Master Graduation Project

Multi-Sensory Unintended Objects: A Prototyping Method for Sensory Driven Product Discovery

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Executive Summary

There exist many ways to use an object outside of its designed function. Chairs were made for sitting; however, people routinely use them to reach things from high places. The invention of the micro-plane (a cooking appliance that is used to grate food) was discovered because of the unintended use of a Wood File. Products everywhere exist to service one function but can serve other purposes they were not designed for. This is not the result of bad design, but of the underlying communication that occurs between a user and a product every time they are interacting. This communication is due to a lot of factors, one of which being sensory communication. A user's interpretation of the sensory aspects of a product influence how they believe said product can and should be used. This misalignment is due to a lack of consideration for sensory experiences and the communication a user is having with a product. This graduation project attempts to develop a method that can be used to generate product ideas that have a more coherent and aligned form, experience, and function because they will lead to innovative designs with stronger emotional connections between the user and the product.

The method that ends up being developed uses the areas of multi-sensory design and prototyping to create a process that allows designers to capitalize on unintended use within products to discover new product directions. The Multi-sensory Unintended Object Method (MsUOM) focuses on user interviews to collect multi-sensory information surrounding two designed objects. This multi-sensory information will be used to combine those designed objects into one prototype. With this prototype, designers will see how users interpret its functionality based on the form and their interaction with it. This leaves the designer with the newly designed object with a form, multiple perceived functions, and a multi-sensory understanding of the user experience. The method gives designers the tools to enter the traditional design process equipped with the knowledge to develop a product with an intuitive experience inspired by the prototype developed through the Multi-sensory Unintended Object Method (MsUOM).

Through a user focused evaluation, the Multi-sensory Unintended Object Method is in a state where it is viable to use and will lead designers to discovering product spaces where their designed object exists with innovative functionality possibilities and strong sensory focuses that inform a consistent and unique form and experience.

The method bodes well for the future of designed objects, as it will generate product ideas that have form, function, and experience aligned and embedded in their development; while also relaying to designers the importance of the user relationship with a product without sacrificing innovation within design.

Glossary

Multi-sensory Experiences
Products that engage multiple senses simultaneously to enhance user engagement, memory retention, and overall satisfaction.

Prototyping
The process of exploring and testing methods and to learn about and develop design directions with combined multi-sensory experiences.

Unintended Use Cases
Specific scenarios where an object has been used in a way that its functionality wasn't intended to.

Object Affordance
The ability of an object's perceivable functionality to be unconventional (Hassan et al., 2022).

Functionality
Describes an ability of an object to perform an operation it was made for

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SECTION 01

Setting the Stage

Introduction

‘Form follows function’ is an ideology that speaks to the embodiment of an object being focused on communicating the object’s function. This was a guiding principle of the functionalism method that focused on objective and logical solutions for design problems. This principle also holds space for the importance of multi-sensory elements within designing (Haverkamp, 2012) . The idea of sensations is an important aspect of form following function. Sensation is the sensory signal that results from interaction with the physical world; perception is the process that rationalizes sensations (Haverkamp, 2012).

Design is about the communication and interpretation of sensory knowledge between a user and the world. As a result of this, sensory knowledge can be seen, felt, heard, smelled and tasted in the world we live in today. All that information existing in the world means that there are opportunities for miscommunication between the product and the user. Because of this, products can have alternative object affordance, or the ability of an object’s perceivable functionality to be unconventional (Hassan et al., 2022) . And even within multi-sensory design, there are a lot of miscommunications between the senses that lead to affordances. Learning how to develop multisensory design from a technology standpoint would be interesting and a skill that develops the understanding of design interactions. The development of this method is a way to explore this gap in communication to see if there were viable insights in terms of idea generation and product development. The method could potentially help discover new ways for developing products with distinct physicality and novel functionalities.

The context for this graduation project is to explore novel ways in which

product use cases can be developed with multisensory design through prototyping. The intention is to apply these insights to the development of a method that will result in novel design directions. The design material will explore multiple avenues: using existing products and dissecting their sensory signature to adapt their purposes; combining existing products based on their sensory experiences; and developing objects with a more intuitive connection between embodiment and function. There will also be a focused study of the unintended use of these products from a sensory perspective (for example, how users interpret the use of an audio speaker outside of delivering sound). The focus is on finding a methodology that generates insights to capitalize on the unintended use of objects to discover new product directions.

Goal

The goal of this project is to develop a method that explores the unintended uses of objects from a multi-sensory standpoint. Multi-sensory design development considers the relationship that an object has with a user and attempts to strengthen that through engaging multiple senses throughout the development process (Schifferstein, 2011). The goal of the method is to generate product ideas that are more intuitive in all their designed aspects, such as function, form, and experience. This means that designers will attempt to discover new products that can communicate their intended use on multiple levels. Moreover, designers will hopefully be able to develop unfamiliar functionalities and physicality while simultaneously strengthening the emotional connection the object has with its user (Schifferstein, 2011).

The method which delivers a physical object as an outcome is not about building a new product necessarily, but about building new understanding between a built object and how it is communicating its potential use. This can lead to innovative design directions because the development of these new objects is not focused on building from a predetermined functionality but instead it is stemming from the need to explore alternative directions emerging from the intuition of use from existing objects (Hassan et al., 2022). This results in a collection of information stemming from the built object that can be utilized for potential future products.

What are the learning goal of this method?

- Learning about products from a multi-sensory perspective
- Developing research and development skills within prototyping
- Discovering innovative design directions to develop new unconventional products
- Low-fi prototyping skills
- Focusing on sensory experiences and interactions with products and not on developing functionality-based solutions (this allows for the object to discover its function and not its function being determined first which can narrow the design development)
- Building a stronger connection between physical product components and design feature (better understanding of how design and engineering overlap due to the disassembly process)
- Learning how to change the perspective on making within research for design is important to get students engaged.

EXPERIENCES LEAD TO FUNCTION LEAD TO FORM LEAD BACK TO FUNCTION.

PROJECT SIGNIFICANCE

This project is significant because of its potential to develop new product directions. It attempts to use the miscommunication within the usability of an object as a jumping off point for new and innovative ideas, a concept that is in some ways the inverse of the traditional design process which focuses on a consistency within a product (Hassan et al., 2022).

The exploration of the unintended use space within an object can potentially result in new innovations in terms of both functionality and embodiment. Moreover, it will allow for a stronger emotional connection between the user and these objects; a result of implementing multi-sensory design principles. The objects will be associated with stronger user interactions because of the focused effort on the sensory aspects in the objects use cases (Schifferstein, 2011).

Lastly, this method is significant because of its usability. It has the potential to be adapted to any context a designer needs and will still be a viable option in terms of gaining insights for the development of new innovations. Because the method is focused on stripping existing products down into their multi-sensory elements and then building them back up into new design directions, it can be used in a myriad of scenarios (within the educational context as well as the professional one):

- With randomly selected products in order to come up with an unknown object exploration (traditional process)
- Picking one primary object and a secondary object to specifically enhance a sensory feature lacking in the primary object.
- With specific objects that are related in their multi-sensory experiences and elements

This project attempts to supply designers with the necessary knowledge to inform a design discovery process that will lead to new novel objects in functionality, embodiment.

Literature Review

The literature review was conducted to gain information about the focus areas within this method. The areas included understanding multi-sensory design, unintended use, and prototyping. Each play a significant role in the Multi-sensory Unintended Object Method, therefore gathering knowledge to implement is paramount to the success of the developing the method. The review is broken up into a breakdown of important insights gathered across the myriad of literature that was analysed for this graduation project. Each offering a key knowledge component that would feed into the method as it developed.

Redefining the Prototype

Traditionally, prototyping is focused on being a solution-based technique within the design process. It can be a sketch, a mock-up or polished material outcome confronting the world of ideas and skills of the designer with the world-out-there before a final artifact exists (Buchenau & Suri, 2000). This means the prototype is a manifestation of its development meant to be to realized understanding of the design process up until that point to address the validity of a product's development. However, that definition does not fit within the way prototypes are being used in this scenario because the prototype in this scenario is an object that is not a manifestation of a specific design goal but instead a physical representation of the process used to generate the prototype itself. It is an artifact being used to gain knowledge about its development process and not the next step in building and testing the validity of a product; which means the definition of the prototype needs to be redefined.

Discovering Research through Design

This new definition of prototype also exists within the framework of an existing design process that heavily influenced the development of the Multi-Sensory Unintended Objects Method (MsUOM), this existing process is called Research through Design (RtD).

When it comes to the process of research through design, there is a need to shift the objectives of the prototype and what it accomplishes within the process of designing. The prototype becomes an “artifact” that can be used as a way to explore and gain knowledge about a process, or a design development. Prototypes within research through design can take on many forms of understanding depending on what outcomes a designer wants; from material explorations to provoking alternative use cases, the prototype is an object that is exploring the current state of development and not an proposed end goal, in order to help learn about the process that was used to make said prototype.

“Propose that the artifact of RtD should be considered as a research product. This proposition ...suggests that the engagement that people have with it should be “predicated on what it is as opposed to what it might become” (Giaccardi, 2019)

“The “artifact” in relation to RtD explores the ways in which prototypes can be used in relation to design; artifacts give way for questioning... they are purely for research purposes”(Giaccardi, 2019)

Research through design prototypes should be focused on what the current state of the developed process is, rather than what the prototype and process could eventually develop into (RtD is focused on concrete lessons that can be learned now). It is a process that confronts the now for the purpose of addressing and advancing the steps used up until that point.

This allows for insights to be unpolished and knowledge focused because the prototype is not a polished entity itself (so the insights gained from it are not representative of its own quality but instead of the things that lead to its existence). In this way, the insights being gathered from the investigation of said prototype are immediately applicable to the process used to create it.

This manifested itself in the development of the method as the prototypes were developed. They became physical manifestations of the information collected about multi-sensory experiences users had had with existing products. Through the process of combining. products, efforts were taken to allow the object’s multi-sensory focuses to be at the forefront of the prototyping. While also allowing users to define how those senses were informing the prototyped object’s use. This is because there was interest in learning the best way to relate the multi-sensory element insights with the newfound functionality as the method solidified itself.

Purpose of Prototypes

Moreover, within the working method itself (the MsUOM), this shift in the role of the prototype allows designers to discover and define many alternatives of use for the prototyped object. The point of the prototypes as they exist within the method itself also attempt to allow the designers to gain knowledge about multi-sensory experiences and unintended use. Through “Histories and futures of research through design: From Prototypes to Connected things” by Elisa Giaccardi the prototype “when investigated can provide these purposes”:

- Prototypes can also be used to intentionally provoke and speculate on alternatives
- Disrupt norms and thus stimulate discussion and debate, or to reflect on our own world and to generate alternative possibilities for the future
- What is possible now; it opens up an imaginative space
- Is a counter functional artifact open to multiple interpretations and meanings
- Provoke a range of speculations as participants attempt to make sense of its purpose and place within their homes

(Giaccardi, 2019)

This was true two-fold for the prototype in this scenario, as it was used to learn within the development of the method itself as well as its purpose within the method itself.

Implementing Research through Design

There are established practices and the theory behind Research through Design, but the process also allows designers to discover their own relationship with its implementation. The explanation of RtD goes to great lengths to establish the difference between research and design and how both approaches require a change in perspective and practice. It also discusses the different philosophies around the relationship between design and research and how they can be intertwined and influence one another.

"'designers' appear in many roles: as researchers developing the tools, techniques, and methods; as beneficiaries using these; as explorers not only of these tools but also finding out how the exploration should be done"(Stappers & Giaccardi, 2017)

Understanding the approach to the MsUOM development came mainly from understanding how research and design can be intertwined to discover and develop different outcomes. The articles also show how research and design can be overlapped to develop a method. The importance of making things for learning is an important part of the developed method. However, it is hard to understand how these making processes can contribute to the learning and not directly to the development of the object itself (like within a traditional design process). It is a hard connection to dismantle, especially in students and designers who have been taught about specific processes and their outcomes and will now potentially be asked to reform those connections in their mind and in practice. It is about changing the point of making to gain knowledge and learning. This is hugely important and is in line with design research, which was implemented to develop this method.

"Making things for research requires design students to consider the qualities of the objects they create on their instrumental value for acquiring knowledge or gaining insights, ... For many students this is a difficult transition, being trained to look at things primarily from a design perspective."(Pasman & Boess, 2010)

Learning how to change the perspective on making within research for design is important to get students and designers engaged. This new perspective on making will allow designers and students to gain insights and knowledge on what they are making in a new way (Pasman & Boess, 2010). One main thing that is important to do is to give individuals an attachment to the research process so that it is not perceived as being boring. For one thing, playing into their design abilities and skills is important because it engages designers in the process of research. It also forces students to look at their objects in a way that prompts research and questions which helps shift their perspective on their approach to

design.

Affordances with Form and Function

'Form follows function' is a tenant of design education and is held as the golden rule within all areas of design. However, when affordances start to emerge within the use of a product, the statement may come into question. In affordances, the perception of alternative uses within a product, function becomes ambiguous in accordance with an object's form. This introduction of alternative use can disrupt the goal of the object, which is to carry out its designed function (Haverkamp, 2012). The exclusion of sensory focuses within development can misalign users from the function of an object.

Adding ornamentation, or an effort to introduce features to an object that does not align with its form can end up confusing the natural communication that occurs with users and products. Thus, resulting in the disturbance of use.

"During product design it is thus necessary to acertain which sensory stimuli and perceptual characteristics best transmit this information and which perceptions should be avoided, where possible"(Haverkamp, 2012)

Multi-sensory information can get in the way of an object being used 'correctly' if it is not designed in tandem with the object's function. Not considering this when designing can exacerbate the miscommunication of a product's use which will end up transmitting different intents with different senses. (Haverkamp, 2012; Norman, 2008). Even in the case of affordances, this misaligned sensory design does not communicate functions that can be successfully carried out by a product.

Learning how to implement multi-sensory elements is important for developing a product that is in harmony with itself.

Multi-Sensory Design Education

Something that multi-sensory design education attempts to do is shift focus to asking questions, questions surrounding sensory experiences. Recognizing the importance of the user experience when using a product, multi-sensory design attempts to bring that perspective to the forefront of the process of design (Schifferstein, 2011). This space of design needs new tools and techniques to further explore the boundaries of this approach. However, in its current stage, it helps shift the understanding of how a designer can use the senses to communicate intended functionality. This will ultimately lead to products that are consistent in their design aspects: functionality, sensory experiences, and physical embodiment; thus, resulting in products with stronger bonds with users and clearer communication (Camere et al., 2015). Something that multi-sensory design education attempts to do is shift focus to asking questions, question surrounding sensory experiences.

Research Problem

Objects exist in a way where there are latent alternative uses embedded in their existence. Users of objects are constantly balancing the perception and ability that they think an object has. That balancing act allows objects to be exploited in ways they were not designed for. This means there are objects communicating underlying uses through the way users interpret their physical attributes.

There has always been miscommunication with objects which lead to unintended use that do not match the functionality of said object. For example, an umbrella that is traditionally used for blocking weather elements can be repurposed as a clothes drying rack, or the invention of the cooking micro-plane inspired by the misuse of a wood file. These miscommunications end up creating potential experiences of objects that users exploit (Hassan et al., 2022). Their functionality has been misinterpreted, and although that is not necessarily a problem, it reveals that there is a need to explore the potential for alternative use cases within objects.

This new method is needed to help explore and expand on those alternative uses. It attempts to find a way to understand where those alternative uses are stemming from and subsequently tries to use those findings to create new innovative design ideas.

Knowledge Gap

Through the literature research, it was clear there was a lack of intersection between the main three sectors of the proposed research:

- Multi-sensory Design
- Prototyping
- Unintended Use

It is clear through the literature that aspects of prototyping, multi-sensory design, and unintended use can be utilized to create a method that can spark an innovative product generation process. Using the multi-sensory aspects of a product to discover new design directions through the latent miscommunication of use between users and products is not present in the literature research. However, that idea presents itself as an interesting and potentially innovative process that has yet to have been developed or explored. Its potential impact on the design space in a multitude of contexts could be revolutionary.

Investigating how these concepts can work with one another in order to get to a point where all their impacts in tandem result in the development of product directions and objects with stronger user experiences and new functional focuses.

Multi-sensory design was developed to shift the perspective of the design process and enhance the emotional connection users have with objects they interact with and vice versa (Schifferstein, 2011). Prototyping is the perfect stage to develop how senses interact and influence the use of an object. These three areas of interest are perfectly positioned to end up developing a method of design that creates an outcome of novel

design directions. This is where the unintended use potentially fits in, as enhancing the connection between objects and their experiences with users will allow for unintended uses to help communicate what mutual experience the user and the object want to have with each other.

Each area of interest in this method reveals a key element that would make the method stronger in terms of its outcome. The emergence of alternative use cases for existing objects reveals the potential for novel objects to be developed (Hassan et al., 2022, p. 3). There just needs to be a way to figure out how to pull out those ideas and insights that could bring about innovative objects. The method attempts to figure out the best way to bring that information to light.

Research Question

Through synthesis of the research, the question space that emerged as needing to be addressed relates to the ability to mesh the unintended use of objects with multi-sensory design and prototyping in a way that allows designers to identify and subsequently develop new product direction ideas. The goal is to investigate a method that utilizes prototyping to improve and expand on the development of novel and unintended design directions within the multi-sensory design process. In other words, trying to answer:

In what ways can we capitalize on the unintended use of objects to discover new product directions using multi-sensory focused prototyping?

- Product directions are the idea spaces that could lead to a fully realized and embodied product
- Multi-sensory focused prototyping is defined here as the process of prototyping with a focus on enhancing or combining the sensory elements of the prototyping material to achieve an object with a more experience-based functionality and form

Creativity in the overlapping spaces of multi-sensory design, unintended use, and prototyping will bode well for the development of these new product directions. Learning how to change the perspective on making within research for design is important to get students and designers engaged. The method also attempts to attack these research questions:

- How can we more closely align experience, form, and functionality within product development?

- How can we build a stronger connection between physical product components and design features to help better understand how design and engineering overlap?
- How can we better align product experiences with embodiment when developing products?
- Does shifting the focus of developing a product from functionality to product experience result in distinctive and novel product developments?

Methodology

The methodology used to develop this multi-sensory design approach (which from now on is referred to as: Multi-sensory Unintended Objects Method) was Research through Design, specifically by way of prototyping. This process came to light during the literature collection phase of the project. Designing in this context acts as a way to learn about the things that affect the built object; for example, the prototypes built throughout the development of the MsUOM were used to evaluate and adapt the development of the MsUOM itself (Pasman & Boess, 2010). With that in mind, the approach to creating the MsUOM was taking insights from the literature regarding prototyping (to start with) and building out the MsUOM from there by adding focus areas to build out the method to gather a coherent outcome. This meant constant iterating and running through versions of the MsUOM at whatever stage it was currently at, and using the prototype as a way to gauge the state of the method (Stappers & Giaccardi, 2017), restructuring areas that did not make sense in relation to others until all components of the method that were relevant to the development of the Multi-sensory Unintended Objects Method were formalized.

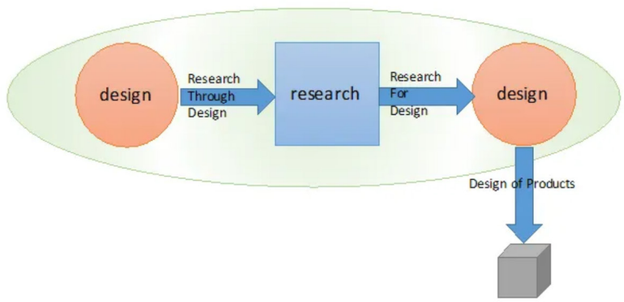

Figure 1 : Diagram showing how to design a method using RtD (Stappers & Giaccardi, 2017)

Prototyping Methodology

The way research through design was utilized most heavily was through prototyping (although research design principles were heavily used in the approach development, the tangible effects of its influence can be seen directly with the prototyping efforts). This is because prototyping allows for physical insights for research and development purposes. Prototyping was essential when dealing with the sensory properties present in the development of the Multi-sensory Unintended Objects Method. The traditional way of approaching prototyping is working towards a solution to a problem. This needs to be reframed in the context of the MsUOM. In developing the approach, there needs to be a commitment to iteration. While prototyping lends itself to the iterative process, it does so in reference to a linear development of a product (Pasman & Boess, 2010). To create the Multi-sensory Unintended Objects Method, and more specifically an approach that is focused on developing potential design directions and not necessarily finished and polished product, the prototyping needs to be focused on provoking alternatives and gaining knowledge. “the artifact of RtD should be considered as a research product...suggests that the engagement that people have with it should be “predicated on what it is as opposed to what it might become” (Giaccardi, 2019), this is because the prototype in the context of research through design is a vehicle for evaluating the process that manifested the said prototype as well as gain knowledge (Giaccardi, 2019).

More specifically, in the context of this approach’s creation, the research through design method used to develop was based on creating prototypes from the perspective of multi-sensory experiences. This allowed new angles of interpreting form and function of objects, which allowed knowledge to be gained about how to develop new sensory experiences not held back from defined functionality. This is the benefit of research through design, as the end goal is knowledge collection for further development purposes and not specific outcomes which allows the method to grow and change as it naturally needs to.

The 3 sectors of this method (multi-sensory, prototyping, and unintended use) are integral to getting to the end goal of the method. They each play a part in shifting perspectives, pushing boundaries, and discovering insights for experiences with these newly built objects.

SECTION 02

Building Out The Process

This section is focused on breaking down the three focus areas the emerged as pillars of the method. Each area is explored, discussing their importance and their place as a part of the method. From the introduction of interview to collect multi-sensory information to how prototyping physically manifests insights; each area was integral to the Multi-sensory Unintended Object Method.

Multi-sensory Design

Multi-sensory design is the first sector used to develop the Multi-sensory Unintended Object Method. The way that muti-sensory design is being utilized is by changing how the designer understands the objects they are utilizing, changing the perspective from functionality into sensory experiences. This shift in focus to the sensory aspects of objects is important to help prompt a stronger relationship between physical elements and how they contribute to sensory experiences (Schifferstein, 2011). The method takes on this area of interest from both the designer's perspective in terms of how they look at the physical embodiment of a product in relation to its functionality; and from the user's perspective in the form of interviews to find out how users interpret the interactions they have with a product and how it informs their experience.

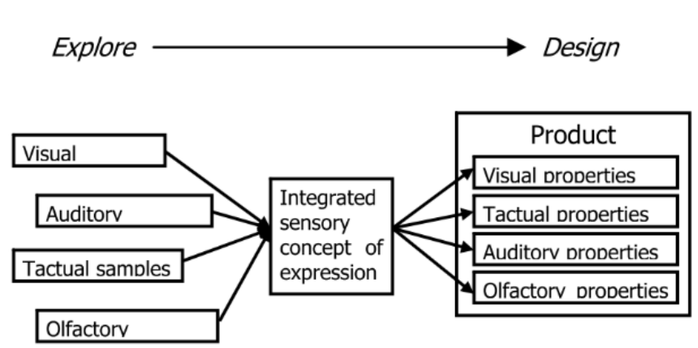

Figure 2: Diagram for the approach to multi-sensory design (Schifferstein, 2011)

Designer Perspective

Focusing on the multi-sensory aspect of objects requires an adjustment in the way that users think about objects and their interactions. Traditionally, objects are functionality focused and so they are thought of and evaluated from that frame of reference. However, multi-sensory aspects require reframing the mind in relation to objects. The multi-sensory aspects of an object are more focused around the experiences that are attached to the object and user and less about the functionality.

The idea is to strengthen a designer's ability to understand a sensory experience and then to see what physical elements about the object contributed to that experience (Schifferstein, 2011). This is an integral part of the process as it allows the understanding of the object to be divorced from the functionality that the object was designed for. Getting that sensory information and its connection to the object is instrumental in changing the way the objects are looked at going forward.

The multi-sensory interview acts as a twofold process in the first stage of the method as it begins to collect insights and thematic consistencies from external users around sensory objects. It also starts to switch the designer's perspective around the sensory experience that objects provide and not just their ability to carry out a function (as mentioned in the previous section). This is because the interview questions are primarily centered around the sensory information that the objects provide and not focused on its functionality. In questioning the users from this sensory perspective, the designers will be able to start connecting the embodiment of the objects with their sensory attributes and what those mean in terms of building a product with a specific functionality (Sonneveld et al., 2008).

This shift in how designers look at objects is important to carry out the rest of the method and so getting that shift started in the beginning of the approach bodes well for potential outcomes of the process.

User Perspective

The user interviews are the first way into getting this sensory information and connection between sensory experiences and their physical attributes.

It is important to establish and gather knowledge from multiple users to learn about those sensory connections. There are no specific criteria for the users needed for the interview. This is because everyone has experience using products and an intrinsic understanding of how they communicate with products. The interviews are structured in a way that allows designers to pull these understandings from users to make them actionable.

The interviews act as a way for the designer to understand how sensory qualities manifest in an object, moreover, how it relates to that object's functionality.

"In order to understand how to shape the product's sensory qualities to appropriately express an idea, and therefore how to elicit a specific experience in users, we must first define what an experience is and how every sensory modality can fuel it." (Camere et al., 2015, p. 148)

The perception and ability that the user feels about an object and its use determine how they communicate the sensory relationship in relation to that object's functionality. Meaning, how the user understands the

function of an object influences the way they talk about its sensory features. Approaching this interview with the right questions is important to gathering the necessary information to act on understanding these sensory relationships.

User Interview Questions

Given an object, users are taken through an interview process to discover how they interpret the existing object in front of them. This step of the process allows for outside perspectives on the multi-sensory information that users have with said object.

Each question is structured in a way to get information about each sense and all the interactions a user has had with the object in question. This interview process is important to establish how the senses are speaking to the user through their interaction with it. This information will be used in the next stage of the process to inform the approach in prototyping that focuses on the multi-sensory combination and communication of objects.

The questions are separated into sections depending on what they attempt to address (the full list of question is in the Appendix)

Multi-sensory Focused Introductory Context Questions

1. What is this object?
2. Do you use/have you used this object?
3. What is this object used for in general?
4. Describe to me how to use this object (step by step)
5. Where would you categorize this object in terms of these three senses (sight, sound, touch)?
6. Why did you choose these senses to categorize this object?
7. Describe the experience of using this object from every sensory perspective
8. Is there a specific sense you would like to improve about this object's experience
9. Which sense is the most important to the experience? The least important?

Extra Question Set (Depending on direction of conversation)
Multi-Sensory Experience

1. What do you think about the sensory aspects of using this object?

Sight

1. How does the appearance of the object influence your interaction with it?
2. Do you rely on any visual indicators to use this object effectively?

Sound

1. Can you describe any specific sounds that would improve your experience using the object?
2. What sounds does this object make when in use, and how do they affect your experience?

Touch

1. How does the texture of the object handle affect your understanding of functionality?
2. What changes in the material or design could improve your tactile experience?

Enhancements and Improvements

1. What specific features would you add to the object to improve its functionality?
2. What sensory aspect of this object would you enhance to improve the user experience?

General Usage and Experience

1. What do you find most intuitive about using the object?
2. What challenges do you often encounter when using this object?
3. Regarding Unintended Use Cases
4. Have you ever used this object to do anything else?
5. What are some creative ways you think this object could be repurposed?

Synthesizing Insights

To get thematically actionable insights, it is important to look at the number of interviews done for the same object and uncover what sensory information is actionable in the prototyping phase. Information that is actionable is considered any information that sparks an idea for prototyping, as in this process there is no wrong answer because it is an exploratory method promoting novel insights. However, it is also important to consider the thematic and more consistent insights as well as those learnings that will lead to sensory combinations that are more universally consistent and well-communicated across users. Gaining insights is important in order to give the prototyping phase enough background information to build objects that convey the multi-sensory aspects accurately.

To do this, the transcript is used to synthesize the rounds of interviews. It is a line of questioning that gathers functionality and sensory information consistent across all users while also pulling out fringe insights from some users in order to potentially push the idea generation (see appendix for example transcript as well as sample questions). Using Chat GPT, direct quotations from interviews were used to gather these insights from transcripts.

Prototyping

The next stage of the process requires making a prototype. Prototypes will be made using the insights from the user interviews. This means that through reviewing the synthesized interviews the designer will find multi-sensory information from two objects and they will take aspects of those insights into consideration when they are brainstorming a new object and its subsequent experience, form, and function.

Because multi-sensory design is about the sensory elements and how they connect to the physical embodiment of an object, a prototyping phase using said sensory information gathered from the user interviews is essential to the goal of the method: to discover new product directions using multi-sensory focused prototyping.

The more focused goal in this stage is to try and establish a new object experience by combining the individual sensory information of the two original products gathered from the interview stage. Physical prototyping allows for building a new object from the multi-sensory insights of the interviewed products. This stage is focused on forcing two seemingly unrelated objects together (as the method uses existing products to build new objects). However, how they can be intertwined is revealed through the lens of multi-sensory experiences. This allows for connections to be made that were not originally seen because these objects are now being looked at from a lens that is more universal (the sensory experience), and not from a functionality standpoint which is specific to each object.

The prototyping phase encourages more sensory focuses in the design, attempting to further change the perception of the designer. It does this by not attempting to achieve a specific design solution through its

process (Hassan et al., 2022). Using the sensory information gathered from interviews, designers are now challenged to combine the thematic information of two separate objects into one coherent one. This new object will then have a clearly defined functionality that the designer will prescribe to it through the process of making the object. Starting from the point of sensory elements and experiences (via interview insights) the designer will intentionally design a new object that uses those separate elements to carry out a specific function that reflects the combination of the once individual objects.

Building a new object will create something that houses the original physical elements of the once individual objects in order to come up with a new function utilizing repurposed sensory elements.

With the methodology that is being utilized to discover the MsUOM, the overarching purpose of prototyping is to provoke alternatives (Giaccardi, 2019, p. 142). This means that through this prototyping process communication distinct sensory experiences and physical attributes will be used to provoke alternatives of use. The prototyped object will hold the experiences of the former embodiments in a new form (Hassan et al., 2022).

Objects were designed for a specific functionality, and latent multi-sensory aspects help communicate intended functionality. Because of this latency, using these objects and repurposing their physical attributes will also bring with it the associated sensory features. Although this overlap is being used to contribute to a new object with a new functionality, the sensory information it brings along can lead to divergent interpretations in the object's intended functionality. This is the point of prototyping in this stage as it leads to the next important sector: the object communicating with the user, the unintended use.

Unintended Use

There is a latent messaging within the communication of objects with users. A partial inspiration for this method was the ability of an object to communicate a different functionality than it was intended to do (Hassan et al., 2022). This miscommunication potentially offers new design directions that a designer can take advantage of to create an object with similar sensory experiences but different functionality all within a new form.

Unintended use cases are important to understand to get to the next stage of the process where the prototyped object is tested for its potential affordances through a second round of user interviews.

Figure 3: Visual showing how unintended use (object affordance) operate (Hassan et al., 2022)

"The affordance concept denotes object attributes and human interactions to implicitly create the potential actions associated with perception and ability. People create novel object competence to complement their requirements across other settings ... Such capacities could catalyse novel design possibilities and insightful ways for designers to develop a specified purpose." (Hassan et al., 2022, p. 3)

Objects are regularly and consistently used in contexts in which they were not intended. This phenomenon is not necessarily emblematic of bad design but instead a point of realization between the user, designer, and the object that there is potential for something else. The overlap of perception of what an object is supposed to do and its ability to carry out the alternative function is creating a space where objects are carrying out use cases that are beyond its intended function.

The point of taking advantage of this phenomenon is to potentially discover innovative use cases for objects. Unintentional use of an object can indicate a miscommunication between designers and users; however, it can also be interpreted as the objects having latent alternative uses that are being exploited by users that should not be ignored by designers and instead utilized (Hassan et al., 2022, p. 4). This is being addressed by the unintended use case focus within the MsUOM.

Once the first round of prototyping is completed, there is now an object that has a myriad of sensory properties within it that contribute to its physical attributes. And although it was designed to have a specific functionality through the prototyping process, without knowing that functionality, external users will interpret the object's function on their own. This will allow a deeper understanding of the ways in which sensory experiences relate to functionality and how mixing different physical attributes from objects with different functionality can lead to new and unintended possibilities within a new object. This section of the method is exploiting the inherent overlap of perception and ability of an object's use (Hassan et al., 2022) in order to develop new novel ideas.

The goal is not to use unintended use to eliminate the miscommunication between users and objects, that miscommunication will always be there and should not be seen as a negative side effect it is a result of individual perception and innovation. The goal is to use these divergent thoughts and use cases to come up with new objects, new functions, new experiences that engage new sensory combinations and in turn allow for stronger connections with objects whose physical manifestations and sensory communications with a user create stronger relationships and capabilities.

Prototype Interviews

Users are asked to communicate with the object to discover how this new object they have never encountered is communicating its use to them. They are asked to describe its functionality and detail why they believe the object is made to carry out that functionality. This translation between the user and the object when cross referenced with the designer's own understanding of the designed object will reveal what the physicality of the object itself is communicating in terms of use. The new combinations of physical attributes are meant to elicit new use cases that have not been attached to the individual objects that were combined. The combination of familiar components in a new and unfamiliar form will cause users to attempt to rationalize these components into an understandable functionality.

The individual objects overlap should prompt a stronger response of novel ideas as users try to make sense of familiar elements of objects they would previously have recognized in a completely new configuration and context. Those perceptions, experiences, and understanding of abilities of those objects in this new form create a new understanding of what is possible with those familiar attributes of those previously recognizable objects.

The questions for this interview attempt to prompt the user to define the functionality of the new combined object in front of them. The line of questioning is placed within the Appendix. The users must rationalize the form in front of them that contains the recognizable components of existing objects. The recognizable elements will help users rely on sensory communication to clue their way to a function (Haverkamp, 2012). The questions ask them to define the functionality and then explain what about that object communicated that understanding to the user.

Conclusion

The method's goal is achieved using the three focus areas of Multi-sensory design, prototyping, and unintended use. Each focus builds on each other in order to get to the goal of capitalizing on the unintended use of object in order to discover new product directions.

Figure 4: Example form users need to fill out to discuss function and sensory understandings

SECTION 03

The Method

Developing The Method

This section documents the thoughts and insights collected through the development of the method. It may seem disjointed in its presentation because of this.
To get to a place where the method was viable, it had to be developed based on the research through design methodology that was discussed earlier in the report. Research through Design principles can really influence the insights learned from prototyping or throughout the design process by focusing on using design as a way to gain insights instead of a way to develop.

Iteration I

The development process started with the synthesis of the literature research conducted just to get a basis on how the different elements (multi-sensory design, prototyping, and unintended use cases) could work together. What was discovered, specifically with prototyping, was the different ways in which prototypes can be used depending on the intended outcome of the making process.

Instead of the prototype being a manifestation of all the work you've done to get there and focused on improving the physicality or the object itself, it is instead a marker for the development of the method itself. And so, that way of prototyping or framing prototyping was an interesting way to start the research.

So, the first 'method' that emerged was tested internally; it consisted of playing around with different objects and attempting to combine their properties. At this stage the attempts to prototype were just experimenting for the purpose of figuring out what worked. The focus was not on what properties were being combined (aesthesis, functionality, sensory properties) but instead on the validity of the process.

This was done by starting simple; taking objects that were interesting to combine (based on their differences in multi-sensory communication as well as use) and that were available in the vicinity just to test the viability of the basic idea of brute force combinations within prototyping. So, starting with a suction cup, earphones, a mouse, and a pillow (all items that previously had been discarded). An attempt was made at combining the multi-sensory aspects of these products to develop prototypes that provoked alternatives.

Starting with a mouse and a pillowcase, this very immature version of the process was carried out to even see if there was a possibility of combining the objects.

Figure 5: Photos displaying the first attempt at the prototyping phase of the process

The pillow and a mouse were combined with the idea of playing around with the touch qualities of these products. The touch sense stood out with both of these products, so when prototyping combinations took place there was a considerable amount of ideas that were generated from the combination of the touch aspects of both products.

And attempts at what this combination could yield were brainstormed and documented during the prototyping.

- A mouse that forms to the pressure of the user's hand. Like a Tempur-Pedic mattress of sorts. Comforting to match the user's specific hands.
- A silent mouse that doesn't make audible noises when in use
- A device that you can toggle between pillow modes (hard, soft, and other modes of preference.)
- A pillow that controls the atmosphere of a room when you touch it.

Providing qualitative evidence that the combination could lead to new innovations and ideas.

Figure 6: Prototyping Testing combining suction cup and earbuds

The second prototype was a little more abstract, combining the touch sense of a suction cup attachment to an earplug, exploring a new way of attaching headphones to a user's body.

- Allowing the suction to be placed anywhere on a user and they can extend the ear plug to their ear.
- A music or sound sharing device where a user can listen to music privately while also "sharing" with others as suction transfers the vibrations or sounds.
- A stethoscope of sorts amplifying sounds for users across barriers or vice versa
- A "de-amplifier" taking noise using the suction and translating the negative sound amplification to quiet down noise from outside sources (way more abstract)

Prototyping Exploration Insights

The preliminary insights are that the brute force prototyping, (i.e prototyping that is focused on forcing the combination of two random objects together) once it gets going makes idea generation more fruitful, abstract and exploratory. Having a tangible product in the hand of the designer made thinking about future avenues and concepts for ideas a little easier. Also knowing that the prototypes were very low fidelity divorced the anxiety around the realistic qualities of idea generation during the traditional design process.

It was also interesting reviewing the development of the mouse and pillow combination because aesthetically, it resembles a tiny pillow sack, but it was still able to generate ideas around the other ways of communication it had access to, like its sensory properties. This is reflected in the potential functions that were brainstormed. Each calls on a different sensory interpretation of the product combination that results in radically

different use cases for this potential product.
A pain point that was noticed while brute force combining or designing with objects was the objects being randomly selected. This was because it was hard to see how some products' purposes related to each other in order to combine and so developing ideas felt like a dead end because the elements of both products felt underrepresented.

Picking two objects and breaking them down into their sensory focuses and purposes and then combining and prototyping to inspire new ideas seems to be the process that was followed naturally. This will be important for the next iteration of the method.

Designer Insights
Depending on the combination, it is hard to think of physical combinations that are not attached to the function of the objects that are in front of you as a designer. It can be hard to think of something that is not directly tied to the physicality of the objects (i.e a soft MOUSE, or a PILLOW that you can click on). Finding ways to further abstract multi-sensory elements might be beneficial. Although rooting the ideas in reality might be necessary, and initially all ideas are good ones, but at what point do we stop and reevaluate and restructure directions?

Multi-sensory Thought Processes
The paper The Experience Map. A Tool to Support Experience driven Multisensory Design was very helpful in thinking about the implementation of Multi-sensory principles within design. Using the concept of 'abstraction levels' (the process of removing pragmatic thoughts when thinking from a sensory perspective and gradually implementing more concrete processes) helped to discover new innovative directions by freeing the mind of the designer when generating ideas.

Collecting sensory insights from existing products gives designers the ability to divorce themselves from the physicality of the interview products. From this point designers are dealing with information that is as abstract as it will get within the method. They are able to use the multi-sensory information to design an experience, and when they start prototyping they will attach the physical features of the objects back into the process. This way they can now prototype an object that carries out the experience they envisioned with the abstracted sensory insights using the physical elements that elicit those insights.

"the challenge is to understand what to create and how to create it... The way designers will answer these questions is highly related to the designers' expertise and sensitivity... Designers can start exploring their idea, first at a very conceptual level, to subsequently look at every sensory modality and consider all the properties that will shape the product (e.g. its colour, material, details, etc.)..."
(Camere et al., 2015)

Those four objects turned into two new objects through prototyping, and through that process the method was being discovered.
Internally, from the designers perspective, this is what was happening: Dissecting and analyzing these new objects brought up the answer to the question: what was happening during the prototyping?

1. The brain was observing these objects and categorizing them and dissecting them by their multi-sensory properties. The brain at the same time is thinking of new ways that the combination of these objects could be used in their end state. And what that means is in making these new objects, the physicality and the multi-sensory nature of them were being manipulated, but potential design directions were also being brainstormed. And that is where the

method started to form. At least the very beginning stages of it. Due to the forced combination of these objects, the designer innovated and produced new radical brainstorming prompts and ideas (prompted by the unusual object combinations).
2. The thought process was that in this portion of the method, it would be an optimal place to focus more on the multi-sensory and unintended purposes of these objects as it would potentially promote and facilitate a wider range of potential prototypes.

With that in mind, it was important to formalize the methodology more. This is where user interviews are introduced to gain different perspectives on how these objects were communicating their sensory properties, functionality, and unintended uses.

Iteration I

The next stage that was focused on was taking some of those insights and seeing what information could be used in the next stage of the method.

Addressing Previous Iteration Concerns

It was noted that during the first iteration of the discovery process that the brain is constantly thinking of new functionalities for the prototype as you are already attempting to prototype a specific functionality that was prescribed to the object combination. And so, there was a need to find a way to collect all that information before and during the process, so it was not lost (as it was important to understanding how the process promotes unique design directions) in the building stage of the physical prototype.

A potential solution was:

1. Initially, after developing the first prototype, you catalog all the divergent potential ideas and evaluate them against the physical prototype you have.
2. You pick functionality to prescribe to this object based on every other design direction that comes up in your head while prototyping (later in the process).

However, this was quickly recanted as it was discovered that this could get confusing. As you are building a physical prototype you are building it with a sort of functionality in mind, and so to then take that object and redefine it without readjusting the physical components to better exemplify the new functionality that you are prescribing it does not bode well for the communication of the object and the process itself. It makes the functionality less concrete in its physical manifestation and weakens the process's point (at the time, redefining after prototyping was an attempt to involve all the different design directions coming to mind during the making process).

Developing Innovative Directions

The next thing was to figure out what to do with this new prototype that was produced and what it meant in the process of developing new innovative design directions.

Stopping at this new object did not feel like the extent to which this process could be pushed. In thinking about the communication users and objects have, it was important to incorporate that within this prototyped object, introducing more unintended use cases as well as enhancing the multi-sensory design aspect. The more the object moved away from its initial objects (in terms of functionality and sensory communication of that functionality), the more we would discover unique design directions, unique functionalities, unique physical prototypes that will then lead to

more innovation and novelty within functionality.

So, what developed from there was taking those objects and putting them through user testing to develop or discover their unintended use cases, which is also a corner of the trifecta of the graduation project. With this new prototype, it was important to discover what external users and external designers would think about the prototype in terms of functionality and what information it was providing to them. This was so this information could be cross-referenced with the functionality that had been prescribed during the making process to see whether the intentions of the designer, the outcome of the prototype, and what the new object communicates are aligned. So, some preliminary testing with users was done in order to see what information could be collected from that process.

In tandem with that, testing was also done with the individual existing products to see what insights could be gained from users around sensory experiences and use cases.

Interviews were done around an AB object that combined a clock and a speaker. Users were interviewed about the clock and the speaker before their combination, and then users were interviewed about their prototyped combination, the new object.

This new object is the combination of the speaker and the clock, so users don't know the functionality of this object.

The goal of the interviews was to discover their unintended use through what users believed this new object did. This new physical form was able to elicit functionalities that were not in line with what the designer was thinking when prototyping. Because of this, the user insights surrounding this new form were going to be used to further develop this prototype in the unintended direction. The thought process behind this was to solidify its functionality by enhancing multi-sensory features that aligned with the function direction in order to discover a totally novel combination of sensory communication, physical embodiment, and functionality. Through testing it was revealed that the interview process was essential to the development and discovery of these novel product directions. While it was essential to gaining insights, it also allowed a testing ground to see how well prototyping was being carried out by designers. This is because the way users would respond to the prototype would indicate the level of success of prototyping. The ability for the user to discover object affordances is an indication of the success of the prototype.

Prototyping Insights

It was quickly discovered that the prototyping was not rigorous in terms of the combination of these objects as was anticipated and so a lot of users were confused around what the objects were doing in some cases.

- Users were too stuck on the individual products they recognized and the functionality to came along with those recognizable elements instead of treating form in front of them as a new object. So, a lot of their insights on functionality were focused around the already known functionality of the individual AB objects (This eventually developed into not being an issue with the method, as it led to the introduction of variations in the outcomes. However, this informs the prototyping and the different objects that are being combined. Then, designers are less focused on the concrete functionality and more on designing for the experience of use).
- Although the object's functionality is being prescribed as it is being prototyped, its physicality has less of a defined description which will become more defined in the next round of interviewing. This round will allow for potentially more innovation and more creativity in terms

of prescribed functionalities from external users as it is centered around an unknown object.

- The process up until this point developed into taking all the insights in the first stage from collecting multi-sensory information, using that to develop an AB prototype which is a combination of two objects. Then taking that object and giving it functionality to be tested against the understanding of the object through an external user tasked with defining its functionality.

The process needed to feel seamless in terms of the steps and how they feed into the next stage of the method up until the end goal was reached. The method went through a lot of iterations and restructuring to figure out a form that was really to be fully tested with external designers; that form will be presented in the next section.

The Multi-sensory Unintended Object Method

Taking all those areas of focus, multi-sensory, unintended use, and prototyping, into consideration and marrying all of their insights and revelations into a method allowed the Multi-sensory Unintended Object Method to be born.

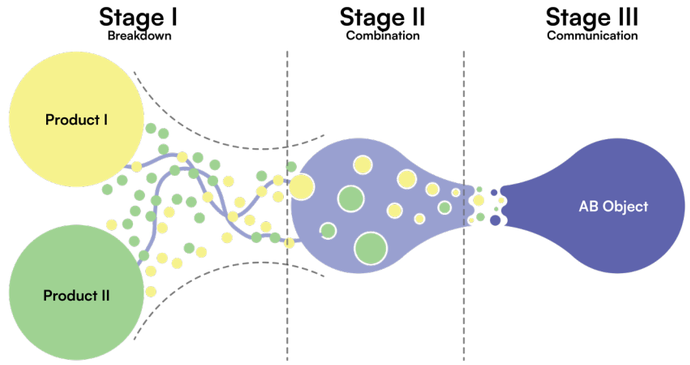

Figure 7: Labeled visualization of the Multi-sensory Unintended Object Method

What Is the Multi-sensory Unintended Object Method?

This method is focused on developing new relationships and experiences within multi-sensory design development.

The Multi-sensory Unintended Object Method is focused around capitalizing on the unintended use of objects to discover new product directions using multi-sensory focused prototyping. Exploring sensory experiences in existing objects to discover new experiences, functionalities, and forms can lead to innovative product developments. It is an exploratory method that looks to expand on the potential of the design process by giving designers a different perspective and focus when developing ideas; a focus that utilizes the sensory information from objects to communicate new functionalities, forms, and experiences. The method takes on 3 stages (Breakdown, Combination, Communication) that focus on sensory analysis and prototyping to get to the method's end stage. It utilizes explicitly designed objects as the

framework for which new combinations and insights will be discovered. It is an exploratory method, not meant to replace the traditional design process, but instead add to it in order to push the boundaries of what is possible as an end goal within product discovery and development. This method is applied before the traditional design process as an idea generation tool to spark creativity with product directions by exploiting the spaces of multi-sensory design, unintended use, and prototyping. The end of the process is not the ultimate end goal, the method allows new design directions to come to light and hopefully will birth new products that have new functionalities and deeper connections with its users.

What Is the Multi-sensory Unintended Object Method?

The method is used when you want to explore potential design solutions that are not present in the forefront of the current design focus or, alternatively, when you want to open the mind to new ideas and design spaces. This method allows you to understand, dissect, and expand on sensory elements of existing and known objects to discover new spaces to design for.

It is best implemented when you are trying to discover new design directions and not when you have specific functionality end goals in mind. Another case is when you have specific objects with sensory experiences that you want to enhance the properties of.
Moreover, the method itself can be adapted to any design environment. Primarily made to explore the potential of the combinations of objects means that the scenarios in which the method is applicable are endless.

Variants

There are potential variations in the starting point of the procedure depending on what intended outcome is wanted:

- Develop or enhance a specific product with others strong sensory elements
- Explore the sensory combinations of two existing products.

Starting Point

The starting point of this method is gathering existing objects with varying functionalities and forms and picking two to use throughout the process (these two can serve different purposes within the method as mentioned in the 'When to Use The Multi-sensory Unintended Prototyping Use Case Method?'). The method heavily relies on the physical embodiment of objects for prototyping, so the ability to break down and combine or explore the physical elements of objects is also important to have access to. The MsUOM is about exploration and discovery and can be seen as a pre-step to a traditional design method that is focused on the end goal being a product.

Expected Outcome

The expected outcome of using this method is an object that contains sensory and physical elements of two separate individual objects. This object is the manifestation of the myriad of unintended design directions that are latent within its existence. Utilizing the sensory combinations and connected physical elements, this object houses an understanding of how these elements (that originated from separate existing products) play a role in this new object's communication with the world. This information and the object associated with it can be used to then develop novel design directions with strong sensory elements enhanced (backed up by the implementation of user feedback from interviews and the prototyping done by the designer). The designer also learns to have a better

understanding of the sensory perception that an object has and how to go about enhancing those elements in the future.

It is not about building a new product necessarily, but about building this object that leads to innovative design directions. The object itself is a totem of the combination of objects, and their conversation with use, experience, and senses. A physical thing that houses all the multi-sensory combinations, enhancements, functionalities, and uses that the object can potentially be developed with at some point. The object is a diary of its journey, and a jumping off point for its evolution.

How to Use The Multi-sensory Unintended Object Method?

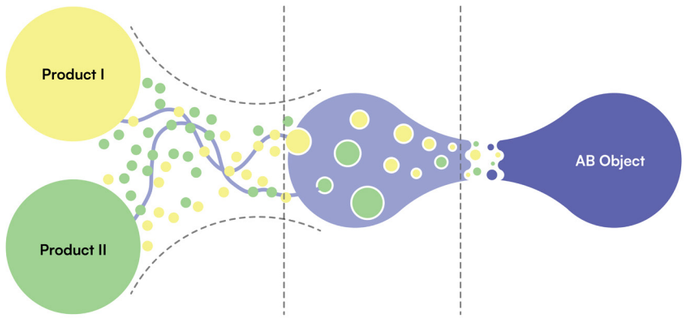

Figure 8: Visualization of the Multi-sensory Unintended Object Method

STAGE 1 (Breakdown)

The breakdown phase is centered around breaking down the existing objects (i.e the cameras, chairs, paint rollers, remotes, TVs, etc) from a multi-sensory standpoint. It is focused on understanding these objects from the perspective of senses and how those elements help with the understanding of the functionality by building up how those sensory elements attribute to the functionality of the object users are being interviewed about. The goal of this phase is to collect sensory information that can inform the prototyping phase in order where the two objects that the designer has chosen will be combined around using the sensory information gathered here.

1. Gather a group of existing objects to use for the process of the method and select two objects at random (there is no need to choose objects based on any reason specific to the steps of this method unless you are following a variant procedure).
2. Conduct user interviews (at least two) focused on the multi-sensory communication of the two objects selected following standard interview procedure and using the list of questions developed for the multi-sensory interview.
3. Analyze the transcript of the interview conducted (following the specifications detailed in the appendix) to figure out specific thematic multi-sensory insights for both objects selected.

STAGE 2 (Combination)

The combination phase is centered around prototyping. This stage means to give designers the space to brute force combines the sensory elements of their two chosen objects in order to come up with a new object (the AB Object) that exists separate to that of the two original objects in functionality. However, the AB object uses the physical components as well as the sensory elements of the original two objects in order to build a new object that has uses those sensory elements to inform a new

prescribed functionality. The phase is about taking those multi-sensory insights from the interviews and using them to develop a new object, with a new functionality, using the combined sensory elements of the original two objects selected in Stage I.

1. Synthesize the sensory elements of the individual objects into a new object with a new functionality.
2. Through prototyping, develop a new functionality for the combination of the two original objects based on using that multi-sensory information from Stage I. Combine these two objects into a new object that physically embodies the multi-sensory experiences of the two individual objects into a new object.
3. Based on this new physical embodiment, describe the physical features of the AB Object in terms of multi-sensory properties and functionality

STAGE 3 (Communication)

The communication phase is about understanding how this new object's function is perceived by an external user. In an effort to further understand how multi-sensory elements, form, and function relate and affect one another, designers will confront their newly designed object with users. The users will be tasked with defining the functionality of the new object themselves and describing why they believe the object in front of them holds that functionality based on the sensory attributes from the physical elements of the object. This will provide more information to the designer that they will be able to use to help develop a product that has sensory focuses at the forefront of the design; as well as providing them with a myriad of functionalities to go along with those base sensory elements. Giving them the tools and information to manipulate the physicality and use of a product development based on understandings and interpretations of users. This phase is also heavily interview based, and follows a standard interview process and has accompanying questions in the appendix.

1. Give the AB Object to user to conduct an interview around them defining the functionality of the object in front of them based on the cues they get from experiencing the object firsthand.
2. The user must define a functionality for the object in front of them based on their interaction with it and their interpretation of what it's supposed to do.
3. With that defined functionality determined, ask users to explain how they came to that functionality based on the sensory experiences of the object.
4. Take that and get the users to describe what they would do to this object to enhance the sensory experiences to enhance or change them to better communicate the functionality they attribute to this object.
5. Take that information, transcribe it and collect thematic insights from individuals to collect information about the full experience of the object and how to enhance that multi-sensory combination initiated in Stage I.

What happens after the completion of the traditional method process?

The method does not have to end where the standard steps stop. There are potential continuations that can be carried out if the designer wants to push their object even further:

- Developing one of the three functionalities collected from the interview (keeping in mind all the additional sensory enhancement that should be added to the AB objects in the second stage interviews)
- Doing another round of prototyping with the AB Object to enhance sensory elements came to light from the interviews in the functionality stage of the process to strengthen the relationship between user and

the object being developed.

- Adding another individual object to address thus creating an alpha object to with a new functionality and enhanced sensory elements carried over from an existing object (potentially reentering the Novel Object Approach from stage III).
- Taking the sensory information gathered up until this stage, develop and entirely new design direction with a new and deeper understanding of the sensory information and their physical elements (potentially reentering the Novel Object Approach from stage II).

Example Method Run-through

Here is an example run through of the method to see the process in action.

STAGE 1 (Breakdown)

1. Gather a group of existing objects to use for the process of the method and select two objects at random (there is no need to choose objects based on any reason specific to the steps of this method unless you are following a variant procedure)

Figure 9: Photo of all potential products that were collected for the method

In this scenario the objects that were selected were the paint roller and the remote. Then the designer conducted user interviews focused on the multi-sensory aspect of the objects that were present in order to categorize and understand their multisensory features. The questions asked were centered on breaking down user understandings of the object from each sense. For example:

- What is this object used for in general?
- Describe to me how to use this object (step by step)
- Describe the use of this object from these three sense perspectives (sight, sound, touch)
- Where would you categorize this object in terms of these three senses (sight, sound, touch)?
- Why did you choose these senses to categorize this object?

For the full transcript as well as the interview guide check the Appendix.

Figure 10: Photo of selection object (remote)

Figure 11: Photo of selection object (paint roller)

User interviews were conducted to gather information about the sensory information and relationship multiple users had with said objects. This introductory interview attempts to capture a wide range of information about the sensory perspective users have with these two objects the remote and the paint roller (both transcripts for the object with multiple interviews is within the appendix). The line of questioning is also present with the appendix and covers a range of topics.

2. Conduct user interviews (at least two) focused on the multi-sensory communication of the two objects selected following standard interview procedure and using the list of questions developed for the multi-sensory interview.

After the interviews the information from the users is used to come up with consistent insights across users to make the action taken with the prototyping stage uniform and more reliable.

The interviews were interesting as hearing the insights that users thought of outside of the perspective of the designer was insightful. It also allowed for new thought processes to start happening in terms of potential combinations that would result in innovative product ideas.

Below is a summary of the insights gathered that are needed to discover the sensory combination that will be carried out in the prototyping stage (the full transcript for the summary is in the appendix).

4. Analyze the transcript of the interview conducted (following the specifications detailed in the appendix) to figure out specific thematic multi-sensory insights for both objects selected.

Summary of Remote Insights

Multi-Sensory Experience

- The remote's functionality is primarily communicated through sight and touch. The combination of visual identification (e.g., color, shape) and tactile feedback (e.g., button texture, pressure) determines the overall user experience.

Integral Sense

- Touch is the most integral sense for the experience of using the remote. The physical interaction with the buttons and the overall feel of the remote are pivotal to its usability.
- Tactile feedback is critical. Users value the feel of the buttons, emphasizing the need for the right pressure and responsiveness.
- Smooth, non-sticky surfaces are important for a pleasant user experience.

Enhancement Suggestions

Touch:

- Improve button texture and responsiveness. Users prefer softer buttons that do not require much effort to press.

Sight:

- Enhance visual features such as button illumination, especially in low-light conditions.

Thematic Comments

- Simplicity and Comfort: Users repeatedly emphasized the need for a simple, comfortable, and user-friendly design.
- Visual Clarity: Clear, intuitive visual design is critical for ease of use.
- Multi-functionality and Efficiency: The remote should handle multiple functions efficiently without overwhelming the user with too many buttons.

Overall Insights

Enhancing the tactile and visual features of the remote control can significantly improve the user experience. Users value a comfortable,

intuitive, and responsive remote that provides clear visual cues and requires minimal effort to operate. Addressing these aspects can lead to a more satisfying interaction with the remote, reducing frustration and increasing efficiency.

Summary of Paint Roller Insights
Multi-Sensory Aspects and Experience:
Touch:

- Touch is integral to the experience, as users need to grip and manipulate the roller effectively.
- The tactile feel of the roller, including its texture and weight, significantly impacts the user experience.
- “Touch because obviously since you’re touching it” (Paint Roller Interview_...)
- “It gives me a feeling that I need to hold it like this. And it’s not the same soft like a sponge” (Paint Roller Interview_...) .

Integral Sense:

- Touch emerged as the most integral sense across the interviews, given the necessity of physically handling the roller and the importance of its tactile feedback.
- “Touch because obviously since you’re touching it” (Paint Roller Interview_...) .

Sense to Enhance:

- Sound was identified as a sense that could be enhanced to improve the overall user experience. Enhanced auditory feedback could help users better control the paint roller and be alerted to issues such as applying too much pressure or needing more paint.
- “Sound because they make not just their roll itself like this. But when you are using the pen, the pen makes up particular noise” (Paint Roller Interview_...) .
- “Ohh, maybe sound can be when you are super strong and you start breaking this, maybe that would be the only thing I would like” (Paint Roller Interview_...) .

Thematic Insights:

- Functionality and Ergonomics: Users consistently discuss the design and usability of the paint roller, emphasizing the importance of grip and ease of use.
- Versatility: The paint roller is seen as a multifunctional tool, with potential uses far beyond painting.
- Potential for Improvement: Suggestions for enhancements focus on improving sensory feedback, particularly sound, to make the tool more user-friendly and informative during use.
- These insights collectively provide a comprehensive understanding of the paint roller’s current user experience and areas for potential enhancement.

STAGE 2 (Combination)

1. Synthesize the sensory elements of the individual objects into a new object with a new functionality.
2. Through prototyping, develop a new functionality for the combination of the two original objects based on using that multi-sensory information from Stage I. Combine these two objects into a new object that physically embodies the multi-sensory experiences of the two individual objects into a new object.
3. Based on this new physical embodiment, describe the physical features of the AB Object in terms of multi-sensory properties and functionality

One-off notes from the summary that the designer pulled from the summary of interview insights

Paint Rollers

- Touch is super important and improving the sound is important
- Giving information about how much pressure is present

Remote

- Button Pressing
- The Feel and the Pressure are important
- Visibility is crucial
- Function is to manage electronic devices

Remote Breakdown

Sight

- The colors are huge indicators of use during this experience

Sound

- There is none, so it is not presently important to the use of the object

Touch

- The touch of the remote communicates where to use it
- Responsiveness of the feedback

Addressing undesired tactile and auditory feedback

The proposed prototyping exercise through building and the analysis of the individual object interview led to the development of the prototype that maps a surface.

This function and subsequent form came from the consistent mentioning of touch. The individual objects of the paint roller and remote were repeatedly called touch heavy communicators. Touch being integral sensory communicators within these objects brought that focus over to the AB Object's form and communication.

Next, enhancements were looked at in terms of these two objects. In the remote the presence of pressure was mentioned as being important and well executed, communicating a completion activating a function within the remote; while within the paint roller pressure was mentioned as an element that could be enhanced in a way that would be helpful with use and understanding of accurate use. The idea of using the remotes pressure application in response to the lack of pressure communication in the paint roller inspired the attachment of those elements together.

Once that occurred, a new potential function came to light. The ability of the foam element of the roller to rotate in combination with the button elements of the remote being repurposed to that surface births the idea of the button elements becoming sensors for the touch between the AB Object and other surface. That surface applies pressure to a section of buttons which sends that information to a linked source that is then translated into actionable information.

This device developed into a handheld scanner of real-life objects that can be transmitted into the digital plane or some sort of electronic database.

Function:

Mapping a surface in the physical plane

The buttons apply pressure to an object to translate that tactile information elsewhere to translate what is going on in this plane.

Figure 12: Photo of prototyped combined object

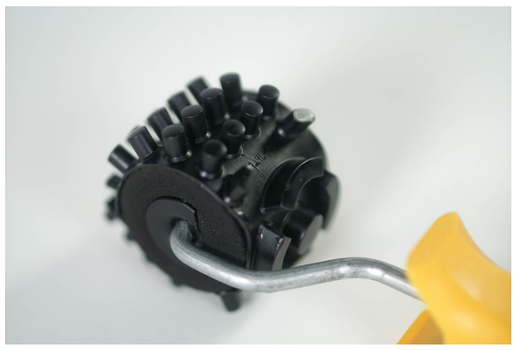

Figure 13: Detailed photos of prototyped combined object

STAGE 3 (Communication)

1. Give the AB Object to user to conduct an interview around them defining the functionality of the object in front of them based on the cues they get from experiencing the object firsthand.

Figure 14: Product Sheet for combined prototyped object

2. The user must define a functionality for the object in front of them based on their interaction with it and their interpretation of what it's supposed to do.
3. With that defined functionality determined, ask users to explain how they came to that functionality based on the sensory experiences of the object.
4. Take that and get the users to describe what they would do to this object to enhance the sensory experiences to enhance or change them to better communicate the functionality they attribute to this object.

Figure 15: Filled out Product Sheets for combined prototyped object done by users during user interviews

Two interviews were conducted with this form to fill out describing the function and sensory focuses of the AB Object. Throughout the interview questions focused around the reasoning behind the perceived function as it relates to the sensory features of the object. These questions attempt to understand how the user interacts with this never before seen object form. The goal is to see how they rationalize its use so that it can be compared to other uses that the designer themselves and other interviewees come up with in order to find thematic consistencies (the unintended line of questions is located in the appendix).

5. Take that information, transcribe it and collect thematic insights from individuals in order to collect information about the full experience of the object and how to enhance that multi-sensory combination that were initiated in Stage I.
6. Create a summary of the breakdown of the final AB Object

Post Functionality Interview Insights

Common Themes and Insights for Further Development

- Users highly value the ability to customize their sensory experiences.
- Develop an app/interface for controlling LED colors, music, and tactile feedback.
- Visual elements like color and design significantly impact user attraction.
- Incorporate high-fidelity speakers and customizable soundscapes.
- Design intuitive tactile controls and experiment with different textures.
- Users see potential in connecting the device with other systems.
- Ensure compatibility with smart home systems, gaming consoles, and other devices.
- Users valued the ability to customize the device's settings according to their preferences.

By following these steps and focusing on the consistent insights from the user interviews, the prototype can be further developed to better define and enhance its inherent multi-sensory capabilities, providing a rich and engaging user experience.

Next Steps

This is the stopping point of the example process run-through. At this point, these insights can be synthesized into actionable steps to develop a novel design. All of the steps in this process contain information that can be compiled into different potential directions that a design can take from here.

SECTION

04

The Future

Evaluating the Method

For the evaluation purposes, the method needed to be tested with an external designer (one that was not involved in the making of the method) it order to see what outcomes they were able to come up with by following the method.

It also will allow for an adaptation of the steps of the method. Having an external designer carry out the task will allow a fresh perspective on what is being carried out within the method and if the focuses and wanted outcomes are achieved. This stage is important to the future of the method as it informs what aspects of the method work or what aspects need to be revisited.

The evaluation was done by two different designers to get more than one perspective on how the methods works and how it can be improved.

Adaptations to the Method (For Testing Purposes)

To get the evaluation started there needed to be some adaptions within the methodology to adjust for time constraints as well as availability of participants. One of those adaptations was in Stage 1 (Breakdown). The interviews for the objects were carried out by me in an effort so reduce the amount of time and scheduling needed for interview participants as well as.

However, this change in the evaluation does not negatively affect the results of the external testing phase as the external designer is still giving

all the information and transcripts and summarized documents from the interviews. On top of that, there is a standard way to carry out interviews that should be known to designers, and that as been outlined within the description of Stage 1 of the method itself.

Because of this, each designer who is carrying out this method should already have the skillset necessary to conduct the interviews in order to get insights consistent with that of what is expected from the method itself. Moreover, the questions come from a standardized set tested and adjusted with each round of development of the MsUOM, so their outcomes should be

This is mitigated by giving the designers the ability to review the transcripts and the interviews so that they can gather the insights that they need for the prototyping phase of the method.

Evaluation

The main portion of the evaluation starts from Stage Two (combination) once the designers are given time to digest the knowledge and follow the line of questioning in the summarized and thematically focused document for each object.

From there the designers begin prototyping based on the ideas generated by the multi-sensory information from the interviews they just analyzed. The main focus of the evaluation would be on how the interview insights translates into the actions the designers take within their prototypes. Seeing how well that sensory information informs and inspires the new combination of the elements of the individual objects. Moreover, how the designers rationalize bringing those new ideas and building a prototype that uses the multi-sensory insights and attempts to clearly communicate a distinct functionality (also derived from the interview insights). This is the crux of the method, how the user based multi-sensory insights and experiences translate into actionable and innovative developments of objects, and how those objects can be built with an understanding of those insights to communicate a new functionality.

The last stage is having designers conduct interviews with an external user who has never seen the individual objects or the combined AB object. As mentioned before, this part of the method is to collect information about how the new object is perceived in terms of function through the multi-sensory perspective. It interview is conducted similarly to the interview in stage I of the method, the only difference is that user are asked to fill out a product sheet for the new object they are being interviewed about, this way the understanding of the object and the rationale behind the choices in functionality. This as well as the first stage interviews were not conducted with the external designer as the scheduling did not allow for it to be put together as well as the fact that it is the same structure as standard interviews that designers should already be equipped with as a skill. So, in order to focus on the portion of the method that was up in the air in terms of validity, focus was placed on getting designers to run through and evaluate the prototyping section to see how the multi-sensory information translates over to their prototypes.

Comments from Evaluation

The comments from the evaluations were insightful for the future development of the method. Throughout the evaluation process, external designers were asked to comment on the process. This was to discover what was working, and what they believed could be improved. A lot of information came out of this evaluation that should be considered in future iterations of the method.

"I think there is too much, too much information... I think if only like communicate the conclusions... because I already start to forget what's happening there."

External Designer I

There is a lot of information that comes between all the objects even in the way that the summaries are sectioned off now. It is important for all summarized information to be delivered concisely to the designers so that they are not overwhelmed by the insights.

Moreover, it is important for the designers to conduct the interviews in future testing, this way they can have a better understanding of the documented insights and have a better idea of what they are looking for when they review the information back for thematic insights. The overwhelming amount of information does not help with the selection process. Any variations in the method should not have designers selecting objects based on the interview insights. Selecting two objects as the first step in the process is essential.

"Like if you pick these two objects and then you maybe can like cluster some insights from both together."
"That is like the other way around is introducing the bias from myself."
External Designer I

Understanding the steps of the process or looking through the interview documentation introduces a bias in the process that is not necessary as it might limit the range of ideas that users will come up with when combining products. Having designers pick objects before anything else allows for the greatest range of unlinked products being selected together.

The workflow would be:
1. Designers pick two objects
2. The process of the method is explained
3. Designers conduct the interview process

"Cluster them in like different senses. So instead of like separate documents. So, I'm reading it like from the telephone perspective and hair dryer perspective and if I I'm thinking like it would be easier for."
External Designer I

The insights from the interviews should be presented together. The layout should be segmented by questions and by senses, not two separate documents. This will allow for designers to compare and contrast the multi-sensory elements of the products in real time and might allow for connections to come up more easily in order to inform the prototyping process.

"What I'm doing now is like, more randomly, I didn't follow any like routine or order so... If I want to based on the insight from the document, I would do a brainstorm on those insights before disassembly...Because right now I'm sort of lost because I have more information. So I think it will be like if I want to focus on that information, I should think about like use that information because when I open up the products I'm like, not overwhelmed, or distracted by everything...So it makes sense if I just start thinking about those first."
External Designer I

A brainstorming stage needs to be implemented in the process for designers' ideas to be added and understood before they begin making. The brainstorming was originally built into the prototyping stage; however, this results in many ideas being developed while designers

are disassembling their products. It once again results in an overload of information and ideas.

"I don't know. It's a mindset thing, like if I see for example here if I read like recommendation for improvement. Yeah, they already think OK, what's good in this can be implied in this to help it to improve... But then that's not the purpose, because in that case I'm thinking of improving the functionality of this one object."
External Designer I

The improvements section of the multi-sensory interviews begins to influence the mind of designers and makes them focus on those aspects instead of a wider range of insights.

"It provides like an example for like different people's perspective.

Differently, for example, I wouldn't say like this button is heavy to press, but like it's mentioning like yeah, it's very hard to press or heavy to press maybe. But on the like then you get different perspective of experiencing it and you think that's helpful

I don't experience that way, so it's good to know, like different people have different experiences. It's more like giving me more new ways of observing the objects.

But I think it's helpful in a way that is providing new perspectives and like different people have different."

Overall, the designers that conducted the evaluation relayed that the method was a new and exciting process that they felt was leading them to think about new product spaces. The multi-sensory focus as well as just having the interviews helped with getting out of their own head in terms of how products are communicating with them and looking at the interview insights as more ubiquitous information that is actionable, as well as information that is unique to help spark design directions. There are aspects of the method that must be updated and tested to get to the next iteration. All of that is built off of the evaluation results from external designers as well as the trajectory of the method itself.

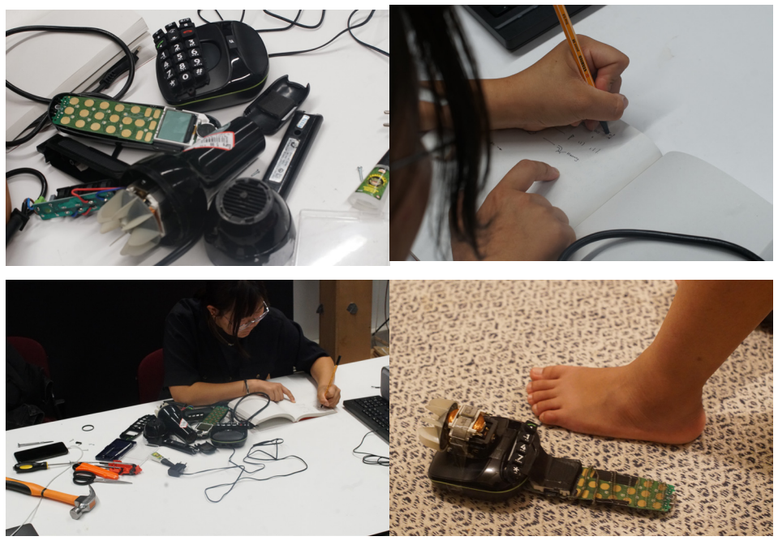

Figure 16: Photos taken during the evaluation of the method

New Potential Method

STAGE 1 (Breakdown)
The breakdown phase is centered around breaking down the existing objects (i.e the cameras, chairs, paint rollers, remotes, TVs, etc) from a multi-sensory standpoint. It is focused on understanding these objects from the perspective of senses and how those elements help with the understanding of the functionality by building up how those sensory elements attribute to the functionality of the object users are being interviewed about. The goal of this phase is to collect sensory information that can inform the prototyping phase in order where the two objects that the designer has chosen will be combined around using the sensory information gathered here.

STAGE 2 (Brainstorming)
This stage is focused on giving designers the space to synthesize information from user interviews. With a new brainstorming stage, designers can come up with ideas from the interview insights before diving into the physical products. This allows designers to develop potential ideas and weigh them against one another as well as against the multi-sensory insights before building it will help them solidify their idea against the insights instead of brainstorming exclusively with the physical components of the products. This way when they finally begin the disassembly and prototyping process, they are interacting with the physical internal components of each product and trying to figure out how those elements can help build and communicate the experience and functionality of the object that they brainstormed during that brainstorming exclusive phase.

STAGE 3 (Combination)
The combination phase is centered around prototyping. This stage means to give designers the space to brute force combine the sensory elements of their two chosen objects in order to come up with a new object (the AB Object) that exists separate to that of the two original objects in functionality. However, the AB object uses the physical components as well as the sensory elements of the original two objects in order to build a new object that uses those sensory elements to inform a new prescribed functionality. The phase is about taking those multi-sensory insights from the interviews and using them to develop a new object, with a new functionality, using the combined sensory elements of the original two objects selected in Stage I.

STAGE 4 (Communication)
The communication phase is about understanding how this new object's function is perceived by an external user. In an effort to further understand how multi-sensory elements, form, and function relate and affect one another, designers will confront their newly designed object with users. The users will be tasked with defining the functionality of the new object themselves and describing why they believe the object in front of them holds that functionality based on the sensory attributes from the physical elements of the object. This will provide more information to the designer that they will be able to use to help develop a product that has sensory focuses at the forefront of the design; as well as providing them with a myriad of functionalities to go along with those base sensory elements. Giving them the tools and information to manipulate the physicality and use of a product development based on understandings and interpretations of users. This phase is also heavily interview based, and follows a standard interview process and has accompanying questions in the appendix.

SECTION

05

Conclusions

Conclusions

This paper tries to answer the question: In what ways can we capitalize on the unintended use of objects to discover new product directions using multi-sensory focused prototyping?

There is latent messaging within all products that tell the user how they are supposed to interact with said object. That unintended space is where new products can potentially be born, if they are deliberately cultivated and developed. The traditional design process attempts to design objects without this unintended space; however, it is inherent in all things (Hassan et al., 2022). Its presence with objects is not a sign of bad design, but of an opportunity to create something new. Utilizing the multi-sensory information that is linked with an object's experience as well as physical attributes, the method attempts to design objects that can house multiple sensory focuses in order to carry out a functionality inspired by the unintended use space within existing objects.

Contributions

Through testing and iterating on the method a conclusion was reached on a process that will lead designers to discovering product spaces where their designed object exists with innovative functionality possibilities and strong sensory focuses that inform a consistent and unique form. The method bodes well for the future of design in all areas of relevance, as it will lead to products that are consistent and coherent in form, function and experience, as well as designers that understand the importance of the user relationship with a product without sacrificing innovation within design.

The Multi-sensory Unintended Object Method has been developed to a state where it can contribute to the design development process. The method gets designers to see the importance of multi-sensory inclusion in the design process. This contribution on its own will result in designs that are more connected with users emotionally and in terms of use. On top of this, the method results in product ideas that have an expanded sense of functionality, this means that new products will exist in a state where their embodiment is synonymous with their use, as well as their sensory signatures.

Every step of the method builds off the other, collecting information for designers to use to design products with aligned justification in terms of form, function, and experience.

Moreover, it will result in innovative design ideas (this can be seen in the ideas that were developed during the method making). Ideas generated with this method push the boundaries of idea generation because designers are not tied to the physicality or reality of the design process within this method. Designers are making decisions based on sensory insights that although are gained from physical objects, are not attached to them. This abstraction of the insights gives designers the freedom to think of interesting ways of combining elements. Additionally, being forced to combine existing objects that might not be related from first glance forces designers to expand their mind in terms of possibilities that could be achieved by their prototyping skills.

The combination of multi-sensory design, prototyping, and unintended use creates a unique mix of knowledge and design implementation that creates space for innovation. Objects prototyped through this method will lead to novel design ideas that will develop into innovative products because of the methods focus on creating a wholistic product.

Although this method's end goal is not that fully realized product itself, its commitment to building the framework for the end goal of a fully realized product makes it a seamless addition to the traditional design method in any scenario.

Where the final method fits into the traditional design process

This method's adaptable nature allows it to be viable in many situations. The method itself being an addition to the traditional design process allows for it to be plugged into any situation that needs the inclusion of multi-sensory focuses or a streamlined development of a product from an experience, functionality, and form perspective.

Educational Sector

The method works within the educational sector as a way of learning. It opens the door for new perspectives with the design space, making design students more aware of multi-sensory importance within the development of products. It also instills in them the importance of connected design elements when developing products. Keeping the sensory experience in mind just as much as functionality concerns is important to designing a product that really connects with users (Sonneveld et al., 2008).

Professional Sector

In the professional sector, the process inspires new product directions for projects. The method in this context can be used to understand the multi-sensory aspects of products to bolster the relationship between the physicality of an object and the experiences that potential users will have in developing a product. It can also be used to play around with the redesigning of an existing product (if you were to use a variant procedure)

to add sensory aspects of a specific product into another product lacking in a specific area of experience.

Limitations

Some of the limitations of developing the method came down to the amount of information collected from different users. In developing the method, it was unclear how much time certain things would take to complete (i.e. multi-sensory interviews, prototyping, unintended use interviews), because of this prioritization of different tasks that needed to take place meant that there were areas did not get as much time as others. One thing that needed to be focused on more was the number of interviews conducted per individual object and AB Object. Iterating on the interviews took a while, and on top of that, conducting them took a substantial amount of time. So, the amount of information that was collected per individual object was subject to vary and usually stood around two interviews per object.

Another limitation was access to random prototyping materials. Because the results of the method are different each time, during the prototyping process it is hard to anticipate the needs of the designer when combining objects. This makes it hard to have on hand the necessary supplementary tools and materials that are not present in the objects themselves to help designers produce the most accurate version of the AB object that they envisioned.

These limitations did not halt the project's progression, but they should be noted if the method is to be revisited and used in the future.

Future Recommendations (Where should the method go from here?)

The Multi-sensory Unintended Object Method is in a state where it is viable to use to come up with insights for innovative products. However, there are still some iterations and testing that would be useful in developing the methodology even further. These are some of the recommendations that could be implemented in the next iteration of the MsUOM.

Updating the method based on the specifications mentioned during the evaluation will be important to the development of the MsUOM. Starting with a restructuring of the stages by including a synthesis phase which is focused on understanding insights and brainstorming ideas for the prototyping phase. Separating these two elements into its own stage emphasizes their importance in the process. It also allows designers the opportunity to collect their thoughts before moving on to the most intensive part of the process where they are taking this newfound knowledge and implementing it in a physical form.

The next thing to do would be to test the entire method with designers from the selection stage to the AB object interview and synthesis. It is important to see how the entire process affects different stages of the whole method as well as if every step translates well into one another and that they feel linked and coherent.

One thing is to test the method with clones of the same products but with different designers to see how information is transmitted and interpreted and utilized between designers. The method is supposed to produce different ideas each time it is conducted, even if the same products are

used; so, it would be interesting to see how that plays out.

These are the few things that need to be kept in mind when taking the method to the next level. These aspects of the method could be implemented to make the method more seamless.

Self Relection

My graduation project was motivated by my interest in the communication products have with users. I was fascinated by the ability of a product to be able to be used in more context than it was designed for. This was the impetus for the project as I wanted to see how I could fold my interest of understanding this communication into something actionable.

Through the guidance of my supervisory team I was able to learn a lot about how to approach working on such a large scale project as I have never done anything like this before, in terms of time. They were both super accommodating and knowledgeable about the topic at hand as well as how to work effectively.

One big thing that I learned was to trust the process. There were many times that I went into meetings super stressed and overwhelmed because an outcome I had reached wasn't in line with what I expected. However, time and time again I was reassured that things weren't supposed to always go the way you expected. Unexpected insights are still incredibly helpful to the process of development and learning. That is something that I will take with me from this project.

I also learned about the importance of time management and good planning. When the project began I had made a huge effort to plan and keep track of the timeline I had given myself. But as things do with projects, timelines changed and I felt like I wasn't the best at keeping up. Once again, my supervisory team was super helpful in easing my stress, and that helped along the way but I think that time management was a huge concern for me in general with this project. I had such big ideas for where I wanted to go and I lost track of the time that I had.

In terms of the project, I learned a lot about multi-sensory design in relation to the design process. I had assumed that sensory aspects of products were built into design processes from the get-go. As every object a person interacts with has sensory information it transmits. However, learning that multi-sensory design was so segmented from the traditional design process was a shock to me. Moreover, learning about the where prototypes can be used was fascinating to me. Their ability to hold more information and purpose than just an object that represents a design idea was mind blowing when I first encountered it. A lot of the literature I read was fascinating to me and I hope that I continue to learn about all of these areas of interest. Through the project my interest about all three topics has grown, as the more I learned about each area (multi-sensory design, prototyping, and unintended use). Each paper I read about any of these areas was super compelling, even in the areas that did not necessarily relate to the work I was doing.

This project was a huge eye opener for me in terms of who I am as a designer, and what I am interested in in the future, all I know is that my grown is not over and there is still so much to learn and improve on.

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Appendix

Appendix

QR Code to Full Transcripts
Prototyping Videos, Photos,
Insight summaries, etc.

QR Code to Video

Appendix

Individual Objects

Introductory Context Questions (Multi-sensory Focus)

1. What is this object?
2. Do you use/have you used this object?
3. What is this object used for in general?
    a. Describe to me how to use this object (step by step)
    b. Describe the use of this object from these three sense perspectives (sight, sound, touch)
4. Where would you categorize this object in terms of these three senses (sight, sound, touch)?
    a. Why did you choose these senses to categorize this object?
5. Describe all the different ways this object can be used (i.e. a chair as a way to get an object out of reach)
    a. Ways you have used it
    b. Ways you can imagine it being used
6. Imagine you are stranded on an island (office, living room) with only this object, what would you use it for?
7. Is there anything you tried to do with this object that didn't work that you thought would? What was it?
8. What is the most creative/unusual way you have used this object?
9. Describe the experience of using this object from every sensory perspective
10. Is there a specific sense you would like to improve about this object's experience
11. Which sense is the most important to the experience? The least important?

Extra Question Set (Depending on direction of conversation)

Multi-Sensory Experience

1. What do you think about the sensory aspects of using this object?
2. How do you feel about the sounds the object makes when in use?
3. Do you think the visual aspect of the object that helps you in any way during use?
4. How important is the tactile feel of the object in your experience?
5. How do the senses inform or influence the use of the object?

Sight

1. How does the color or design of this object affect your use?

2. Do you rely on visual indicators to know when to do something with functionality? If so, how?
3. How does the appearance of the object influence your interaction with it?
4. Do you rely on any visual indicators to use this object effectively?
5. What visual features do you find most helpful when using this object?
6. Would any changes in color, design, or visual indicators improve your experience?

Sound

1. How do you feel about the noise the object makes when it's in use?
2. Can you describe any specific sounds that would improve your experience using the object?
3. What sounds does this object make when in use, and how do they affect your experience?
4. Is there any auditory feedback from the object that you find useful?
5. How could sound be used to enhance the functionality or usability of this object?
6. Would you prefer the object to be quieter, louder, or produce different sounds?

Touch

1. How does the texture of the object handle affect your understanding of functionality?
2. How does the texture of the object affect your comfort and control when using it?
3. Do you find the weight and balance of the object appropriate for its intended use?
4. How important is the tactile feedback you receive from this object?
5. What changes in the material or design could improve your tactile experience?

Enhancements and Improvements

1. What specific features would you add to the object to improve its functionality?
2. How could the object be redesigned to be more ergonomic?
3. What technological enhancements could be integrated into the object?
4. What features would you add to this object to enhance its performance?
5. Is there any feature or aspect of this object that you think could be improved?
6. What sensory aspect of this object would you enhance to improve the user experience?
7. How could this object be redesigned to be more user-friendly?
8. What changes would make this object more ergonomic and comfortable to use?

General Usage and Experience:

1. What do you find most intuitive about using the object?
2. Are there any common issues you encounter with the object?
3. What do you find most intuitive about using this object?
4. What challenges do you often encounter when using this object?

5. What do you like most about using this object?
6. How often do you use this object, and for what purposes?
7. How do you usually use this object?
8. What do you find most challenging about using this object?
9. What do you like most about using this object?

Regarding Unintended Use Cases:

1. Can you think of any alternative uses for this object? Why?
2. Have you ever used this object to do anything else?
3. What are some creative ways you think this object could be repurposed?

Sample Transcripts

Paint Roller Interview Transcripts

Remote Interview Transcripts

Post Interview Insights (Paint Roller)

Multi-Sensory Aspects and Experience:

Sight:
- Users rely on visual cues to gauge paint coverage and ensure even application.
- Visual feedback (e.g., color changes) helps users know when to reload paint.
- "With the side you can see you need more paint or not? Because it's yellow" (Paint Roller Interview_...) .

Sound:
- Current sound feedback is minimal and mostly incidental.
- There is potential to enhance the auditory feedback to signal proper pressure application or low paint levels.
- "Sound because they make not just their roll itself like this. But when you are using the pen, the pen makes up particular noise" (Paint Roller Interview_...) .
- "I think the sound is not related to the object. It's more related to where the object goes" (Paint Roller Interview_...) .

Touch:
- Touch is integral to the experience, as users need to grip and manipulate the roller effectively.
- The tactile feel of the roller, including its texture and weight, significantly impacts the user experience.
- "Touch because obviously since you're touching it" (Paint Roller Interview_...)

    - "It gives me a feeling that I need to hold it like this. And it's not the same soft like a sponge" (Paint Roller Interview_...) .

Unintended Use Cases:

- Users identified various creative and practical uses beyond painting, such as using it as a foam roller for sports, a hook for picking fruit, or even for fishing.
- These insights suggest that the paint roller's design inspires versatility and can be adapted for multiple purposes.
- "Well, this kind of looks like foam rollers that you could use for warming up in sports tight" (Paint Roller Interview_...) .
- "I could use it for as a hook to pick... coconuts and stuff like that, or I could use it for fishing" (Paint Roller Interview_...) .

Integral Sense:

- **Touch** emerged as the most integral sense across the interviews, given the necessity of physically handling the roller and the importance of its tactile feedback.
- "Touch because obviously since you're touching it" (Paint Roller Interview_...) .
- "I don't say touch me to know where to put the hand" (Paint Roller Interview_...) .

Sense to Enhance:

- **Sound** was identified as a sense that could be enhanced to improve the overall user experience. Enhanced auditory feedback could help users better control the paint roller and be alerted to issues such as applying too much pressure or needing more paint.
- "Sound because they make not just their roll itself like this. But when you are using the pen, the pen makes up particular noise" (Paint Roller Interview_...) .
- "Ohh, maybe sound can be when you are super strong and you start breaking this, maybe that would be the only thing I would like" (Paint Roller Interview_...) .

Overall Function:

- The primary function of the paint roller is to apply paint to surfaces efficiently and evenly.
- There is also a recognition of its versatility and potential for various unintended uses, reflecting its adaptable design.
- "I think it's for painting, but maybe say you have a prototype. You could attach... some paper" (Paint Roller Interview_...) .
- "Maybe if you're stranded on an island you could attach some pole like a wooden stick to it and see if it make it easy to use with a longer stick" (Paint Roller Interview_...) .

Thematic Insights:

- **Functionality and Ergonomics**: Users consistently discuss the design and usability of the paint roller, emphasizing the importance of grip and ease of use.
- **Versatility**: The paint roller is seen as a multifunctional tool, with potential uses far beyond painting.
- **Potential for Improvement**: Suggestions for enhancements focus on improving sensory feedback, particularly sound, to make the tool more user-friendly and informative during use.

These insights collectively provide a comprehensive understanding of the paint roller's current user experience and areas for potential enhancement.

Post Interview Insights (Remote)

Functionality in Terms of Senses

Sight:
- Visual cues, such as color-coded buttons and clear labeling, are crucial for identifying and using the remote control efficiently.
- The layout and visual differentiation of buttons help users navigate the remote without confusion.

Sound:
- Auditory feedback, while noted, is generally seen as an undesirable feature. Users prefer a silent remote, associating sound with malfunction or poor design.

Touch:
- Tactile feedback is critical. Users value the feel of the buttons, emphasizing the need for the right pressure and responsiveness.
- Smooth, non-sticky surfaces are important for a pleasant user experience.

Multi-Sensory Experience

- The remote's functionality is primarily communicated through sight and touch. The combination of visual identification (e.g., color, shape) and tactile feedback (e.g., button texture, pressure) determines the overall user experience.

Unintended Use Cases

- **Hammering**: Used to hammer small items in the absence of proper tools.

- **Elevating Objects**: Used as a makeshift stand for taking selfies when no tripod is available.
- **Handling**: The remote's size makes it easy to locate and handle, preventing it from getting lost easily.

Integral Sense

- **Touch** is the most integral sense for the experience of using the remote. The physical interaction with the buttons and the overall feel of the remote are pivotal to its usability.

Enhancement Suggestions

Touch:
  - Improve button texture and responsiveness. Users prefer softer buttons that do not require much effort to press.
  - Address issues with sticky or unpleasant surfaces.

Sight:
  - Enhance visual features such as button illumination, especially in low-light conditions.
  - Use clear, intuitive labeling and color-coding to make the remote more user-friendly.

Thematic Comments

- **Simplicity and Comfort**: Users repeatedly emphasized the need for a simple, comfortable, and user-friendly design.
- **Visual Clarity**: Clear, intuitive visual design is critical for ease of use.
- **Multi-functionality and Efficiency**: The remote should handle multiple functions efficiently without overwhelming the user with too many buttons.

Function of the Remote Control

- **Primary Role**: The remote is used for controlling electronic devices, primarily TVs, including changing channels and adjusting volume.
- **Multi-functionality**: Users expect the remote to manage various functions across multiple devices.
- **Ease of Use**: The remote should be easy to handle and operate, with a design that facilitates quick and accurate button presses.
- **Visibility and Identification**: Clear visual differentiation of buttons is necessary to enhance usability.

Overall Insights

Enhancing the tactile and visual features of the remote control can significantly improve the user experience. Users value a comfortable, intuitive, and responsive remote that provides clear visual cues and requires minimal effort to operate. Addressing these aspects can lead to a more satisfying interaction with the remote, reducing frustration and increasing efficiency.

Transcript Analysis Question

Transcript Context

This is the transcript for an interview conducted about the multi-sensory aspects and experience of this product and its unintended use cases. The goal of this interview is to retrieve information about this product in order to categorize its functionality in terms of senses and to explore the roll of the three senses (sight, sound, and touch) in the experience of using this object in order to find new and innovative understand how this product communicates its functionality through the senses and how the senses influence the experience of the object with the user. This product is (name of the product) and there are (number of interviews) interviews present in this file (transcript 1 and transcript 2). When I ask for insights, please give me direct quotations references from the document, thank you!

Thematic Transcript Questions

1. What sense seems to be integral to the experience of this object across the interviews?
2. What sense should be enhanced to improve the experience of this object across the interviews?
3. Are there any comments that are thematic across these interviews? Both in a general sense and multi-sensory perspective?
4. What is the function of this object as defined by all the interviews
5. Describe the functionality and insights people gave using multi-sensory design language and concepts.
6. Give a summary of important insights based on the interview and all the questions I asked.

AB Object

Unintended Use Case Questions

Unintended Context Questions

1. What is this object?
    a. Do you use/have you used this object?
    b. What is this object used for in general?
    c. Describe to me how to use this object (step by step)
2. Where would you categorize this object in terms of these three senses (sight, sound, touch)?
    a. Why did you choose these senses to categorize this object?
3. Describe this object and its experience in terms of each of these senses (Sight, Sound, Touch)
4. What words would you use to specifically describe this sensory experience of using this object
5. Are there Visual features that are present in this object that enhance the usage (Aesthetics, Visual Functionality)
6. Are there Auditory features that are present in this object that enhance the usage? ()
7. Are there Tactile/Haptic features that are present in this object that enhance the usage?()
8. What would you do to this object in order to enhance specific sensory elements that you described earlier
9. Which sense is most apparent in the usage of this object
10. Which sense is most important in the usage of this object
11. Which/what sensory enhancement would greatly increase the experience of this object
12. What words would you use to describe this object and explain why?
    a. Word Bank:
    b. Can you think of any others?
13. Any more comments?

AB Object Sample Transcripts

AB Object Functionality Interview Transcript I

AB Object Functionality Interview Transcript II

Post Functionality Interview Insights

Visual Elements (Sight)

Color and LEDs:

- Users were attracted to the ability to change colors using LEDs, which communicated the device's potential for creating various visual ambiances.
    - Quotations:
        - "And you can change this color like that. They have some LEDs." (A Paint Roller AB)
        - "And maybe, according to the mood of the music, it can turn one color or another, or according with ambience in the atmosphere you want, it can be one or the other one." (A Paint Roller AB)
        - "The Honda attracts me because of the color and the top part that attracts me because of the texture cause it's like not common." (C Paint Roller AB)

Auditory Elements (Sound)

Music and Sound Integration:

- Users emphasized the importance of integrating music and sound, highlighting the device's potential to enhance auditory experiences.
- Quotations:
    - "That maybe so smart and the sound because the sound, the music." (A Paint Roller AB)
    - "It sounds like should I hold like should it maybe does something?" (C Paint Roller AB)

Tactile Elements (Touch)

Texture and Buttons:

- The device's physical buttons and unique textures provided a tactile experience that users found appealing and important.
    - Quotations:
        - "Untouched because you have here the buttons to change the music to play change." (A Paint Roller AB)
        - "The top part that attracts me because of the texture cause it's like not common. That's why I always want to touch it." (C Paint Roller AB)

Integration with Other Technologies

Customization and Control:

- Users valued the ability to customize the device's settings according to their preferences.
    - Quotations:
        - "You can choose like atmosphere or music." (A Paint Roller AB)
        - "Connecting this you can...customized game configuration." (C Paint Roller AB)

Technological Integration:

- Users saw potential in connecting the device with other electronic systems, emphasizing the importance of integration.
    - Quotations:
        - "Place the cables to the speaker." (A Paint Roller AB)
        - "Connected to...like a microcontroller or something like a module...to create an atmosphere." (A Paint Roller AB)

Key Multi-Sensory Consistencies

- **Sight**: Importance of color changes and LED lights for visual appeal.
- **Sound**: Integration of music and sound as a key feature.
- **Touch**: Unique textures and physical buttons that invite tactile interaction.

Common Themes and Insights for Further Development

Multi-Sensory Customization:

- Users highly value the ability to customize their sensory experiences.
- Develop an app/interface for controlling LED colors, music, and tactile feedback.

Enhanced Visual Appeal:

- Visual elements like color and design significantly impact user attraction.
- Invest in high-quality LED technology and focus on aesthetic design.

Improved Auditory Interaction:

- Sound integration enhances the multi-sensory experience.
- Incorporate high-fidelity speakers and customizable soundscapes.

Enhanced Tactile Feedback:

- Physical interaction through buttons and textures is crucial.
- Design intuitive tactile controls and experiment with different textures.

Integration with Other Technologies:

- Users see potential in connecting the device with other systems.
- Ensure compatibility with smart home systems, gaming consoles, and other devices.

By following these steps and focusing on the consistent insights from the user interviews, you can further develop the prototype to better define and enhance its inherent multi-sensory capabilities, providing a rich and engaging user experience.

Unintended Transcript Analysis Question

Thematic Unintended Transcript Context

These two documents contain interviews with two different people each trying to develop and define the functionality of the same device that is to their knowledge undefined in its usability and functionality. The goal of these interviews is to figure out thematic consistency between these two interviews in terms of insights that the interviewee's gain from the object that they are being asked about. Although they developed different functionalities is there consistent information that the object gives users that can then be used to develop the object even further? for all answers please give quotations from both documents.

Thematic Unintended Transcript Questions

1. Are there multi-sensory consistencies across sight sound and touch with each of these interviews?
2. What words, terms, or concepts were repeated between the interviews
3. What multi-sensory experiences or explanations of the object were repeated between both interviews
4. Are there any similarities between the two final functionalities that these users came up with?
5. The goal of these interviews is to find a consistent set of insights across the interviews that can be used to develop this object further to better define its inherent multi-sensory. To do that I need to understand what about this objects is communicating its functionality and sensory experience to the users as well as what to do with that information afterwards.
6. What are the next steps I should take to further develop this prototype. using the consistent insights from users as well as quotations

Combined Object Breakdown

AB01

Speaker

Sound

Communication of information, a speakers primary interaction with a user is the sound quality coming from it, how that information is being communicated is the important feature of the object

Clock

Sight

Visual design is crucial for easy readability and aesthetic appeal, information is communicated through visually looking at the face on the clock

SOUND TOUCH VISION

AB01

Speaker

Sound

Communication of information, a speakers primary interaction with a user is the sound quality coming from it, how that information is being communicated is the important feature of the object

Clock

Sight

Visual design is crucial for easy readability and aesthetic appeal, information is communicated through visually looking at the face on the clock

SOUND TOUCH VISION

A01

Remote

Touch

The remote's user interaction is primarily communicated through touch. Its sensory focus is around ergonomics and comfortability with the use of the device

The remote is used to control the TV by signaling to it different commands by pressing button

TOUCH

A02

VR Headset

Touch

The VR Headset interfaces with the face, so physical touch is present. It needs to be comfortable in order to be used. Weight also contributes because it is resting on the head, pulling it down. Additionally, controls for the device require touch interface.

Sight

VR Headsets are primarily communicating with the eyes as they are a visual interaction for users, it needs to be also visually comfortable for users to want to interact with it.

A VR Headset is used to create immersive experiences for users where they are transported into a new space

TOUCH VISION

AB02

Pillow

Touch

The pillow sensory focus is on touch as it is primarily about providing comfort to an individuals head

Computer Mouse

Touch

The mouse interaction is ergonomic and fits within the users hands and translates the physical touch of the user into actionable digital information

TOUCH

A03

Umbrella

Touch

Touch can be explained by the umbrella literally being a physical barrier between physical properties trying to interact with a user

Sight

The umbrella is able to communicate when it is working properly you are able to visually see that you are being protected from whatever element you are using the umbrella against

Sound

Sound is also integral to the interaction of the umbrella able to tell if the umbrella is working properly by the audio feedback on opening and closing. Additionally, in the rain, the umbrella communicates that it is still useful by the audio feedback of the rain hitting the umbrella

SOUND TOUCH VISION

Acts as a protective barrier between the elements and a user

All existing Objects

AB Object Product Sheet

Introducing the new
Dark Sunflower sound

Speaker

220e

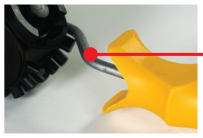
Multi-sensory description

Sight: It can have different lights configuration accordign to he song or the atmosphere that the user wants to have
Touch: It has buttons to change song, play/pause and volume
Sound: Music

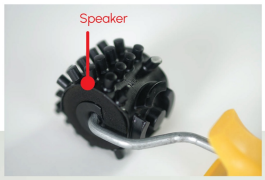
Light atmosphere acccording to the music/mood

Product Description

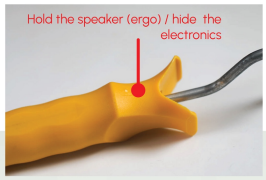
It is a decorative speaker to play music combined with lights. The lights can work accordign to the song or accordign of the atmosphere



Hide the cables from the PCB/battery etc to the speaker



Speaker



Hold the speaker (ergo) / hide the electronics

Charge the speaker

Introducing the new

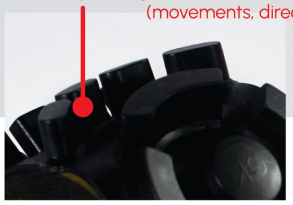
'YOU GAME' controller

Video gaming

100$

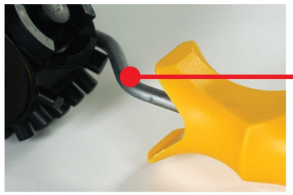
Multi-sensory description
Lights and sounds can be personalized
Ergonomic, pleasant to touch with vibration buttons

pressing to control virtual avatar
(movements, direction...)



Product Description

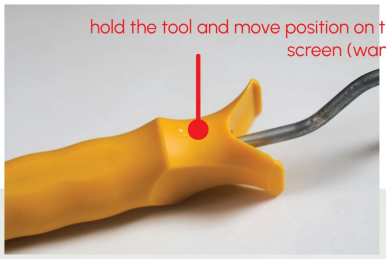
With the tool you can play remotely videogames in a personalized way. The tool is connected to a microcontroller/computer program where you set your specific gaming configuration (what options you have for each part of the tool). Here is explained one configuration example.



sliding in /out to control game modes
(beginner, advanced...)

rotating to control game scenarios
(night, day, under water...)

hold the tool and move position on the screen (wand)



connect the tool to your own microcontroller/-
computer with customized game configuration

You are being invited to participate in a research study titled “Discovering Use Cases for Multi-sensory focused Objects”. This study is being done by Caleb Amanfu from the TU Delft.

The purpose of this research study is to explore the multi-sensory experiences within existing objects to discover how these senses influence the usability and experience with these objects. This research is being used to develop a new a new method within prototyping for multi-sensory design. This will take you approximately *30* minutes to complete. The data will be used for insights for future prototyping focuses within the development of the multisensory prototyping method. We will be asking you to answer questions attempting to prompt a thoughts and insights about the experiences of using multiple objects from the perspective of the three senses (sight, sound, touch). You will be prompted to answer questions about 3 to 4 objects. Moreover, you will be prompted to help discover use cases for a new object that doesn’t currently have a prescribed functionality.

As with any activity the risk of a breach is always possible. To the best of our ability your answers in this study will remain confidential. We will minimize any risks by excluding personal details from reports, however, your likeness might be used in reports or presentations in order to show the process.

Your participation in this study is entirely voluntary and you can withdraw at any time. You are free to omit any questions.

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
A: GENERAL AGREEMENT – RESEARCH GOALS, PARTICPANT TASKS AND VOLUNTARY PARTICIPATION		
1. I have read and understood the study information dated [19/06/2024], or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☐	☐
2. I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☐	☐
3. I understand that taking part in the study involves: an audio-recorded interview, a video-recorded interview to be transcribed into text and archived	☐	☐
4. I understand that I will be compensated for my participation by thanks and potential snacks	☐	☐
5. I understand that the study will end 20/08/2024		
B: POTENTIAL RISKS OF PARTICIPATING (INCLUDING DATA PROTECTION)		
6. I understand that taking part in the study involves the following risks tiredness I understand that these will be mitigated by the ability to ask for the experiment to stop at any point	☐	☐
7. I understand that taking part in the study also involves collecting specific personally identifiable information (PII) and associated personally identifiable research data (PIRD) with the potential risk of my identity being revealed	☐	☐
8. I understand that some of this PIRD is considered as sensitive data within GDPR legislation, specifically religion, political views, Data concerning criminal activities will/may be collected and processed, Research has a Data Processing Impact Assessment (DPIA) in place	☐	☐
9. I understand that the following steps will be taken to minimise the threat of a data breach, and protect my identity in the event of such a breach transcription, blurring, voice modification	☐	☐
10. I understand that personal information collected about me that can identify me, such as e.g. my name or where I live, will not be shared beyond the study team.	☐	☐
11. I understand that the (identifiable) personal data I provide will be destroyed 01/09/24	☐	☐
C: RESEARCH PUBLICATION, DISSEMINATION AND APPLICATION		
12. I understand that after the research study the de-identified information I provide will be used for reports, publications, website, video channel	☐	☐
13. If you want to use quotes in research outputs then add extra question: I agree that my responses, views or other input can be quoted anonymously in research outputs	☐	☐
14. If you want to use named quotes, then add extra question: I agree that my real name can be used for quotes in research outputs	☐	☐
15. If written information or other works are provided by the participants (e.g. in a reflection or other diary, or as images etc.) please check https://www.tudelft.nl/library/copyright/c/what-is-copyright) for information on copyright, and/or contact the Copyright Team for further information at copyright-lib@tudelft.nl and insert appropriate consent questions accordingly.	☐	☐
D: (LONGTERM) DATA STORAGE, ACCESS AND REUSE		

PLEASE TICK THE APPROPRIATE BOXES	Yes	No
16. I give permission for the de-identified [. anonymised transcripts, audio recording] that I provide to be archived so it can be used for future research and learning.	☐	☐
17. If relevant please add: I understand that access to this repository is [open/ unrestricted/ restricted only to …… according to the access status to be conferred.]	☐	☐

Signatures

_____	_____	_____
Name of participant [printed]	Signature	Date

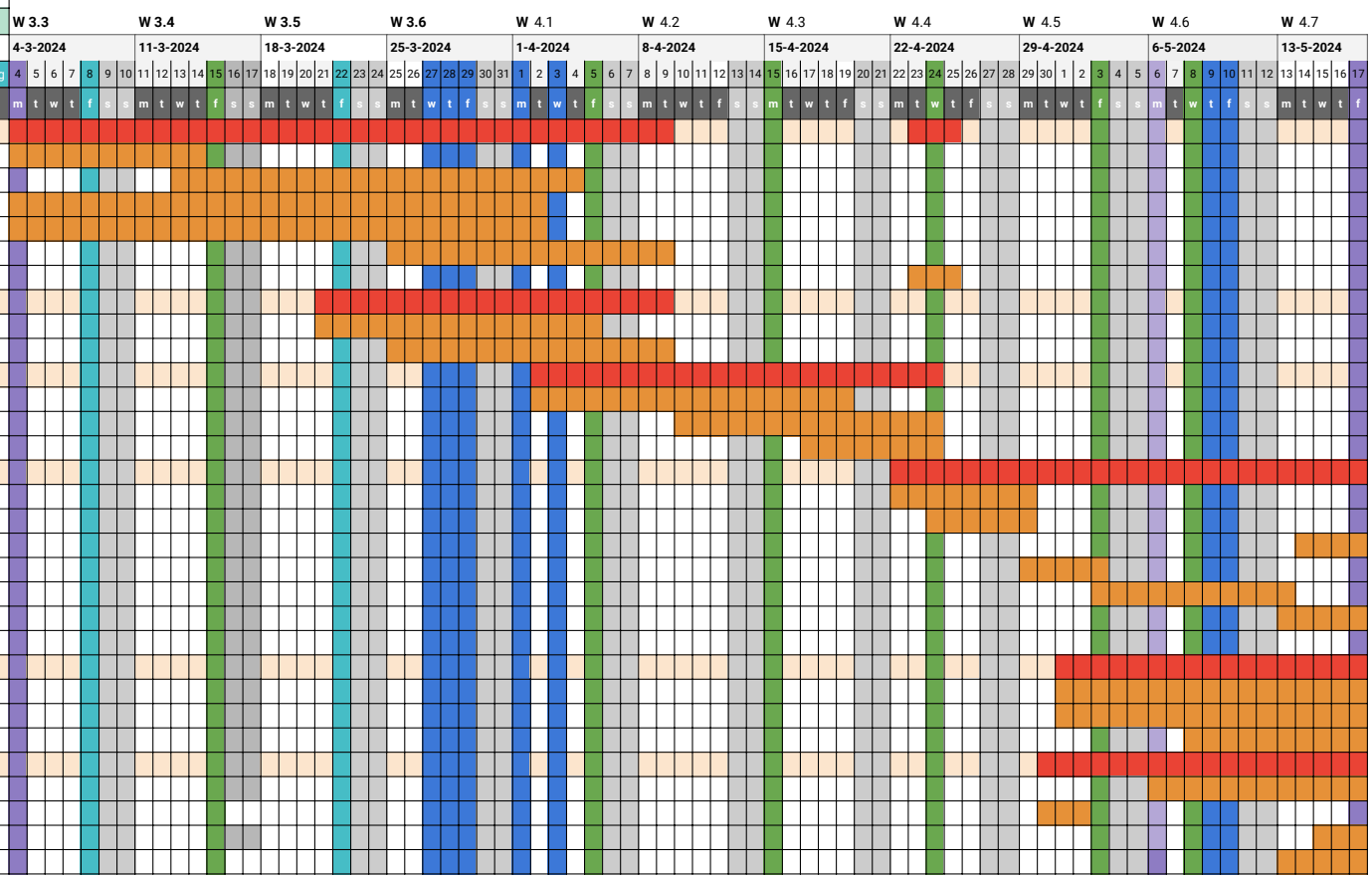
I, as researcher, have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

_____	_____	_____
Researcher name [printed]	Signature	Date

Study contact details for further information: Caleb Amanfu, c.amanfu@student.tudelf.nl

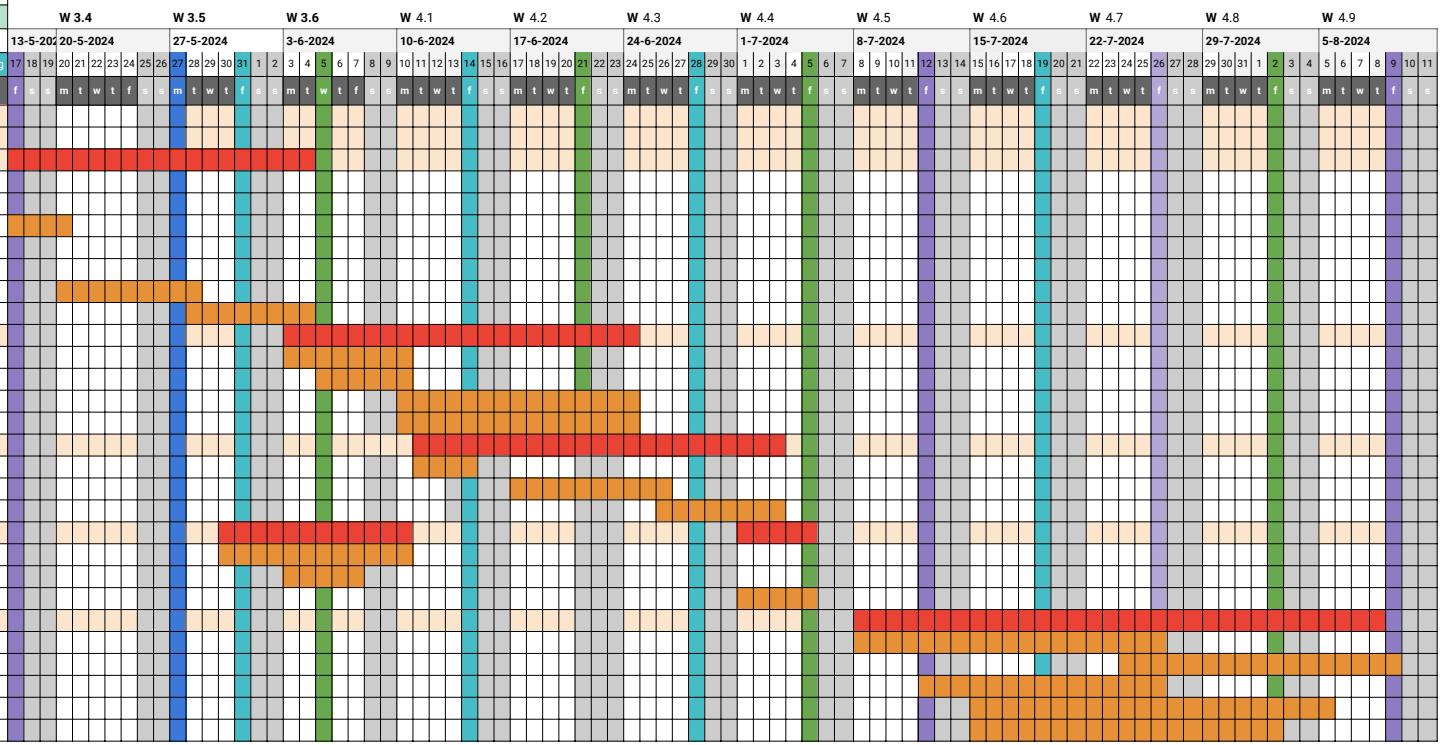
Graduation Planning

TU Delft Quarter 3				**Project Start:**		**26-2-2024**
Caleb Amanfu				Display Week:		1
Trips	Breaks		Presentation Days	Meetings		Check-in/Meeting
TASK	**ASSIGNED**		**PROGRESS**	**START**	**DAYS**	**END**
Research						
Literature Research		0%		4-3-2024	11	14-3-2024
Technology Explorations		0%		13-3-2024	23	4-4-2024
Haptics Study		0%		4-3-2024	30	2-4-2024
Multisensory Study		0%		4-3-2024	30	2-4-2024
Ordering Materials		0%		25-3-2024	16	9-4-2024
Defining Scope		0%		23-4-2024	3	25-4-2024
Individual Conceptualization				**30-3-2023**		**18-4-2023**
Concept Brainstorming		0%		21-3-2024	16	5-4-2024
Prototyping Explorations (Haptics + N		0%		25-3-2024	16	9-4-2024
Prototyping I						
Testing Prototyping Methods		0%		2-4-2024	18	19-4-2024
Building Prototype Testing Materials		0%		10-4-2024	15	24-4-2024
Prototypes V2 Plan		0%		17-4-2024	8	24-4-2024
Testing I						
Defining Testing Plan		0%		22-4-2024	8	29-4-2024
Developing Testing Material		0%		24-4-2024	6	29-4-2024
Finding User Testers		0%		14-5-2024	5	18-5-2024
Conducting Preliminary Test		0%		29-4-2024	5	3-5-2024
Refining Testing		0%		3-5-2024	11	13-5-2024
Building Testing Materials		0%		13-5-2024	6	18-5-2024
Testing Debrief + Analysis		0%		6-6-2024	4	9-6-2024
Prototyping II				**1-5-2024**		
Building Prototypes		0%		1-5-2024	20	20-5-2024
Updating Technical Drawings		0%		1-5-2024	20	20-5-2024
Assembling Pieces		0%		8-5-2024	10	17-5-2024
Formal Tasks						
Midterm Presentation		0%		6-5-2024	12	17-5-2024
Midterm Documents		0%		30-4-2024	3	2-5-2024
Adjustment of Graduation		0%		15-5-2024	3	17-5-2024
Update Reportation		0%		13-5-2024	5	17-5-2024



Graduation Planning

TU Delft Quarter 4				**Project Start:**		**6-5-2024**
Caleb Amanfu				Display Week:		1
Trips	Breaks		Presentation Days	Meetings		Check-in/Meeting
TASK	**ASSIGNED**		**PROGRESS**	**START**	**DAYS**	**END**
Research				**30-3-2023**		
Conceptualization				**30-3-2023**		**18-4-2023**
Testing				**6-6-2023**		**27-6-2023**
Defining Testing Plan		0%		21-3-2024	6	26-3-2024
Developing Testing Material		0%		21-3-2024	5	25-3-2024
Finding User Testers		0%		13-5-2024	8	20-5-2024
Conducting Preliminary Test		0%		25-3-2024	5	29-3-2024
Refining Testing		0%		9-4-2024	4	12-4-2024
Conduct Test		0%		20-5-2024	9	28-5-2024
Testing Debrief + Analysis		0%		28-5-2024	8	4-6-2024
Prototyping III				**24-4-2023**		**12-5-2023**
Testing Prototyping Methods		0%		3-6-2024	8	10-6-2024
Building Prototyping Plan		0%		5-6-2024	6	10-6-2024
Technical Drawings		0%		10-6-2024	15	24-6-2024
Building Prototype		0%		10-6-2024	15	24-6-2024
Testing II	**If Necessary**			**24-4-2023**		**24-4-2023**
Refining Testing		0%		11-6-2024	4	14-6-2024
Conduct Test		0%		17-6-2024	10	26-6-2024
Testing Debrief + Analysis		0%		26-6-2024	8	3-7-2024
Extra Stuff				**20-4-2023**	**20**	**28-6-2023**
Ordering Materials		0%		30-5-2024	12	10-6-2024
Updating Report		0%		3-6-2024	5	7-6-2024
Updating Report		0%		1-7-2024	5	5-7-2024
Reportation				**24-4-2023**		**20-6-2023**
Final Reportation		0%		8-7-2024	19	26-7-2024
Presentation		0%		24-7-2024	17	9-8-2024
Alpha Prototypes		0%		12-7-2024	15	26-7-2024
Prototype Design Documents		0%		15-7-2024	22	5-8-2024
Video Editing		0%		15-7-2024	19	2-8-2024



IDE Master Graduation Project

Project team, procedural checks and Personal Project Brief

In this document the agreements made between student and supervisory team about the student's IDE Master Graduation Project are set out. This document may also include involvement of an external client, however does not cover any legal matters student and client (might) agree upon. Next to that, this document facilitates the required procedural checks:

- Student defines the team, what the student is going to do/deliver and how that will come about
- Chair of the supervisory team signs, to formally approve the project's setup / Project brief
- SSC E&SA (Shared Service Centre, Education & Student Affairs) report on the student's registration and study progress
- IDE's Board of Examiners confirms the proposed supervisory team on their eligibility, and whether the student is allowed to start the Graduation Project

STUDENT DATA & MASTER PROGRAMME

Complete all fields and indicate which master(s) you are in

Family name	Amanfu
Initials	CA
Given name	Caleb
Student number	

IDE master(s) IPD ✓ DfI SPD

2nd non-IDE master

Individual programme *(date of approval)*

Medisign

HPM

SUPERVISORY TEAM

Fill in he required information of supervisory team members. If applicable, company mentor is added as 2nd mentor

Chair	Maarten Wijntjes	dept./section	HCD
mentor	Mahan Mehrvarz	dept./section	HCD
2nd mentor			
client:			
city:		country:	
optional comments	Maarten and Mahan's expertise both contribute in significant ways. Maarten is in the Multi-sensory domain in which my graduation takes place, and Mahan is in unintended use case space which helps with exploring design directions. Both will be uniquely important.		

! Ensure a heterogeneous team. In case you wish to include team members from the same section, explain why.

! Chair should request the IDE Board of Examiners for approval when a non-IDE mentor is proposed. Include CV and motivation letter.

! 2nd mentor only applies when a client is involved.

APPROVAL OF CHAIR on PROJECT PROPOSAL / PROJECT BRIEF -> to be filled in **by the Chair** of the supervisory team

Sign for approval (Chair)

Name Date Signature

Personal Project Brief – IDE Master Graduation Project

Name student Caleb Amanfu **Student number**

PROJECT TITLE, INTRODUCTION, PROBLEM DEFINITION and ASSIGNMENT

Complete all fields, keep information clear, specific and concise

Project title *Exploring Novel Methods To Guide Students Through Innovative Prototyping Within Multisensory Design*

Please state the title of your graduation project (above). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

Introduction

Describe the context of your project here; What is the domain in which your project takes place? Who are the main stakeholders and what interests are at stake? Describe the opportunities (and limitations) in this domain to better serve the stakeholder interests. (max 250 words)

Psychology textbooks refer to sensation as the sensory signals that result from interaction with the physical world and perception as the process that 'makes sense' of sensations. This hierarchy leads to cognition, experience etc. Although it is not entirely clear where the exact border is between these processes, it is clear everything starts with physical interaction with the world.

Sensation has been scientifically studied and is applied everywhere in design. An important source for knowledge about sensation comes from designers and artists who play with these processes. The result can be seen, felt, heard, smelled and tasted in the world we live in today. The 'appearance' of the contemporary world is shaped by sensory iterations.

The context for this graduation project is to explore novel ways in which product end use cases can be developed about multisensory design through prototyping. With the intention of applying these insights to the development of a teaching strategy for students. As design material, I want to explore multiple avenues: using existing products that possess a clear sensory signature and adapt their purposes; combining existing products with multiple sensory across them; and developing objects with a multisensory focus from scratch. I will study the unintended use of these products from a sensory perspective (for example, can an audio speaker be used for haptic stimulation. The focus is on finding a methodology that generates insights about unintended use cases within the sensory design process to create design consideration for design students.

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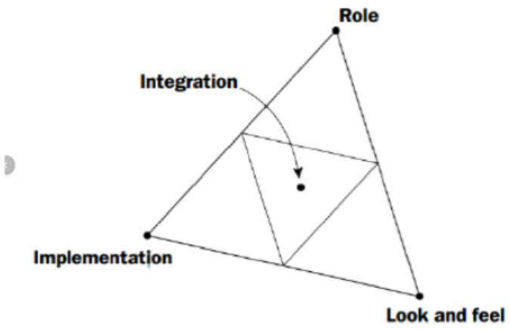
introduction (continued): space for images



"prototyping as a form of serious play where the rules of design are momentarily relaxed to allow for the emergence of new possibilities"

(Schrage, 1999, 2000) (Moussette, 2012)

Dimensions of Prototyping (Houde and Hill)

image / figure 1 Dimensions of prototyping and a descriptions of the purpose of prototyping

image / figure 2

Personal Project Brief – IDE Master Graduation Project

Problem Definition

What problem do you want to solve in the context described in the introduction, and within the available time frame of 100 working days? (= Master Graduation Project of 30 EC). What opportunities do you see to create added value for the described stakeholders? Substantiate your choice.
(max 200 words)

The problem is twofold. Firstly, it concerns the lack of knowledge in terms of appropriately implementing sensory design in a design process. What type of prototyping activities align well with learning about the senses, and how to increase 'sensory literacy' within the development of sensory design from the perspective of students discovering multisensory design. Developing a methodology that generates insights about unintended use cases within the sensory design process. To create for example design considerations for future designers (current design students). The second problem is more theoretical and concerns the overlap of product design and the evolution of sensory knowledge in order to foresee the future of the design space and potential innovations that the overlap presents.

Assignment

This is the most important part of the project brief because it will give a clear direction of what you are heading for.
Formulate an assignment to yourself regarding what you expect to deliver as result at the end of your project. (1 sentence)
As you graduate as an industrial design engineer, your assignment will start with a verb (Design/Investigate/Validate/Create), and you may use the green text format:

Investigate a prototyping approach to improve and expand on the development of design directions within the multisensory design process for design students.

Then explain your project approach to carrying out your graduation project and what research and design methods you plan to use to generate your design solution (max 150 words)

I will iteratively formulate design briefs that concern unintended sensory design. Playing the role of a designer developing in an autoethnographic fashion. The initial briefs will be: identify a product with a clear sensory signature and explore sensory alternatives, force-fitting products with differing sensory focuses, and developing product directions with new combinations of senses. While also studying the development of product design in a sensory context to discover alternate ways of developing sensory design.

I will then organize small workshops to test my methodological explorations with students to validate my own prototyping studies. The outcome of this project will be a report about the trajectory of sensory product design, a design process that can be reframed into a workshop format for a multisensory design course, and a set of prototypes that allude to the future of multisensory design and can inspire with the potential of the developed prototyping approach.

Project planning and key moments

*To make visible how you plan to spend your time, you must make a planning for the full project. You are advised to use a Gantt chart format to show the different phases of your project, deliverables you have in mind, meetings and in-between deadlines. Keep in mind that all activities should fit within the given run time of 100 working days. Your planning should include a **kick-off meeting**, **mid-term evaluation meeting**, **green light meeting** and **graduation ceremony**. Please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any (for instance because of holidays or parallel course activities).*

Make sure to attach the full plan to this project brief.
The four key moment dates must be filled in below

Kick off meeting	4 Mar 2024
Mid-term evaluation	17 May 2024
Green light meeting	12 Jul 2024
Graduation ceremony	9 Aug 2024

In exceptional cases (part of) the Graduation Project may need to be scheduled part-time. Indicate here if such applies to your project

Part of project scheduled part-time	
For how many project weeks	
Number of project days per week	

Comments:

Motivation and personal ambitions

Explain why you wish to start this project, what competencies you want to prove or develop (e.g. competencies acquired in your MSc programme, electives, extra-curricular activities or other).

Optionally, describe whether you have some personal learning ambitions which you explicitly want to address in this project, on top of the learning objectives of the Graduation Project itself. You might think of e.g. acquiring in depth knowledge on a specific subject, broadening your competencies or experimenting with a specific tool or methodology. Personal learning ambitions are limited to a maximum number of five.
(200 words max)

Throughout my time in the design space (my architectural and mechanical studies within my bachelors, and my time at TU Delft in IPD) I have constantly thought about the role of a product and the intention of design. I think that design is about communication between a user and the product, and I find it interesting that that means that there are opportunities for miscommunication. Because of this, products can be used "incorrectly" to correctly address an issue.

I am interested in exploring how changing the way a product is developed affects potential design directions in order to enhance the development of products that are designed to address problems their technologies are typically designed for.

I think that the space of multisensory design is very interesting because it is how we all interpret the world as people. And even within that there is a lot of miscommunication between the senses that leads to "incorrect" interpretations. Learning how to develop multisensory design from a technology standpoint would be really interesting and a new skill that I have dabbled in but never really been able to sit with and actively develop.