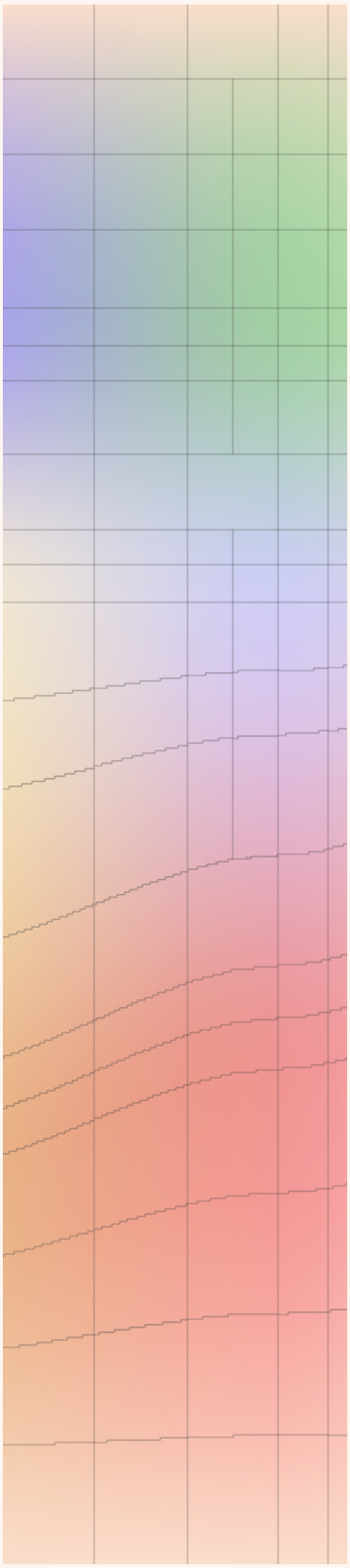
Beyond a food container:

Enhancing the relationship between ultra-processed sustainable food products and consumers through multisensory packaging experience

Explore multisensory packaging design's possibility in future trends



Master Thesis | Design for Interaction

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6th July 2023

Beyond a food container: Enhancing the relationship between ultra-processed sustainable food products and consumers through multisensory packaging experience

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Chapter 1

Introduction

This chapter contains 3 sections. The executive summary introduces the beginning to the end journey with explanations of the concepts. The introduction provides an overview of the project from motivations, backgrounds, and processes. A visualization project detail stages will show in the progress overview.

1.1 Executive summary

Consumers encounter many food choices in the supermarket, including ultra-processed food. Observing in the context and reflecting on the daily interactions, these products often present with product identities visually, and the food does not transparently show on the packaging. Consumers can see images of dishes, contextual visuals, labels, product claims, rendering pictures, ingredient depictions, and various product representations in many styles on the packaging of different ultra-processed food. The lack of transparency reduces the intuitive communication of the food's authentic attributes. More challenges are shown in the context, including consumers' habitual decision-making, bias brought by labels and product claims, and market trends of relying on visual representations. These are insights revealed from literature research, observations, and context analysis.

In the spectrum of ultra-processed food products, sustainable food is relatively new, with large growth potential compared to other well-established ultra-processed food categories. The mentioned challenges add potential obstacles to sustainable food in effectively communicating its unique food identities and values. Recognizing these challenges, the project focuses on ultra-processed sustainable food, as this category faces less effectiveness in communicating food attributes and values and can improve on establishing a stronger connection with consumers.

To foster the relationship between consumers and ultra-processed sustainable food, the project leverages multisensory packaging design as an opportunity to enhance the experience in a future context. The project developed the idea through multiple design exploration sections combining multisensory design and traditional design methods to implement the vision. During the explorations, the concept development is based on deconstructed food-related messages (e.g., food textures, tastes, associations, and values), transforming them into design elements (e.g., packaging materials, patterns, structures, and shapes) that can be effectively conveyed through sensory stimulations. Interactions are involved along the process to ensure the harmonies, intuitiveness, and other main qualities for the holistic experience. The final results of the multisensory packaging design apply to a meat alternative and a dairy alternative product. The innovation transformations in the packaging design empower consumers to uncover food messages through various sensory modalities. Furthermore, the concept showcases the distinct values of sustainable food. The final concept demonstrates a multisensory packaging experience that utilizes design elements in message delivery in a cohesive, meaningful, and immersive way.

1.2 Introduction

As consumers, one of our daily interactions with food products is through grocery shopping. In this routine, many challenges are underlying. Ultra-processed food is a broad category encompassing products from candies to pre-made meals and is often presented with fully-covered packaging. The food product is not accessible content until the consumption stage in many cases. The interactions remain between consumers and product identity. Some example includes packed chocolates, cereals, and chips. The packaging wraps around the products. On the front side, it is the products' images instead of the authentic product. This experience limits consumers to building connections and interacting with the food at the stage of grocery shopping.

Ultra-processed food packaging

(Pictures from AH website)

In today's marketing trends, it is observable that the packaging design of ultra-processed food is marketing-oriented and leads through primarily visual design innovations and investigations in the practices. Brands care for sales volume instead of natural connections between food and human being. On the consumers' side, more mindless decision-making appears with a fast selection time. From the cognitive science perspective, the impulse system will work when people make quick decisions (Mensink & Feunekes, 2015). Environmental cues trigger this type of decision-making, and it happens naturally. Habitual behavior influences decisions. One research that focuses on consumers' examination time in the supermarket indicates people rarely have a pre-evaluation of the product before going into the context (Machín et al., 2020). When comparing the examination time of food products, more consumers check processed and ultra-processed food and spend more time on it. Nevertheless, the examination process could be fast in general. The research discusses that consumers lack in-depth processing of food informantion and decisions are led by habitual purchasing behavior. Most importantly, ultra-processed food packaging usually does not provide authentic and intuitive food interactions through packaging. Within this context, consumers are likely to misunderstand or lack information when evaluating ultra-processed food and continue relying on habitual behavior in decision-making. Thus, it is a challenge to precisely and intuitively communicate food attributes to consumers.

Currently, many studies indicate misconceptions about packaging cues. For example, the "low fat" labels are not equal to low sugar, which the label is a fact but potentially stimulates wrong perceptions through packaging, whether the product is indeed healthier (Jahn et al., 2023). Some products are high in sugar but still low in fat. The label leads to biases in evaluating the sugar level of these types of products. It is not the only case. The "Organic" label also makes consumers misunderstand the authentic calorie information (Schuldt & Schwarz, 2010). The inappropriate understanding of the product influences not only the choices of the food product but also other health goals such as exercising. Cues are various. Besides labels, other cues influence consumers' understanding of the food product. A study shows that images, as a cue, influence consumers' perceptions of plant-based food (Baptista & Schifferstein, 2023). For example, consumers respond more to bean taste when packaging shows a soybean image instead of a cow. The study further points out that animal images on plant-based products confuse consumers' evaluation of food sources. More items are shown on the packaging, increasing the purchasing willingness (Bublitz et al., 2010). Product claims also have a great influence on the decisions. When healthy hints show on the snack product (e.g., oven-baked chips), consumers may think it is more reasonable to choose it, leading them to be more accepting of the food even though it is not a product in the healthy food category. The environment is also another potential decision-making trigger. These examples highlight the influence of intentionally designed and placed cues on the packaging, potentially impacting consumers' understanding of complete food imagery. Packages use techniques such as adding contexts and raw materials to shape their product imagery through visuals (Velasco & Spence, 2019, p53-p54). Food imagery is less connected with consumers when food is packed inside since the messages conveyances rely on visual elements (shaped product imagery) on the packaging.

In the project, multisensory experience design is viewed as a significant innovative opportunity to address the issues. Food experiences never lean on single sensory modalities' delivery regardless of other interaction stages such as consumption. Directly interacting with the food, consumers can smell the scents, taste the flavor, hear the sound, feel the textures, and observe the food. All senses contribute to communicating complete food imagery and building comprehensive and natural experiences. The multisensory packaging design is a novel direction that has not largely landed on the market and brought impact. The project steps into new areas and envisions the future of ultra-processed sustainable food packaging with multisensory design possibilities.

Beginning with ultra-processed food, within this large category, the project narrows the focus to sustainable food. In general communication, sustainable food is about food with less environmental impact. In the market, many brands seem to use cues to promote the food as meat/dairy-like and reduce the original food imagery. Some meat alternatives are made to look like a meat shape, and promotion hints are placed through text and pictures. The potential situation of exaggerated and biased product identity may continue misleading consumers. With the problem raised, possible adverse effects can appear in future interactions with sustainable food, such as consumers misunderstanding the sustainable food's attributes or having confusion about sustainable food's positioning when encountered in the context. The project uses multisensory packaging design as a breakthrough chance to envision future experiences with sustainable food dynamically and intuitively. In the design, the packaging plays the role of a bridge and delivers messages from the food to consumers, and fills the gap between food images and consumers. Ultra-processed sustainable food selection in the project is plant-based products. Sample products applied with the design practices are a meat alternative product and a dairy

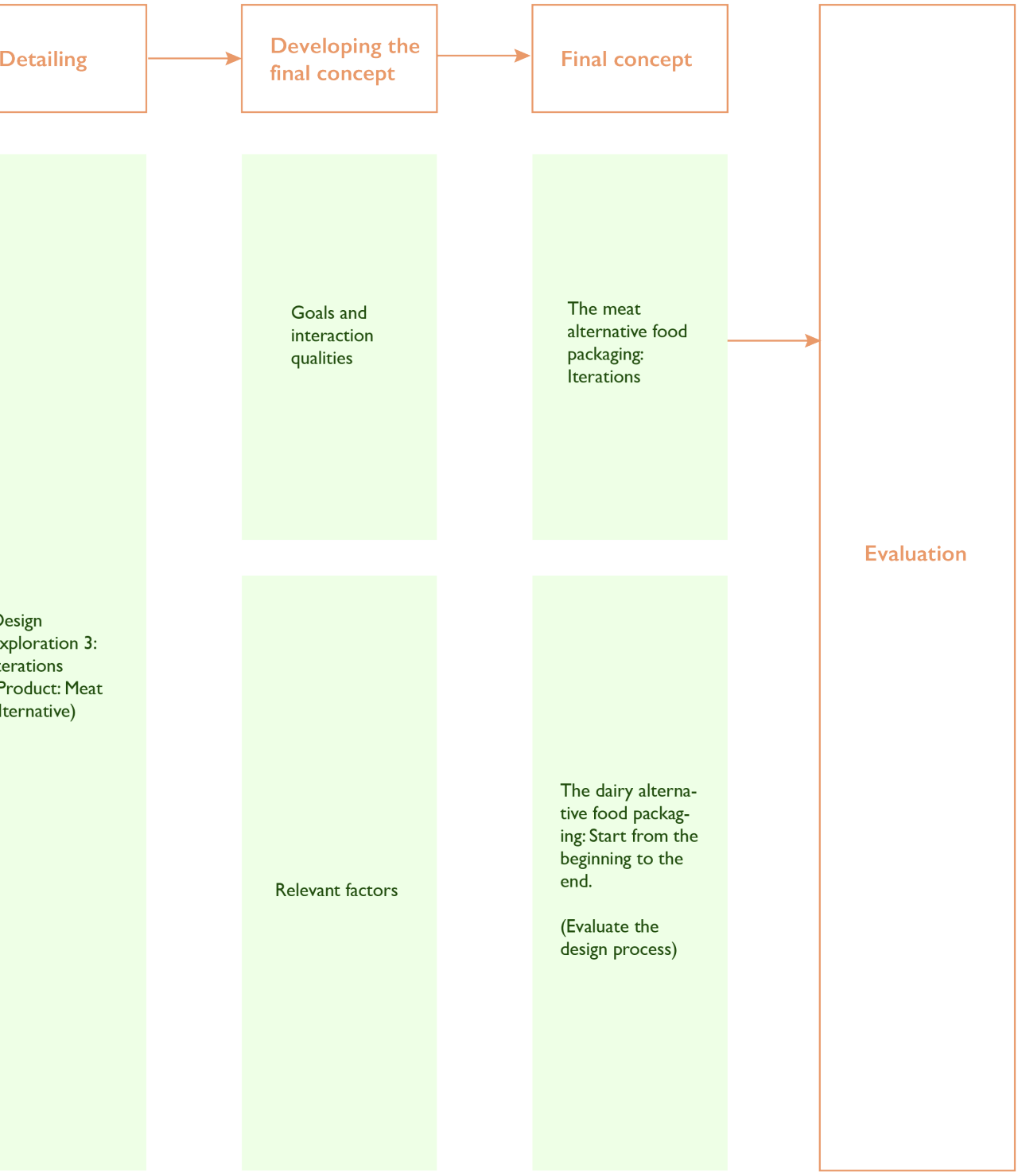
alternative dairy product.

The project is design exploration oriented and involves new methods and traditional design methods. The approaches are not simply transferred the sensory food characteristics to the packaging but focus on defining messages and transforming information into design languages that can be implemented. The goals are beyond making the attractive packaging. The project pushes the boundaries of the current packaging format. It aims to produce outcomes that fit into the future context with a more effective multisensory packaging experience for sustainable food products from a designer's angle.

Challenges in the project

There are three main challenges in the project. The initial challenge lies in establishing a clear connection between various design steps, ensuring all inputs remain consistently aligned with the final objective. The second challenge is defining and transforming messages into the design language from complex information clusters. The last challenge is to create a harmonious integration of interactions and design elements to bring a cohesive multisensory design outcome.

1.3 Process overview


Detailing
Developing the final concept
Final concept
Goals and interaction qualities
The meat alternative food packaging: Iterations
Evaluation
Design
xploration 3:
terations
Product: Meat
lternative)
Relevant factors
The dairy alternative food packaging: Start from the beginning to the end.
(Evaluate the design process)

2

Chapter 2

Deconstruct the current context

Envisioning the future requires a solid understanding of the current situation. The starting point of the project is deconstructing the current context. This chapter discusses four aspects: the current situation, multisensory food experiences, store and packaging, and product and consumers.

As the introduction chapter explained, consumers have many mindless choices in the supermarket. Especially for ultra-processed food, brands lead intentional purchasing experiences. It is an unnatural experience for consumers to interact with food without engaging with the actual food. Barriers have emerged in the current context. The interactions take place primarily through product identities. Packaging's responsibilities are more than merely communicating flavors and other superficial information. The rise of thoughtless decisions and unnatural experiences may cause by packaging design trends and other relevant factors within the context. Analyzing the current context from multiple angles can provide underlying insights to steer subsequent exploratory steps.

2.1 Current situation

Inspirations start from an observation section between fresh and ultra-processed food packaging in the supermarket. Fresh food usually applies with little or no packaging. Color and text styles are also simple, with large transparent food display portions. Consumers can directly interact with the food without any additional designed explanations. Conversely, ultra-processed food spends more effort in designing its product imagery. Consumers only see the food packed inside after purchasing and consuming it. Most of the time, visual elements such as signs, logos, texts, and images lead the packaging design and tend to have a dominant place. Rendered images are polished to add attractiveness. Some packaging will have sensory claims such as creamy to emphasize the food consumption experiences (Schifferstein et al., 2021). Consumers read the textures of the food instead of experiencing the food textures. Moreover, these terms are not yet well-established and standardized globally. Ultra-processed food packed inside is less represented from the packaging since packaging separates consumers from the food most of the time. It is a category with a large consumption group. Ultra-processed food is a large consumption food product category. Consumption of ultra-processed food for US adults grew from 53.5% in 2001-2002 to 57% in 2017-2018 (Juul et al., 2021).

According to Albert Heijne's mission report, the company provides over 40,000 products in its supply chain (Missieverslag 2021, 2021). Consumers constantly search and make decisions within mountains of products in their daily grocery shopping routine. As the introduction mentioned, consumers get used to environments and are less conscious of their food choices. Roughly 1/3 of all food and beverage products are convinced to be purchased from the package, and 88% of consumers will not review the other side of the box before purchase (Velasco & Spence, 2019, p50). The first contact between consumers and packaging turns out to be a crucial moment. Lacking other sensory touchpoints gives consumers fewer opportunities to review food intuitively and truthfully.

Packaging as a direct communication channel is responsible for delivering authentic experiences and effectively conveying messages about the food. However, the current market pushes packaging into a trend of selling as priorities, potentially negatively altering the natural interactions between people and food. Gaps appear when consumers come into contact with a designed product image that follows brands' planned intentions instead of food. Consumers need more opportunities to connect closely with what they eat daily and be more careful about their food choices. Ways of communication should change in the future to reduce the negative impact, such as low transparency and authenticity on consumer and food relationships. Low information transparency leads to an unequal relationship between food producers and consumers (Barnhill & Civita, 2019). Unified strategies are lacking for supporting information delivery in the food selection stage. Packaging in the current trend is no longer for communicating food information but for convincing people to purchase. Brands are eager to win the competition on the supermarket shelf.

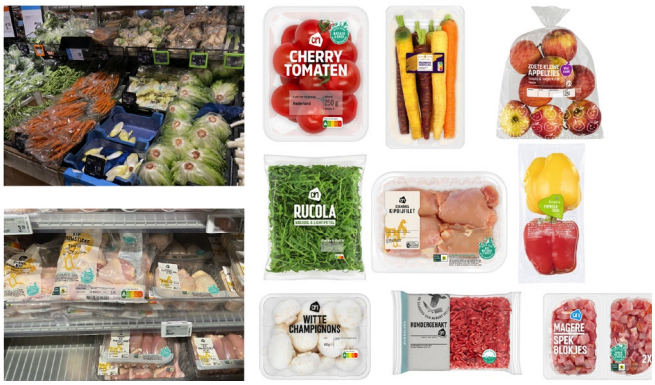


Figure 1. Fresh food/Low processed food

Pacakges does not play a role that fully replace the food identity.There is minimum packaging strategies such as naming, color, graphic and rendering on the packaging. Consumers are perceiving and processing information directly from the food.

Consumers are interacting with the product identity which plays a central role in the experience.

Figure 2. Ultra-processed food

Problems show that consumers do not have the ability to evaluate processed food in-depth and rely on habitual behavior in decision-making. Ultra-processed food usually do not communicate through showing the food packed inside but through product identities on the package.

2.2 Multisensory food experiences

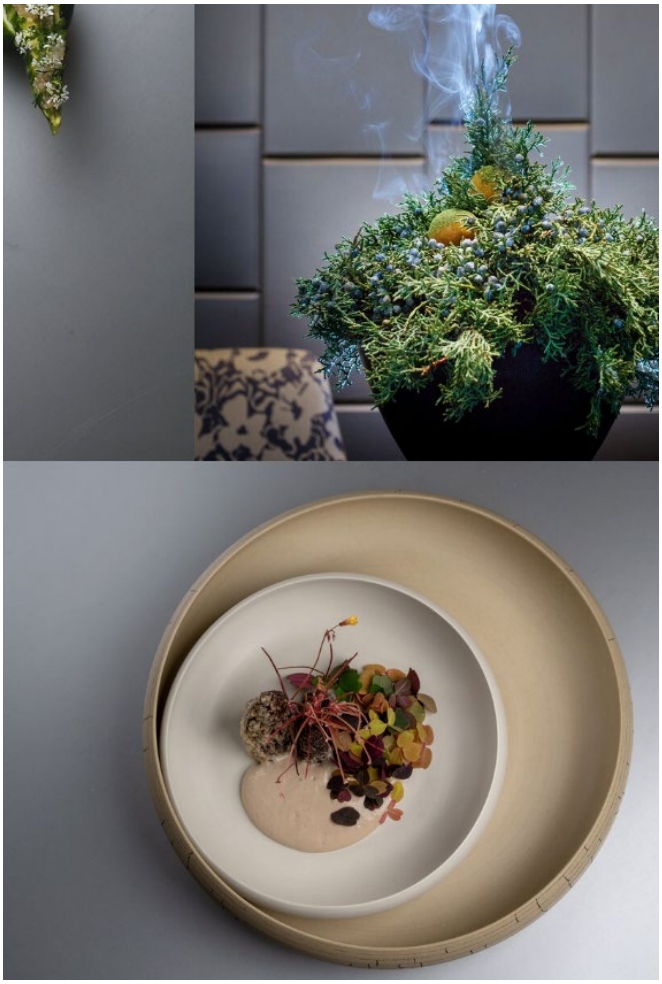
"Crucially, though, the majority of our everyday experiences are multisensory. It is not only visual but more broadly auditory, olfactory, tactile/haptic, and even, on occasion, gustatory cues that guide a consumer's brand experiences, evaluations, and ultimately their behaviors."

-Multisensory packaging (Velasco et al., 2019, p.191-p.192).

Reflecting on the quote on page 10 and the current situation, other senses have been notably absent as supplement touchpoints in interacting with ultra-processed food within the context. However, sensory experiences are inherent in the interactions with food. For instance, when eating a cinnamon roll, people naturally smell the scent of cinnamon, feel the soft texture of the bread, and see the round shape of the food. Engaging senses in the experience enhances the overall experience with the food.

The multisensory design has enormous opportunities to play an essential role in tweaking food experiences and changing consumer-food interactions positively. This design opportunity can have more investigations and bold innovations. In the current context, senses are also involved but have not been effectively used. For example, when consumers grab a desired item, they interact through touch. Tactile attributes can subtly change the experience using different textures or package weights. A study shows that the importance of a package can influence consumers' perceptions of products' quality. A heavier wine bottle is often perceived as having higher quality (Spence et al., 2013). Weight of the bottle increases along with the price. Also, sound often gets ignored in the supermarket scenario. The sound experience is implicit but always exists in selecting the food stage, especially when consumers shake or move the product (Velasco & Spence, 2019, p103-104). Sensory modalities are underlying the interactions naturally without consumers noticing. There is a significant potential for diving into the area and making the experience of making choices more intuitive and communicating meaningful messages. In the project, I see multisensory as opportunities that can play a more substantial role in changing ultra-processed food selection experiences. Through intentional design, sensory experiences have the possibility to convey intended meanings and create immersive and intuitive experiences effectively.

Food-related multisensory design is invested in other food scenarios as new experiences. Dining experiences are brought to the next level by sensory touchpoint creations. Tasting food is no longer a singular and linear action. Through forming sensory experiences, the interaction with food has more meaning and connects tightly with consumers. The food can be turned into a storyteller with the support of sensory touchpoints to convey meanings and ideas. Kitchen Theory is a UK studio that creates multisensory dining experiences (Kitchen Theory | Immersive & Multisensory Dining, 2017). The team has chefs, designers, and researchers. The enhancement of experiences is from tableware design, cooking techniques, food presentations, sounds, lights, and video arts. The creations change simple eating actions to a consistent and immersive experience. All meanings and ideas transform into a dining experience. It is not the only pioneer that invests in the dining experience. Alinea, a restaurant in Chicago, has challenged the form of food and brought new somatosensory experiences. Many dishes get consumers surprise experiences and a feeling of novelty. The dishes' creations in their gallery are surrounding experiences that can represent food and ideas (Alinea, n.d.). The experiences are embedded with the restaurant's philosophies. All these approaches enhance the authentic food experiences and are based on the possibilities of the food. These approaches show how to involve the senses in design to reshape experiences. The multisensory design offers a new pathway to expand the options of food experiences. The food packaging areas have great opportunities remaining to explore.



Alinea dishes showcase

Kitchen Theory experience

2.3 Relevant factors

To optimize the utilization of sensory modalities and discover possible design directions, a deconstruction of the entire design context in categories can support organizing and drawing out in-depth insights. This section focuses on what triggers the current situation and how sensory modalities are involved. In a broader view of the key scenario, packaging experiences are related to multiple interrelated factors. A framework indicates that four highly related factors can influence healthy food choices (Velasco & Spence, 2019, p.227). Product, packaging, consumers, and stores are the four factors. Every factor holds its own significance. Packaging provides interaction triggers, consumers have personal preferences, products have market positions, and stores provide environmental cues. Drawing inspiration from this multisensory design framework, the discussion is surrounded by these four factors. Related questions and methods are listed before the discussion to provide ideas for conducting the section (see Figure 3).

As pointed out in the earlier content, consumers usually receive information through product identity for ultra-processed food. Stores and products are grouped for discussion, as these stakeholders can determine shopping environments and packaging design from the upper level in the journey. Another focus in this chapter is how the senses are involved in current experiences. I put packaging and consumers as a group to discuss, mainly about interactions and consumers' mental models. The groups are only for organizing the thought progress, but they are closely interconnected in multiple ways.

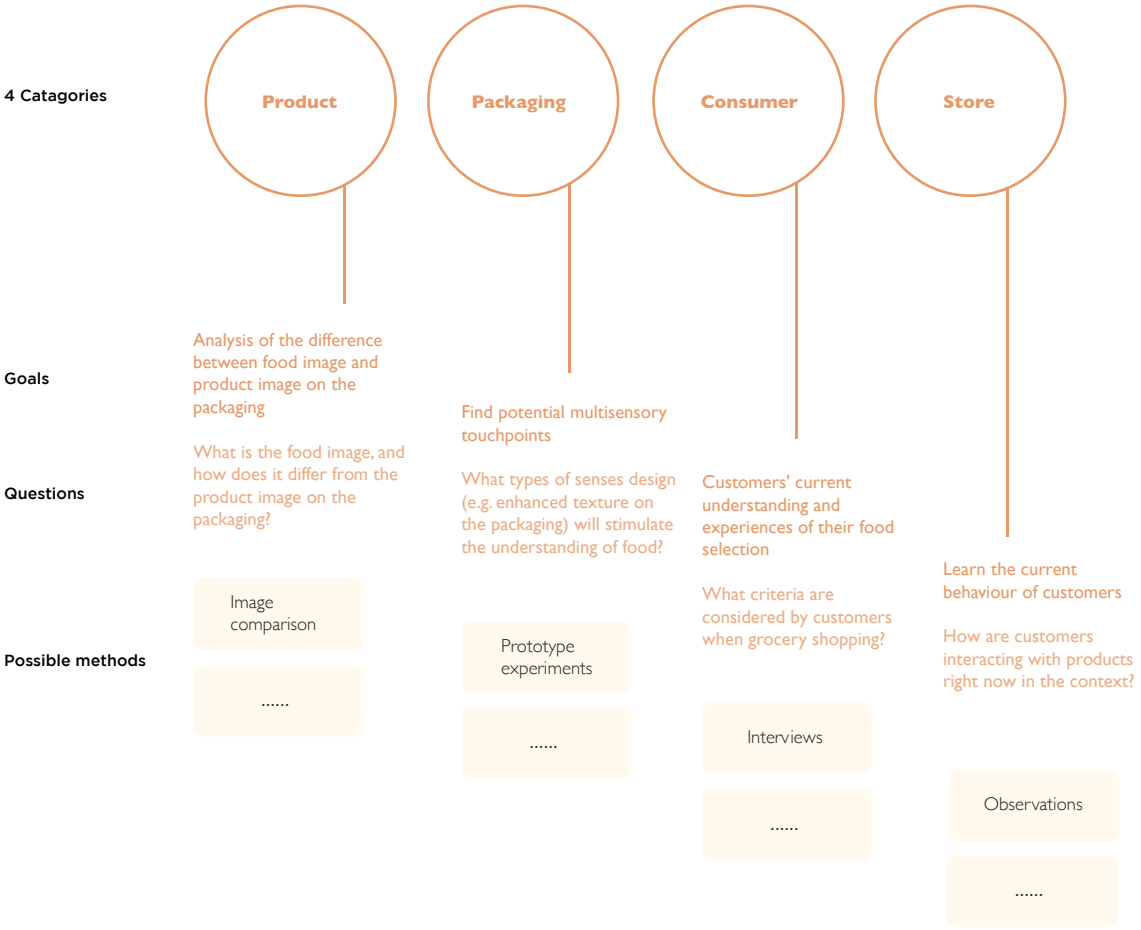
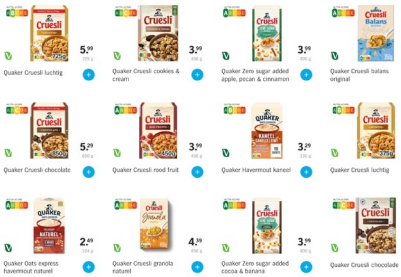


Figure 3. Brainstorming goals and exploration methods for four aspects related to packaging interactions

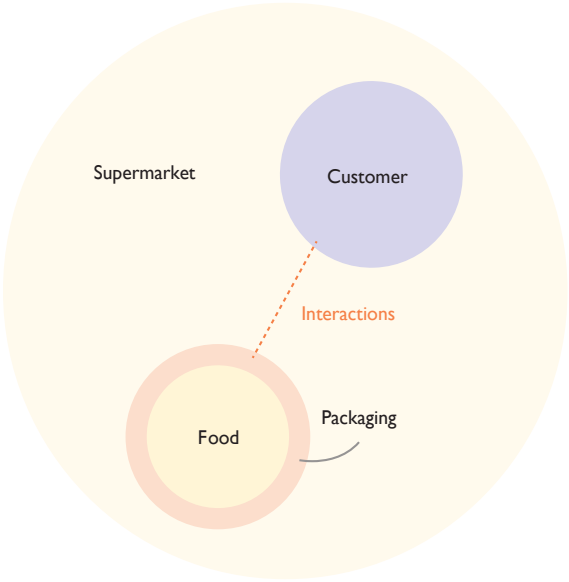
Store and Product

Both products and environments have the potential to influence consumers' behavior. Supermarkets use in-context promotion strategies through displays, labels, and other cues to simulate purchasing behaviors, and many food decisions are made in the context (Vukmirovic, 2015). Mentioning food decisions, in the past, consumers were grocery shopping by giving product lists to grocery store employees who would then collect the desired items (Ross, 2016). Then evolutions in grocery shopping styles lead to changes in consumers' behavior. In 1916, self-service was introduced. The transition increased the flexibility in the grocery shopping experience. At the same time, consumers can freely access a wider range of food products. Technological development gives the grocery shopping experience more possibilities. In 1987, Albert Heijn introduced self-scanning to stores (Geschiedenis | Albert Heijn, n.d.). Nowadays, brands expand their product lines with product variations. More options showed on the shelves. For example, Quaker Oats started by producing oats for convenient consumption and later came up with the idea to include a recipe on the packaging (The Quaker Oats Company, 2023). Over time, their product lines increased. A simple search on the AH website brings out over 20 individual products from the brand. Many of them are ultra-processed food. These developments highlight the possible underlying trends of having more available product options and promotions in the context.

The brand's iconic packaging from 1915 (from Quaker Oats website)



Part of the current options consumers can access (a screenshot from AH website)



In the current situation, the role of other senses is missing. Consumers mostly rely on browsing behavior, a visual touch point to help them define the selections.

Also, in the interactions between consumers and ultra-processed food, the experience is mainly limited to the level of packaging. Consumers do not have a channel to interact with food or even consider details about the food inside.

Figure 4. Visualizations of interaction in the current context

Consumer and Packaging

When approaching less familiar ultra-processed food products, densely packed information into small areas requires consumers to process multiple details quickly, mainly through visual interactions. This includes taste, price, flavors, food textures, and other relevant information. After listing out the visual-driven process (see Figure 5), I am further curious about how other sensory modalities incorporate into the experiences. I conduct field explorations through observations and interviews to have a clear and more profound insight.

In the exploration research section, I ask participants to act naturally when grocery shopping by telling detailed objectives only after the observation section ends. To further understand how customers interact with food products daily and how senses are engaged. I conducted observation sections to find out the key stages. During the observation, I grocery-shopped with 4 participants without interrupting their shopping flows and choices. These 4 participants grocery shop as single-households and focus on their personal grocery shopping experience. There is also a short interview about their grocery shopping experiences afterward. During the section, I take photos of the critical interaction stage and observe related behavior such as walking fast and browsing behavior and see what might be potential factors that are also related to the journey of the senses and can be part of the design opportunities. In section 2.4, insights about senses and interactions are uncovered.

Figure 5. A possible scenario of making decisions based on visual perceptions

2.4 Field exploration

Observations

The grocery shopping behaviors vary among participants, even if they are going through the same journey. Differences are most obvious in two aspects, interactions with the selected food and personal preference for the food. For example, a participant prefers walking fast and stopping at desired products, and another participant is in a strolling style and curious about unplanned but preferred categories. Participants also rely on different interactions to ensure their selections. Some look closer at the product held in hand; the others mainly rely on browsing. All participants seem not to have strict shopping lists to follow, leading them to move directly from one point to another. They are likely attracted by items that capture their interests, even if they are not in priorities, pre-planned purchases, or essential food. The essential products here indicate milk, eggs, vegetables, bread, or other daily meal supplies. Four participants gained ultra-processed food in their grocery journey, such as premade meals, beers, and flavored yogurt.

Insights

Interviews

The interview questions focus on criteria influencing their food choices to understand further what information they are processing when selecting food items.

In daily life, all 4 participants will include 1 or 2 processed or ultra-processed food items in their purchases. The specific products are various based on personal preference.

All 4 participants mentioned that taste is the prioritized criterion for choosing a food item. Past experiences are their basis. All 4 participants said about past experiences when explaining their choices.

All 4 participants mentioned they would attract to products through packaging, especially bright colors, and glossy finished surfaces.

3 out of 4 participants mentioned that novelty is essential, and they recognized it from colors. Two of them will have one or two new items each time they buy food. These items are usually ultra-processed food such as packaged cake, chips, and other snacks.

Two participants sometimes mentioned needing help to evaluate the taste correctly through packaging. Moreover, 1 participant says that even though she wants to look into more information, she thinks it is time-consuming and wants to avoid reading.

- The interactions happened quickly in the context. Visuals and haptic interactions frequently occurred in the experience.

- Current packaging is not intuitive enough to communicate information. Customers are browsing instead of reading when it is in the context.

- The information does not all come from the food itself. The evaluation process currently is related to multiple information channels, including information customers received at the moment, brands, experiences, and recommendations.

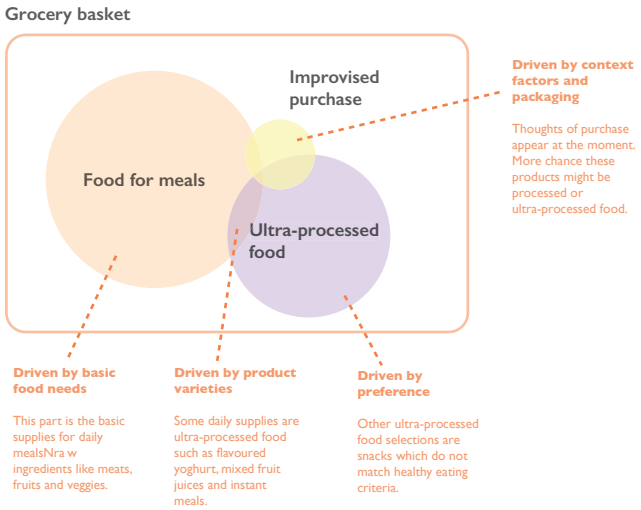
- Participants rarely think of health factors in their shopping experience. There are also not many cues to trigger the health evaluation to happen.

Reveal from field exploration

It is also interesting to note the differences in participants' selection of UPF and low-processed products in the observations. From the observations, 4 participants have a common pattern in their groceries experience:

Participants buy low-processed food normally for their daily meals, which is essential for their daily basic needs. However, some ultra-processed food, such as flavoured yoghurt, is also in this category. Participants' selections of UPF products are diverse based on personal preference. This selection group often includes snacks. UPF selections also appear in improvised decision-making. One participant mentioned that his purchase sometimes follows special promotions with a festival atmosphere. These shelf types can always attract his attention and lead to a purchase.

Based on analysing from the previous exploration sections, here is a figure shows ultra-processed food's position among the entire purchasing pattern from the participants.



*The pattern should be further validated through more design research and exploration with a larger group of participants, such as a diary study.

Figure 6. Analyzed different types of food based on field explorations

How are senses involved?

Participants can think of the taste based on their experiences in the imaginative world. The presence of the senses is more than just at the superficial level. Other sensory inputs are passive stimuli. These senses are weak and implicit. Even though not all senses are shown in the interactions, they are closely connected. The senses relate to the food that physically participates in the experience are vision and sound. The analysis of the sensory experience reveals that the senses are naturally present but not effectively evoked and utilized through packaging and environment. At the same time, consumers' realizations of the other senses are also weak. The following sections explain insights into how senses are involved in the current scenario and some potential opportunities.

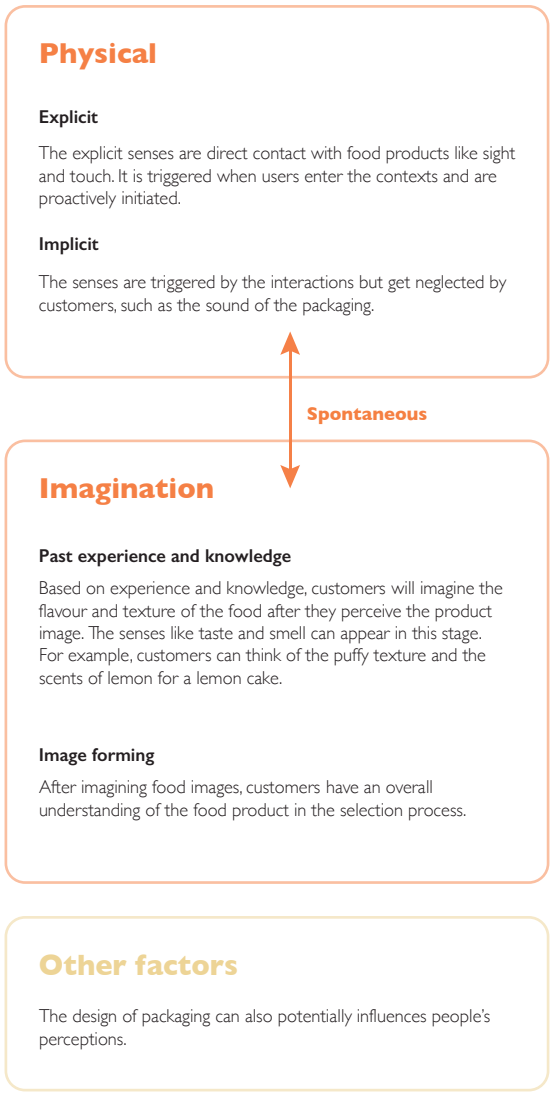


Figure 7. What factors might influence sensory experience?

End of this chapter

Understanding the current context with mixed methods and analyzing from multiple perspectives builds a foundational understanding for envisioning the future. I comprehensively learned the context in this section and outlined the sense's experience. The insights provide potential multisensory design directions.

Scenario: Browsing

Sight acts as the leading role in perceiving.

Imagination

Customers are browsing through the categories and haven't focused on the product level. Therefore the product image might is still very general in mind.

Weaker connection

Scenario: Getting close and picking up a product

Explicit

Touch and sight senses are involved simultaneously

Implicit

Triggered along with the actions

Imagination

Customers are thinking about specific choices, having a clearer product image, and thinking about their decisions.

Stronger connection

Figure 8. Sensory journey in two different stages

3

Chapter 3

Illustrate possibilities

The last chapters provide insights at a macro level, from the current context to sensory operations. The next challenge is how multisensory design can be designed and embodied in packaging design. The focus of this chapter is conducting multisensory packaging design explorations. I initiate two main sections to support the exploration process. First is the preparation stage. Preparation includes searching and analyzing existing multisensory packing design approaches on how they comprehend sensory with design achievements. Besides analyzing multisensory design projects, existing methods are investigated. Even though the sensory design has not been explicitly shown on the market, academic papers and other resources have proposed methodologies for landing sensory design to the product level. Potential methods will be explored on application possibilities and guide the design exploration. Upon concluding this chapter, a more grounded design possibility will be identified and taken to more refined explorations in the next chapter.

3.1 Preparation

Preparation A
Analyze the current multisensory packaging approach

The collected project covers manufacturing products to food installations in analyzing the current multisensory approaches. These projects have different end goals, such as evoking reflections, creating food-correlated experiences, and enhancing the performance in sales. The design implementations are various regarding interactions affordances, product appearances, and design techniques. The following is analyzing section that explains the details. Five iconic projects are selected.

01

The Mary biscuit box is a multisensory design project that evokes various feelings in the user experience. The appearance is soft, and the box has a creamy cookie scent. With these designed qualities, the product conveys the message of harmony. As an example of coherent sensory projects, it enhances the experience of interacting with the biscuit box in contrast to the biscuit box with material like metal. Through sensory modalities, the biscuit box can further stimulate memories that interact with the biscuit itself in a context, such as sharing biscuits with friends (Schifferstein, 2021). Multisensory design enriches the experience and works as a stimulation to further engages with emotions, experiences, and memories. An excellent MSD design can also change the message conveyed by products. This design delivers friendly and harmonious feelings to users.

Image from: https://eu.alessi.com/products/mary-biscuit-biscuit-box

02

Naoto Fukasawa uses the properties of ingredients and transfers them to the packaging. The packaging stimulates vision and touches sensory modalities with shapes that maintain rectangular-based juice box shapes. The appearance is designed the same as the characteristics of the ingredients. For example, the design presents the kiwi with furry surfaces realistically. The haptic feedback also restores the feeling of touching the components. The approaches can stimulate a direct connection with taste experiences even though there are no words for communicating detailed product information since the understanding of specific fruits is shared between most people.

Image from: https://naotofukasawa.com/projects/349/

03

Even though the project is not packaging-oriented, it evokes the thinking of the complexities of the food. The author cuts 98 ingredients into 2.5 by 2.5 by 2.5 centimeters cubes (Goldberg, 2015). These food are unprocessed food. When these cubes are put together, the audience is surprised by the diversities and complexities of daily consuming food. In the meantime, audiences automatically start to recognize food and think of the experience with the food. Each cube presents its characteristics. From the sensory perspective, the photo may also stimulate sensory feelings when the audience sees the texture and color and thinks of experiences and information related to the ingredient.

Image from: http://lernertandsander.com/cubes/

04

The canned packaging from Kirin enriched the tactile experiences. Once consumers hold the coffee, the product immediately differentiates from other products. The stage of consumption gets emphasized by the packaging. The touching feedback makes consumers concentrate more on the drinking activity since there are more touchpoints other than only taste. The pattern also plays an essential role in visual feedback when it is on the shelf. It is not a flat surface. Therefore better to reflect lights in the environment and reach the goal of attracting customers (Luttenberger, 2014).

Image from Pinterest

05

The project aims to communicate naturalness. To translate the abstract information, the project owner used sensory mapping with terms and sensory analysis to further specify how to translate messages to design (Desmet & Schifferstein, 2011). The stage of implementation is creating stimulations through packaging.

Conclusion

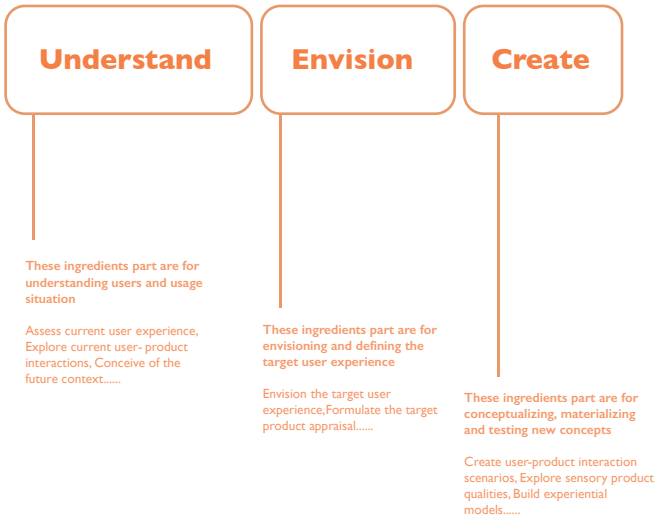
Through the analysis, the effectiveness of the design is shown. These projects have different sensory approaches, using linear dimensions to engage other senses, amplifying one or two sensory experiences to reach the design goal, or using the senses to communicate singular messages. On one side, it brings distinguishable and intractable experiences with other senses. However, the communication experiences weaken again due to overemphasizing the designed sensory. The experiences are still lacking in balance in information transmission and explorative affordance. The first and second projects are closer to the goal of this project that carries strong meanings and intuitive experiences. The richness of the communication experiences lies in the balance integrations of multiple senses and as a cohesive whole. Hence, this insight inspires me to consider how sensory touchpoints can be combined in the design to deliver a stronger experience with complex meanings, especially in the future vision of achieving the goal of intuitive and meaningful connections and creating experiences that bond food with consumers tightly.

Preparation B
Multisensory design methods

Sensory experiences can stimulate through a single modality and as a whole. Multisensory design is related to finding harmony between various modalities and considering the context. To ensure explorations cover design components, here are two inspirational methods that can use as a guide to starting the design exploration.

Experience-oriented design

Experience design can be divided into 3 main aspects and 14 ingredients. These ingredients are a guide tool to follow when creating a new experience that functions as a cooking guide (Desmet & Schifferstein, 2011). As multisensory experiences drive the project, this guide tool can outline the desired experience. Facing new experiences that lack details, the 3 design aspects suit the design process to create a desired future. The field exploration is already done in the previous stage to have a solid view of the current interaction and context. With those insights, in this chapter, the main step is to envision and create. Envisioning can direct explorations to specific experiences and possibilities instead of first focusing on polishing the interactions. The creation section can support the experience land and determine whether design ideas match the envisioned experiences.

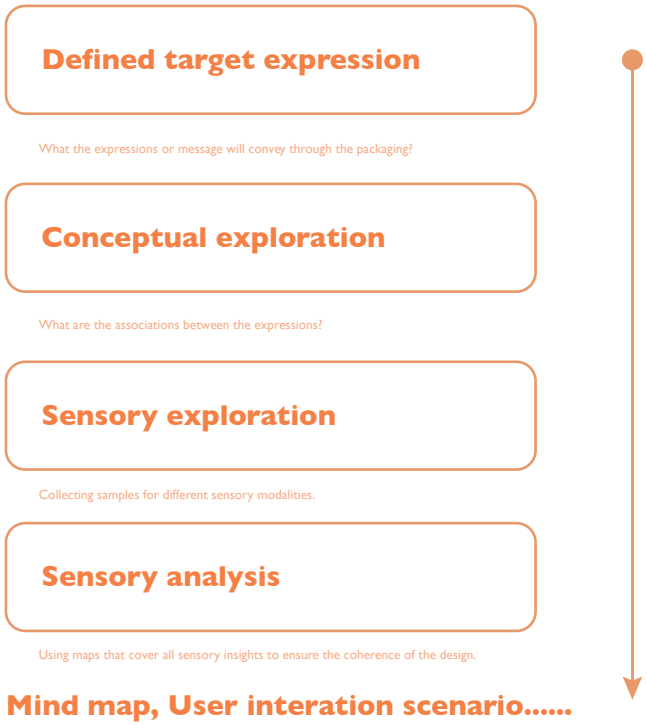


**The methods' content is from book: From Floating Wheelchairs to Mobile Car Parks: A Collection of 35 Experience-driven Design Projects*

Figure 9. Summarizing the methods from literature research (1)

From abstract sensory expression to solid solution

Designing for sensory experiences is abstract and complex due to the many influential factors. The sensory design can not be set as the same design flow as designing a switch to control the living room's light. Developing products in marketing like a switch is driven by more clearly defined functionalities and specific user needs. As designers, learning multisensory design processes to solve the complex design scenario is an important task. Digging insights around sensory expressions is a solid starting point for the design, especially defined target expression (Schifferstein, 2021). It is a step to generate messages or expressions in the experiences. An example of sensory design can be delivering the message of "healthiness." Multisensory design can design logically with appropriate design activities, such as mind maps, analyzing/writing scenarios, and mood boards. Here are some key points that are organized from the article *Designing food experiences: A multisensory approach*:



**The methods' content is from article: Designing food experiences: A multisensory approach*

Figure 10. Summarizing the methods from literature research (2)

3.2 Design Exploration 1

Related insights are generated from existing project analysis and methods research in the preparation stages. The wide range of food information brings a challenge in selecting messages. Food imagery can deconstruct into multiple messages, ranging from appearance, consuming experience, and ingredients used to nutrition information. To address this challenge, the design exploration section has 2 experiments. The experiments are set to gain insights into the practices of gathering messages and integrating sensory modalities in the design. The first experiment deconstructs and transforms the information into the design language. After the first experiment, the process will be evaluated to determine what is successful and what is not. The second experiment build-up based on the first experiment includes considerations of meaningful interactions and complete experiences. At this stage, the prototype is low-fidelity, as polishing the design outcome is not the priority.

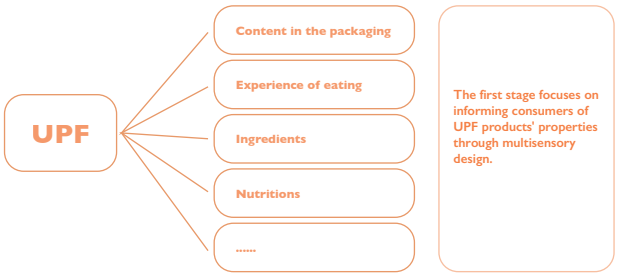


Figure 11. Messages that can be deconstructed from the food

In experiments, chips are selected for the experiment as an ultra-processed food product since it is more common for the audience to understand and suitable to make a rapid prototype. The discovery surrounds the effectiveness of the multisensory design steps instead of reflecting on the product. The end of this chapter will explain the new example product selections that match the vision.

Experiment 1

The first experiment focuses on transferring information to physical packaging through learned methods. The multisensory packaging design has not matured commercially. Finding a suitable path to innovation is also one of the objectives of this project. At this point, the focus is on finding a way to translate food messages into design languages. The exploration sections go through 3 steps to generate the outcome. The experiments are based on self-experiments and involve design tools such as a sensory map and moodboard.

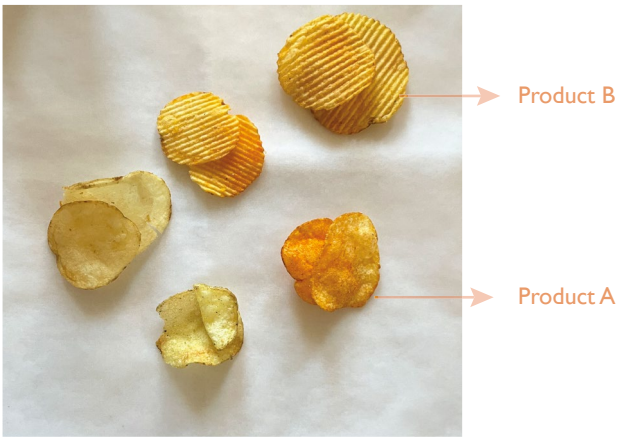
01

First, I tried to deconstruct my associations related to different sensory modalities. There are two products chosen to analyze further. In the sensory map, I listed terms representing my associations when interacting with the product.

The food appearance is similar between different flavors and brands. Food's diverse characteristics are more noticeable if we focus on the experience and sensory feedback in consuming experiences. Consumers can notice the difference when interacting with the food. Here are several touchpoints that influence perceptions of food identity:

When interacting with the food, the textures make chips vary from each other. Through the visual, colors associated with the flavors are different. Also, in the experience of picking up the chips, I notice the difference in the weight of the chips, which stimulates the feeling of how it will feel in the oral environment. For example, noticing one chip might be more crunch than the others through tactile feedback.

The packaging
Many elements are applied to shape the product identity. Different brands have their own strategies.



The food
If only experience with the visual, the difference is not as large as looking at the package.

02

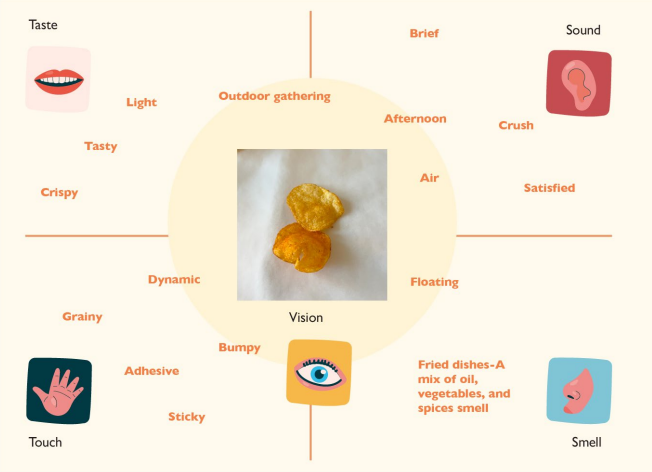
Second, it follows the steps of deconstructing the sensory expression. I use a map to put all related sensory associations in 5 senses categories. The keywords inside the map have feelings, emotions, and contexts that capture the sensory characteristics. The word clouds later guided my mood board collecting. The selection of the images in the moodboard represents elements in the sensory maps.

Product A

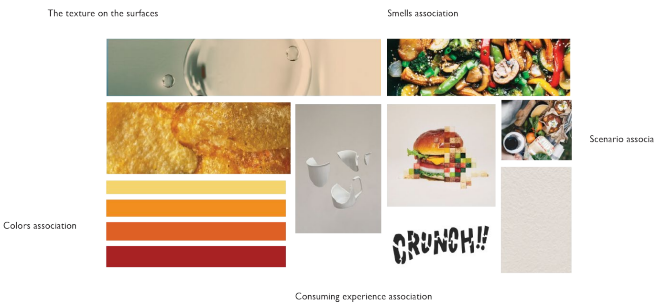
The experience of consuming this product

When observing the chips before taking them, I found many bubble-like shapes, reminding me of air. The rest of the surfaces are bumpy. The chips are light and thin. I am also thinking of the scenario of a backyard picnic with many friends. The weather is sunny, and people enjoy relaxing time in summer or early autumn. The sound feedback is like breaking something very crisp. It is very satisfying when eating. The chips smell like fried vegetable dishes. It is a composite scent and feels very complex. After grabbing the chips, some grainy texture spices are left on the fingers. It is also adhesive to the hand because of oil.

Sensory analysis



Collage about senses association

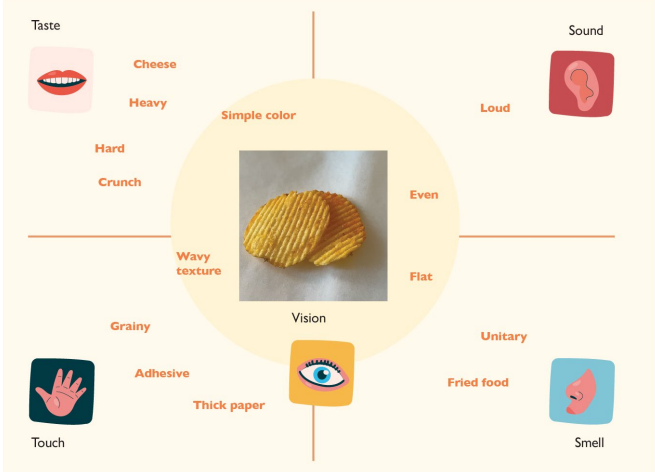


Product B

The experience of consuming this product

The surface of this product is flat and does not contain many curves. A wavy and even texture applies to the product. The product smells like fried food, such as fries. But when eating it, the taste has a strong cheese taste. I am fully immersed in the cheese taste at the first moment. After consuming a few more pieces, the cheese taste is less impressive than in the beginning. It also has a strong salty taste. When eating the product, it feels rigid and crunchy. Using mouth muscles to break it into pieces will take some effort. The sound feedback is loud. Consuming the product reminds me of ordering snacks in a restaurant. Thin and grainy ingredients stick on fingers. They feel like a mix of salt and cheese powder.

Sensory analysis



Collage about senses association

03

In the step between analyzing and creation, I decided to create a sensitizing tool to generate rapid prototypes that can quickly see results from the design process and receive insights. Other considerations are that sensitizing tools are often used in the design evaluation that involves participants. The effectiveness of the sensitizing tool can be reviewed in this exploration.

Creating sensitizing tools for stimulations

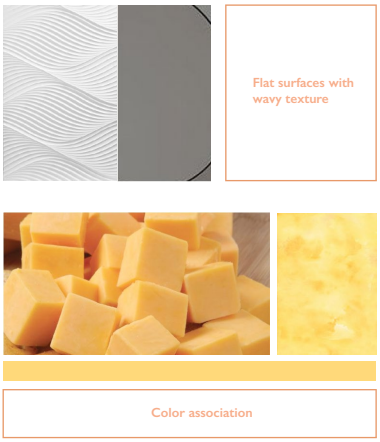
To concentrate the senses stimulations for study. I developed a sensitizing tool to help me focus on different sensory modalities and combine sensory samples. Also, a small sensitizing sample is suitable for the scenario of the first experiments. Based on the results, there will be analysis and further iterations.

Transit properties to prototypes

By deconstructing the sensory information related to food, much information can be applied to the sensory design. Combined with sensitizing materials, the most notable properties are selected for further design. After selection, a smaller collage is created to guide the procedure. Then the design is implemented to the tool with sensory modalities possibilities added. On the right side are detailed explanations of the results.

Product A

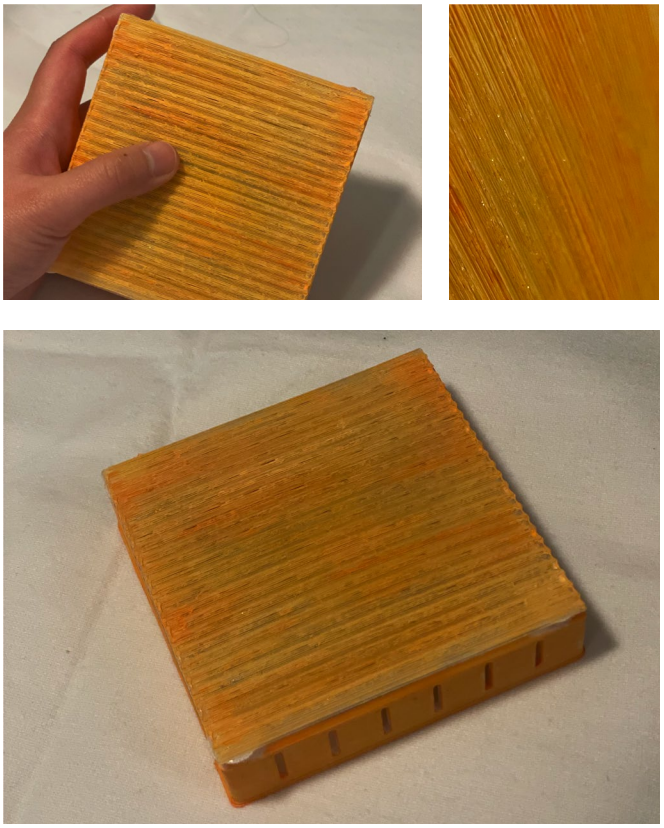
Product B



Product A

The bumpy and bubble-like textures lead the design of the surfaces. When touching the feedback makes people feel uneven. Paper material is placed inside the box; therefore, when interacting with the box, people will hear a very crisp sound.

Product B



The wavy surface is an iconic product characteristic, which also transits to the prototype. The color is also less orange and with more of a yellow tone. It also feels very even and has an organized pattern.

Concluding and reflecting on the experiment 1

Information needs to be more effectively processed to design language.

Multisensory design functions as integration results instead of scattered design areas.

Layers of information

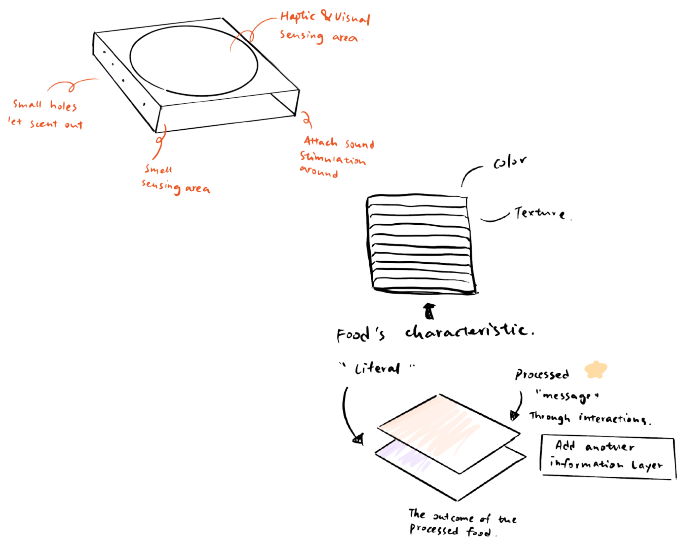
In transitioning from the food's sensory properties to the prototype, some properties, such as textures and colors, are successfully delivered and emphasized through prototyping. It creates a symbolic representation of the qualities of food. The current approaches require more message layers and interaction touchpoints to enhance design meaning delivery. The prototype approaches need more harmony in the entire experience. For example, the shape of the sensitizing box makes it hard for people to correlate to specific food products' experiences. Other properties also matter in understanding the product. The exploration validated that food qualities can be transit to sensory feedback.

Level of clarity

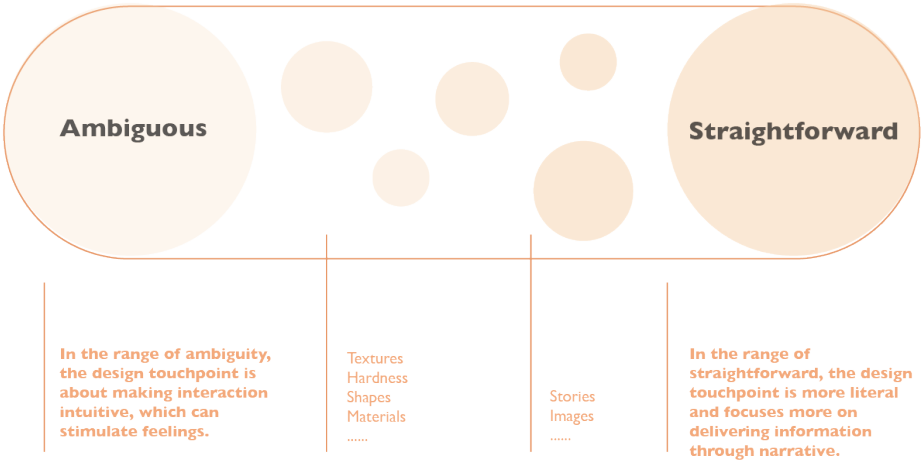
The Experiment 1 prototype leads to consideration of the level of clarity in design. Sensory feedback exists naturally in our daily scenarios. When these elements turn to design, they appear abstract without clear descriptions. The challenge remains in balancing abstractions and clear communication of design meanings. The sensory elements can add to the aesthetic and intuitiveness of the experiences, aligning with the project's visions. But if the design turns too abstract, it may lose the capability to convey the meaning of the design. In the future process, the level of clarity can include in considerations when generating ideas. The future design will maintain sensory's interesting characteristics and find a way to combine meanings into the design.

The importantness of integration

A variety of factors influence the multisensory experience. Specific sensory elements can provide a piece of the experience but cannot offer users a larger overall picture. Multisensory design cannot solely rely on an individual sensory component and needs to consider how to unite elements as a whole cohesively. For example, the textures created in the experiment 1 prototype successfully evoke associations and feelings of interacting with chips. However, the rectangle shapes may confuse, making users unsure about their perceptions. Users are curious but lack further interactions for exploring and learning when experiencing prototypes. Integration of different senses can be considered at the beginning of the design process, and interaction possibilities can be used to connect them in the design. With notice of the importance of integration, future prototypes can deepen the entire experience.



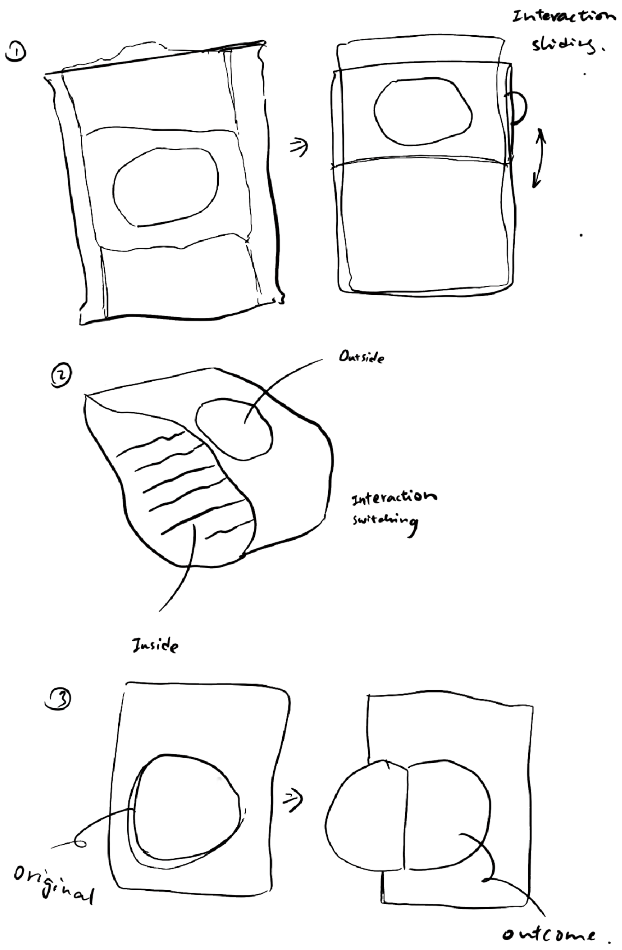
Range of information



Experiment 2

From the reflections of the last experiments, having only a single sensory touchpoint cannot provide an overview to consumers and may lead to confusion. Although applying haptic textures evokes engaging experiences and intuitive findings, sensitizing toolkits can not give an overall experience to participants and reach the goal of having a complete experience. The Experiment 1 prototype also lacks richness in information and affordances for interactions to expand experiences comprehensively and meaningfully.

In Experiment 2, the design uses narratives to enrich the meanings of experiences. Narratives also bridge touchpoints together, enhancing the interaction's discoverability and motivation. The experiments also aimed to gain insights into the balance point of information. The previous prototype played less of a role as an information container and more as an experimental tool. This situation puts the sensitizing toolkits on an abstract level. The Experiment 2 prototype has more information. It does not use techniques to list information explicitly, such as by putting sentences for users to read. The design uses multisensory techniques to evoke an understanding between consumers and food.



01

The design takes results from the first part of experiment 1, the part of defining sensory expression. The sensory design of the two experiments' outcomes is different. The design in experiment 2 tilts focus towards integrations and tries to raise the perceptual of other sensory modalities when interacting with the packaging.

New and original design

The approaches of multisensory design and the original design are different in the goals and potentially change the current experience from the perception and experience levels. The original package uses various visual design techniques to increase the attractiveness and richness of product explanations. In my approach to multisensory design, I focus on evoking the understanding of food and driving consumers to think and feel about food identity instead of only product identity. With interaction opportunities added, consumers have more experience with packaging. Furthermore, I tended to involve the message of "processed" through design.

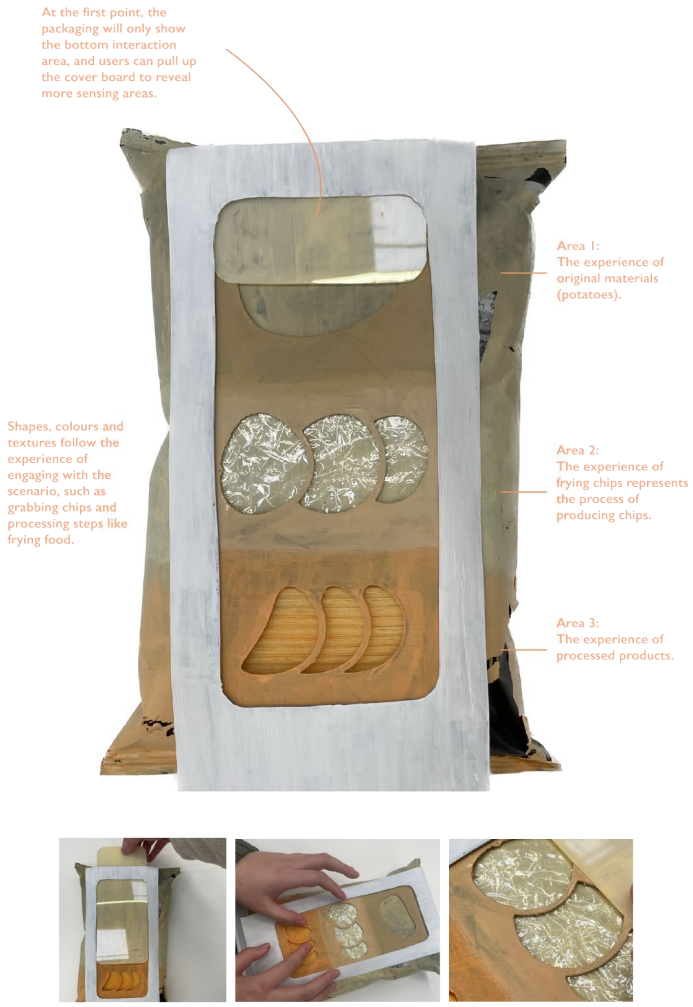
Original packaging

The original packaging applies the design mainly to the visual touchpoints. It maximizes the product identities and adds selling points. The package itself has sound feedback implicitly.

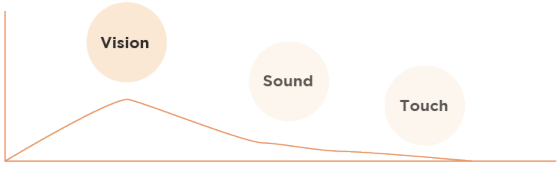
New design idea

Inspired by the previous prototypes, textures can evoke and engages the senses. Also, when combined with visual hints, it can represent the idea of objects. Therefore, in the prototypes, the design uses different materials to match the experiences. For example, glossy surfaces and the crisp sound of touching thin plastic represent the sensory experiences of frying food. The purpose of adding the covering board is to avoid showing many stimulations simultaneously and confusing users.

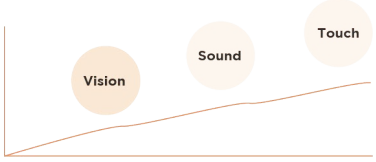
Comparison on the original packaging and designed packaging



Sensory focuses in the experience



Sensory focuses in the experience



02

Invite participants

To find out insights about the experience of multisensory and evaluate approaches. I invite 7 participants to experience the prototypes and ask questions about their experience between prototypes and current packaging approaches. Participants only have brief introductions on the concept but no descriptions of different modules. They can interact with the prototype and have interpretations based on their intuitions and understandings.

Feedback highlight

Participant 1

- The new way of packaging perception and interactions. It has a novelty feeling.
- The packages feel designed with a structure.
- It brings a realistic experience to me.

Participant 2

- It feels very playful. The sound is interesting and makes me think of a crunchy feeling.
- It gives me the feeling of experiencing this food in advance and associations with the eating experience.
- The original packaging is monotonous even though it has rich visuals.

Participant 3

- The last module is very comfortable to interact with touching.
- The plastic sound is uncomfortable, and it feels low quality.
- I will be more motivated to interact with this packaging than the original one since the original packaging is nothing special.

Participant 4

- The last module strongly correlates with chips and gives a pleasant feeling.
- The sound feels very annoying. It makes me want to avoid interacting with the second module.
- The two experiences are different. The prototype has diverse backgrounds. There are enjoyable experiences and very unpleasant experiences.

Participant 5

- I like the feeling of the material and have a strong motivation to interact with the packaging.
- The last module has a high association with the chips. Other parts are vague. The sound of the second part makes me think of deep-fried food.
- This experience gives me a sense of change. The original one does not stimulate the willingness to interact.

Participant 6

- I like the texture of the last module, with a strong perception, which feels enriching.
- This form of packaging is very engaging. It makes me think that the food is interactive.

Participant 7

- The interaction feedback is related to the food inside and immediately thinks of the food itself.
- The original packaging all feels the same to me.

Insight clusters

Association with food

When participants interact with the packaging, they associate it with the food packed inside. Especially the last sections on the packaging create powerful stimulations with the food. 6 out of 7 participants especially liked the bottom sensing areas, which deliver pleasure and relaxation moments when interacting.

Increasing willingness in interactions

4 out 7 participants mentioned that the prototypes make them motivated and willing to interact instead of just looking at the packaging.

Likes and dislikes

The experience of interacting with the packaging also stimulates different feelings in the experience. Most of the participants prefer interacting with the last sensing area. 2 participants especially mention they do not like the second sensing area because the sound is annoying. Therefore, they have contrary emotions, such as not wanting to interact.

Enriching in experience

7 out of 7 participants say that the original packaging is monotonous since they think it is just packaging and uses the same strategies in design. The multisensory design makes the entire experience diverse and attractive in interaction.

Experiencing food before actually consuming

When the sensory feedback aligns with the experience of consuming the food, participants feel like they interact with the food packed inside before actually opening bags and eating.

Barrier in understanding underly meaning

Participants are not sensitive and fully understand the anticipated meaning of the top two sensing areas. Even though participants can not fully follow the anticipated meaning, they have their associations when interacting. For example, when interacting with the second sensing areas, participants mention they feel about crisp food that is deep fried.

3.3 Conclusion

After the two experiments are conducted, many insights are collected about sensory perception and interactions. These insights can guide the future design process. In the next stage, these insights inspired a new prototype design that can more successfully convey messages. Moreover, with new processes of constructing information and transitioning information to experience.

Sensory analysis

Processes such as deconstructing food experience step by step and collecting materials for the mood board can help define prototype elements. Also, many sensory experience details are uncovered through the analysis.

From messages to prototypes

The prototypes need a sense of harmony to shape the desired experiences. For example, textures and colors can represent part of the experience, but more is needed. Shapes also influence the perceptions of the design. When lacking information pieces or experiences pieces, users might not receive the planned message from the design.

Food can be interactive

In the last prototypes testing section, the design stimulates the interest in interactions, making the packaging more interactive than the original packaging. During the interaction experiences, participants connect more and think of food-packed insights. The format of multisensory design can transition the concentration from product to food identity. The food correlate messages need to be further enhanced in the following design projects.

Balanced information through design

If the sensory stimulus has enough design, users can receive the message immediately and connect it with their experiences. In this case, the design can focus more on creating simulations and experiences. If the packages involve narratives, guidance design for engaging various sensory stimuli should also be considered.

I learned how to implement food identity into the packaging through experiments. Before the next step, I would like to discuss different types of UPF products and the underlying higher-level message behind these products. These higher-level messages go beyond the direct representations of the food, such as its raw ingredients. They are the messages that reflect deeper influences and values associated with products. For example, choosing sustainable food represent a positive environmental impact and a conscious lifestyle choice. In the subsequent design process, it is essential to consider both messages representing the food products and additional higher-level messages in the multisensory packaging design. Packaging is an information carrier to communicate and enhance meaningful connections between the product and the consumers.

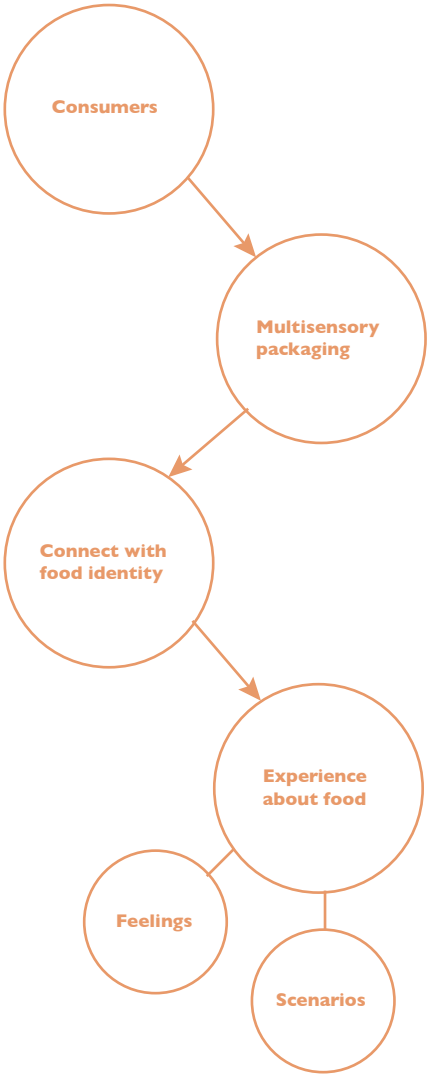


Figure 12. What might the overall experience look like?

3.4 Selection of the product

Insights about transferring food identity to packaging design as been explored through experiments. Before switching to a new exploration stage with the iterated design process, I would like to discuss the selection of products. Various types of processed food can have different high-level messages underly in the product. The defined messages in the early stage of the design are intimately tied to the details of the design. The discussion can facilitate narrowing the high-level meaning and multisensory design selections.

Consumers are confronted with a large volume of ultra-processed food in today's market. Choices such as food such as chips and chocolates play roles in snacks. Snacks are often consumed without a clear understanding of their potential health risks, which is vital to communicate. This message type often has a lower hierarchy than the primary information at the front, and messages are delivered through a nutrition list or health score. Another type of ultra-processed food often seen is pre-made meals. For example, dry soups are quicker to consume at regular mealtime. Compared with cooking from raw ingredients, it is highly processed and has health risks. These two examples are frequently shown in our daily life. However, one category is increasingly getting focus and discussions. Plant-based food is still a newcomer in the realm of ultra-processed food, which does not inclusively reveal its food imagery from the packaging. The challenge lies in using meat/diary-related cues through packaging. The food identity is way weaker than the product identity in this category, potentially confusing consumers. Furthermore, the values of a sustainable lifestyle and distinct characteristics of plant-based food are not effectively been communicate through the packaging.

Evaluating the challenge of sustainable food has more potential, and it is meaningful to reshape the current position of plant-based food. Future multisensory vision can provide a pioneering view of the trends of future sustainable food that solves the current problems and enables better understanding on the consumers' side. Designers can use take this opportunity to join the changing of sustainable behavior.

Sustainable food products on the AH website

4

Chapter 4

From possibilities to design

2 design explorations sections produce diverse insights. The primary takeaway is that a multisensory experience does not solely rely on constructing a few sensory modalities. Other design elements also affect the perceptions of the design and should work towards to same meaning. Experiments 1 and 2 are inspired by the researched frameworks but have different approaches. The design outcome from experiment 2 is focused on building integration and comprehensive experiences, which is more effective in introducing experiences in the desired way. Consequently, in Chapter 4, the focus is to iterate the design process and implement it. The iteration process is based on the learnings from the previous section and provides ways to connect the design step from determining messages to transforming into the design language.

4.1 Iterated design process

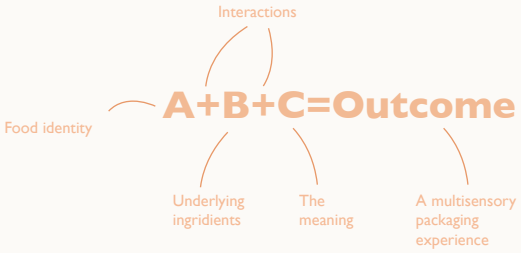
The multisensory design's complexity requires designers to clearly understand the design path and manage the elements within the design steps. Combining insights from experiments, current packaging design, and researched multisensory design methods, the new explorations have a new path for connecting expression and innovation. The latest exploration process is expected to transform food information to design language through deconstructing, defining, and creating. The following is the detailed explanations of the design path.

Based on the previous experiments and researched methods. I conclude a process that suits the project's development process. Transit packaging to multisensory design is like using a "formula" to solve a question. The process can be deconstructed into three main steps.

The first step is deconstructing information. In this step, information can be concluded into three layers. The first layer is observing and concluding food identities. In this part, sensory modalities are involved. These sensory experiences originate from the interaction between consumers and food. A harmonious food-consuming experience is related to various sensory touchpoints. Each modality is a component. The second layer is to overview the ingredient of the food product. Consumers cannot see ingredients directly, but it is still an essential food part. For example, meat replacer is often using soya as the main ingredient. The last layer is to think about the meaning of the food. Different food has a distinct influence on consumers and the environment. The meaning can be designed for delivery through the packaging. Therefore, defining the meaning of the food first can help transition to packaging later in the brainstorming section. This structured process can efficiently organise information samples for the later design and provide directions. The design ideation steps are to match these characteristics with specific design pieces and modules.

After the first step, the process moves forward to generate design keywords. Design components can refer to parts of packages. In the package, some settled categories can apply to all typical products. These design categories include shapes, materials, textures/patterns, text and graphics. The information can be concluded into design keywords by connecting to these opportunity areas.

The last step is to integrate design samples through interaction. Interactions can be crucial in connecting individual parts and play as the sign in the formula to combine separate pieces well. Interactions can trigger new experiences and integrate samples into a complete piece.



Information level 1:
The ingredients are the underlying information about the sources of the food.

Information level 2:
Sensory modalities have close relations to food identities. Food attributes trigger rich sensory feedback. They also empower food recognition.

Information level 3:
The meaning refers to the higher-level messages relating to food choices' consequences or reasoning.

4.2 Design exploration 2

01 Deconstruct

The deconstruction separates into two perspectives: the food side and the packaging side. The purpose of deconstructing food is to break down information into distinct pieces that can be transformed into defined messages and used in the design. The information is organized into three levels (product meanings, sensory experiences, and food origin). These information pieces of the food product have uniqueness and commonalities. The unique messages evolve into distinct design points that make food imagery recognizable from one product to another. From the packaging perspective, commonalities of the design elements are identified to be used for various steps. The creation's starting points can take these analyzed results for further interactive experiences design.

From the food product side

Ingredients
100% plant based
Mainly made out of soya and water

Food experience
Sensory experiences have uniqueness between products, and it is the sensory expressions that belong to the product
Have a vibrant smell experience. Reminds people of the flavored ingredients for BBQ. Tasteless salty, and more affluent than expected. Looks like grounded beef in shape and color. The oral somatosensory is different from meat. It doesn't have meat fiber, and it is chewy (Taste, touch, smell, vision, sound).

The meaning
A sustainable lifestyle A responsible choice A friendly product

From the packaging side

When observing the packaging, several components are shared as design elements in many products. They can be designed in various directions based on different design visions. I listed the main packaging features before matching the characteristics to the packaging components. When brainstorming and collecting samples, ideas can be developed around these components. It helps set the main structure for the brainstorming section and keeps the ideation sections manageable.

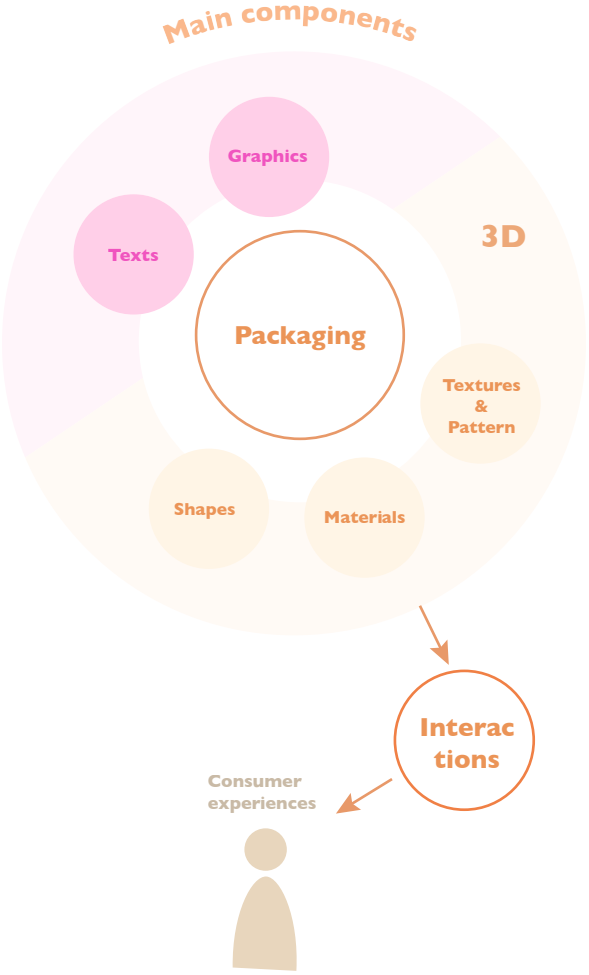


Figure 13. Analyzed main components that can be used in the packaging design

02 Ideations

Based on the findings from the last stage, the messages will be first concluded into sentences and clarified. The messages and design keywords connect through a mindmap. The mind map adds a middle point of design elements that guide the thought process within the design activity instead of going outside the design. The ideation section aims to have as many related design keywords as possible. Based on these keywords, I started to search and select representative images to create moodboards.

The list about 3 levels of information

100% plant-based

Mainly made out of soya

Rich smell experiences like flavoured BBQ ingredients

Taste less salty and rich than expected

Looks like “grounded beef”

The oral somatosensory is different from meat, and it is chewier

A sustainable lifestyle

A responsible choice

A friendly product

The main components

Design keywords

Shapes

- Shape smoothly integrated
- Perfect shapes without too many cut out part
- An organic shape

Materials

- Resilient
- Soft (Medium soft)
- Gentle
- Weight

Textures & Pattern

- Round
- Dynamic
- Vibrant
- Reliable

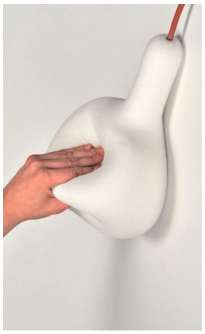
Texts

- Prioritize information on the main ingredient
- Explanation of the food itself

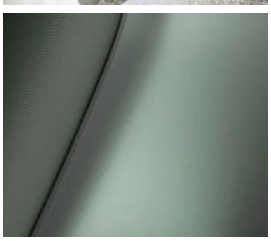
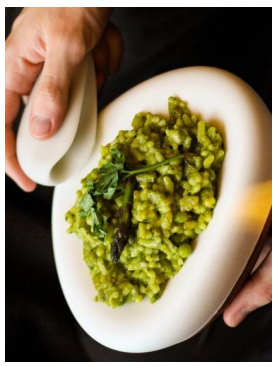
Graphics

- Natural
- Diverse
- Rationale
- The realistic product

Moodboard




03 Creation

The creation was divided into 2D and 3D dimensions, continuing to follow the design elements in the ideation stage. The step can also ensure the design is complete with multiple elements to provide a cohesive experience instead of leaning on only a few design elements.

3D elements

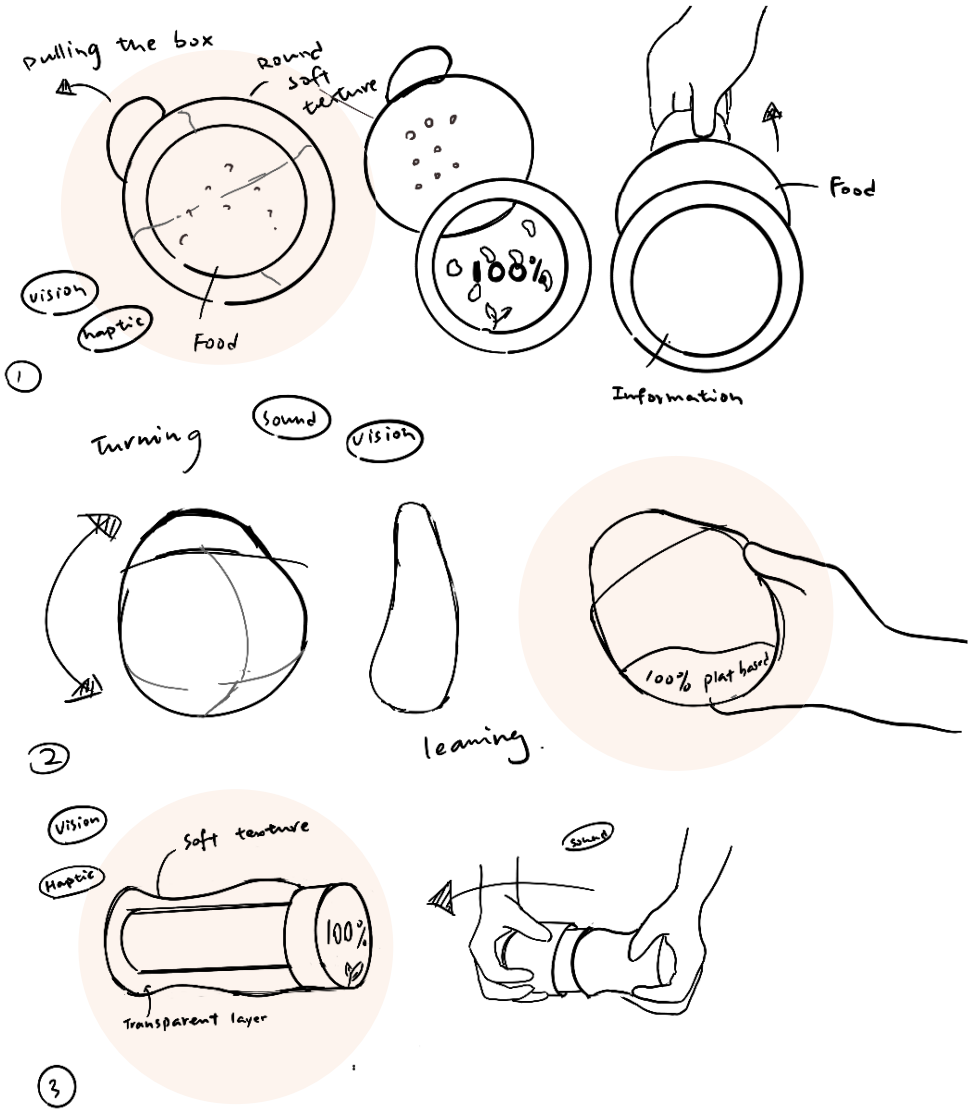
The interaction can trigger feedback from various senses and allow consumers to understand the food. Three questions are involved when considering the interactions:What experiences will be created? Which interactions will trigger sensory modalities cohesively? How to integrate the key design points?

These three ideas trigger sensory feedback differently and provide a different experience. I decided to go with the first idea. In the previous experiments, the shapes and materials can be clearly perceived when they are close to the actual food's characteristics. The second idea is a lack of match with the design vision. Idea 1 is more straightforward than the third idea and has opportunities to further developed different sensory modalities through changing shapes and materials. Idea 1 also fits in a preferable future position.

Idea 1:
This idea is to make food products central when consumers seek and grab products. The food directly shows from the open window, and the label is underneath. This arrangement lowers the importance of the product identity and adds sensory touch points to enhance the interactiveness with food. Consumers can consume food and see further information. The outer part of the product is designed with rounded and organic shapes to emphasize the food's identity. This idea is not too ambiguous and has multiple sensory touchpoints.

Idea 2:
The shapes of the product are a reference to the soya beans' shape. Soft and round shapes can also emphasize the concluded characteristics in the mind map section. Consumers can not see the food in the first place, and when they turn the packaging around, they can feel the food product's movement and see it through the open window. The interaction is also for further promoting the product produced by the soya, which is plant-based. This idea has remained the same as the current packaging design trends.

Idea 3:
The packaging is a bottle shape and has two layers. The product is in the inner layer but can be seen through. There are some raw ingredients between the two-layer, and when consumers interact with the packaging, they can have a dynamic experience. This idea focuses more on experiencing and is more ambiguous in the narrative. It is more futuristic and novel compared to the other two ideas.



2D elements

The information panel can be considered an "interface" that delivers information to the consumer. The choice of colors, images and text design influence consumers' perceptions. It also often plays an essential role in shaping the product identity. In order to enhance the food identity and tweak the experience around the food, I re-constructed the information hierarchy. 2D elements are designed around food-related information to emphasise food identity and improve information communication when the consumer reviews the food label.

Current trend and future trend

In analysing both the experiments and the current product, the key information about the food is always listed in the lower hierarchy level of the information. During the purchasing experiences, normal consumers who do not need to filter food are hard to read or often ignore the food information.

In the re-constructing process, the focus is on the identity of the food. The ideas are selecting the information mostly related to the food identity and increasing the hierarchy of this information. The design style should be simple and with fewer biases to prevent enhancing the product identity. Consumers should have a direct perceiving experience when receiving food information.

Reflection on food name

In the project, the commercial goal is not the priority. The design direction focuses on enhancing the food identity and consumer experience in perceiving food identity. 2D design elements are utilized to enhance the brand style and uniqueness of the product in the current trend. In meat replacement products, naming strategies emphasize the brand's values and increase attractiveness.

In the new design of the 2D elements, they are transformed into message containers that communicate the food characteristics. The design minimizes the impact of visual or naming strategy and focuses on delivering clear and direct information.

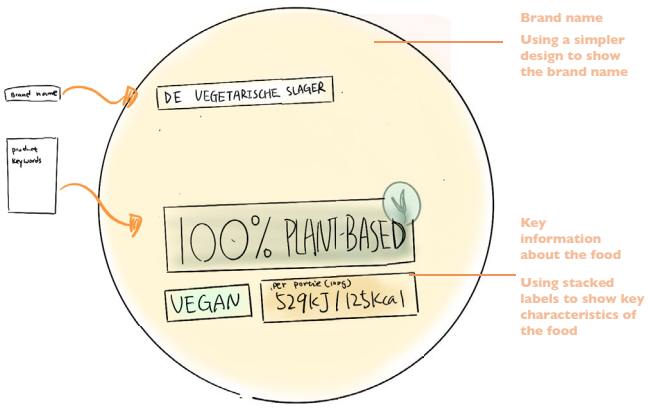
A reflection on the product name:
Meat replacers took the shape of familiar meat products when invented. Product names sometimes optimize the attractiveness of the product with various naming strategies. In the fresh food category, the naming strategies are not that important, and the name is for calling the food, not changing its identity.

Using format to provide more precise information and less visual design to polish the product identity.

Design for better communication

Current

Future



Increase the importance of food characteristics

As the introduction section mentioned, research indicates that labels and product claims can mislead consumers. This issue may also arise in the context of ultra-processed sustainable food. These labels may not accurately represent the information about the actual food contents, resulting in further confusion for consumers. While labeling may be considered optional and less significant in a multisensory packaging experience, it is still a crucial touchpoint for information delivery in this project. Therefore, the redesigned label is based on reflections and explorations to align the design with the project's overall goal.

The new design approach considers potential biases in the context of ultra-processed sustainable food categories. The food names are removed to avoid confusion. Instead, the label focuses on presenting key characteristics of the product in a high-hierarchy format. By highlighting these essential attributes directly on the label, the design aims to provide information in a clear and accessible way.

Reduce the emphasis on brand style.

04 Concept

There are large open areas that are transparent, which are for dragging consumers' attention to the food first and using vision as a touchpoint to build the connection with the food first. The shapes can also stimulate the interests and motivations to interact.

The theme shape used in the design is round, as it relates to the meaning and information about the ingredients. On the meaning level, the messages conveyed are friendliness and sustainability can represent by the rounded shape. Additionally, the round profile provides a comfortable grip. Moreover, the round shape aligns with the characteristics of the soya. These are the reasons that determine the theme shape.

After consumers continue diving into the experience, they can pull out the containers and review the food product's label. The label directly communicates the food characteristics. The label is not placed on the outer part of the packaging. It is an underlying part that tries to be uncovered when consumers move from abstract to clearer understanding through interactions.

The interactions of uncovering refer to the current behavior, which has the potential to develop further in the following iterations.

The journey seperated to 3 stages:

During the browsing and evaluation process, vision plays the main role, while haptic interactions participate as following touchpoints when consumers pick up the product. Shapes enhance the haptic experiences during interaction.

Stage 1: When consumers haven't interacted with the packaging, look at the packaging.

Have connections and stimulate motivations to interact.The rounded shapes deliver a friendly feeling and affordance for touching and holding. Users can also see the food product through the packaging from the very beginning.

Stage 2: Consumers further interact with the product and discover more information.

Consumers can pull and take out the food container. At this stage, they will see more information about the food in another format. Consumers are in the experience of learning about the food product. The previous stage focuses on perceiving the food's identity from its appearance and the haptic interactions. In this stage, consumers can enrich their understanding of the specific food product by reading about its key characteristics.

Stage 3: When consumers build food images in their own understanding and reflecting

Consumers in this stage can continue interacting with the food product. In the end stage of the experience, consumers can actively reflect on the food identity they perceive from interactions.

01

02

03

4.3 Conclusion

Next stage: Detailing design

The prototype demonstrates how the concept engages with consumers and where opportunities exist. However, the outcome still lacks creations in interaction affordances that lead consumers through the sensory touchpoints. The sensory touchpoint can play a more significant role in communicating messages with detail considerations. The concept still has touchpoints that can be further improved through detailing.

The design has innovative creations in terms of experiences through designing packaging components in multisensory design approaches. The experiences and interactions for the future vision can be estimated in detail. The details of the material using shapes' style, colors, interaction cues, and other detail components can enrich the connection experiences. Therefore, alternative methods are searched for adding details in the design iterations.

Methods for iterating and improving:

Design polishing requires thinking about detailed design components, such as specific materials and textures, and interactions in the user experience flow. Materialization and interaction improvements are the two main focuses in the next iterations.
The experience map is a tool that empowers in detailing, especially for the materializing stages design. The map has five steps covering design visions to sensory analysis (Camere, Schifferstein, & Bordegoni, 2018). The tool supports narrowing possibilities in detailed textures, materials, and interactions in the detailing stage. The concept iteration is built based on further ideations from the tool, which added richness to the experience. The tool empowers generating detailed design-related thinking. Through the tool, design components get filtered. The next page shows the experience map.

Mian reflections on the current prototype:

- Shapes play a central role in bringing diversity to interactions. At the same time, materializations can be further defined to enhance different sensory modalities, as other material selections can stimulate different feelings and understandings.

- Experiences can be further polished to connect micro-moments in the user journey. When the concept focuses on experiences, the entire experience becomes more experimental and focuses on the inner connections between food and human beings. The concept is expected to stimulate feelings, emotions, and understanding of the food identity. According to the insights from Experiment 2, narrative can be considered to enrich the information perception and make the experiences more complete.

5

Chapter 5

Detailing

Results from previous explorations succeeded in generating design from the defining messages and providing a novel experience. Sufficient consideration in the detail aspects is lacking. Therefore, the concept still has gaps in connecting sensory touchpoints and interactions. The detail level of the design, such as materials and hierarchy of design keywords, can be investigated more in the re-creations. The iteration concept will create based on the new methods and previous insights to enrich the detail level and estimate the role of multisensory.

5.1 Iterations for detail

In the detailing phase, the experience map methods (Camere, Schifferstein, & Bordegoni, 2018) unpacked the design components into smaller parts and united the parts into the map. The methods stronger the rationale thinking between vision and multisensory touchpoints. It also enables us to narrow down into more specific design details. The figure below is the experience map I created based on the method for the selected product.

Multisensory design experience map

Use the experience map to empower the detailing process

The experience map identifies the multisensory design's materials, interactions, patterns, and details. While creating the experience map, I focus on filtering out the most relevant words and images that fit the design vision. Since the design contains different messages delivered to consumers, I define the vision as the meat alternatives packaging replaced will be like an old friend sharing a food story. Consumers' experience evaluating food tends to be longer than the current situation. When selecting images for the experience map, many images represent an idea. In the experience map, combining the inner circle, outer circle, and keywords provides directions for further brainstorming. Characteristics include vitality, aesthetics, interactive scenarios, etc. Experience map supports diving deeper into design details. Here are some examples of how I reflect on sections on the experience map to move to the further design:

The transparent characteristics increase the trustworthiness and clarity of the experience. Using different angles to see the same objects and discover new things is also enjoyable.

The original resources of sustainable food have a living cycle and grow proactively and dynamically, which can be taken into the ideations of shape forming. Imply the natural language to the design language.

When thinking of the design, I also connect the force feedback to the higher-level meaning of the project since sustainable food is also a responsible choice which in the force feedback and textual can create a supportive feeling and holding areas to emphasize the accountable feeling through haptic.

Many small reflections appear in the design process to ensure the decision-making matches the desired delivery messages.

The experience map effectively directs the design to a different outcome and details the design. In the creative ideation sections, I follow the keywords and key images as inspirations and try to break through the traditional packaging design format to create a packaging match with visions. Based on the experience map, I started brainstorming the iteration version of the prototype. Some reflections of the design also guide the experience map's elements selections. Some advertisements will reference the context for food products, such as strawberry milk. For example, advertising practitioners use the "Moo" sound from the cow and merge it as an identifiable highlight in the promotion video to render its food quality. Consumers view these advertisements from Bus stations, YouTube, or other channels. Sustainable food should also have innovations to set its positions in people's daily food impressions. Looking closely at the current sustainable food category in the supermarket, the current sustainable food mainly uses the packaging design ways of existing food from packaging manufacturing to the design. There is rarely have new trend been invented that helps sustainable food differentiate from meat food. For example, low-processed or ultra-processed meat products will all be placed in a plastic boxes with covers. Meat replacers are also taken in the same format to create the package without many innovations in the experience of interacting with the packaging. As a new innovative trend and product, different types of consumers may have significant barriers to knowing about sustainable food. Since it is not meat but takes the packaging format of the meat product without any innovative design format added. The additional information relies entirely on informative elements such as texts and graphics. Sometimes, the images are confusing for the consumers since the context of the images is hard to see the difference between meat products. Following the experience map, I designed details considering the sustainable food's unique characteristics.

Transforming messages into a cohesive whole

The messages turn into the design intention and are present in the design language selections. In the generating process, the first step is to break down the messages. This message includes 3 parts, sensory modalities of food, authentic ingredients (before processing), and the higher-level meaning of the food. These messages are designed as a combination cohesively instead of designed separately. Recognizing the necessity of cohesiveness, the design intends to merge messages into a complete design piece. In the research of the multisensory projects, the Mary Biscuit box and Cubes are projects that do not set sharp boundaries of messages representation in the design outcome but blend the messages in the design language. The project is influential in forming experiences and stimulating reflections. Consumers' mindsets float along with the design details like cookie smells and soft haptic feedback. The iterations aim to merge the messages in the design ideations to create an explorational, experiential, and dynamic experience.

5.2 Re-creation

The design insights in the last chapters are valuable to the fundamentals. It narrows the messages and links them to the design. Therefore, insights are taken for the detailing. The re-creation is not about creating from the beginning but building up with the detailing methods. The outcome is an iteration that focuses on solving the remaining problems in the last concept. The prototype considered components within the experiences map, and due to the prototype limitations, the design first covers design priorities in ensuring experiences of sensory modalities. Other supplement design considerations, such as color and materials, will be discussed in the next section.

Compared to the prototype's last version, the design concept is more infectious and achieves sensory elements of transformation with aesthetic approaches. The packaging is in two sections, the upper part and the lower-based part.

Design intentions

Interaction
The interaction not only has the role of supporting experiences but also help to connect different sensory touchpoint. Consumers can hold the packaging to feel the weight and take the bottom part apart to view from the ultra-processed to the unprocessed stage. As the interaction evolves, consumers experience the context of changing perspectives. They can also hear the sound when interacting.

Haptic
Users can hold the packaging and feel the wave-like pattern, representing the plant's dynamic growing pattern. It also has the force feedback to deliver a reliable feeling.

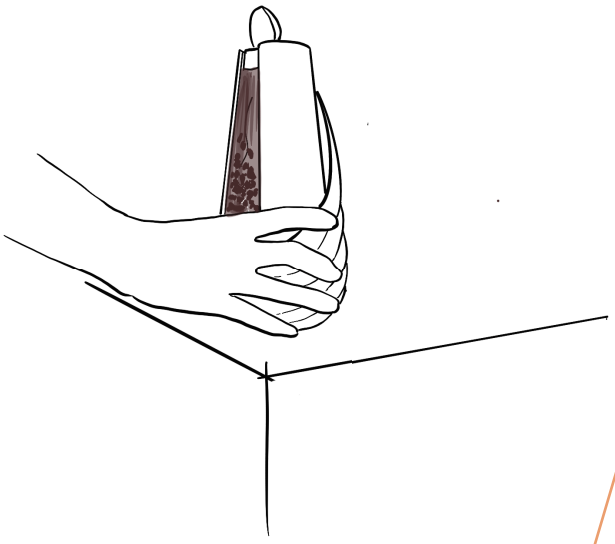
Sound
The design leads consumers to change the perspective of front view and back view. The front view is a transparent window that shows the original food. The rear view is the label and raw ingredients. When rotating the packaging, consumers can hear the crisp and light sound of soybean collapsing with each other.

Vision
When users see the entire packaging, they feel the vitality. The shapes feel like upwards growing. Taking inspiration from a growing plant, also find a different angle from the plain design style, the packaging uses a vertical design direction to represent the characteristics of the plant growing pattern. From the vision, consumers can feel dynamic and proactive.

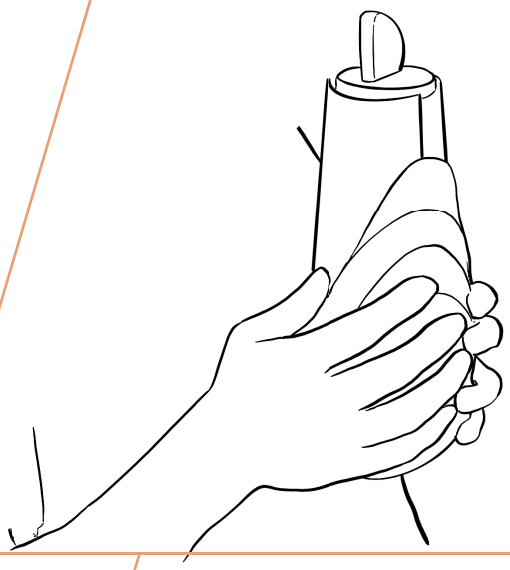
Smell
The user can pick up the top part of the packaging package and experience the smell of food. The sensation of taste enriches the user's perception of the food.

Storyborad

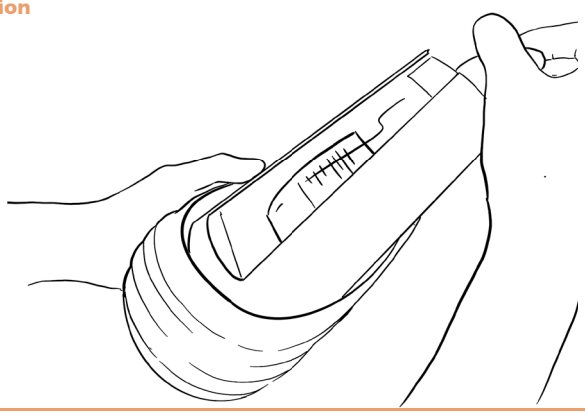
1. Attracted by interest.
Grabbing from the shelfs



2. Holding and start a explorative and interactive journey.



3. Tweaking to switch view between the food and its background information



4. Observing and diving into the food

5. Smell to form a richer food impressions through interactions.

5.3 Open conversations with users

The section is not for usability testing but to see how the prototype will be perceived through multisensory design touchpoints from the users' perspective instead of me as the designer for the project. There might be interesting findings, and insights from the communications can be carried to the next stage. I conduct 3 conversations with different participants.

It also evaluates the entire design explorations, with design outcomes generated through the process.

Overall experience (Key insights)

In the design exploration process, the logic and innovations are based on multisensory design methods, analysis of the current situation and design iterations. In this stage, I invite users to experiment with the prototype again to see the overall experience of the multisensory design prototype and how these sensory touchpoints affect their understanding of the food and the categories of sustainable food. From the experiment, the main goal is to see how consumers will interact with these novel packaging designs. In the experimental section, participants will be encouraged to use more adjectives and focus on their inner reactions to the prototype. The atmosphere in the area is formed as an open conversation. Since I want to give space to the participant to reflect and feel, in this setting, I can capture the natural and original thinking of participants who are not the designers. They provide exciting feedback on the prototype. Below is the detailed stage of the section.

First, before seeing the prototype, the participants will be introduced to a scenario of 50 years later, future supermarkets with multisensory design packaging. Then participants will be introduced to the prototype. At this point, information about design intentions will be hidden. Only the background context is shared. Then participants will be asked to experiment with the prototype freely.

Second, after the experiment, the participants will be asked to introduce the experience to me, not as an operator but as a friend. In this stage, participants can share their instinct feeling, reflective thinking and expectations. This step is to learn the understanding from users' mindsets.

In the third section, participants will see and experience the original packaging. In this step, participants will be asked about the difference in the experience.

Lastly, participants will provide feedback for different sensory modalities.

Users who are not very familiar with the details have been actively thinking about the prototype, which is also interesting for me to review their thoughts.

Here is some word cluster used by participant:

Participant 1: Eco-friendly, natural, soft, stable, clean, safe
Participant 2: Plant-liked shape, organic, interactive, futuristic, exploratory
Participant 3: Novel, curious, interactive, engaging, warm

How are experiences different between the original packaging and the designed speculative packaging?

Participants show strong interest when they get the opportunity to interact with the prototype. The prototype is playful and interactable. It drags participants' focus. The label has high readability. 2 participants can associate with raw ingredients and processed food without any introduction ahead. One participant reflected on his daily routine. The information shown on the prototype all shows on the regular packaging, but he never flipped the packaging to the back and reviewed it. The designed concept is interactive and drives his interest and attention to the food information. Participants can resonate that the designed multisensory packaging contains higher value messages. During the experience sections, participants are proactive in the reflections and learning process. In the conversations, participants did not use the same adjective to describe the experience they gained from interacting with the prototype. The words they choose are in similar clusters and match with design intentions. The designed packaging is aimed at having complete multisensory experiences. Participants spend more time in self-explorations and resonate with their feeling. Also, they process messages contained in the design through discovering and interacting. Engaging various sensory modalities makes the participant feel the experience brings a bridge and connects more with the food when they are in the packaging. When interacting with the original packaging, participants lifted the packaging to the visual horizon and saw the food through the small transparent window. Since at the front sight, it is all covered by packaging paper. They evaluated the food briefly and did not continue to read the detailed information. Participants mentioned that only seeing the front side with the rendering pictures are not clear enough. They think finding transparent windows is more trustworthy and clear when exploring the food product. One participant mentioned that vegan processed food is still new to consumers, and he wishes to learn the difference between vegan processed food products through the packaging. Facing the new food categories, he thought the current packaging needed to contain identifiable information to help customers distinguish. In the current daily routine, he is not motivated to learn sustainable food.

Participants relfections on different sensory modalities (Taste is not included in the touchpoints).

Haptic
Participants mention envelopment and playfulness to the haptic feedback. The haptic feedback gives users a friendly feeling and a starting point for exploration.

Vision
From the vision touchpoint, users think the packaging is aesthetic and attractive. Through the coordination with another sensory touchpoint, it also brings the feeling of honesty and politeness.

Sound
The sound feedback brings delightful, interesting and connective feelings. It is also a touchpoint that can further maintain people's attention to the entire experience. Participants spend more time interacting with the sound feedback.

Smell
Participants mention the experience of the smell is crucial in their food experience. Involve smell can make the impression of food more vivid. One participant said flavoured food is sometimes hard to distinguish the exact feeling unless purchased and tried.

Quotes clusters

"It feels organic to me. A bit like a plant shape. The color between grey and white feels futuristic and clean."

"It gives me an impression of playfulness. It makes me want to interact with it and has an exploratory feeling from the experience."

"Interesting and attractive. I think it also has potential (in the IoT aspect). Let's say I consume 50 grams, and the bottom packaging can display information linked to health."

"Interaction is engaging. The food is natural. The design uses specific expressions."

"I imagine it is on the supermarket shelf. Then I notice it is something eco-friendly and interesting. I would like to interact with it and explore the product. "

"It will be nice if be able to smell the product. That will be a great experience. In many scenarios, I need to buy the food product back home and get to know the flavoring."

"Visually is calm. The overall design makes me feel welcoming, warm, and friendly. Also, there is a bit mysterious."

"A sense of control. Trustworthiness and be informed."

"Novelty. Aesthetically pleasing."

"Comfortable to hold."

"Sounds remind me there is something else at the back of the packaging. Making me very curious about, and try to follow the sound."

"I see the product and learn the ingredients. The sound can also link to the understanding that it is a soy-based product."

"The packaging is large. Since not every part contains the food."

5.4 Conclusion

Insights from this exploration process indicated the effectiveness of creating sensory experiences as a whole experience instead of creating linear ones in creating communicational experiences. The experiences are no longer about emphasizing messages such as creamy, crunchy, or other specific food characters but as cohesive experiences. The experiences build with the philosophy of delivering complete images with multisensory approaches. The future vision development can include more aspect and makes the multisensory packaging has long-term development potential with multiple products and within the context.

The outcome from the design explorations has shown the changing of the experiences, especially in haptic and visual sensory touchpoints, and the way of reading labels. Two key aspects can be incorporated into the process that enhances the future vision's cohesiveness and completeness.

The first aspect is to make experiences smooth. Forming the future vision has the challenge of linking the future design to the current consumer mental model. The design currently has fewer implementations of the traditional product experiences, resulting in some design elements not following the users' current interpretations. To make the experiences more intuitive. Interactions need to be more polished to fit with the expectations of the consumer side and increase discoverability. The next iterations will have improvements focusing on multisensory design and combining it with interaction details. Also, the prototype communicates a message of not single-use since it is now made out of PLA through 3D printing and with a larger size in shapes than the normal packaging. Another perspective in iterations is making the multisensory design more concise and smooth. The design language can be simplified and connected.

The second aspect is extending the design to the entire journey. The design process is iterated to maximize the multisensory packaging design approaches. Other factors in the context might also influence multisensory experiences. The future vision needs considerations about connecting relevant aspects to ensure the investigation's feasibility and potential.

6

Chapter 6

Developing the final concept

The main design exploration phases have been done with a mid-fidelity prototype demonstrating how multisensory is involved in the packaging. The next stage is the final concept. This chapter's sections contain insights from interactions to highly relevant factors to prepare for the final iteration. interaction criteria are refined to guide the final concept. Going for a more complete vision instead of only reviewing the problems through specific product, the future vision gathers insights into the feasibility of the design approaches and reflect the design outcome to reality. The zoom-out view of the multisensory design provides solid preparations for the final design outcome.

6.1 Design approaches toward the Future

01 Design goal

To clarify the future vision for ultra-processed sustainable food, I write the end goal into 3 parts. The context indicates where the design will place and offer experience. It sets in the context of supermarkets 50 years later, when ultra-processed sustainable food develops into large categories, consumers surrounding advanced service and material costs will be low on the technology side. The packaging design level is setting the new design possibility, which is the main exploration outcome of this project. The last is the influence on the consumers' side which indicates the results from the experiences.

The context

In supermarkets 50 years later.....

The packaging design

Leveraging packaging as a communication channel that represents the food inside by transforming ultra-processed sustainable food into a dynamic and engaging multisensory experience containing messages.

The consumers

Enhancement in the relationship with ultra-processed sustainable food.

02 Interactions

The sections describe and refine anticipated interactions, including the interaction inspirations and interaction qualities. While the outcome from the design explorations is built around specific products. But the vision in this project is expected to apply to the future trend of entire categories of ultra-processed sustainable food, not only the specific product.

In the prior exploration journey, two critical points guided design: cohesiveness of multisensory design and transformations. The cohesiveness of multisensory design requires approaches to integrating sensory modalities as a piece that reaches a harmonious experience with aesthetics. Transformation is a crucial step that links food messages to the design components. It is a key step to generate and guide the final design. Based on the previous understanding and approaches, the interaction is refined in detail, extending these two main approaches and other relevant qualities.

As chefs masterfully create and engage diners, designers can use design techniques to develop experiences and redefine the relationships between consumers and their food choices. When interacting, consumers are actively reflecting and engaging with the experience. The scenario creates a holistic experience that engages all senses and incorporates narratives within the interactions, aligning with the vision of multisensory packaging design.

Alinea's floating sugar

Interaction inspirations

The multisensory experience of consuming a signature dish in a Michelin restaurant.

In the documentary "Chef's Table," in Season 2, Chef Grant Achatz and his team explore and create explorative and surprising dining experiences. One iconic dish is an edible balloon that floats in the air. It offers a unique sensory encounter with multiple touchpoints and creates a new way of interacting with food. In the experience, consumers can smell the scent of the food, and the further tactile feedback breaks the limitations of serving the dish with tableware. The dish provides simultaneous oral, tactile, smell, and visual feedback. Various senses are combined with increasing discoverability, encouraging reflections, and fostering food interaction.

Chefs apply their thoughts to the new dining experiences and interactions between dinners and food. The atmosphere in the industry is built and continues to evolve. Many practitioners pursue innovations in experiences. The new experience attempts often change interactions between food and consumers. With these attempts, the food values are magnified. In contrast with the food packaging industry, more opportunities are needed to highlight the connections between consumers and food.

To organize all the desired interactions in the experience, consuming a dish in a Michelin fine dining restaurant is an interaction inspiration in the design. The experience precisely uses sensory touchpoints with an outstanding balance of interaction innovations in the experiences. If we analyze the experience from the multisensory design perspective, several insights are highly related to the desired interactions. The restaurant's environment is designed for better engagement with the atmosphere. The tableware is also intended to support consumers to focus on the moment of consuming food. These elements are all designed for centralized dishes at the current moment and help consumers emerge to the intended experience. It can be concluded as the experience preparing the stage for activating senses, which connects with the actual consuming stage. The chef uses techniques to create a food experience with scents application, food textures shaping, visual aesthetics creation, and elements integration. The dish contains messages from the restaurant's philosophy, the food, and the story. Consumers experience from all senses, interpreting the messages and constantly reflecting on and discovering the food. The moment of consuming is the main stage of the multisensory experiences. Every detail directs consumers in the experiences and entirely focuses on the activities. The entire experience carefully considers the elements to support the multisensory experience.

Several interaction keywords are generated with reflections on the experiences and the previous packaging design explorations. The following sections explain the details of multisensory packaging.

Interaction qualities

Here are key points that lead the interaction design to ensure consumers gain a multisensory experience that matches the goal. The qualities of the interaction cover from sensory activations to meaningful experiences. There are many products under the categories of sustainable food (ultra-processed food), including fried vegan "chicken," protein bars, snacks, pre-make meals, etc. Each food has its characteristics at the detail level, such as textures and appearance. The packaging is designed for specific products with different details. Even though the design lands on particular products, in the vision, the design approaches should fit and align across the products. The interaction qualities can apply to all design results.

Senses activation:

The design stimulates sensory modalities (visual, tactile, auditory, and olfactory) to build a multisensory experience for ultra-processed sustainable food products. Elements in the stimulations connect with food-related details and feature as stimuli. Sensory cues, such as shapes that invite interaction and trigger tactile feedback, contribute to intentionally activating corresponding senses.

Explorative actions:

The design fosters discoverability and interactivity. In the future, selecting food in the supermarket becomes an explorative sensorial journey that bridges the gaps in the current experiences. Consumers can evaluate food through interpretations received from their experiences, and the experience is self-manipulation. Since food information has transformed into the design, consumers can interact to unveil layers of information and discover their findings.

Immersive conversation:

The design creates a new way for consumers to form connections with food. It provides a "space" beyond physical environments and encourages consumers to immerse themselves in the experience and establish a deeper relationship with food. Unlike quickly grab-a-product-and-go scenarios, the experience is intended to be immersive and have a longer reflection time. Through this approach, consumers delve beyond superficial information (e.g., flavor and name).

Deliver meanings of the food:

The design transforms mindless and mundane routines into a meaningful journey connecting with food. In the design process, the meanings of the food are included in one of the message clusters. The meanings represent a higher level impact on the food, and it acts as an initiative to encourage consumers' thoughtful consideration.

Embrace sustainable food:

The overall experiences encourage consumers to bond closely to the food in the selection stage. Usually, the complete food imagery is shown in the consumption stage. Multisensory packaging design brings this process to the forward stage with a holistic view before consumption, allowing consumers to embrace distinctive food features without consuming them.

6.2 A complete vision

Design for the future vision

Through the previous design explorations, some opportunities are reviewed. Designers have the energy to define and translate the message into the design language. The designed touchpoints deliver the intended messages to consumers and provide desired experiences. For the final result, the concept will show a collection of sustainable food multisensory packaging and future scenarios. The building of future vision is centralized around multisensory packaging. Before returning to the design activity, the future vision will be further discussed and reflected. Other elements related to the main visions can enrich the visioned contexts and support the feasibility of the final concept.

The future vision showcases a larger scenario instead of only a design innovation on a specific product. Behind the idea of the packaging, environments, other products in the categories, and commercial opportunities are highly related systematically (see Figure 14). The following sections of this chapter will dive into these aspects, surrounded by multisensory packaging design approaches.

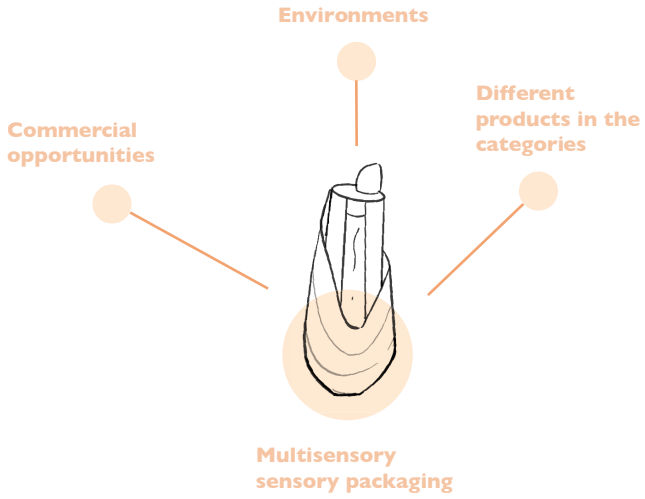


Figure 14. Future vision with multisensory packaging design: considerations on multisensory design relevant factors

Considerations for iterations

The multisensory design integrates many layers of information and presents a harmonious design outcome. It makes the experience powerful in reaching its full potential. The current prototype development has always been guided by integrations of information layers and designed with multiple sensory modalities. Outcome uses the sensory touchpoint to stimuli experiences and tells the information. The further steps are finalizing the concept with in-depth multisensory experiences thinkings. The section lists some possible ways to improve.

Multisensory approaches do not implement as an industry trend in the ultra-process food packaging areas but have various outcomes in other product types. The multisensory design is close to us, especially in daily reachable products. For example, video games use multiple senses to support the immersive experience. The controllers have haptic feedback, and the screen plays the game's scenes. Sensory modalities in lots of expertise are in coordination instead of operating by a single modality (Frankel, 2023, p.251). Many products have changed the way of using sensory relate features. In the Ted talk by Jinsop Lee, he raised the concept of using five senses evaluation tools to review daily life experiences (Lee, 2013). When one or more sensory qualities are emphasized in the design, it can improve the satisfaction and richness of the experience. The interaction is also changed to match the intended sensory features by changing the affordance. In the future, food packaging experience can also be one of these product groups to provide positive experiences with synthesis and dynamic experiences. As the design develops, the details can refine through alternative multisensory design approaches that cover extensive considerations.

A set of multisensory design principles demonstrates how multisensory design functions in different design objectives. It is inspirational sources that provide supplement thinking methods when aligning the current prototype to the principle. There are 4 parts in the set: 1. Flow, 2. Maintaining focus, 3. Managing demands on attention, 4. Sequencing (Frankel, 2023, p.267-272).

Aligning the design outcome with the principle, there are several insights on continuing to pursue the interaction goal:

Flow
Users are in the flow when using the product. The current design concept introduces participants to the immersive flow of connecting with food.

Maintaining focus
Various sensory modalities keep people focused on the explorations of food. For example, sound is an excellent stimulus that catches consumers' attention and encourages consumers to continue to explore more.

Managing demands on attention
It is interesting to discuss attention in this project. The attentions are designed. As the earlier chapters described, consumers care less for detailed information about the food, and brands have ambitious promotions. Hence, the attention to the food gets weakened by promotional details.

Sequencing
When users have interactions, sequences connect different stages in the journey. Not every project has organized experience phases. In this case of interacting with the packaging, there is a more flexible sequence, but some sequence orders are provided. For example, users first see the food instead of any other detailed information. The design aims to expose food in the first place to make the first attention to the food. Except for the food, interaction hints guide the following sequences. After interaction starts, there is no fixed sequence that consumers have to follow. It is more about explorations.

Other considerations
Some factors are not included in the principles but are valuable to the design. First is the aesthetics. Aesthetics are not only about the appearance of the product but also about dynamic sensations. The dynamic can occur in the detailed interaction design, such as interaction affordance and feedback. The second is ensuring the concept matches the interaction qualities. In the previous page, the interaction qualities are defined. The food information mainly guides the design. Still, when polishing the invention, the interaction qualities should also be involved and matched in the considerations to support the central goal.

Influence to consumers

Multisensory packaging design will influence whom it implements in the markets. The section discusses the potential benefits and influence of multisensory packaging when the design is launched.

Sustainability is a social challenge, and food is one part of the solution. People can follow strict vegetarian meal patterns or involve vegetarian meals in their daily food-consuming routine. In my design vision, multisensory packaging benefits more to those who hesitate to select and are unfamiliar with sustainable food. Multisensory packaging is a good channel to open the conversation and reduce concerns in choosing a product. The project brings more authenticity and meaning to the food packaging. People can experience the food without consuming it. For people who have followed the vegetarian diet pattern, multisensory packaging design can help consumers distinguish desired products, dive into information about products and discover new products. With multisensory packaging design, the meaningful food experience is promoted to more people positively and intuitively.

Non-Vegetarian
For people unfamiliar with or without motivation to change their lifestyle. The multisensory packaging design can be the intervention to open sustainable eating conversations with this group of people. It can reduce the unfamiliarities and hesitations of knowing the new food. The sensory touchpoint is also more intuitive and reflects on the food. Consumers can notice the new lifestyle and food through the packaging channel before consuming.

Vegetarian/Vegan
People who are already in the lifestyle of embracing sustainable food can have the opportunity to learn about the food they are consuming from another perspective. The multisensory can provide better information perceptions progress. For example, they can review the food resources and experiences of the food. With the opportunity, they can discover a new product that fits with their behavior better. Consumers learn about the main benefits and the meanings of their actions. The experience can potentially provide pleasant moments and supports their actions in the longer run.

Commertial opportunites

The commercial opportunity has value in seeing how the design can function and fit into the system. Observing the trends can also help to define the material used. Through research on the pioneer packaging companies, the current possibilities map to the future. In the project, I am in the role of the designer. Launching multisensory packaging in the future requires collaboration with the manufactory stakeholders. Opportunities exist on the system level in association with other stakeholders. When considering the materials and future manufacturing possibilities, searching the current approaches is inspiring for building future systems. Currently, there are advanced technologies to achieve the goal of reducing carbon footprints.

In the larger context of commercial productions, many materials are in the future trends—for example, bio-degradable materials, nanotechnologies, and intelligent technologies. Driving by designing for the sustainable food categories, bio-degradable and sustainable materials are the most exciting opportunities that fit the design. Focus on these materials can make the entire multisensory packaging design lasting instead of only the message containing a sustainable lifestyle. Lots of food packaging is single-use. Making packaging recyclable and easily degradable is a future trend to ease the negative impact on the environment from packaging. Envisioning the possible collaboration mode with green materials can also ensure the plan is in a healthy system circle in the long run. Considering the values of the invention, using sustainable materials is an emphasis of the concept. Due to the limitation of prototyping, the physical prototype will try to restore the vision.

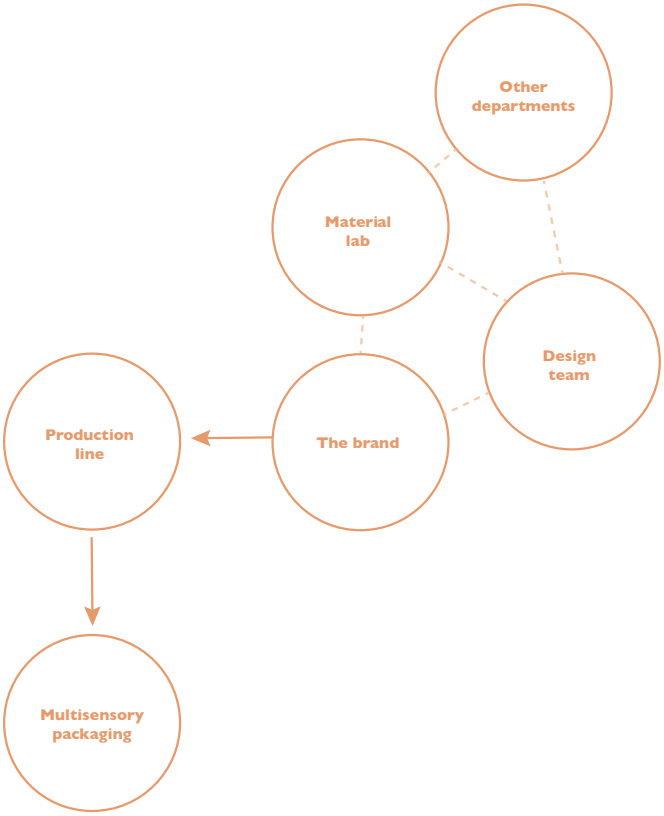
Some companies are using sustainable sources to create packaging functions as the same. NOTPLA is a company that actively innovates material-wise. They have seaweed coating techniques and a water-resistance role (NOTPLA, 2019). Another innovative product they have is an edible soft bubble packaging for liquid ingredients like oil or salad dressing. It is a solution that smartly replaces the plastic bag. Even though the market scope of NOTPLA is on takeaway packaging products, great opportunities can be seen in packaging sustainable material innovation. It is one of many companies that are using eco-friendly sources. In the system, companies like NOTPLA focus on providing solutions as their products. In the future, the brand can also invest its packaging production and have a sustainable production line.

Products from NOTPLA

Considering the future feasibilities of the design approaches and inspired by the system's current situation, there are two possible modes to apply sustainable sources to multisensory packaging design. One is the brand purchasing the solutions from the packaging companies, forming a collaboration relationship. The other mode is starting their packaging innovation lines.

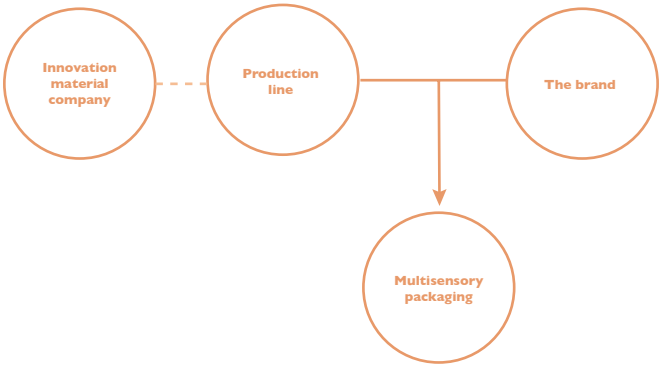
01

Brands invest in their own sustainable packaging production lines.



02

Collaborates with the innovative packaging materials company



Extend experience to environments

In the consumer reports from Deloitte (Jagt & Hop, 2021), over half of the consumers in their research responses are interested in the food's influence on them. Another critical insight mentioned is the role of the grocers who have not played significant roles in delivering sufficient information to assist consumers' behavior in becoming more sustainable and healthier in food purchasing. The environment setting is also one of the factors related to the packaging display and consumers' experience. In the project of multisensory packaging design, the envisioned scenarios are for people to learn and connect with food packed inside through packaging. Unlike encouraging them to buy food, the system encourages people to experience it. Supermarkets have put smells such as fresh bakery to increase buying willingness (Dunne & Raby, 2013, p63). The environments powered by technologies have abilities to impact consumers' behavior. Back to the design context, the design outcome is for the supermarket environments. Discussing the environmental possibilities can also emphasize the experience of the multisensory design packaging. Considering the environment, it can be tightly connected with the practiced multisensory design methods and current prototypes.

In this context, the shelf is the most connected and influential factor in the packaging design. The current grocers have taken unified structures to arrange packaged food products in the supermarket. The products are nicely listed on the standing frame, and we wait for people to review the price tag and the product. As the explorations redetermine the packaging language, the design language can also be applied to the environments to emphasize the sensory experiences further. In this section, the discussion will be discussed how innovations and technologies can support the multi-sensory design for sustainable food.

Certain touchpoints in supermarkets can guide consumers' experiences, including labels, shelf layouts, promotional activities, and more. These opportunities can be modified and aligned with the design vision. The project will not dive deep into the environment design extends with the multisensory approaches but will provide an example scenario to illustrate the possibility. Based on the existing elements and involving multisensory thinking, factors encompassing using scent, sound, and visual guidance can re-direct consumers' experiences. These touchpoints play a more subtle role than the main design focus on the packaging. The environment can offer an introduction stage to the journey and a connective experience to the main experience.

Environment explorations

Possibilities are in sharing the defined design language into the environment design. The design language used in the packaging design is generated from different layers of food information. Language implementation presents patterns, shapes, colors, materials, and other design details. Some of these languages can be taken further to the shelf shape design to make the environment matches with part of the sensory modalities and creates stronger resonates.

Supplement sensory modalities

Currently, 4 senses modalities all exist in the prototype. In the environment, there are possibilities to add supplement sensory touchpoints to smoothly connect consumers to the flow of experience with the packaging. For example, environmental sound and light scent can be placed. The natural sound of the original sources' farm can be played, and the light scent of plants can be integrated into the environment. These selections can also coordinate into stimuli to enhance consumers' association abilities with the food information.

Other opportunities

New technologies such as IoT products like scanning machines and digital displays can also be a touchpoint to explain food information in this project. It is out of scope and doesn't improve the intuitive multisensory experience much. After evaluation, a digital screen will not be used in the designed scenarios.

Image from Pinterest

An example scenarios

In the designed example scenarios, the idea is to provide a designed shelf for the plant-based food to highlight the products, similar to the approaches of the promotional showcase in the current supermarket. To build the pre-experience step, the shelf has speakers and aromas diffusers. The scents in the aroma will be selected from the environment of some raw materials, and then key sounds from the production scenes will be played.

6.3 Conclusion

In Chapter 6, interactions are defined, and long-term possibilities are discussed. In the final concept, the relevant factors will not continue going deeper and turn into alternative materials that support the final concept. Iterations will focus on the multisensory experience that brings by the packaging itself, except for iterating the first product selection, which is flavorful meat alternatives. In the final concept, dairy alternatives are added to enrich the outcome and provide evidence as self-evaluations of the multisensory approaches.

Products in final concept

Last but not least, the focus is still on the packaging of ultra-processed sustainable food products.

The final concept will align with the defined design goal and interaction qualities. Since the entire vision is towards ultra-processed sustainable food, the final concept will add one more product to the collection to provide more evidence of the viability of the design vision. The other selected ultra-processed sustainable product is chocolate flavor oat milk from Oatly. Oatly is an iconic sustainable food brand that focuses on producing oat-based products. The brand has standing-out styles in the packaging design to communicate its brand philosophy. Consumers can see lots of comic-style text and visual expression on the packaging. It is a great product selection that can review how effectively the multisensory approach can change messages deliveries in food detail and higher-level qualities. The multisensory design for the second selected product will follow a concluded exploration process.

Products from Oatly!

7

Chapter 7

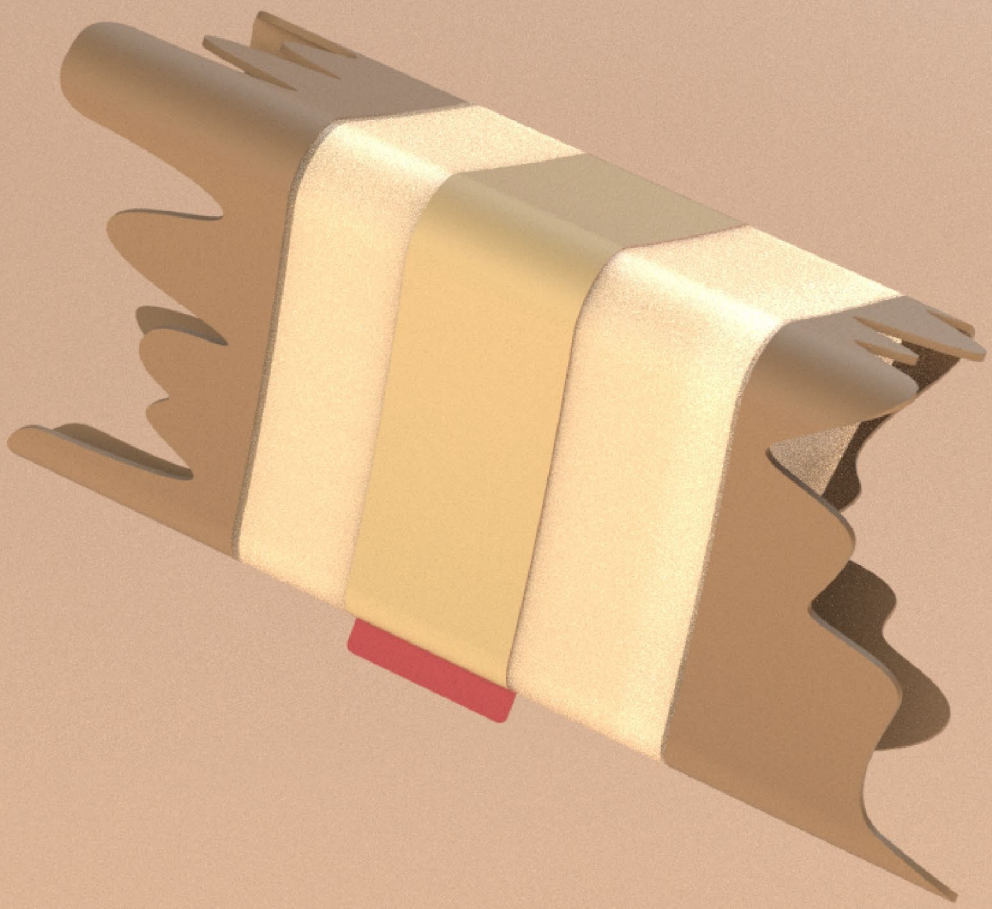
Final concept

Two design outcomes are generated as the final concept. The chapter concluded the design explorations to a complete design process and applied them to the new product selection (Chocolate oat milk). The meat alternative product is focused on iterations in interactions and cohesiveness. Besides the design process, the chapter discusses color usage and prototyping methods. The final design first shows in digital rendering with explanations of design intentions. Then made into physical prototypes and demonstrated consumers' journeys with analysis of sensory expressions.

New packaging launch

2.49
Euro

10% off

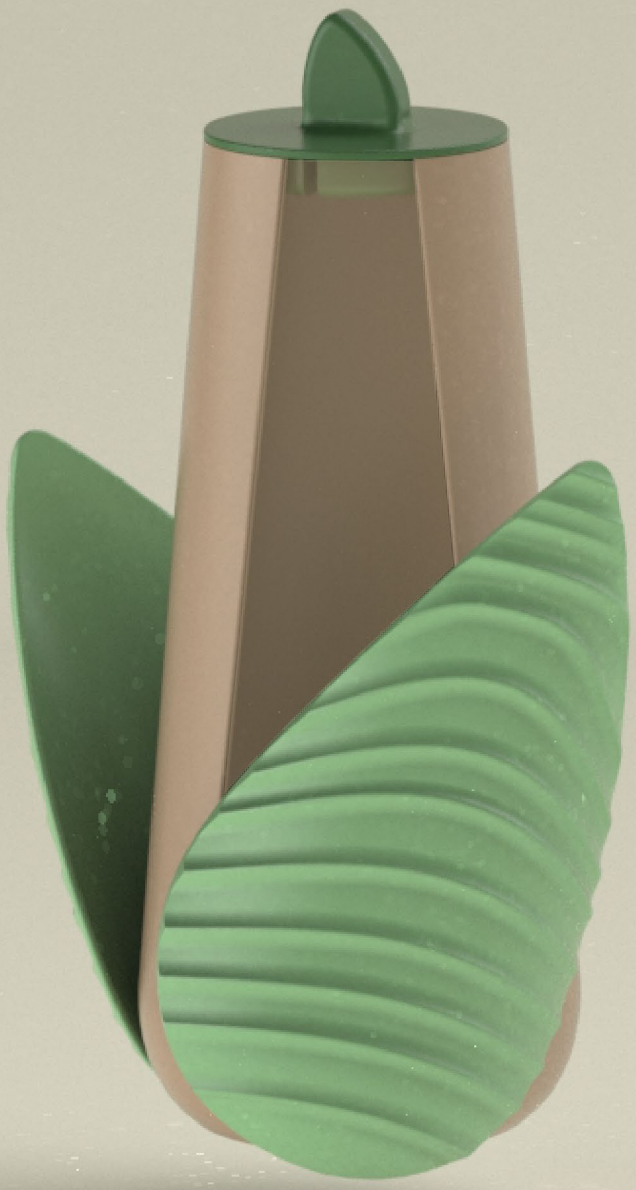


100% Plant-based

New packaging launch

3.19
Euro

10% off



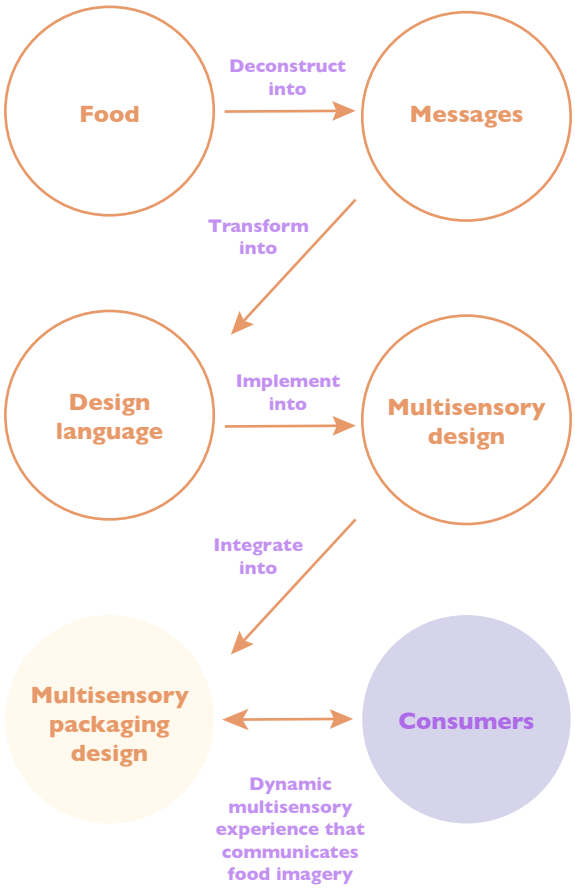
100% Plant-based

7.1 Generating two concepts

The final concept contains two finalized outcomes based on two ultra-processed sustainable food. The first is the selected product and iterated with previous design explorations. Its final concept is based on previous insights. The second product is added to exploration with the concluded process for generating a multisensory packaging design. From the beginning of the process to defining sensory expressions and information, the process goes through small steps to the design results. It is also a self-validations of the possibilities and path to generating a multisensory design that reaches the design goal. Furthermore, evaluate the design exploration as a duplicatable process with multiple product possibilities.

Concluded process from design exploration

As processes are integrated and improved through many times of design explorations. Here is the concluded process for designing packaging containing multiple sensory modalities and conveying messages through design elements. Vegetarische Slager Vegan rul gehackt, a minced fake meat product, focuses on the last few stages of smooth integrations. The change is mainly around the interaction iterations and reducing unnecessary parts to make journeys connective. Oatly chocolate flavor oat milk, its design starts from deconstructing the food. The following content will first showcase the dairy alternatives' process and the meat alternative's design.



Reflection on color usage

Materials and shapes can be found from the experience map and previously defined meanings in the finalizations points. However, the selection of colors can be a perplexing dilemma. Colors' functions are vital and diverse. Intentions from the design side determine it. For example, brands have their theme color to fit their entire portfolio and make themselves stand out (Velasco & Spence, 2019, p21-p48). The same color can present different meanings in various design definitions. The meaning is also changed based on the cultural context. Also, colors can influence interpretations of fragrance and taste perceptions. The intensity of saturation of the color influences the interactions of smelling fragrance. The more saturated the color, the stronger the fragrance consumers perceive (Velasco & Spence, 2019, p25). In this context, colors can also associate with the flavor. 7-up is tasted with a more robust lemony flavor in a yellower can (Spence, 2016).

Consumers use cue utilization theory (CUT) to overcome large volumes of information to make decisions (Herbes et al., 2020). Cues have various formats, from packaging shapes, colors, and materials to sensory cues. The study indicates that green, brown, and dull colors communicates the information of environmentally friendly. In the sensory aspect, warm and soft materials connect the perceptions of sustainabilities. These insights help the design in the finalization stage determine the color choice and detail level of the material used. The research indicates that consumers find packaging sustainable through labels and visual cues like images and colors, then the form of the packaging.

Reviewing colors' function from a boarder perspective, at the phycology level, colors can convey information, elicit emotions, and evoke specific feelings. Red is a vibrant color often associated with motivation and indicates errors (Frankel, 2023, p127-p128). Green and brown colors are closely linked to nature. Green, in particular, can stimulate emotions of balance, harmony, and growth, reflecting the natural world around us. On the other hand, brown conveys a sense of endurance and stability, evoking feelings of reliability. By understanding the color's functions from the multisensory packaging approach and its general use, color can be better leveraged to enhance the messages delivered and create an experience in the final outcome.

To further finalized the choices in the colors. The first is to clarify the project goal and the intentions of using the color. Multisensory packaging in the project has changed the process of thinking and designing sustainable ultra-process food packaging, which aims to provide the cues mainly in the structure, forms, colors, and materials. The structure, forms, and materials contain information from the food and meaning levels. The primary color selections in the project can emphasize the higher-level information to deliver a sense of sustainability. Consuming this food is a harmless and friendly choice. The highlight color can provide hints for the interactions and make labels part of the packaging distinct but not disrupt the overall feeling. Lastly, harmony and aesthetics always exist in the design process; the combination of colors should consider balance and unity. Based on the considerations of color use, both multisensory design packaging follows color usage reflections.

Methods used in prototyping

Developing a concept begins with sketching and filling more detail with digital rendering. One challenge is to make the design concept materialize, transforming them into an interactive packaging prototype in reality. The prototype aims to reflect the sensory touchpoints, colors, materials, and other elements defined in the design accurately. Considering messages in the packaging, paper materials are used to emphasize sustainability. Paper-based materials are challenging to prototype in shapes containing textures and curves. I researched online methods for creating my own recycled paper-based model. I discovered a particularly effective method that guides one to create a paper-based prototype right from the initial material. XYZAidan, a tech blogger, fabricates recycled paper models, with the final result embodying the desired form and having robust qualities supporting objects (XYZAidan, n.d.). My prototyping of the paper-based parts follows his instructions and aims to create shapes close to the design with textures and shapes. I adopted some key steps in his recommended process. For example, cutting collected paper into shreds and wetting it for the next step to make them into paper pulp. The materials can collect from all waste paper types except for paper that contains plastic. The crucial step includes adding adhesives to paper pulp through rice paste (a natural source) and creating molds. The design of the molds relies on analyzing the envisioned shapes and textures to have the designers' own mold design. After learning from the tutorial, I created molds for different parts based on the design of the two multisensory packagings. The last is de-molding from the molds and assembling parts together.

In addition to creating the prototype, the molds provide proof of potential in mass-produced since the molds can be used repeatedly for creating multiple packaging prototypes. This repeatability underscores the feasibility of the design for large-scale manufacturing and can maintain consistency in the look and feel of the design.

As a newly selected product in the multisensory packaging design collection, the design goes through the mentioned concluded process, starting with understanding the food and its sensory expressions. The process goes through 6 key steps with related design activities and methods to reach the end goal and showcase the consumer experience.

7.2 Oat milk

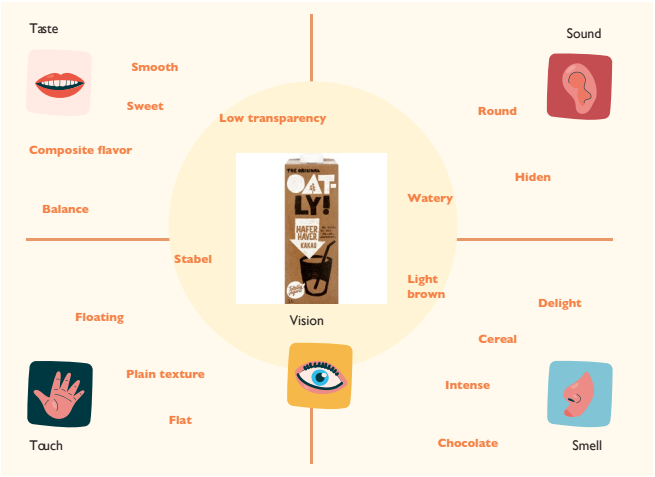
01 The food

What are the sensory expressions? What is the feedback received from different sensory modalities? The first part analyzes the food through its overall experiences and outstanding characteristics in different sensory experiences. This section's sensory map and expressions drive the detailed messages in section 2. From the food, the experience is deconstructed into a message list.

Sensory expression

Oat milk has a lighter texture than milk, and it is more watery. Milk has a thicker feeling in taste and touch feedback. But it is not as light as water. The texture brings a smooth sense when consuming it. It tastes fragrant and sweet and not overly sweet. The product does not directly make consumers associate with types of products that have many additives, such as slushy. Since the taste has an outstanding balance and visually does not have any pop-out color. The chocolate flavor oat milk has a light brown color and is low in transparency. Putting the nose close to the cup with chocolate oat milk gives off a cereal-like aroma mixed with a chocolate note. This compound scent gives a pleasant and soothing sensation. But this aroma does not last after a period of sniffing. It is only felt most strongly in the first moments. The sound feedback does not exist in the entire experience and is shown in consuming and pouring the oat milk into the cup. The sound is round and lacks sharpness.

Sensory map



02 Messages

Combining with insights about sensory experiences and observations, the food imagery is deconstructed from 3 layers, from the originals of the food to the higher level meaning. The detailed messages will be organized into short sentences and used in the map to generate the design language. Then the message lists are generated. Through a mapping method inspired by a mind map, the idea goes through the categories of the packaging components. Then the design keywords are generated.

1 Main ingredients of the product

The main ingredients in the ultra-processed food awwre not showing its state. The main ingredients in the product are Oats, sugar, low/fat-free cocoa powder, and water. The product also adds some vitamins and calcium.

2 Sensory modalities

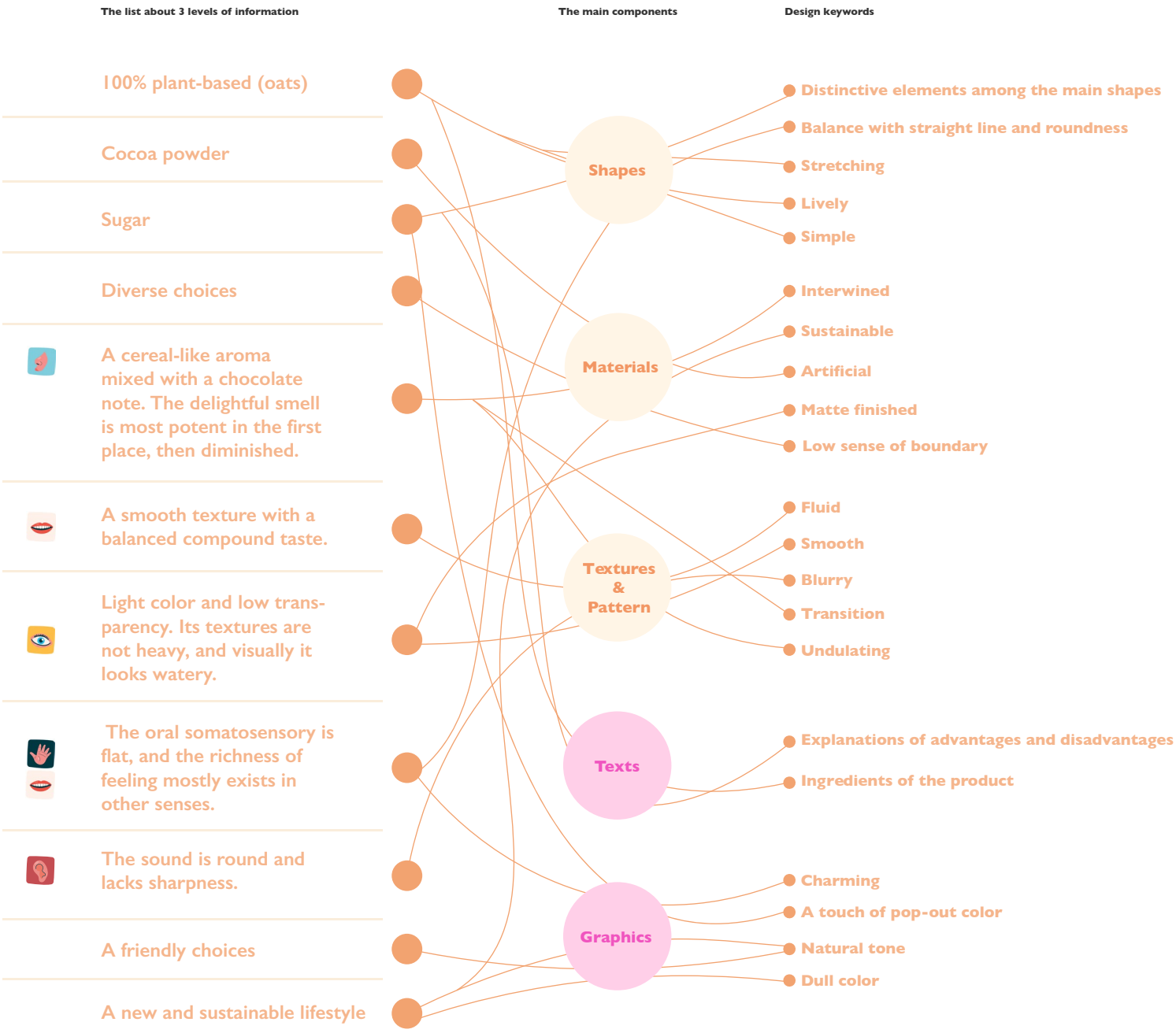
The sensory expressions reference the analyses in step 1, such as fragrant and sweet taste, round sound, light color, non-heavy taste, and other sensory experiences. The most outstanding sensory elements are the compound smells and tastes of oats and chocolates, with a rich and delightful experience.

3 The meaning of the product

Within this aspect, products in the sustainable food categories represent a friendly choice and a positive lifestyle for the environment. This product, at a higher level, also communicates that sustainable food products have plentiful options in terms of flavor. Available decisions for products in this category are diverse.

The message analyzed is broken down into single entries in the map, and this organization in the map gives designers' brainstorming a starting point. The second column of the map is the packaging design elements, and the design keywords are generated according to these elements so that the keywords are not too far removed from the theme and have a dispersion. The endpoint of the map can provide direction for the next step in filtering representative images in the experience map.

From message list to design keywords generation



03 Design language

After generating the design keyword, the design tries to capture the essence of words first, even if it is abstract. These ideations can be used in the solid design when moving to the more solid ones with interactions and figurative shapes. The step is to ideate how to deliver sensory experiences with information. Experience map as the tool leads out more specific and adequate design language based on the multisensory design aspect. As the product is also a sustainable ultra-processed food, some qualities are the same as the vegan meat product. In the experience map, I utilize the characteristics of the current product. Therefore, many assets are notable for the product in the exploration process. With the step of the experience map, the design language is more defined and more apparent.

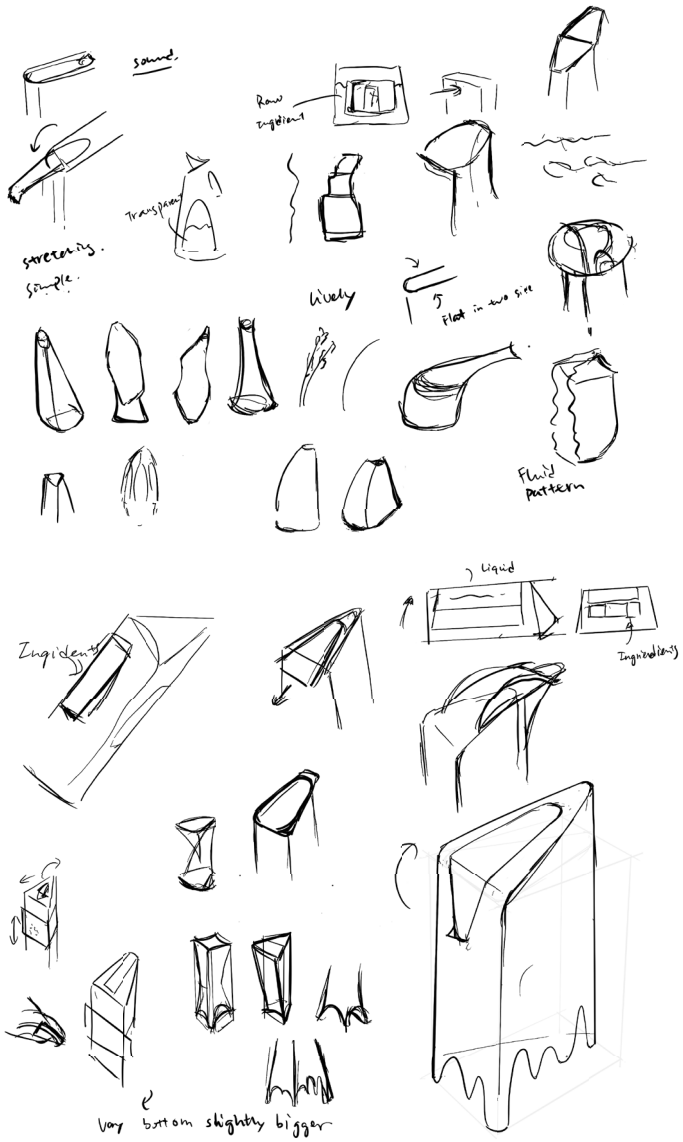
Experience map

04 Multisensory design

Building on the outcomes of the previous steps, including prioritized sensory representation words, defined relationships between food attributes and design elements, and chosen images reflecting sensory experiences, the current stage turns to practical implementation. Based on the selected directions, the emphasis now is on integrating various aspects and crafting the interaction design to create a complete experience. Elements like forms, structures, colors, and interactions become the building blocks for the final multisensory experience.

The ideation process for the sketches initially concentrates on capturing the design language of shapes and themes since they are the structure of the entire packaging design. For example, rectangular and triangular shapes satisfied the initial predefined considerations of the design language of straight lines, flat surfaces, and rounded corners. Then as I weighed between the design choice, the triangular form is more suit for the expected reason because of the following reason. First, it is more effective in distinguishing plant-based products as the products mostly use rectangular shapes. The shape can show the innovation of the product. More importantly, it enables the integration of flat surfaces, rounded corners, and straight lines, mirroring the product's smoothness, innovativeness, and flavor balancing. These are the key sensory terms defined in earlier stages.

As developing further, Interactions are engaged in the process of connecting various sensory expressions together. Considerations include enhancing the auditory experience and integrating olfactory elements based on prior definitions and explorations. The interactions also involve visual and tactile feedback, gradually refining aspects as the design solidifies. By employing consistent multisensory design thinking, the final design concept ensures the outcome aligns with the anticipated experience and leverages detailed design language to convey complete messages comprehensively.



05 Multisensory packaging (outcome)

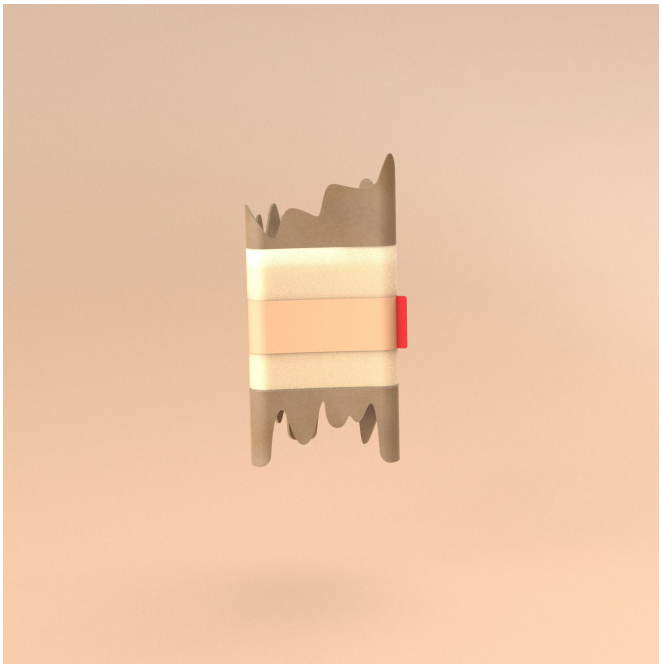
Design intentions

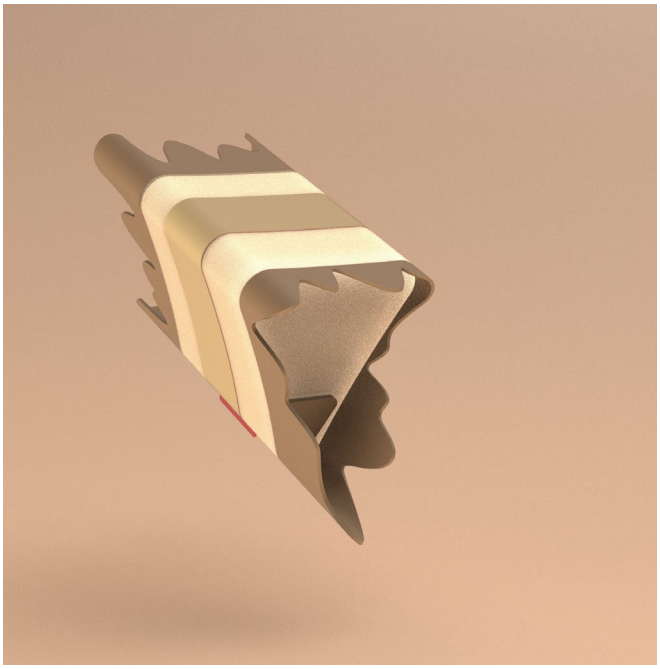
The keywords in the previous predefined qualities include flat surfaces and wavy patterns. Hence, the design uses three surfaces instead of using multiple and curved surfaces. The pattern is also intended not to be designed unevenly to show flexibility and fun feelings to mimic the liquid's movement. With the combination of the structure and the pattern, the outline shape represents the liveness and fluidity of the product quality. The oat milk product is more watery and brings a less resilient feeling in the mouth than whole-fat milk or other regular milk products. The product also has a balanced taste and smell that brings a strong impression. In the experience map, "balance" is one of the conceptual words that can be detailed by shaping the design. The main shape uses a triangle to show stability and novelty since the compounds oats and cocoa taste and smell experience are novel and unique to this specific product.

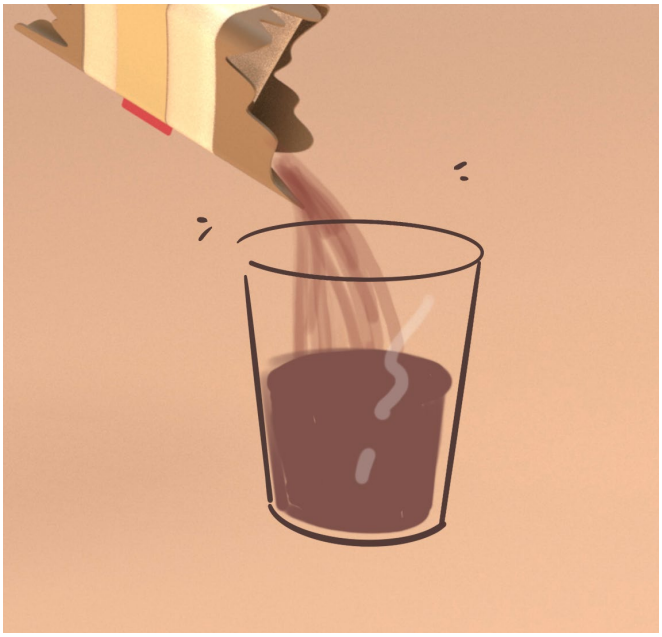
After the overall structure, it comes to more detailed sensory representation. Another important insight from the analysis is that the product contains a sense of perfection crafted by food-manufactured creations with ingredients components instead of having a strong natural taste. The product also involves aromas and sugars to harmonize the taste (Oat Drink Chocolate | Oatly, n.d.). The perfection of taste delivers a joyful experience and stimulates the sense of processing. Therefore, details like applying a rough texture without disrupting the main structures (only on the bottom and top parts) and two parts of visuals indicate change and processing in visual and tactile feedback. The middle parts function as a transparent window for reviewing the product. In the design, I choose to use cloudiness to design the transparent window with only half transparency. The design is intended to trigger curiosity and encourages consumers to look closely at the information in the visible parts, such as adding elements. Then the information label was designed in a ring-shaped paper strip with olfactory feedback. The scent can act as an affordance for leading consumers. There is also a visible affordance that uses bright and light colors, such as red, to attract consumers to open it.

Since the product is liquid, it already offers some sound feedback. To emphasize the feedback and make it more delightful and noticeable, I extend the experience to the consumption stage. The longer the distance the liquid travels from the bottle opening part to the cup, the longer users will have to notice the products and listen to the flowing sound. Especially when the height of the bottle increases when pouring out the product, the sound of falling into the cup has the potential to become crisper and louder. The top part of the design has a corner higher than the order designed for two reasons: to strengthen the sound feedback and afford consumers to distinguish the opening part.

The choice of color and materials are both for reinforcing and multisensory experience and align with sustainability approaches. Paper, cardboard, and glass are more convincing to users about the products' eco-friendly quality (Ketelsen et al., 2020). Parts not functioning as the main containers were applied with recycled paper in the approaches. As discussed in section 7.1, dull colors can echo the sense of sustainability. The primary color is brown tone, which presents sustainability and reflects the products' characteristics simultaneously.

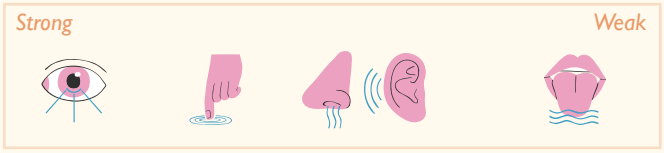




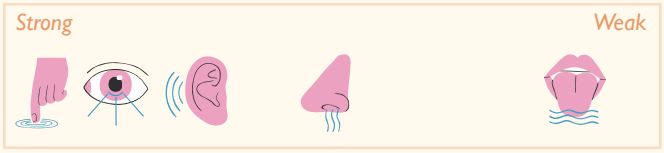


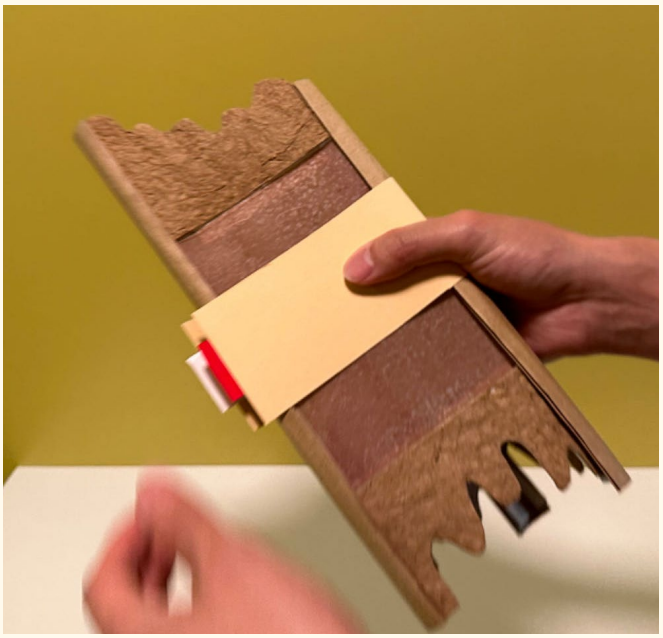
06 Consumer experience

01 In the product-seeking stage, consumers are initially presented with an overview of the product, which serves as a connection point to capture their interest. In this stage, the visual is the primary sensory connection established by design integrations to encourage further explorations.

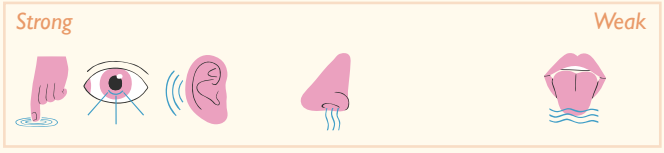


02 The broader part of the product is designed to provide a comfortable area to grab. Consumers can hold the product to have some observations. When consumers move the packaging, the product inside creates subtle sound feedback.

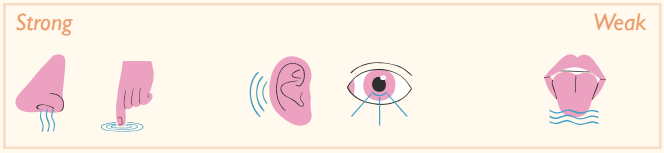




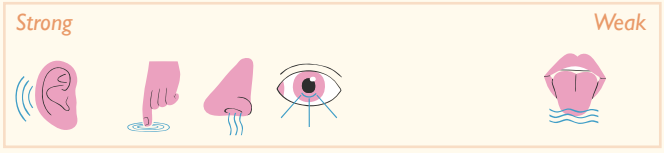
03 After users notice the cues for labels (a prominent part in red color), they can open the label from this part of the product. The opening actions trigger the smell feedback. The scent will release from the paper strip. The label content highlights the sugar attributes with light orange to capture consumers' attention.



04 Users can take the strip closer to the nose for stronger scent feedback.



05 Even though consumers can hear the sound when moving the product, the sound feedback design emphasizes the interaction of pouring out the oat milk into the cup.



The meat alternative product already implies multisensory design approaches. The last stage focuses on refining the experience by polishing design details for harmonies, rationalities, and aesthetics.

7.3 Meat alternative

Iteration focus

The previous design includes sensory cues in the design outcome. For example, curved grooves and spherical bases for holding provide intended force feedback and present the message of the responsibilities of food choices. Similar approaches include upward movement in the pattern to show growth and progress and longer height in proportion to show the sense of stretching. The design language is closely connected with sensory expressions and messages. However, these cues appeared disconnected from one another. In the last version, the concept is designed in two parts, which may confuse users regarding its functionalities, especially food packaging. The interactions need improvement in making stimulations more intuitive and connecting cues more closely to provide a holistic experience. In order to have a rational and cohesive concept with aesthetics. The iterations focus on iterating the interactions towards defined five interaction qualities (Senses activation, Explorative action, immersive conversation, delivering the meaning of the food, embrace sustainable food).

Iterated interaction

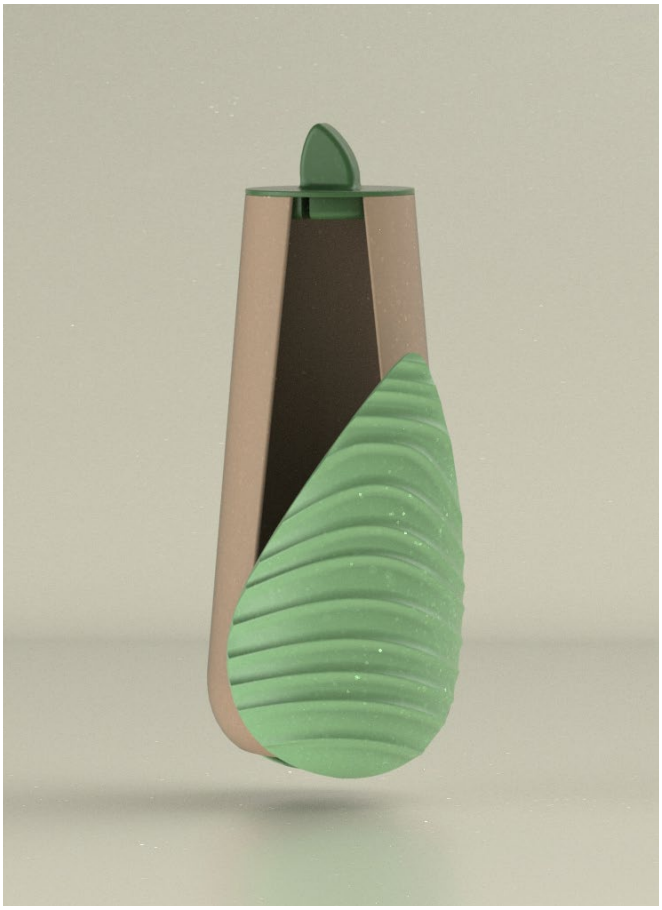
Multisensory design (outcome)

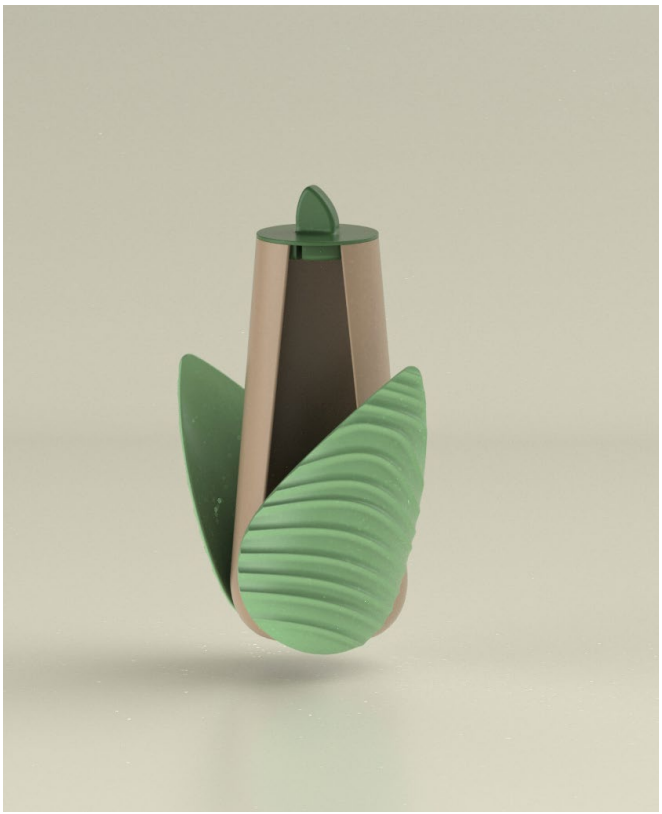
Design intentions

The iterations continued utilizing the predefined design language, and the update has specifically addressed the unnatural interactions in sensory stimulations. Before, consumers needed to separate the design's two parts to seek the olfactory touch points placed at the bottom areas of the top part. During this experience, the bottom part (with a series of grooved curved parts) is not in use. In this experience segment, clear discoverability and distinct cues are absent. Another unclear touchpoint is turning the top part to trigger sound feedback, which also lacks distinct cues that consumers can easily discover, even though participants in the last experiment section mention the surprising experience of receiving sound feedback. The two parts design might have redundant and unbalanced feelings on the structure level since sensory touchpoints are placed in two separate structures. Sound feedback can be more naturally embedded in the experience while maintaining the pleasantness of surprise.

In iteration, the design resolves these pain points. The lower parts in the original design are changed to two leaf-like surfaces as the outside surface areas connect to the main parts with an axis. Compared to the previous solutions, the iterations increase the sense of cohesiveness, aesthetics, and intuitiveness. At the same time, it carries the expressions of proactive, smooth, and stretching. The design reduces redundancy and integrates different parts. It also more clearly shows the interaction affordance. The axis provides the movement to the parts, and it first covers 1/3 of the open window areas to encourage consumers to interact with the product. The interaction is a "twist" action. After twisting, the aroma of the food emits around. The structure will change form (like plants grown from), showcasing the story of growing and being processed into plant-based products. Narratives show through subtle cues rather than using straightforward methods such as words. Sound feedback is activated once consumers pick up the product and accompany each consumer's actions. Since in the iteration, the sound trigger is hidden in the inside structure of the packaging. The interaction is embedded with consumers' intuitive actions along the entire journey. In the design, sensory expressions interwind and function no longer as stand-alone stimulations.

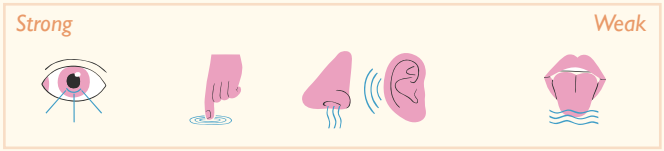
The design considers message presentations holistically by considering colors, shapes, textures, patterns, structures, and other related design elements. Sensory touchpoints weaved within these design intentions. The messages are embedded through rich and layered experiences with non-linear narratives practiced. Consumers have an immersive of the product through interactions and sensory feedback along the journey, which creates a closer connection with the food product's qualities, feelings, background, and values. Detail interactions will showcase in the following sections, which explain how multisensory design is integrated. Similar to the considerations of the oat milk product, the design uses recycled paper materials as possible. The primary colors follow a green tone and light paper tone. When deciding on colors, the specific colors will be adjusted to make parts recognizable and for aesthetics.



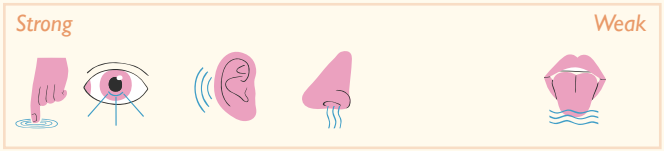


Consumer experience

01 The first interaction stage is similar to the previous product journey. The experience first starts with visual stimulations. Consumers have an overview of the packaging.

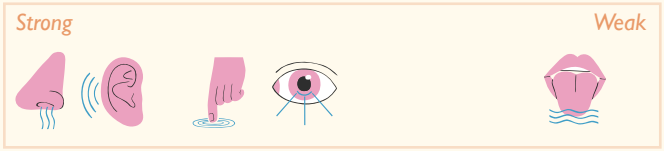


02 Then consumers can hold the product to explore more sensory features.

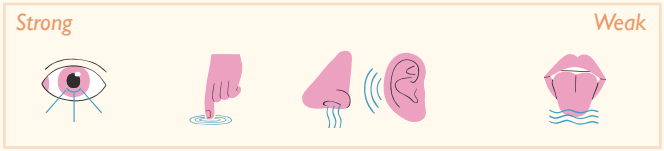


03 Consumers can twist the flexible parts in two directions to let the scent out and see the entire transparent window.

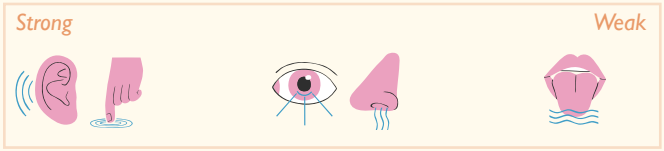
04 Moving the packaging closers, consumers can have stronger olfactory experiences.



05 Consumers can see the product on the front side, and on the back side, it is the label.



06 While turning/moving the packaging, there are also sounds of the soya beans accompanying. The sound stimulation materials are placed in the hollow bottom areas, which can not view by the consumers. Consumers can shake the packaging to emphasize their hearing experience with louder sounds.



8

Chapter 8

Evaluations

As the design journey reaches a high-fidelity prototype stage, it is the right moment to evaluate how well the design outcome aligns with set design goals and the quality of interaction. This evaluation gives insight into multisensory packaging design's future adjustments and impacts. The design leverages multisensory design approaches to communicate food product-related messages, providing a dynamic and immersive experience. It aims to strengthen the bond between consumers and ultra-processed sustainable food.

8.1 Evaluation objective and methods

To gather insights from the participants, I have identified two interests to focus on during the evaluation phase: evaluation of design goal and integration qualities. Each area will be evaluated through structured activities and methods. This section first explains in detail the goals and methods. The entire process elaborates in the "Evaluation Process" section, combining a series of activities to provide a comprehensive evaluation process. The approach supports further understanding of current multisensory design from various angles. Only the meat alternative product's packaging is involved in the evaluation process to draw out related insights. 4 participants joined the evaluation section

Toward the design goal

01

Understanding the correlation between the intentional sensory design and participants' sensory perceptual experiences.

The sensory touchpoints within the design have been carefully crafted, embodying the design's intentions. Evaluating the designer's intention and the participants' perception is instrumental in ensuring the effective transmission of messages and the design language. Insights can be into whether the designed sensory experience resonates with users as intended.

Evaluation materials

After freely experiencing the prototype, participants will be asked to reflect on their experience of each sense. This will provide a more in-depth understanding of each sensory input. They will describe their perceptions and experiences from each sensory perspective. This arrangement allows for a detailed exploration of how each sensory modality contributes to the overall experience and highlights potential areas of enhancement or refinement within the multisensory design.

Participants will be guided to describe their sensory experience:

- Visual (sight)
- Auditory (hearing)
- Tactile (Touch)
- Olfactory (Smell)
- Gustatory (Taste)

Even though the taste is not included in designed interactions, seeing how participants will reflect on the taste is also beneficial.

02

The effectiveness of message conveyance

The design is rooted in food imagery and deconstructs messages from the food. Underlying the customer journey are messages. This section will guide participants to share what messages they perceive from the packaging and how they understand through open-end conversation.

Overall experiences' impact

The design reshapes the traditional experience of interacting with packaging in the supermarket by introducing a multisensory approach to packaging-consumer interactions. Feedback on this novel experience can help verify whether multisensory approaches foster a closer bond between consumers and ultra-processed sustainable food instead of only building relationships with product identities from the packaging. The insights can also guide the future development of the current approaches.

Evaluation materials

Participants will ask to explain their understanding of the food product perspective.

Questions:

What does this product try to communicate to you?

How do the design or specific packaging elements contribute to this understanding?

01

The project focuses on delivering an enriching experience, and interaction qualities integrate into the overall theme. Given this context, the participant's perceptions, opinions, intuitions, and understandings are more significant insights to evaluate the interaction qualities. Hence, I created an evaluation form based on the Likert scale method (Likert, 1932) to assess how well the interaction qualities are incorporated into the design from the participants' perspective. The Likert scale reveals insights at the level of attitudes and is now widely applied in research, especially in surveys (Bhandari, 2023). Even though the Likert scale can measure people's opinions, the response may have biases.

Moreover, in this case, the participants are a small group. Therefore, I added open questions along with each statement to determine the reasons behind the responses. Considering the small group of participants in this case, I have also included open-ended questions following each statement to understand the reasoning behind the responses better. This approach allows for a more in-depth understanding of the specific feelings and perspectives of the participants. The 5 points scale is chosen to avoid potential complexities and confusion for the consumers considering the multitude of activities they are required to engage with throughout the research process.

Evaluation materials

Satement&open questions:

1. Senses Activation

- The packaging design effectively stimulates my various senses (e.g., sight, touch, smell, etc.).
- Could you please describe which senses were most stimulated and why? Also, did you feel any sense was neglected?

2. Explorative Actions

- The packaging design encourages me to explore more about the product.
- What elements in the packaging design prompted your curiosity? Could you explain why?

3. Immersive Conversation

- The packaging design creates an immersive experience that feels like the product vividly expresses itself.
- Could you please elaborate on how the packaging design enabled this immersive experience? What could improve this aspect?

4. Deliver Meanings of the Food

- The packaging effectively communicates the various essence messages of the food product (e.g., about the food's origin, ingredients, preparation, or cultural significance).
- Which specific essence messages about the food product did you derive from the packaging? How could these messages be better communicated?

5. Embrace Sustainable Food

- The packaging design embraces the concept of sustainability and seems eco-friendly
- What features of the packaging convey its sustainability? How could the design better emphasize its eco-friendliness?

5 points scale: strongly disagree, disagree, neither agree nor disagree, agree, strongly agree

The next section shows proper oders of these evaluation materials and the process.

8.2 Evaluation process

Since the evaluation is focused on the experience, the background information, such as how you are considering facilities for grocery shopping, will be avoided to ask during the evaluation sections to reduce biases. The limitations are that participants' backgrounds might still bring biases in their responses. In the beginning, I will give a setting to emphasize focusing on personal experience with multisensory packaging, regardless of other factors that are not related, such as prices and current supermarket contexts. The detailed materials are described in the previous section. This section focuses on explaining the key steps in sequence.

Step 1: Context establishment

Participants will first look through some future lifestyle-related images to create a mindset of living in the future. Then they will be introduced to a scenario of future grocery shopping. They will be instructed to focus on their experiences of interacting with the packaging. The preparation setting is for decreasing the concerns on experience irrelevant aspects.

Step 2: Initial experience

Participants will have their initial experience and freely explore the prototypes. Following the initial experience, participants are asked to write down keywords for each sense's experience. During the section, participants can re-engage with prototypes.

Step 3: Sensory perceptions

Subsequently, open-ended questions about the overall experience will be asked. As the moderator, I will review sensory keywords, ask related questions about specific keywords, and determine insights into individual sense modality.

Step 4: Likert scale and following questions

The final step involves participants completing a Likert scale evaluation. Each Likert statement will then be followed by associated open-ended questions to gather a more in-depth understanding of the reasons behind their responses.

8.3 Results

Participants' perceptions of senses

One key observation is that sensory experiences in the multisensory packaging design are not stand-alone. The perceptions of individual sensory modalities are interwound with each other. Some responses are repeated between multiple senses in writing down keywords, and some ideas are based on a holistic perspective. The keywords specifically describe a sensory experience, but from the further explanations, insights indicate that participants' understanding is related to more than the current focus senses. The following insights highlight specific aspects related to each sensory experience.

Auditory (hearing)

Two participants have a strong interest in sound feedback. The sound feedback stimulates comfort, pleasant, calm, and healing feelings. The participants raised two examples to explain their associations: the rainstick and the musical instrument have rhythmic sounds. The other two participants have different responses to the sound feedback. One thinks it is neutral compared to other stimulation because the sound feedback always accompanies and does not feel very surprised when focusing on this specific stimulation. Another participant links the sound feedback to the product qualities of "uneven size."

Visual (sight)

Visual as the first experience derived to consumers in the journey, all participants established positive attitudes in the first place. High-frequency keywords are sustainable, recyclable, and eco-friendly. Participants also link the packaging with plants related scenarios, such as buds, seeds, the movements of growing out from the ground, and the natural environment. This feedback may also be related to the twisting interaction. Two participants mentioned the "richness" of the product due to variations in materials, shapes, and colors of different components.

Tactile (Touch)

All participants used keywords related to "roughness" to describe the tactile feedback. They think the roughness in textures combined with the grooved patterns makes the packaging easy to hold and stimulates intimate, safe, and friendly feelings. The tactile feedback emphasizes the understanding of vegan food and sustainability.

Olfactory (Smell)

The packaging is intended to provide an authentic smell through intuitive interactions. The smell feedback itself is from the product. Participants think it is a distinctive touchpoint, drawing them to consider the food consumption experience. Since the packaging delivers the smell instead of changing the aromas, the olfactory experience stands out from other senses (the food product smells similar to combinations of BBQ spices). Two participants mention that the smell is out of their expectations.

Gustatory (Taste)

Even though the taste is not in the design elements, I add it to the evolution section to review how other senses can support the taste feedback. Participants can associate with gustatory experience, but each person has different opinions, such as original flavor, chewy, and rich in taste. The gustatory responses are more based on personal ideas than other sensory modalities.

Effectiveness on message delivery

All participants immediately reflect on sustainability, eco-friendly, and recyclable as the keywords when first interacting with the packaging. Other words from various responses include organic, fresh, and minimal waste. The reasons are mainly because of the overall shapes, materials, textures, and color cohesiveness. These perceptions mostly come from visual and tactile feedback. Two participants mentioned nature. Participant D described the overall perceptions of the packaging that led to an imaginative scenario of plants growing under a tree in the forest.

Coordinating with information from the labels and the overall experiences, participants easily recognized and associated the product with vegan products and sustainable actions. Participant A mentioned seeing additional values and explained the priorities motivation for selecting the product is changing the current lifestyle instead of thinking about the taste as a priority. Participant B feels the packaging has a strong sense of narrative. The transparent windows give participants a sense of reliability as they directly. The reliability also relates to the experiences of interacting with packaging with multiple touchpoints.

Interaction qualities

Senses Activation

The dynamic twisting movements and packaging changes create a lively and engaging experience. The interactions integrate visual, sound, tactile, and smell feedback closely, with each sensory touchpoint's unique qualities. Participants' perspectives on the insufficient touchpoints are various, from visual to smell. One participant thinks the visual cues received less attention in the interactive journey due to focusing on interactions. Another participant mentions that the trigger interaction for the smell feedback is interesting, but the scent is more abstract than other sensory feedback.

Explorative Actions

All participants mention their sufficient affordance to guide and encourage them to explore. The packaging showcase possibilities through cues such as half-covered transparent windows, movable parts, textures, and sounds. The interactions are playful and supportive of consumers' exploration willingness.

Immersive Conversation

The design detail brings diverse experiences. When viewed the design as a whole, it creates a sense of bringing a sense of coherence and immersion. Three participants mentioned narratives by different design approaches. Participants have expressed curiosity about the intermediate stages of food production, as the packaging provides information about the origin and results of the food. The experience stimulates thoughts of the middle progress of ultra-processed food.

Deliver Meanings of the Food

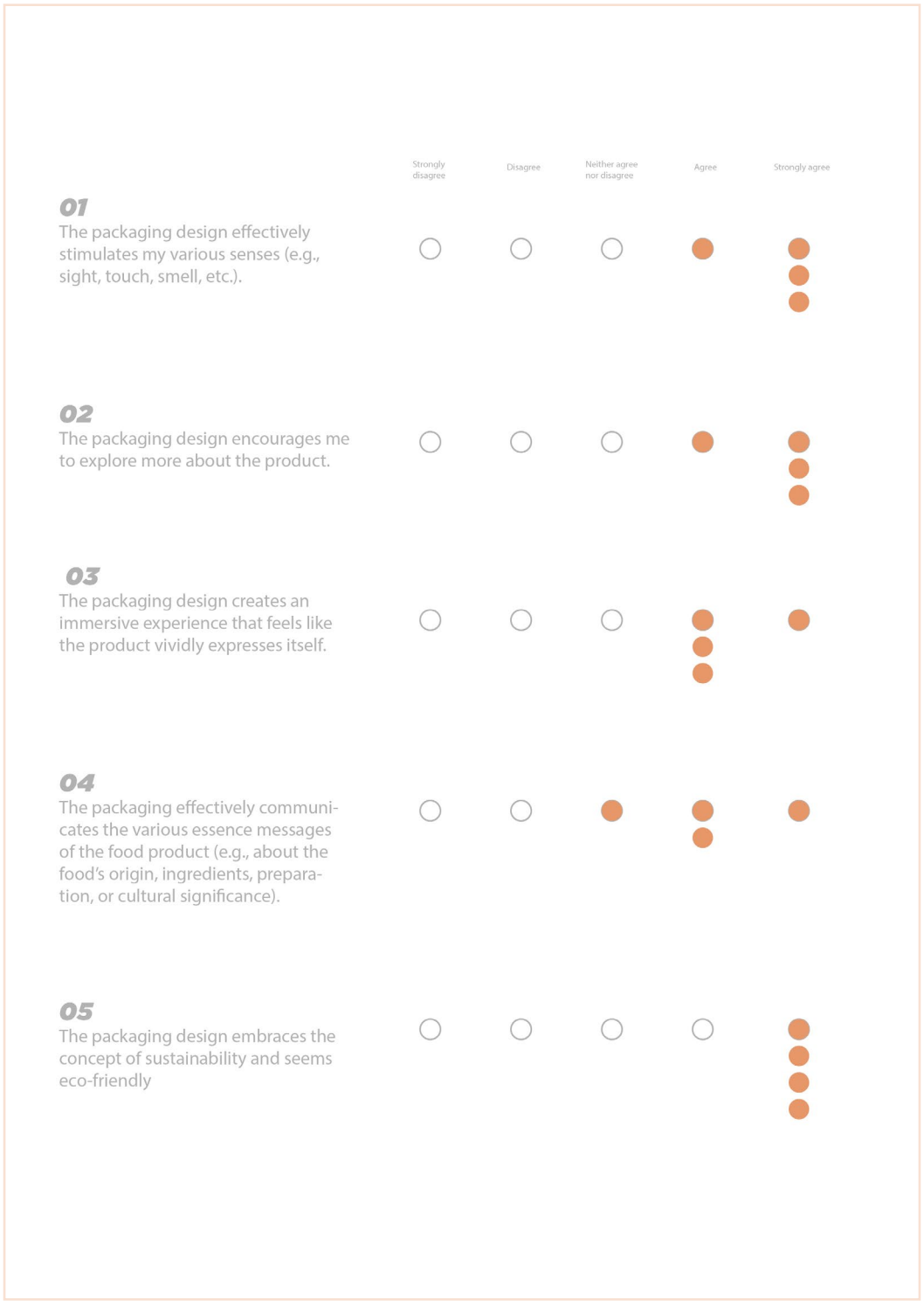
Participants can capture the food's key characteristics, which are plant-based, vegan, and sustainable, and the food itself. For participants, the experience explicitly shows values. However, as mentioned in the "immersive conversation" section, the processing

part is missing and can be resolved by adding visualized indications. Another insight is that when certain information gets emphasized, others might receive less focus in the overall experience.

Embrace Sustainable Food

The design successfully establishes a connective experience between consumers and sustainable food, as 4 participants selected "strongly agree" anchors for this statement. This outcome relates to interplay with interactions and design language use. The design highlights a multisensory and engaging experience of exploring the food and its value.

Likert scale result overview



Quotes clusters

"Plants breaking from the dirt.The entire packaging feels eco-friendly and recyclable."

"The low saturation of the color and materials makes me think of grain and plant-based. It does not like some snack products, always with very bright colors like red. So I also think it is healthy."

"It is a pleasant and healing sound. It reminds me of the experience of playing with a rainstick when shaking the packaging. I feel the flow of the sound."

"The tactile feedback makes me think of low waste and sustainability. Thoughtfulness and valuable."

"Because of the smell. I think the taste is intense and salty."

"There are many cues that guide my interactions with the packaging."

"The label is direct."

"Since the message provides information about the origins and results, I am curious about the middle process to link together the messages. It can be a very simple visual explanation."

"If I choose the food, I will not care much about the taste. It is more about lifestyle changes."

"Natural and eco-friendly. Growing in the forest."

"I feel the packaging has changed my way of perceiving food."

"The color is fresh, and it is very cohesive.The concept is aesthetics, and I feel like the packaging is being designed with reasons."

"It is easy to hold and comfortable. It brings a different experience."

"I like the textures and the grooved pattern (when holding the packaging)."

"The sound is rhythmic. Like a type of musical instrument."

"Triggering smell is an interesting interaction to show the authentic product qualities. It brings a sense of movement."

"The transparent window makes me feel informed, and the product is reliable. I am thinking about the consuming experience. In my daily routines, sometimes I am concerned that what I buy does not match my expectations. It is not always that I can see or experience the food."

"I feel some sensory experiences are shared. Playfulness and inviting (to interact)."

"I feel the packaging is trying to tell a story. When I twist the (flexible) parts, the movement triggers associations of many scenarios in my mind."

"The twisting movements also trigger the sound feedback."

"When interacting, I have many immediate reflections.The cues encourage me to explore more."

Concludes the overall experience

Based on the evaluation feedback, the multisensory packaging design has achieved several intended design criteria. The design communicates vital messages and establishes connections between consumers and ultra-processed sustainable food. The subtle messages lack considerations in creating the design, such as explicitly involving the information in the production process parts in the design. Participants show positive attitudes towards the experience and have interests in explorative actions. Interaction cues functioned as a connective part, enabling consumers to engage in the experience.The overall coherence and aesthetics of the design impart a sense of message conveyance and stimulate thinking from diverse perspectives.

For the future development, some areas can be improved. These areas include achieving a better balance in detailed information, considering the coordination effects between senses and possibilities in implementations, reducing confusion, and refining the design process. The subsequent chapter will discuss in-depth to these reflective insights.

9

Chapter 9

Discussion

The project led me through a fascinating journey and entered the world of multisensory design, a complex field with immense value. Packaging design, with the implementation of multisensory design approaches, brought its own unique challenges. The main challenges in the process include learning food imagery, transitioning associated messages into design elements, design integrations, and facilitating sensory design activities. Ultimately, I can overcome these challenges and have organized design outcomes and insights into the design process. In overcoming the challenge, I used my analytical mindset, learning abilities, critical thinking, and other related skills to navigate challenges effectively. Most importantly, I have in-depth learnings in an unfamiliar field, multisensory packaging design. In the reflection and recommendations, I would like to share insights about the processes and my understanding of the future of multisensory design from various perspectives. I hope these insights can be helpful for designers interested in the topic and ultra-processed sustainable food brands who want to take their practices further.

9.1 Reflection

Reflections on the result and future development possibilities

After evaluating the results, I reflected on them and considered potential areas for future study. The evaluation focused on the packaging of meat alternative products, and the insights are based on this evaluation.

Creating a cohesive and aesthetically pleasing experience is important in the first stage. In the evaluations, participants seem to form their initial impression of the product, influencing their overall understanding and interactions. While engaging with a specific feature, participants focused on the current journey. For example, when intreating through the sounds touchpoint, participants pay less attention to the visual feedback. Once they zoomed out from the focus, the experience returned to an overview level which involved many design elements. Interactions and cues facilitated smooth transitions. Maintaining cohesiveness is also vital for transitioning between smaller journeys. Compared to the last version of the prototype, participants did not appear disconnected from the main experience in this experiment section.

During the evaluation, participants actively engage in the experience, and one observation is about sensory coordination. In the context of a multisensory experience, the various sensory modalities are interweaved to influence participants' perceptions, feelings, emotions, and thoughts. Participants can make connections to numerous scenarios based on their experience. This insight inspired me to raise the question of how these coordination activities might impact future design decisions.

The design effectively aligns with the qualities of interaction, particularly sensory stimulation, fostering exploration, and embracing sustainable food. However, there is room for improvement in message conveyance. Essential messages regarding sustainability, plant-based ingredients, food types, and certain food attributes (such as appearance, smell, and shapes) are effectively delivered through the experience. The experience stimulates consumers' curiosity, leading them to seek complete narratives, such as how the food is processed. Several factors might relate to the insight. First, the materials and colors are both used to emphasize sustainability and plant-based qualities. This part of the message becomes distinctive in the experience. Second, it might be due to limitations in using more types of materials in the prototype. A possible solution is to add a material moodboard in the process to support material implementations.

Some participants also mentioned "healthy" in the evaluation section, even though it is not an attribute in the pre-defined message clusters. This could be caused by their prior knowledge of plant-based food or design languages' influences. It indicates that the design still has the potential to mislead consumers unintentionally. Therefore, it is crucial in the future to consider what messages are intended to be conveyed and how to prevent unintended messages from being communicated through the packaging.

Reflecting on the process

I initially faced two challenges after the project started: defining messages that needed to be conveyed through packaging and lacking clear steps to guide a multisensory design from the beginning to the end results. To overcome these two challenges, I used multiple methods to discover insights as possible. Conducting context explorations, research on theoretical methods, and analyzing current multisensory packaging approaches. These three main steps offer insights and information to initiate my design explorations from the angle of methods, practices, food, and sensory modalities. Hence, I think smartly using methods to dig into the topic from multiple angles and immerse myself in the flow of multisensory design constitutes a beneficial preparation stage and supports me in starting design explorations. After starting, the main reflections are about finding hints from fragmented insight pieces, summarizing them, and initiating design activities. Design explorations are the main activity in the project, but inside the frame, there are many small decision makings and insights generation activities. Even though I have found several design methods for experience-oriented and multisensory design, they still need refinement to solve the problems and achieve my goal. Therefore in the design exploration, I constantly concluded the results, identified areas of improvement, and continually reflected on and adjusted my design process. In the following section, I would like to share some insights based on my approach to the multisensory packaging design process in four key points.

Application of diverse knowledge and skills

Traditional methods, such as mind maps and moodboard, can be beneficial in ideating multisensory design. In the process, I found that establishing the content is less efficient in connecting idea pieces when following the methods in the traditional way. Combining the analyses into the design context includes common design elements of the packaging design and takeaways to the multisensory design components. I divided my mind map process into 3 steps: connecting concluded messages from analyzing the food to general packaging design elements, then ideating related design keywords. These keywords were instrumental in developing an experience map later. The experience map is more detailed and contains a larger range of content, which leads to it may be better to conduct some previous analysis of the design topic. The prior step in generating the design keywords offers a sense of directing to contexts in each layer of the experience map, reducing confusion and random elements that appear in the procedures of creating the experience map. Contents in the experience map can be easier to identify and confirm based on previous steps (mind map and sensory analysis).

In concluding these processes from the design explorations, I combined my existing design knowledge, innovative thinking, and new learnings to solve the problems. Applying this process to the oat milk case made the flow from the initial food message to the design more seamless instead of taking a large leap between each step. It is not the only in-between process I concluded from the explorations. I also found that using sketching as a design tool adequately can empower the process. When sketching, the insights summarized from the experience map allow designers to have many ideas. Starting from larger frameworks, such as shapes and structures, can easily lead the further thinking about the interactions and other sensory details. Estimating all aspects from the experience map simultaneously can easily overwhelm the design decision-making process. In the process, designers can also use sketching as a thinking process to consider all design elements gradually.

Trying to make the design complete even if it is a low-fidelity prototype

At the first exploration, I tried to design a sensitizing material to stimulate rapid tests, but the results were that it did not provide a complete sensory experience. The incompleteness leads to other stimulation unrelated to the intended multisensory experience. In conversations with peers, I found that other design details influence people's understanding of the sensitizing tool. For example, because needs of the planned experiments, square shapes were designed to replace stimulation materials, which were disruptive design language to users. After realizing the situation, I switch my strategies to making prototypes and designs to use low-fidelity prototypes that cover as many possible elements that capture the idea as possible. Participants are more immersive in the packaging and have a lower threshold in the perception of the sensory experience and interaction. When creating a multisensory packaging prototype, even though many details were not fully refined, it is crucial to present all related elements and avoid adding relevant design elements in the prototypes. To have a better showcase to receive feedback. In the meantime, practicing the mindset in multisensory design needs considerations in many design elements in coherence.

Every milestone is necessary and important.

Multisensory design is not relying on a single touchpoint but is related to multiple connective factors. Everything in the project starts with the food product. The initial self-experiment activities, such as association activities of sensory and recording related associative words in the sensory category, can help the designers better capture the intangible information, which may float around as feelings, emotions, and thoughts. Many small activities in the processes support understanding the product, and each provides insights from different angles and still connectives (see the concluded process in Chapter 7). I continuously immerse myself in multisensory design thinking and create a final design that leans towards the desired direction through these activities.

Iteration for integrations and cohesiveness through interaction refinements

Once a design concept is built, the iterations are more important to consider how to improve from interaction details to improve the entire experience that can closely match the design goal. Refinement on the interactions can play a catalyst role in improving the experience overall. In the iteration stage, I consider how sensory stimulations are introduced to consumers through interactions within the entire multisensory approaches and how sensory touchpoints are integrated into an entire piece. In the last iterations of the meat alternative products, I tackle the remaining integration problems by changing the interactions. Since the design elements are predefined and are included in the design, changing the interactions toward desired qualities can emphasize the entire experience.

9.2 Future recommendation

For practical implication

The project aims to make the multisensory design in the future context and take the challenge of combining many message expressions. If reviewed practically, the design outcome may feel novel and innovative since it applies largely to multisensory design thinking. On the practical level, I may suggest that the current packaging can add one or two defined elements for iterating the current packaging. A few sensory approaches generated based on food imagery can possibly enhance the connections between consumers and food through multisensory design. After receiving experiences and feedback, the practical level can add more elements to change the packaging trends. The changing in the realistic words can be smaller and review the impact from the market.

Some steps can incorporate multiple designers or receiving insights from customers to have more precise insights. Food brands can recruit their consumers to conduct activities such as sensory analysis and make word clouds from large amounts of feedback. Then it can be more accurately learned information from consumer experiences. Also, if, in the future, there are still limitations in conducting research with large groups of consumers, designers can do activities and share ideas to make the outcome more diversities and less biased.

Also, the project is mainly focused on the stage of selecting products in the supermarket. On the practical level, packaging production is related to the frames of the entire service, such as raw materials suppliers, factory productions, product shipping, etc. Besides design, other factors can affect design decisions in the real world. In the future, if the process is practiced in the real world, learning constraints from other stakeholders' perspectives will be beneficial.

For food brands

This project encompasses many contents discussing multisensory design approaches and experiential considerations. The project focuses on ultra-process sustainable food, a category in fast development, new positions, and environmental responsibilities. The visioned build through the design exploration seeks novel approaches for the consumer experiences, but also these approaches can reflect the ultra-processed food brands' reinforcement opportunities. Food brands have distinct manifestos, values, and unique characteristics they aspire to convey to consumers through packaging. Traditionally, numerous messages are compressed onto the packaging surface, mainly relying on visuals. This project brings insights from the multisensory approaches and uncovers potential opportunities for food brands to adopt multisensory packaging design as a new strategy. The insights can be categorized into two aspects.

The first aspect is using a multisensory design to closely reflect the foods' values. It can first enhance communication. The traditional styles of developing packaging are visual, and some have textures. The project's approach facilitates the transmission of food messages to the design language definition. With more intentional sensory touchpoints added and designed, brands can turn packaging into a powerful communication tool to convey complex information. Consumers can better engage with the products intuitive, immersive, and comprehensive. As a result, adopting the multisensory design approach could lead to food brands gaining increased benefits, including unique brand distinctiveness, added value, and improved sustainability positioning. Although currently, the project hasn't stepped into the validations on the market level.

In the second aspect, the project introduces a positive shift in thinking about packaging, centered on food imagery and its related information. The design process allows brands to transcend existing constraints in packaging design. Brands can consider shapes, force feedback, scents, materials, and other factors in their design to reflect on their food imagery. Hypothetically, brands can generate packaging solutions that provide authentic experiences and correct food understanding guidance. Looking to the future, it is also the brand's responsibility to offer an opportunity to let consumers learn in-depth about their commercial products.

The multisensory packaging design is expected to influence consumers and food brands in the future positively. For the brand, it is a chance to enhance its market presence, communication, consumer engagements, and sustainability positioning.

For supermarkets

Supermarkets are not the primary design scope of this project. As the context, it also has the potential to implement some of the project findings and enhance multisensory experiences in the broader consumer journey. Recommendations in this section reflect scenarios' multisensory design possibilities. Before reaching the packaging and starting interactions, consumers are already emerging in the supermarket context. The current visual identities design, such as category tags and shelf displays, constantly brings information to guide consumers in grocery shopping. How multisensory approach can add touchpoints to this stage? For example, suppose designers produce ten types of ultra-processed sustainable food items and organize the common design languages. These essential design languages can also modify the environment design for coherent consumer-packaging interactions. Considerations can include redesigning shelves and labels, adding sound and scent, or changing factors to match the primary goal, goals concluded from the multisensory packaging design. In the end, to create a unified multisensory experience for consumers. In Chapter 6, I briefly discuss the role of the environment. Expanding on the project's insights, I believe the environmental factors are also a valuable supplement design opportunity for further exploration. By consciously integrating and designing, the environment can promote sustainable food options and take other actions to assist consumers in forming deeper connections with ultra-sustainable food products.

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The icons of the 5 senses are from Freepik

Appendix

Appendix A: Project brief

DESIGN FOR our future

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

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

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT
Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME
Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: Huo 6239
initials: S.H given name: Shicheng
student number: 5521092
street & no.:
zipcode & city:
country:
phone:
email:

Your master programme (only select the options that apply to you):
IDE master(s): ( ) IPD (★) DfI ( ) SPD
2nd non-IDE master:
individual programme: - - (give date of approval)
honours programme: ( ) Honours Programme Master
specialisation / annotation: ( ) Medisign ( ) Tech. in Sustainable Design ( ) Entrepeneurship

SUPERVISORY TEAM **
Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Rick Schifferstein dept. / section: HCD/DA
** mentor: Gijs Huisman dept. / section: HCD/HICD
2nd mentor:
organisation:
city: country:

comments (optional)

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

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

Procedural Checks - IDE Master Graduation

TU Delft

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Rick Schifferstein date 20 - 02 - 2023 signature Rick Schifferstein - IO Digitally signed by Rick Schifferstein - IO Date: 2023.02.20 11:50:30 +01'00'

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair. The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 18 EC

Of which, taking the conditional requirements into account, can be part of the exam programme 18 EC

List of electives obtained before the third semester without approval of the BoE

★ YES all 1st year master courses passed

○ NO missing 1st year master courses are:

name Robin den Braber date 21 - 02 - 2023 signature Robin den Braber Digitaal ondertekend door Robin den Braber Datum: 2023.02.21 13:39:57 +01'00'

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **. Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: ★ APPROVED ○ NOT APPROVED

Procedure: ★ APPROVED ○ NOT APPROVED

comments

name Monique von Morgen date 06 - 03 - 2023 signature

Initials & Name S.H Huo 6239 Student number 5521092

Title of Project Multisensory packaging: Processed food evaluation experience

Personal Project Brief - IDE Master Graduation

TU Delft

Multisensory packaging: Processed food evaluation experience — project title

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

start date 13 - 02 - 2023 — 30 - 06 - 2023 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

The context of the project is supermarkets. Along with food industry developments, food choices have become larger in numbers. Among these choices, lots of them are processed and ultra-processed food. The package as a direct communication channel with consumers is vital in communicating information. However, the priority for the brands is becoming more attractive through shaping their product imagery. They are eager to win the competition on the supermarket shelf and get consumers to buy.

In current supermarket packages, fresh and processed food use different strategies. In the fresh food section, most food products are packaged with transparent plastic (Figure 1). On these packages, labels only occupy a little space on the package. Product values are perceived from food instead of alternative visual images. Alternative visual elements are rarely added to explain the product. The processed food packaging strategies have strong contrast with fresh food (Figure 2). Consumers rarely have a chance to observe food packed inside. Food's visual identities are dominant in communication and interactions in this category. Consumers connect with food mainly through visuals on the package. Other senses have remained absent in the ultra-processed food purchasing journey. Many studies discuss the functions of different senses in the experience and theoretical framework for designing multisensory packaging. There is significant potential for diving into the area and creating intuitive interactions in food decision-making.

"Crucially, though, the majority of our everyday experiences are multisensory. It is not only visual but more broadly auditory, olfactory, tactile/haptic, and even, on occasion, gustatory cues that guide a consumer's brand experiences, evaluations, and ultimately their behaviours."-Multisensory packaging (Velasco et al., 2019, p.191-p.192).

One research that focuses on consumers' examination process in the supermarket indicates people rarely have pre-evaluation before going into the context (Machín et al., 2020). The research discusses that consumers lack in-depth processing of food information, and decisions are led by habitual purchasing behaviour. Roughly 1/3 of all food and beverage products are convinced to be purchased from the package, and 88% of customers will only observe other sides of the package after purchase (Velasco et al., 2013, p50). The project tends to implement multisensory packaging design and link it with food evaluations in the ultra-processed food categories. The following section will explain the problems further.

Reference

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Initials & Name S.H Huo 6239 Student number 5521092

Title of Project Multisensory packaging: Processed food evaluation experience

Personal Project Brief - IDE Master Graduation

introduction (continued): space for images

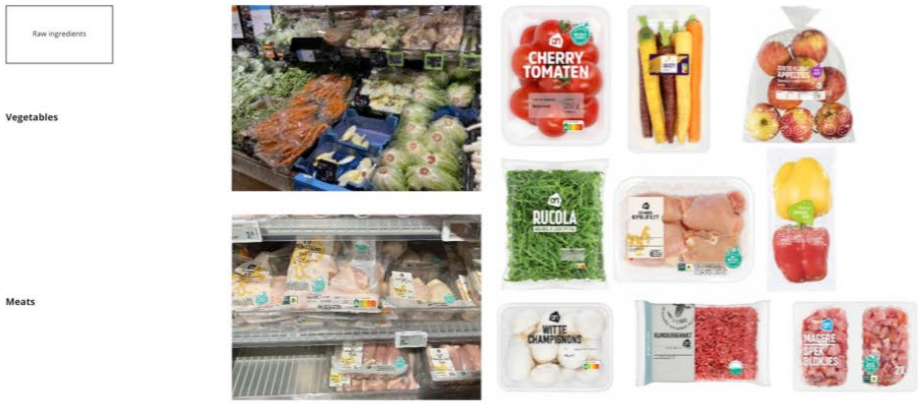


image / figure 1: Fresh food's packaging

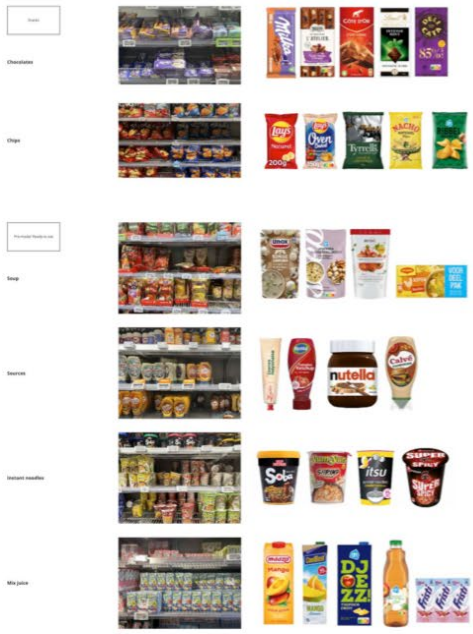


image / figure 2: Processed food's packaging

Initials & Name S.H Huo 6239 Student number 5521092

Title of Project Multisensory packaging: Processed food evaluation experience

Personal Project Brief - IDE Master Graduation

TU Delft

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

Problems show that consumers do not have the ability to evaluate processed food in-depth and rely on habitual behaviour in decision-making. Ultra-processed food usually do not communicate through showing the food packed inside but through visual identities on the package. It is a food category that potentially leads to health issues such as obesity and further to diseases like diabetes and cardiovascular diseases (Barnhill&Civita, 2019) since ultra-processed food has dense calories and is less nutritious. Even though consumers want healthy food, they need more information to assess food accurately.

Concluding
How can multisensory design work as a nudge to help consumers consciously purchase ultra-processed food in the supermarket context and, thereby, increasing healthy food choices.

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

The assignment will focus on changing the current ultra-processed food packaging presentations through multisensory packaging design to empower consumers' evaluation and selection behaviour on ultra-processed food.

The design will be generated by diving into the senses' influences on the consumers' food choices and using multisensory packaging design to create simulations that reflect on food packed inside. The design aims to make people notice that they are choosing ultra-processed food, which may contain high sugar, salt, and fat. It is not about changing people's lives to strictly diet but improving the current circumstances of people buying food unconsciously and lacking abilities to evaluate food. By making consumers aware of what they purchase, the design motivates people to reflect on their choices and make healthier food decisions.

Final deliverable: A multisensory packaging design applied to processed food products that reach the design goal. The concept will land and showcase specific food products (e.g., chocolate, chips). A report and presentation will also be included to explain the process and show the final design results.

Initials & Name S.H Huo 6239 Student number 5521092

Title of Project Multisensory packaging: Processed food evaluation experience

Personal Project Brief - IDE Master Graduation

TU Delft

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and 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 activities.

start date 13 - 2 - 2023 30 - 6 - 2023 end date

Phase 1: Secondary research includes searching and reflecting on multisensory design frameworks and current design approaches. Context and design investigation will be conducted by methods such as sensory journey maps. Opportunities will be identified after a series of design explorations and analyses.

Phase 2: Based on opportunity areas, create various prototypes with multisensory properties. The idea generation section will be involved between the first and second phases to connect these two phases better. In the second phase, the processes focus on prototyping and experimenting. Prototype materials will stimulate senses that associate with food products. User testing sections will be conducted to uncover insights.

Phase 3: The defined direction will apply to food products and into an evaluation section. The evaluation section measures the designed experience and its influences on users' perceptions of food products.

The report will be written along with the process and as a communication format to deliver information between the supervisor team better.

Personal Project Brief - IDE Master Graduation

TU Delft

MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

As a DFI student, I always enjoy observing the current challenges in daily life and designing towards better user interactions and experiences. Inspired by my motivation and food and eating elective class, I decided on the topic of food. It is an exciting field but complex. I am passionate about diving into the complexity and using design skills to define a design path to envision improvements for the current context. Purchasing food in the supermarket is common in people's daily routines. Through deconstructing the context and topics, I found gaps between fresh food and processed food packaging trends as an opportunity. Moreover, multisensory packaging design has potentials to fill the gap. I will use design abilities to connect dots to a novel journey that fulfills the design goal.

Multisensory packaging designs have yet to be implemented largely in the commercial phases. The final concept will be implemented on specific products and evaluated. I want to see how the current proposed framework can land to design in the context and positively influence people. It is also the first time I design with multiple senses and reviews various senses in the same user journey simultaneously. The design should be empowering the relationship between consumers and food.

Comprehensive skills practice in the project can help me further develop skill sets to overcome challenges in the design process. The graduation project has the challenge of involving the senses, which is an abstract factor. In the project, I will find ways to analyze these factors' influences on users and reflect on the design. Design skills such as prototyping to create stimulations and design research skills such as user testing and design evaluations will be practiced based on stages.

FINAL COMMENTS

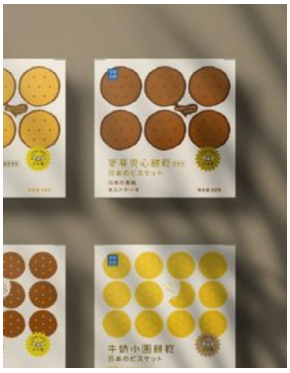
In case your project brief needs final comments, please add any information you think is relevant.

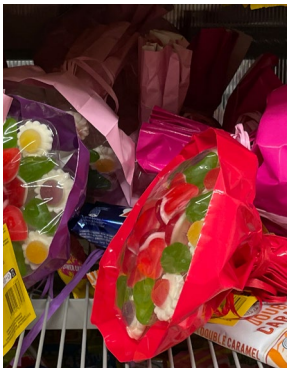
Initials & Name S.H Huo 6239 Student number 5521092

Title of Project Multisensory packaging: Processed food evaluation experience

Appendix B:
Additional packaging discoveries

While exploring current packaging practices and everyday observations, I encountered some packaging showcasing unique design approaches. Here are some reflections on these packaging's features in engaging consumers, stimulating senses, and conveying messages. One example is the water bottle in the first image. Its rectangular shape and pattern combination effectively capture the movement of water. The visual feedback represents streaming flow and stimulates thoughts of scenarios that may indicate the quality of the originating sources. In everyday life, there are also some interesting examples. The last two images are notable packaging I saw in the supermarket. One candy product shapes the packaging as a bouquet of flowers. The food product is used as part of the ideas and arranged as visible flowers for consumers. The design offers a delightfully tactile and visual sensation when holding. Another product is rice packaging, which utilizes a woven bag commonly seen in larger rice bags or transportation packaging. Interacting with this packaging evokes a distinct tactile experience, providing a sense of authenticity and strong connections with the food.





Appendix C:
Prototyping process

Preparations
In my project, I initially developed the final concept through digital rendering to visualize the outcome. Then, I created molds based on the specific characteristics of different parts in the design. The creation of molds can be flexible based on the needs of each part. For instance, more in-depth consideration was given to the leaf-like shape with specific patterns to achieve the desired shape.

a. Collecting materials and cutting them into shreds

Materials can be collected in various paper formats. In my prototype, I used paper for wrapping glass bottles and paper protection shells for egg packaging. Pure paper-based materials are easier to combine together in making pulp. Some paper bags have a coating layer that may not fully integrate well with other paper materials. Before moving to the next step, it is important to shred them into small pieces without requiring in specific organized shape.

.

b. Soaking the paper in water until it is completely saturated, then use a blender to turn the paper materials into pulp

Place the paper in water and let it soak for around 15 minutes until it becomes thoroughly wet and softer. Next, use a blender to transform the paper materials into pulp. In the process, observe the consistency of the paper pulp. Based on my experience, materials are easier to blend together with more water added. The extra water will be filtered out in step d. Therefore, it is acceptable for the pulp to appear watery at this stage.

c. Adding adhesive to the pulp

One crucial step is adding adhesive, which is made from corn flour. Alternatively, similar materials such as rice or other types of flour can be used. The adhesive helps provide a stronger structure to the pulp, preventing it from being too loose and can not form into shapes at the end.

d. Filtering out water

It is important to filter water out. Tools with dense holes can be used to separate the water from the pulp. The pulp does not need to be completely dry at this stage, as it would become difficult to reshape in the mold. It should be in the state of having a shape and not be overly fluid.

e. Putting pulp into the mold
When placing the pulp into the mold, ensure it is evenly distributed on the surface. The amount of pulp depends on the desired shape of the final results, usually not requiring a large quantity.

f.Covering with the lid
After filling the mold with the pulp, cover it with the lid and apply pressure. Connecting the mold tightly through screws or elastic bands. This step is crucial for forming the shape.

g, Squeezing out as much water as possible
During this step and step f, use the lid to firmly press the pulp and mold together to squeeze out any remaining water. The end goal is to have a solid structure.

h. Opening the lid and waiting for fully dry
After 24 hours, remove the lid but leave the prototype in the mold. Since the prototype has even fully covered in the last step, the materials inside have not dried yet. During the drying process, the prototype may shrink. Keeping the prototype in the mold can minimize the effects of shrinking, preserving the desired shape. Placing the prototype in an area with airflow will expedite the drying process.

i. Taking the prototype out
Once the prototype is fully dried, remove it from the mold and prepare it for assembly.

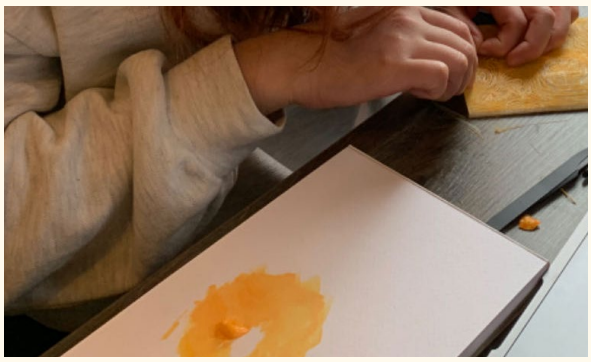
Insights on potential failure

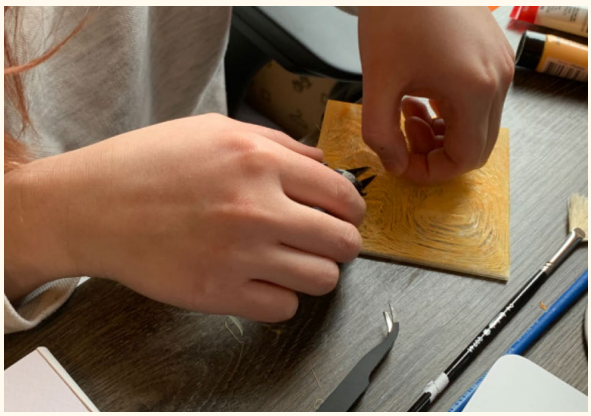
- **Paper shrinking**
Molds shape the prototypes and play a vital role in maintaining the shape until they are thoroughly dried. Using at least a two-part design for molds can better fulfill the goal. The pulp should remain in the mold parts responsible for reshaping until the last step to prevent any distortion in the shape and pattern.

- **Removing from the mold**
The last stage of taking out the prototype may result in the prototype breaking during the process. This can be due to various factors, including the prototype's mold design and humidity levels.

Exploring creative solutions

Given the limited access to advanced prototyping technologies typically available in manufacturing factories, I had to think creatively and search for alternative approaches to achieve my design goals. Throughout the process, I experimented with various methods, including soft materials in 3D printing, coloring on the prototypes, and incorporating clay into the prototypes. These techniques allowed me to explore different possibilities and overcome the constraints of my project in prototype making. One problem-solving example is flexibly using 3D printing in form giving and as a mold to shape other materials such as paper.

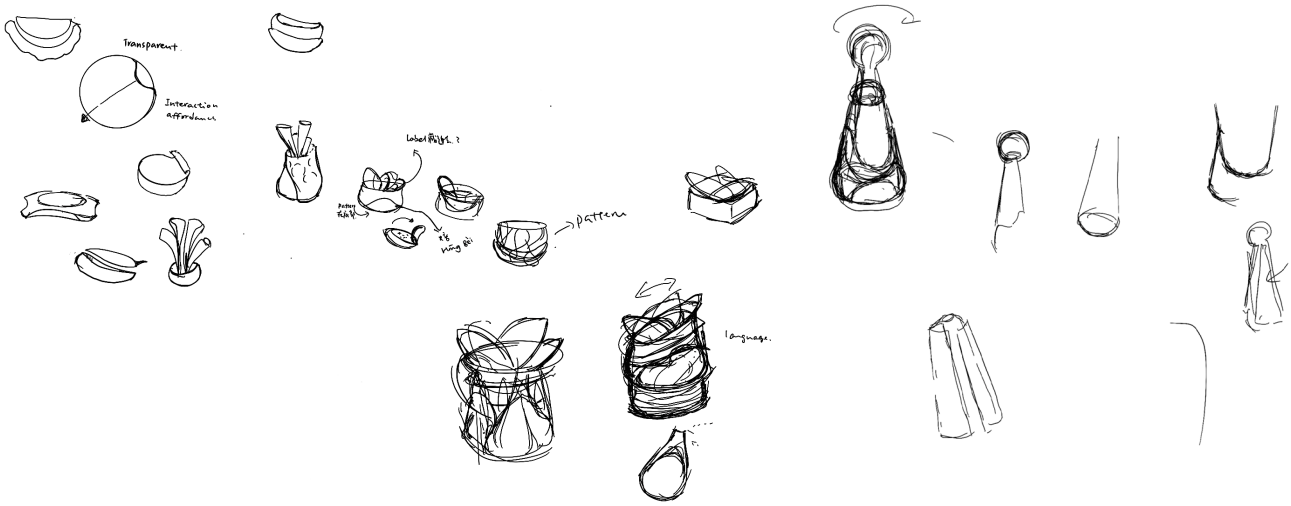




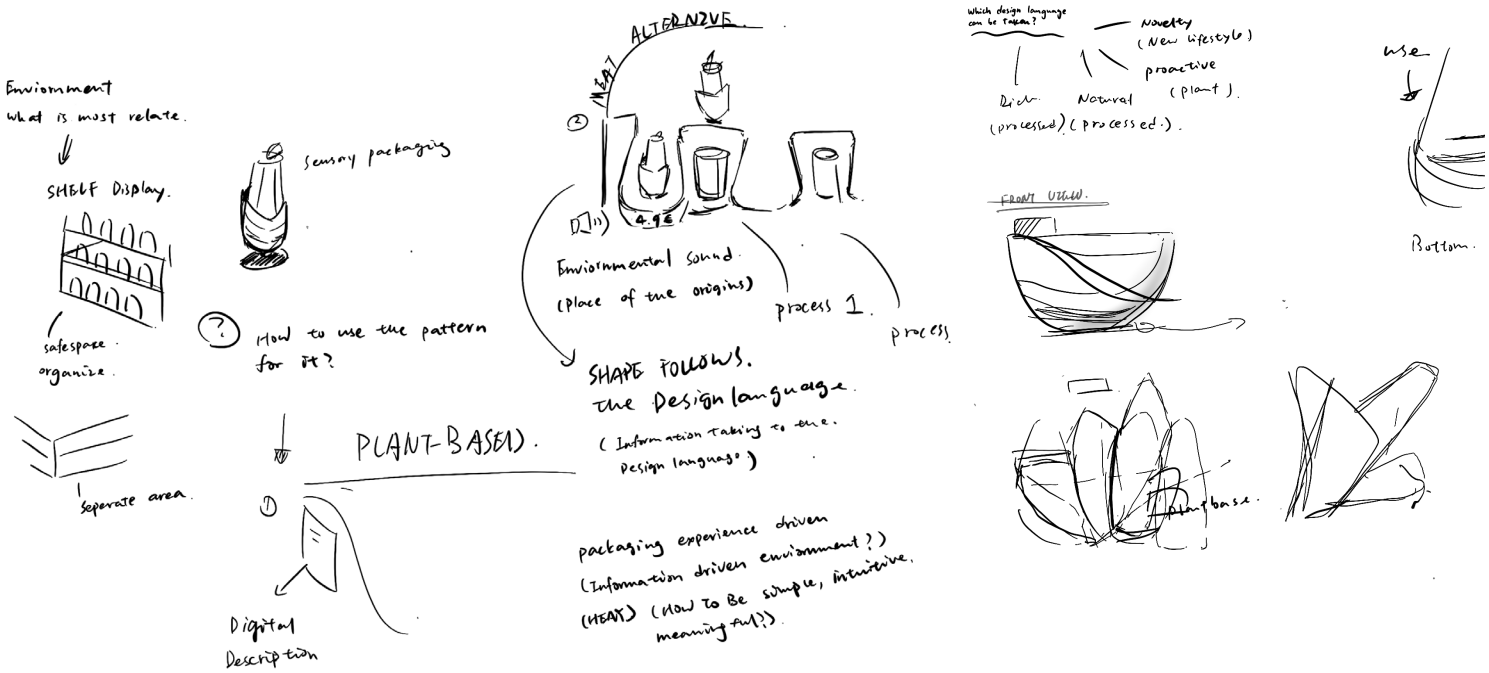
Appendix D:
Other Sketches

This section contains the remaining sketches not included in the main content. The key sketches can be found in each section of the main content.

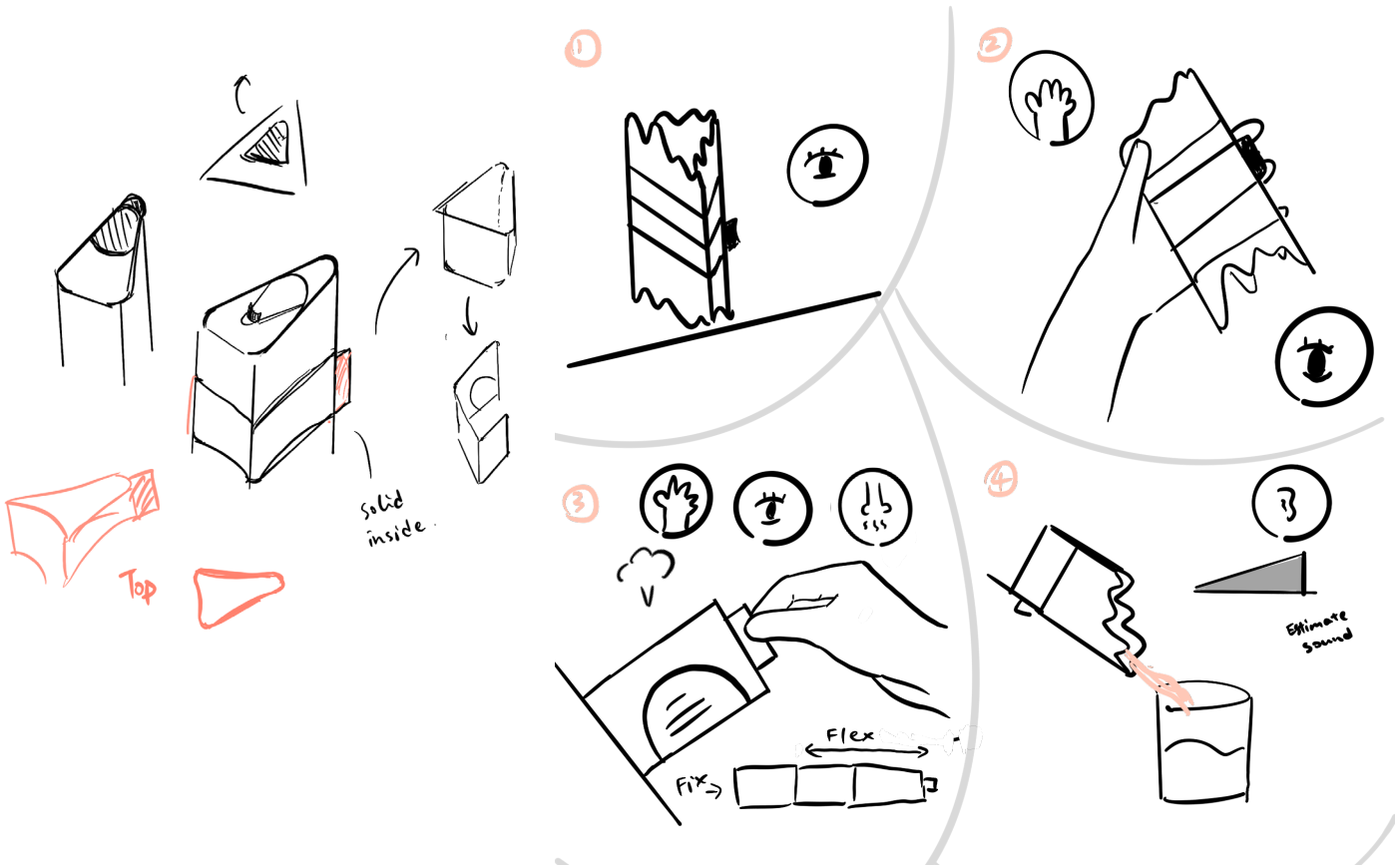
Transitioning from the initial prototype to the second iteration of the meat alternative product. I went through several sketches to define the new concept that captures the defined design language, especially for the shape and structure transitions. Then I explored related interactions that could effectively engage design elements and convey messages.

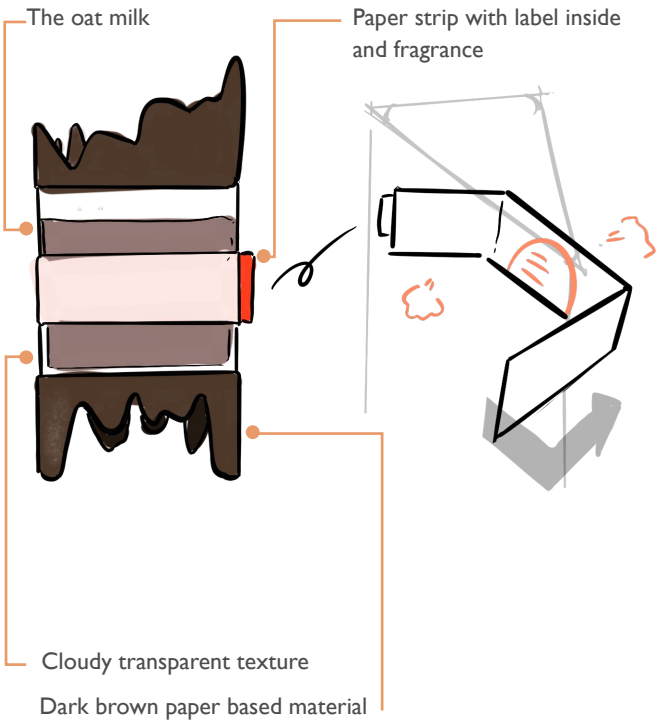


I have explored design possibilities for expanding touchpoints to the environment. Sketch ideations seek solutions that align with the multisensory packaging design based on the main design activities, discussion, and reflections.



In designing the dairy alternative products' packaging, I have also sketched the labels' placement and related interactions that are cohesive with other design elements. The storyboard visually shows sensory journeys and interactions.





Appendix E:
Experimental sections' materials

Organized moderator guide for three experiment sections (Field exploration, Conversations with users, Evaluation section)

General introduction

(These are sample introductions that apply to the overall sections for providing basic background)

Hi! I am currently doing my thesis project related to multisensory packaging experience. Thank you very much for participating in my field exploration section. During the section, materials include notes documenting your responses, insights from observations, and photos will be collected. The photo will only take within the area of interacting with the packaging, and other areas will be outside the frame. The section aims to gather insights related to your packaging experiences, and open questions will be asked accordingly. The notes will only collect parts related to the experiences. No identifiable information will be collected during this section, and your responses will be analyzed anonymously.

Before we begin the section, please don't hesitate to ask any questions. You provide your oral consent to participate in the section by answering these questions.

1. Do you agree to participate in the section?
2. Are you aware of the purpose and materials involved in the following sections?
3. Are you ready to start the section?

Field exploration

Step 1 Grocery shopping without disturbing

In this section, the objective is to minimize any potential bias in your grocery shopping journey. As I shared the project topic previously, this section has no further explanations for the explorations' objective. You are encouraged to focus on your personal experience, follow your habits and pace, and shop as you normally do as a single household. Imagine I am simply accompanying you as a friend during this journey, and I will not offer any opinions or judgments regarding your food choices. At certain stages, I may take photos and observe your interactions, but you are free to behave naturally without any interruptions.

Step 2 Interview

The interview will follow a structured format and remain flexible based on participants' responses. It will cover the following topics:

Topic 1: How do you determine your choices?
Example question: Are there any new products in your choices? Why did you decide to purchase them? What factors attract you, such as flavors, images, seasonalities, materials, etc.?

Topic 2: Grocery shopping patterns
Example questions: What types of products do you usually purchase on each shopping journey? Are you aware that some of them are ultra-processed foods?

Topic 3: The importance of packaging in your food evaluation
Example questions: Does the food-consuming experience usually align with your expectations during the decision-making stage? Based on your self-evaluations, how well do you perceive food information during the purchasing stage?

Step 3 Section end

Thank you very much for your participation! If you have further questions, please feel free to contact me.

Prototype experiment

This experiment aims to gain insights from consumers' perspectives rather than only relying on the project owners' viewpoints. The experiment is designed as an open-ended conversation with activities to facilitate the discussion.

Step 1 Introducing the prototype

Now, you see the prototype of a meat alternative food product packaging. Before you step into the exploration journey with the product, I would like to explain the background context. The design context is in the supermarket 50 years later to provide food imagery through sensory modalities to establish deeper connections between consumers and sustainable food. In the following section, please focus on the experiences instead of the practical side of the technologies. In the process, you can use more adjectives to describe your understanding, feelings, perceptions, and other relevant thoughts.

Step 2 Exploration and sharing experience

Take your time to explore the packaging prototype freely. I will observe your interactions without interrupting you at this stage. Once you have experienced the packaging prototype, imagine meeting a friend unaware of the product, and you will introduce the food product to them.

Based on key points shared in the scenario, further questions will be asked to draw deeper insights and gather more information.

Step 3 Perception through senses

Following our conversation, I would like you to use descriptive words or short phrases to explain your experiences regarding different senses (Haptic, Vision, Sound, Smell). You can reflect on the sensory aspects you perceived during the interaction.

Additional questions will be asked based on interesting points raised during the discussion.

Step 4 Section end

Thank you very much for your participation! If you have further questions, please feel free to contact me.

Evaluation

Step 1 Context establishment

Here are a few pictures that demonstrate the technologies and environments you may encounter in the future. The interactions in many daily routines, such as living environments, working devices, and other surrounding technology, are changed. The project's design context is defined in the future. Now you see the packing in the future supermarket.

I will share a few pictures that showcase potential advancements in technologies and environments in the future. These images depict how daily routines, living environments, working devices, and other technologies have evolved. The design context of this project is set in the future, and you will now see the packaging as it is in a future supermarket.

Step 2 Exploration

Take your time to explore the packaging prototype freely. I will observe your interactions without interrupting you during this stage.

Step 3 Sensory experience

You will be provided with a form that includes different sensory modalities. In the blank spaces, please write down adjectives that can capture your ideas about food attributes, values, feelings, or any other relevant words (refer to form 1).

After participants write down their keywords, I will review them and ask follow-up questions based on these keywords to delve deeper into the reasoning behind the chosen words.

Step 4 Likert scale and following questions

Here is a scale that evaluates the interaction qualities of the project. Choose the anchor that best aligns with your experience for each statement provided (refer to form 2). After completing the scale chart, I will ask you a series of pre-planned questions corresponding to the chart's statements (see page 78).

Step 5 Section end

Thank you very much for your participation! If you have further questions, please feel free to contact me.

Evaluation section

Form 1

Visual (sight)

Auditory (hearing)

Tactile (Touch)

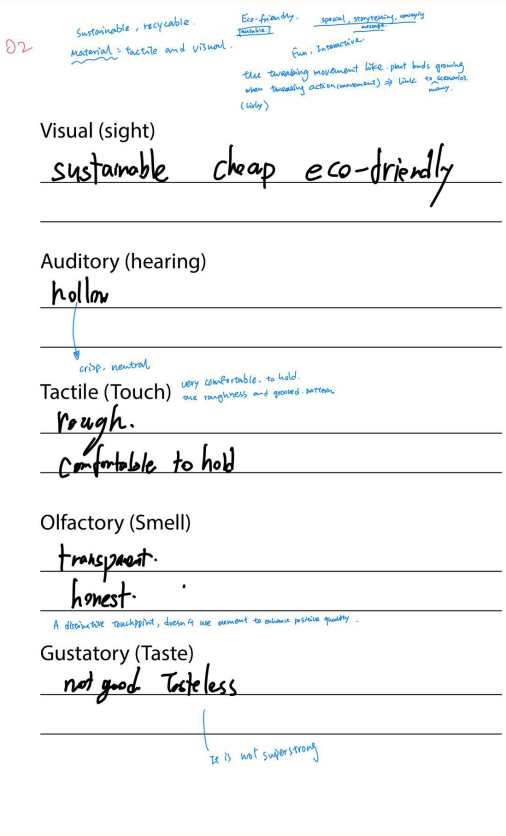
Olfactory (Smell)

Gustatory (Taste)

Form 2

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
01 The packaging design effectively stimulates my various senses (e.g., sight, touch, smell, etc.).	○	○	○	○	○
02 The packaging design encourages me to explore more about the product.	○	○	○	○	○
03 The packaging design creates an immersive experience that feels like the product vividly expresses itself.	○	○	○	○	○
04 The packaging effectively communicates the various essence messages of the food product (e.g., about the food's origin, ingredients, preparation, or cultural significance).	○	○	○	○	○
05 The packaging design embraces the concept of sustainability and seems eco-friendly	○	○	○	○	○

Responded Form and Notes



craftsmanship. Growing. Information is needed.
Recyclable (material, color)
Shape (metaphor)
Nature
Transparent (Being informed)
Reusable.
Buy as one source, consumption.

03

Visual (sight)

Green = calm, peaceful. original

Raw Transparent sustainable

Recyclable Natural Relaxing Multi-layered

Auditory (hearing)

The ratio of the parts playfulness

Unevenness Raw

Different size, like the product's quality. Because of the material

Tactile (Touch)

Original Rough

changing materials

Olfactory (Smell)

It doesn't feel sharp or create a sense of distance, Inviting to interact. A secure sense.

Vegan Herbal Imaginative

Visually evocative

Smells triggers association of other scenarios. The process is faster than other senses

Gustatory (Taste)

Plain Authentic

Food, humble

04

the concept of nature. Like growing in the forest. (Organic, healthy, close to nature, eco-friendly)

Vegan product.

Packaging influence my perceptions of the product. (ultra-processed)

Visual (sight)

color cohesiveness. fresh

Holistic concept. reasonable. Aesthetic.

organic. nature comfortable

fresh, high-contrast

Auditory (hearing)

interesting, loud but not noisy

comfortable

Round, rythm, music instrument. Balance among (sound flow)

Tactile (Touch)

Rough, easy to hold, rugged

Easy to hold. comfortable, By design, Different experience.

Olfactory (Smell)

Vegan, processed food, tasty

previous know ledge.

Gustatory (Taste)

Richness, chewy. like the taste

Rich in layers. spices.

01

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
01 The packaging design effectively stimulates my various senses (e.g., sight, touch, smell, etc.).	○	○	○	○	⊗
02 The packaging design encourages me to explore more about the product.	○	○	○	○	⊗
03 The packaging design creates an immersive experience that feels like the product vividly expresses itself.	○	○	○	⊗	○
04 The packaging effectively communicates the various essence messages of the food product (e.g., about the food's origin, ingredients, preparation, or cultural significance).	○	○	⊗	○	○
05 The packaging design embraces the concept of sustainability and seems eco-friendly	○	○	○	○	⊗

Sound, richness, crisp and loud, think of the consumption experience, will hear the sound again, will be very pleasant.

Visual, I focus on the interaction, instead of varying the visual to have strong impression.

(like to interact) → the leaf encourage to move.

many attendance and feedback. when moving the sound also move

very curious about the the middle process. fosters the tendency of addictive?

learn about the origin and result.

Different from other food.

merely the progress, like knowing parts of it but haven't have a overview process of the entire product

Icon + Interaction visualizing flavor how a toy leaves to one certain result.

the message is readable. / the color.

the feedback when holding have weight, doesn't like others. very light.

Unique design background.

colors

02

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
01 The packaging design effectively stimulates my various senses (e.g., sight, touch, smell, etc.).	○	○	○	○	⊗
02 The packaging design encourages me to explore more about the product.	○	○	○	○	⊗
03 The packaging design creates an immersive experience that feels like the product vividly expresses itself.	○	○	○	○	⊗
04 The packaging effectively communicates the various essence messages of the food product (e.g., about the food's origin, ingredients, preparation, or cultural significance).	○	○	○	⊗	○
05 The packaging design embraces the concept of sustainability and seems eco-friendly	○	○	○	○	⊗

the concept of tweak to have smell. Coordination of the movement and smell.

Sound (listening all the time and compare to other senses)

covers half ⇒ attract to interaction / explore more.

Overall structure and the cohesive feeling

Tweaking ⇒ stimulate sound.

vegan Connect with the process is also sustainable.

Interaction, color

03

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
01 The packaging design effectively stimulates my various senses (e.g., sight, touch, smell, etc.).	○	○	○	○	✓
02 The packaging design encourages me to explore more about the product.	○	○	○	✓	○
03 The packaging design creates an immersive experience that feels like the product vividly expresses itself.	○	○	○	✓	○
04 The packaging effectively communicates the various essence messages of the food product (e.g., about the food's origin, ingredients, preparation, or cultural significance).	○	○	○	○	✓
05 The packaging design embraces the concept of sustainability and seems eco-friendly	○	○	○	○	✓

↑ Tactile, discriminative, the touch receptor is strong. No need to have imaginations. to have feedback.

↓ Smell, abstract. Imagination. Based on coordination of other senses.
Taken inwave into the context

The movement. Flexible parts. Affordance shows more possibilities.

Small parts that have different approaches.
Shapes, texture, color. The sense of narrative.

Plant-based, Vegan
Recyclable.

Sustainability as a competitive. Powers.

04

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
01 The packaging design effectively stimulates my various senses (e.g., sight, touch, smell, etc.).	○	○	○	✓	○
02 The packaging design encourages me to explore more about the product.	○	○	○	○	✓
03 The packaging design creates an immersive experience that feels like the product vividly expresses itself.	○	○	○	✓	○
04 The packaging effectively communicates the various essence messages of the food product (e.g., about the food's origin, ingredients, preparation, or cultural significance).	○	○	○	✓	○
05 The packaging design embraces the concept of sustainability and seems eco-friendly	○	○	○	○	✓

Visual (color, shape, material, structure) ⊕ contrast ⇒ paper, smooth surfaces.
Smell, interesting interaction (true authentic product quality), different

Sounds, attract to listen.
Textures and movements

strong sense of conveying messages.
coherence in the storytelling (more connected)

Vegan, eco-friendly, organic.
(healthy) Distinguish in showing the value of the sustainable-food.

Immediately reflection.

To explore more.
Interesting interactions
Changing
Vivid.

not noticing about.

The end.