KB) of the Netherlands to maintain a cohesive and significant public entity while evolving in response to shifting social, environmental, and urban circumstances across time. As opposed to retaining the current library structure as an irreversible and static ensemble, integrity is regarded as an evolving condition where spatial logic, accessibility, and civic relevance are perpetually redefined. From this viewpoint, socially resilient heritage architecture is characterized not merely by material and structural continuity, but by its capacity to facilitate inclusive use, social engagement, and well-being across diverse user groups and future scenarios.

The value-based analysis of blocks A and D showcased that, despite their age-related and historic characteristics (among others), their present layout negatively impacts social and urban functionality by obstructing visual connections, limiting permeability, and creating unwelcoming ground-level areas within a densely paved urban environment. Their selective removal facilitates the emergencee of a continuous green square (wadi) with biodiverse greenery that serves as a multifaceted approach for social and environmental resilience: providing a space for pause, rest and gathering, improving orientation while simultaneously enhancing microclimatic conditions through shading, evapotranspiration, and water infiltration.

By combining selective transformation of the KB structure with the preservation of the primary KB structure, the redesign reinforces heritage integrity at building ensemble level, thereby strengthening the library's role as a socially resilient, climate-responsive public institution within the city of The Hague.

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