Bicycle helmets for the Netherlands: a new strategic design approach

Graduation report

By Remco Bosch

Preface

First I would like to thank everyone involved in this project. Thanks to Maarten from Abus, Erwin from Closca, Jeanette and her colleagues from ANWB, John from Springtime, and Wim from the fietsersbond. The knowledge and feedback that you all provided have been super valuable to my project. Also a big thank you to my clients Rob and Antoinette. Your enthusiasm and open-mindedness made working for you a pleasant experience. Lastly, a huge thank you to my chair Toon and mentor Ianus. The two of you made a great duo as you both inspired me and helped me improve my design process. This five-month graduation project was an amazing experience for me. What I am most proud of is how the proposed concept designs are typically me: playful and original. Once I started considering bicycle helmets as fashion pieces and designing them like that, My design process became ten times more fun and interesting and there were suddenly numerous new opportunities. I hope that everyone who sees my designs and reads this thesis can notice the passion that went into them. Finally, I would like to start this paper with the following quote:

"Fashion has to reflect who you are, what you feel at the moment, and where you are going."

Pharrell Williams
Producer/Rapper/Fashion designer

However, I would like to make one small adjustment:

"Bicycle helmets have to reflect who you are, what you feel at the moment, and where you are going."

Remco Bosch
Strategic product designer

Abstract

This graduation project concerns the prevention of bicycling head-injuries in the Netherlands, by overcoming the socio-cultural unwillingness and undesirability of non-sports oriented bicyclists to wear a helmet. Getting cyclists to wear bicycle helmets is a task that requires behavioral change as well as a shift in perception from society. The goal of this project is to develop a strategic bicycle helmet concept that changes people's and manufacturers' perceptions of what a bicycle helmet is and hopefully have an impact on helmet usage in the Netherlands. This concept is the result of research in the current and future bicycle helmet/ cycling context by doing market research, reviewing literature, interviewing stakeholders, analyzing trends and creating a future context map. In addition, quantitative user research was done in the form of an online survey, and qualitative user research was done through an emotion capturing exercise

Contextual research has pointed out that the current bicycle helmet market is oversaturated and has very little differentiation between products. Up to now, marketers and designers have been trying to sell bicycle helmets by emphasizing their functional product attributes which are primarily safety-related. However, research showed that safety is not an effective attribute to communicate to Dutch consumers. Instead, marketers and designers should focus on communicating the symbolical attributes of bicycle helmets and express/cater to the user's lifestyles. Using these guidelines, the Fabriqué helmet concept was designed for a target group called Bikes&Blazers. This target group consists of Dutch formally dressed urban cyclists that often ride E-bikes. The Fabrique helmet is influenced by several of the target group's fashion values and combines these into its visual design. This results in a helmet that fits the target groups' formal outfits and caters to their lifestyles. Lastly, several recommendations are given for how to market the Fabriqué helmet.

Delft University of Technology
Strategic Product Design Master Graduation Report

This report concerns a graduation project for Erasmus Medical Centre.

Author: Remco Bosch
Rbsdesigns96@gmail.com

University chair: Toon Huysmans
University mentor: Ianus Keller

Company supervisors:
Rob Verdonschot
Antoinette Rozeboom

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1. About the project

1.1 Introduction

In 2020, over 70,000 people had to visit the emergency department in hospitals because of cycling accidents. Twenty percent of these victims had brain injuries, and five percent of the victims (also) suffered open wounds and/or fractures to the head or face. One in five victims was wearing a bicycle helmet at the time of the accident, but this percentage was significantly higher among sports cyclists (79%) and mountain bikers (69%). The chance of brain injury was one third lower when victims wore a helmet during the riding accident compared to victims who did not wear a helmet (Krul et al, 2022). Nevertheless, Dutch cyclists rarely wear helmets. Getting people to wear bicycle helmets is a task that requires behavioral change as well as a shift in perception from society. Such change can be made with innovation and a new way of looking at bicycle helmets and what a helmet can be/do. This report concerns a graduation project for the master Strategic Product Design at the Faculty of Industrial Design Engineering at the Delft Technical University. This graduation is a full-time individual project, lasting 21 weeks from April 3rd until August 24th.

The stakeholders in this project are:

- Erasmus Medical Centre (who is the main client, and deals with the consequences of bicycle head-injuries on a regular basis).
- Cyclists (for whom a helmet decreases the chance of cycling-related injuries).
- Public safety organisations like VeiligheidNL and Veilig verkeer Nederland (whose interests are in public safety and wellbeing).
- Organisations that cater to cyclists needs like ANWB and the Fietsersbond
- Bicycle helmet manufacturers like ABUS have a financial gain if bicycle helmets in general become more popularized).
- Shared mobility providers whose vehicles can be used while wearing a bicycle helmet.

Figure 1. Average bicycle helmets with purely functional design, used in context

1.2 About me

I am Remco Bosch and believe designing is not about predicting what the future looks like, but deciding what the future will look like. This means that I don't want to repeat what has been done before, but come up with radical and new innovative concepts that provide new values. This exploration of new values is inherently strategic, and this is why I chose to become a Strategic Product Designer. I want to design for and with people, and go out and talk to them to really understand them. The more emotions are involved, the more interesting the project is to me. This is why I chose this bicycle helmet project to graduate on. Bicycle helmets are purely functional products that (for Dutch people) come with several negative emotions and are therefore undesirable. I however think there is much potential for these products to add new values that have not yet been explored. To me, this is a mobility project in which I can apply the skills and knowledge that I have obtained from my past mobility projects. I believe a new perspective from a mobility point of view is exactly what is needed for this project to succeed.

Figure 2. Trying out a bicycle helmet myself at Dutch warehouse Makro

1.3 Project brief

This graduation project concerns the prevention of bicycling head-injuries in the Netherlands, by overcoming the socio-cultural unwillingness and undesirability of bicyclists to wear a helmet. These bicyclists concern the general, non-sports oriented, bicyclist. This population rarely wears bicycle helmets in the Netherlands due to an unwillingness caused by:

- Social and Environmental factors, such as:
  -Socio-cultural norms of being perceived as unattractive or feeble/cowardly, and standing out while wearing a helmet.

- Physical factors, such as:
  -The inconvenience of bringing and storing a helmet.
  -The negative impact a helmet can have on one's hairdo.
  -The uncomfortable feeling of wearing a helmet compared to not wearing one.

- Psychological and Emotional factors such as:
  -The perceived low risk of cycling without a helmet.
  -The majority of bicycle helmets only offer the value of safety. Additional value drivers can have a great impact on desirability.
  -The majority of bicycle helmets being styled functionally and industrially, instead of fashionably and human-centered.
  -The price of bicycle helmets compared to the values they provide.

How much each of these factors influences the unwillingness of Dutch people to wear a helmet, will be further researched in this project. The choice of an appropriate target group to focus the study on will also be explored through research. The end goal of this project is to change people's and manufacturers' perceptions of what a bicycle helmet can be, and hopefully have an impact on helmet usage in the Netherlands. To do this, new bicycle helmet design recommendations and guidelines will be created, based on various types of research This will result in a well defined helmet concept in terms of features, shaping, and interaction. The helmet concept will be a part of a strategy illustrated through product or product service combination ideas. This strategy will also include positioning and marketing.

1.4 Approach

The project consists of four major phases:

- Research phase:
  The research phase made up for most of the project's duration and consists of Present (and past) contextual research, User/cyclist research, and Future contextual research. This is further elaborated upon in Figure 3.

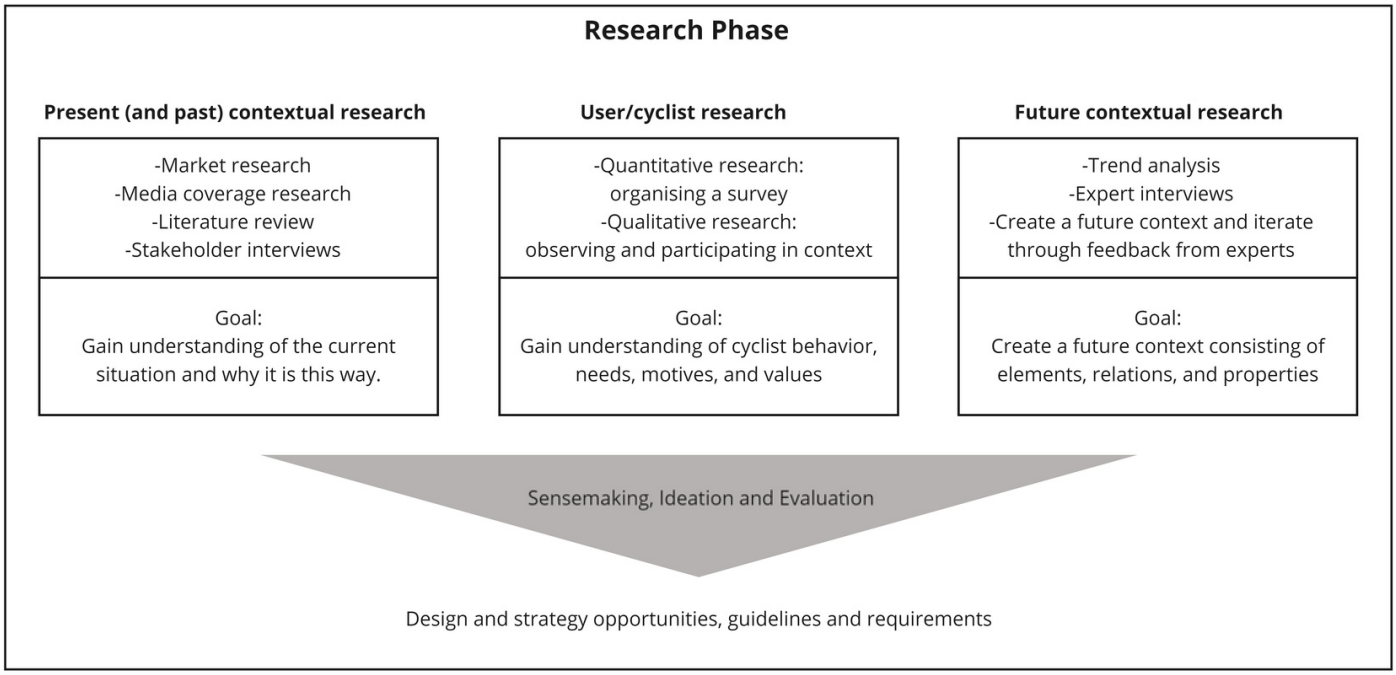


Figure 3. Research phase overview

- Ideation and conceptualization phase:
  Using the design opportunities, guidelines and requirements, a design vision was created as a starting point for ideation. An appropriate target audience was chosen to design for from the gathered research insights, This resulted in detailed persona and moodboards. Through sketching, form and function were explored and iterated upon. And using idea selection methods, the most valuable ideas were selected and combined into several bicycle helmet concepts in terms of functions, aesthetics and interaction.

- Marketing strategy phase:
  Finally, a detailed marketing strategy was created in terms of a launch strategy, advertisement design and sales channels. This involves insights gained from the research phase concerning the context and target group.

2. Present contextual research

2.1 Market research

In order to get an overview of what bicycle helmets are currently on the market, numerous webshop assortments were examined. This mostly excludes sports oriented helmets as these fall outside of the scope of the project. However, it should be noted that some people do use sports helmets for non-sports oriented cycling. And in some cases, the difference between a sports helmet and an urban helmet is not visibly clear, unless you read the product description online. This is similar to how some sports oriented bicycles are used for non-sports activities, and vice versa.

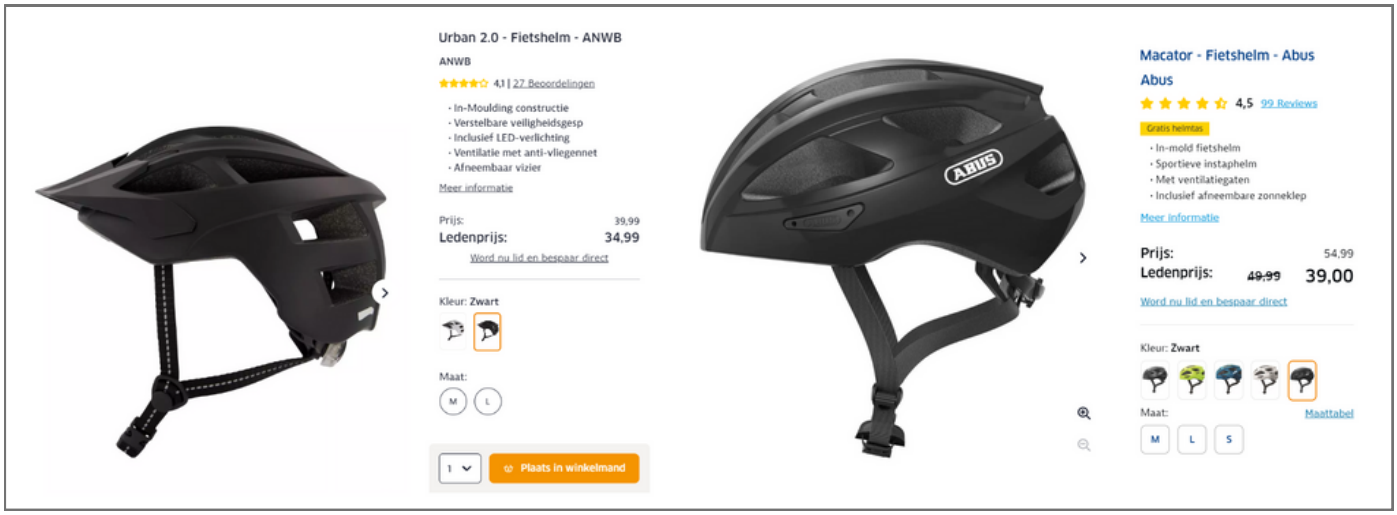


Figure 4. Left is an 'urban' helmet vs a sports helmet on the right

The non-sports oriented helmet that is used for regular bicycle rides and commuting, is often referred to as 'urban'. The urban labeling of products seems to be a recent marketing trend of which there is no publicly available research about the effects of this strategy. Urban labeling can be found on products ranging from Albert Heijn pizzas to Elho plant pots (product types that are used outside urban contexts as well), and seem to target audiences that want to be young and modern. Marketing material of urban helmets often shows the products in urban environments and/or worn by millennials (see Figure 5).

Figure 5. Various urban bicycle helmet promotional pictures

In terms of product design, it can be noted that the majority of urban helmets have reduced the presence of air vents compared to sports helmets. They aim for sleek looks with muted colors, matt finishes and usually do not have any prints (see Figure 6). These attributes contribute to minimizing the conspicuousness of the helmets in contrast to their vibrant sports counterparts. Certain helmets go the extra mile by 'camouflaging' themselves and appearing like conventional headwear like hats. (see Figure 7).

Figure 6. Urban helmet frequent design features

Figure 7. Yakkay and Park&Diamond cap helmets

Figure 8. Closca foldable bicycle helmet

These helmets are a valuable alternative for those who want the safety of a bicycle helmet without the embarrassment of wearing one in public. However, such camouflage helmets still have visible chin straps, no ventilation holes, and still have the other negative properties of regular bicycle helmets like bad hairdos after wearing one and the inconvenience of storage. Foldable helmets from Closca (Figure 8) and Cyclo try to minimize this last property. But reducing a helmet's volume by 30-40% (estimated) doesn't make it much less inconvenient to store. It still needs to go somewhere. Furthermore, the foldability comes at the expense of being waterproof. The average price range of most bicycle helmets lies between €25 and €120. It should be noted that it is not difficult to buy a decent second-hand bicycle for €40. From that perspective, some bicycle helmets can be considered quite expensive. Chinese online shopping giant Aliexpress offers attractive competitors with bicycle helmets mostly ranging from €20 to €40. Appendix 1 shows an overview of the market research on bicycle helmets. This research was conducted by browsing webshops (this includes the ANWB, Bol.com, AliExpress as well as some of the bicycle helmet manufacturers' own webshops) and comparing prices and product descriptions. There are far too many bicycle helmets to list them all, so this collection focuses mostly on a variety.

2.2 Contextual research

The cycling/bicycle helmet context was studied by examining literature, research reports, and media coverage. The report 'Fietsongevallen en snor/bromfietsongevallen in Nederland' (Krul et al, 2022) provides comprehensive data on cycling accidents in the Netherlands over the past decade. Most notable is that in 2020, over 70,000 people had to visit the emergency department (ED) in hospitals because of cycling accidents. Twenty percent of these victims had brain injuries, and five percent of the victims (also) suffered open wounds and/or fractures to the head or face. And the chance of brain injury was one-third lower when victims wore a helmet during the riding accident compared to victims who did not wear a helmet.
Figures 9a and 9b below show the occurrence of accidents per age group as well as per traveled kilometer. Elderly people have the highest chance of experiencing accidents per kilometer, and could best use a bicycle helmet. But younger people travel a lot more kilometers so there is also a lot of potential injury prevention here. These are important numbers for deciding on a target group to design for. Finally, according to a study conducted by Scholten et al (2015), while bicycle-related traumatic brain injuries constituted 9% of all emergency department treatments associated with cycling, they represented a substantial 18% (€74.5 million) of the overall expenses attributed to bicycle-related injuries (€410.7 million) in the Netherlands in 2012.

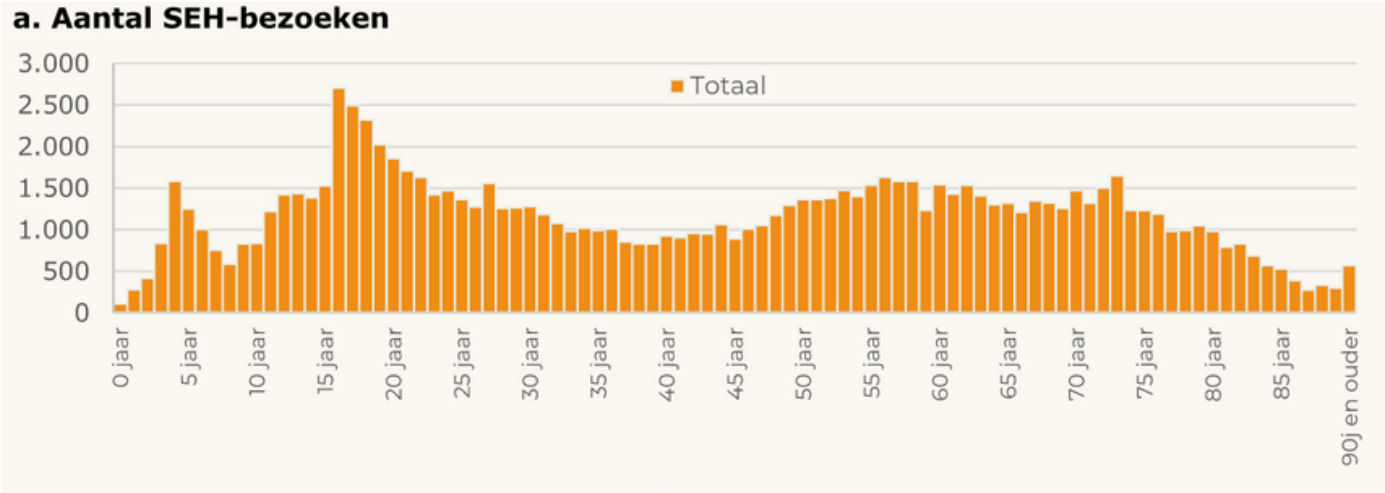


Figure 9a. The number of visits to the emergency department due to cycling accidents, per age, in 2020

Figure 9b. Number of visits to the emergency department due to cycling accidents, per age, per 10 million travelled kilometers, in 2020

At the moment of doing research, there was a large amount of media coverage concerning the topic of bicycle helmets and cycling accidents, ranging from news articles to talk show discussions. The catalyst for this was the annual day of the bicycle helmet (de dag van de fietshelm) on April 19. This is an initiative from many health, traffic, and cycling organisations, as well as bicycle and bicycle helmet manufacturers (dagvandefietshelm.nl, 2023) The aim of this campaign is to get more attention for all the injuries that could have been prevented if more Dutch people would wear a bicycle helmet, and stimulate cyclists to wear a helmet. One way the organisations try to accomplish this is by handing out free bicycle helmets in primary schools and educating young children about the importance of wearing a bicycle helmet. The short term effectiveness of such campaigns has been researched both in the Netherlands and in America (see literature review), but looking at the long term effectiveness it is safe to say this has not achieved the desired effect.

News and talk shows have given a lot of attention to the problem around the time of the day of the bicycle helmet. The statistics from the research report from VeiligheidNL from 2022 are usually mentioned. And people seemed to have the notion that the high accident rates were purely due to elderly people using e-bikes, and therefore trivialize the problem. Public opinion on bicycle helmets is abundantly negative. This is not helped by Arjan Lubach's news item in which he made fun of how terrible people look when wearing one (VPRO, 2022). And in discussions and interviews, the Fietsersbond advocates against bicycle helmets by calling them victim blaming and making claims like ''having no chance of survival when being hit by a car while wearing a bicycle helmet anyway'' (NPO, 2022). This is argumentation for their own interests which are safer cycling roads and the freedom and enjoyment of cycling. And according to VeiligheidNL, the biggest cause of accidents was human behavior with respect to environmental factors. This includes the use of phones while cycling, although this has been illegalised in 2019 (Ministerie van Algemene Zaken, 2022). It might be worthwhile to explore which phone features people miss the most while cycling.

The popularity of E-bikes is a much covered topic as well. Right now there are an estimated 5 million E-bikes in the Netherlands which is about 20% of all bicycles (RTL Nieuws, 2022). The price of an E-bike ranges between €1200 and €3200 (Milieu Centraal. n.d.), and in 2022, almost half a million E-bikes were sold (Hoitink, 2023). Moreover, the average lifespan of an E-bike is approximately 5.5 years before it is replaced (Kamp, R. 2022). A lot of people are willing to pay large sums of money for these products, and should therefore be considered a valuable target group for bicycle helmets. This is further supported by the largely shared public opinion that E-bikes are more dangerous as they can ride faster which I noticed in many forums, talkshows, articles and interviews. This is not true according to the statistics of Veiligheid.nl which state that the number of accidents for which cyclists had to visit the ED was about the same for both E-bikes and normal bicycles (both about 35% of the total amount of accidents in 2020). According to a recent study conducted by TU Delft, E-bikes are particularly favored in urban settings, and their usage for commuting purposes is growing much faster than other purposes (de Haas, M. 2022).

Finally, two campaigns for Germany and Denmark respectively were examined. In Denmark, almost half of all cyclists in urban traffic and 8 out of 10 cycling school children wear a bicycle helmet. In 2004, 6% of the Danish urban cyclists wore a helmet. This increased to 48% in 2021. This dramatic increase can be attributed to viral campaigns like this humorous advertisement from Danish traffic safety organisation råd for sikker trafik (2021), in which a viking is persuaded by his wife and daughter to wear a helmet into battle. Other Danish campaigns used a similar tactic by persuading people into encouraging their loved ones to wear a helmet. The idea that people don't want to wear bicycle helmets, but they do want their loved ones to wear one, has potential for bicycle helmet campaigns in the Netherlands.

Figure 10. Danish bicycle helmet advertisment from traffic safety organisation

A less successful campaign comes from Germany, which involves posters featuring scantily clad models wearing bicycle helmets, with the text: ''looks like shit, but safes my life'' (see Figure 11). According to Germany's transport minister, the campaign was meant to counter the notion that bicycle helmets are unattractive (Exists, N. L. 2021). But the campaign was largely criticised and called 'stupid and sexist'. The posters do grab attention, but stating bicycle helmets look like shit is in no way going to counter the notion that they are unattractive.

Figure 11. Bicycle helmet advertisment made by German government

2.3 Literature review

2.3.1 Critical evaluation of behavior change through campaigns

In order to have a significant impact on Dutch people's willingness to wear bicycle helmets, a behaviour change is required. Two studies from Goldenbeld et al (1993, 2003) have proposed several methods for increasing the voluntary usage of bicycle helmets in the Netherlands: namely educational campaigns, special offers in the shape of discounts and bicycle/helmet combination deals and handing out bicycle helmets in preschools. Similar conclusions can be found in American based studies: Royal et al, 2007, Dannenberg et al, 1993. Children are the target for most campaigns because they have a relatively high risk of getting in accidents (Krul et al, 2022), and their behavior is easier to influence. While this is true, it does not have the additional desired effect of the children continuing to wear bicycle helmets as they grow older: Cameron et al., 1994, Ekman et al., 1997, Povey et al., 1999, Schuffham & Langley, 1997, Sissons Joshi et al., 1994.

Thompson et al (2002) discusses the use of behavioral science to increase the use of bicycle helmets through a literature review. According to this study, behavior change for bicycle helmets moves from consideration of a helmet to helmet purchase, to helmet-wearing, to consistent helmet-wearing. The large majority of Dutch people do not even consider bicycle helmets since the Dutch socio-cultural norm is to not wear one. Thompson et al compared several (American based) studies that involved campaigns to increase bicycle helmet usage in preschools, and found that the most effective campaigns included predisposing, enabling, and reinforcing elements. Most of the campaigns during the annual day of the bicycle helmet in the Netherlands feature these elements as well.

Predisposing in the Dutch campaigns is mostly done by activities that increase feelings of vulnerability by depicting injuries, and activities to increase positive expectations which include education and public information about the effectiveness of bicycle helmets. A key difference with the American campaigns however is that the Netherlands has a completely different traffic infrastructure which is much more cyclist centered. This affects the perceived safety of cyclists which according to my own research (based on 125 respondents) can be scored as a 5,06 out of 7.
Another key difference is that it is very difficult to increase the perception that others wear bicycle helmets in the Netherlands, which was another predisposing element in the American campaigns.
Interestingly enough, a study by Villamor et al (2008) showed that out of 258 Dutch pediatricians, 94% never wear a helmet when cycling for transportation and 70% never wear a helmet when cycling for recreation. The study proposes that this might explain why bicycle helmet promotion campaigns are scarcely supported by Dutch pediatricians. But what can also be taken away from this is that even the highly educated people who deal with the consequences of children not wearing bicycle helmets on a daily basis (constant predisposing), do rarely want to wear bicycle helmets.

This is also true for the Emergency department doctor who is the client for this project. He has also operated on a lot of traumatic brain injuries but does rarely wear a helmet while cycling. Even some of his patients who have suffered from these injuries and experienced the consequences firsthand stated that they would still not be interested in wearing a bicycle helmet.
From this, it is reasonable to conclude that focusing Dutch campaigns on the effects that bicycle helmets have on safety is ineffective.
When it comes to the element of enabling very little further progress can be made in the Netherlands as bicycle helmets are easily obtainable online (and to some extent in physical stores as well) and start at relatively low prices of around € 20.

The element of reinforcing through rewards however has the most potential to bring about Dutch behavioral change. Although the study proposed examples like stickers and prizes for children campaigns, the underlying behavioral theory of rewarding is especially interesting from a product design point of view. If the design of a helmet or helmet/vehicle combination offers a reward that directly impacts the travel, this will have a positive effect on bicycle helmet perception from consideration of a helmet to helmet purchase, to helmet-wearing, to consistent helmet-wearing. The design challenge here is to make the reward attractive enough so that it outways the negative properties.

2.3.2 Functional and symbolic product attributes

Elaborating more on product design, it is worthwhile to look at bicycle helmets in terms of Functional and Symbolic product attributes. Enneking et al. (2007) distinguishes intrinsic attributes (what is present in the product; for example weight, size, color and details) and extrinsic attributes (the intangible aspects such as brand, price, or labeling) to model product choice as a function of these attributes and of consumer characteristics. These attributes are more commonly referred to as 'symbolic' and 'functional' in marketing and design literature. Functional attributes describe a product in terms of what benefits they concretely and (most of the time) physically provide such as warmth from a heater or storage from a backpack. Symbolic attributes are linked to self-identity, self-image, and self-expression (Grubb & Grathwohl, 1967; Lievens & Highhouse, 2003; Hall 2008). For example, the symbolic attribute of a Rolls-Royce can be implying status, and for a Toyota Prius, it can be expressing care for the environment.

The importance of symbolic attributes increases when the functional differences between products are little, and this gives marketers the opportunity to differentiate a product or brand. This is further evidenced by Berger and Heath (2007), who show that consumer's product choice has greater divergence for products with more symbolic value (like clothing) than functional value (like a hammer). Hall (2018) and Zhou et al. (2003) researched the consumer's preference of organic products and local vs. foreign products in China respectively, using functional and symbolic attributes as independent variables. Both papers concluded that emphasizing communication of symbolic attributes has a positive effect as these influence product choice and acceptance considerably more. Bicycle helmets are inherently functional products bought for their functional attribute: safety. And when looking at the bicycle helmet market research it was noticeable that the overwhelming majority only focuses its design and marketing on how safe, light, and aerodynamic the products are.

2.3.3 Conclusions

Up to now, designers, marketers and campaigners have been trying to reach audiences by emphasizing safety-related aspects through education, marketing, and design. From this literature review, it is apparent that the design of bicycle helmets has the most potential to have a positive impact on voluntary bicycle helmet usage; either by rewarding the user, or by emphasizing symbolic product attributes if the functional attributes are too similar between competing bicycle helmets. However, educational campaigns did prove to be effective on children. And Thompson et al noted how parents can be a crucial reinforcing factor for children's continued helmet usage.

2.3.4 Discussion

It should be noted that there is one reinforcing method that has not been discussed: reinforcement by legislation. There are numerous studies that show an unsurprising increase in bicycle helmet usage through the introduction of legislation: Macpherson et al, 2008, Karkhaneh et al, 2006, Høye, 2018, Olivier et al, 2019, Karkhaneh et al, 2011, LeBlanc et al, 2002. The topic of bicycle helmet legislation and recommendation is a much debated one. Experts I interviewed (which include organisations like ANWB and De fietsersbond, bicycle helmet manufacturer Abus, urban mobility design studio Springtime, and my client from Erasmus Medical Centre) are divided on the topic as well, even within their own organisations/companies. It should be noted however that when the Dutch government introduced helmet legislation on mopeds (snorfietsen in Dutch), the sales of mopeds decreased dramatically by 40% in one year (Koenis, 2023). And since the government currently has the goal that in 2025, 100.000 more people need to go to their work by bicycle instead of by car (Rijksoverheid, 2023), it seems quite unlikely that they would hinder this goal by introducing a bicycle helmet mandate. Not to mention the impact such a mandate would have on a politician's popularity.

A counter argument for bicycle helmet legislation is the hypothesis of risk compensation caused by wearing a bicycle helmet. This concerns cyclists displaying more risky behaviour (such as cycling faster or entering more dangerous traffic situations) when they are wearing a helmet compared to when they are not wearing one. However, Esmaeilikia et al (2019) did a systematic literature review on the topic of bicycle helmets and risky behaviour in which they reviewed 141 articles. They found little to no support for the hypothesis that bicycle helmet use is associated with engaging in risky behaviour.

Finally, no scientific research has been done on the topic of bicycle helmet design outside of materials and structural mechanics related to safety. This report will therefore study the desirability of several product attributes for bicycle helmets (see Chapter 3.1 quantitative research).

2.4 Stakeholder interviews

Three interviews were conducted with a sales director from bicycle helmet manufacturer Abus, a policy officer of public affairs from bicycle organisation Fietsersbond, and a policy affairs officer along with a bicycle journey mapper and legal advisor from traffic/tourist organisation ANWB respectively. Figure 12 shows an overview of the organisations and how they relate to each other.

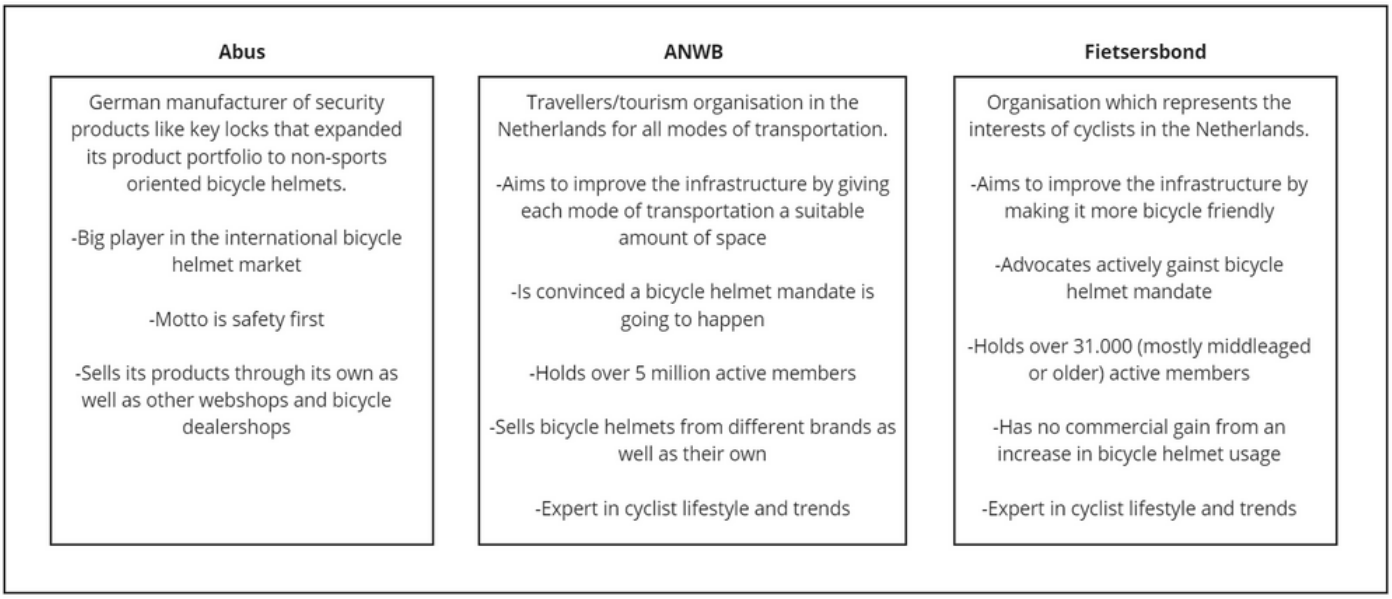


Figure 12. Overview of interviewed organisations

The goals of the interviews were to gain insights into bicycle helmet design and marketing, as well as the organisations' perspectives regarding bicycle helmets.
What follows on this page are the most relevant conclusions combined from the different interviews. (Note: in this report, the spokesmen are referred to by their company names for ease of reading).

Both Abus and ANWB sell bicycle helmets that are labeled as urban and were asked about what made their helmets classified as such (It should be noted that the interviewed respondents were not designers but did have a hand in marketing).
This was a difficult question as neither respondent could give a convincing answer and needed a moment to think about their answers.
Abus explained urban as 'design and sleek', and ANWB explained their urban labeled helmet (specifically the one shown in Figure 4 on page 8) by stating it is primarily sold to customers who live in urban environments (a bit of a chicken and egg situation).

Something that was a bit contrarian is that Abus stated that they are unique in the sense that they didn't start out by making sports helmets but rather non-sports oriented helmets. They target commuters and leisure cyclists. But when talking about marketing through influencers Abus stated that they use known sporters to promote their helmets.

Two spokesmen from Abus and ANWB have also done a bit of research together once, through arranging a design contest with highschoolers. The assignment was to design a helmet that the highschoolers themselves would want to wear.

This resulted in helmets that were to become part of the outfit and were fashionable by looking like hats with e.g. New York Yankees logos. This way of self-expression further reinforces the notion that including symbolic attributes in a bicycle helmet is an effective strategy.

Abus and ANWB also noted that the sales of bicycle helmets have increased quite a lot due to the popularity of E-bikes.
Furthermore, Abus could roughly estimate that the market size of all bicycle helmets in the Netherlands is about 500.000 products sold per year, using its own sales as a reference.

What was noticeable when proposing some bicycle helmet features to the ANWB, was that instead of reacting to the potential of the user values that the product features could provide, the first (and pretty much most) reactions were safety related. The legislation officer was very knowledgeable about safety norms and had some valuable commentary regarding this. But from the whole interview, It was noticeable what the ANWB's main priority is: protecting the travelers that use their products and services.
Abus had considered bicycle helmet features like communication, but these were not included as audio could have a negative effect on the situational awareness of cyclists. From Abus' point of view, this is understandable as safety makes up for most of their brand DNA. But it doesn't seem like both ANWB and ABUS agree that keeping a few people super safe, might not be as effective as keeping a lot of people a little less than super safe. Perhaps there is too great of a fear of a consumer getting injured due to their product feature and the possible image damage this may have.

The interview with the Fietsersbond was less in depth on helmets. It was noticeable that this policy officer did not fully share the same sentiments as the Fietsersbond chairwoman that appeared in a lot of media advocating against bicycle helmets as a solution for injury prevention. His attitude was rather positive and open toward the proposed bicycle helmet features. This makes sense since the Fietsersbond's main priority seems to be more about making cycling as enjoyable as possible. The respondent pointed me toward a large research that the Fietsersbond had done about bicycle helmets. This was done with about 8000 respondents with a mix of both members and non-members of the Fietsersbond. The main goal of this research was to find out how large the support base was for both a bicycle helmet mandate or advice (Boer, E. D., 2022). The result was that 80% of their members and 68% of their non-members were against a mandate from the government. And 56% of their members and 48% of their non-members were against the Fietsersbond advising people to wear a helmet. Interestingly enough, participants were more positive for a helmet advice to target groups that they themselves are not part of. The policy officer repeated something I had noticed before: 'People don't want to wear bicycle helmets, but they do want other people they know to wear bicycle helmets. Especially children and the elderly. He also pointed out that from this research, the main reason people don't want to wear helmets was the inconvenience of storage.

2.5 Conclusions

The marketing analysis showed that the bicycle helmet market was **oversaturated** with very **little differentiation** amongst helmets. Safety is the only value all of these helmets offer. Having read dozens of bicycle helmet product descriptions, it was noticeable that they all mentioned several safety standards the helmets complied with, defined in long codes.

As discussed in the literature review, designers, marketers and campaigners have been trying to reach audiences by emphasizing safety related aspects through education, marketing, and design. This idea that safety is everything came across in interviews with Abus and the ANWB as well. But seeing as how even patients who suffer(ed) from traumatic brain injuries, as well as the doctors that treated them, still do not want to wear a bicycle helmet, using **safety as a predisposing element can not be considered effective**. Especially since the Dutch infrastructure is relatively safe for cyclists and Dutch cyclists already feel safe (5,06 out of 7 according to quantitative research (see page 21)). From a behavioral point of view however, there is much scientific evidence that suggests that the best way to increase voluntary bicycle helmet usage is either by designing a helmet that **rewards the user** for using it, or by **emphasizing symbolic product attributes**.

Finally, the popularity of E-bikes has had a positive effect on bicycle helmet sales. An E-bike/bicycle helmet-connected functionality can therefore be a potential way to design a rewarding product feature. In the Future context research chapter, this will be investigated along with other potential vehicles.

3. Quantitative user research

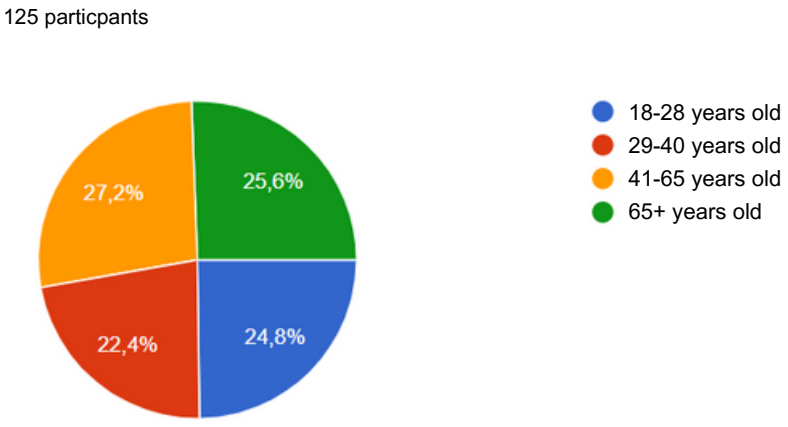
3.1 Objective & research questions

This study aims to gain a deeper cyclist understanding and gain insights into cyclist's needs and wants through the following research questions:

- R1 What features would people like to have added to their bicycle rides, and how do age and travel purpose influence this?
- R2 Do people rather cycle alone or together?
- R3 How safe do people feel while cycling?
- R4 What are the biggest reasons people do not wear bicycle helmets?
- R5 What is the effect of combined offers of E-bikes with matching bicycle helmets on bicycle helmet usage?
- R6 Does luxury branding with matching aesthetics contribute to helmet desirability?

3.2 Procedure & Results

For this research, data from 125 Dutch participants with a minimum age of 18 years old were collected through online questionnaires which were distributed through different channels and flyers with QR codes placed in a bicycle store and university faculties. Every participant filled in the same questionnaire. The ages of the participants are shown in Graph 1, which are quite evenly distributed.



Graph 1. age distribution amongst participants

Although no special attention is paid to the effect of gender, it is worth mentioning that this property was also quite evenly distributed with 48% male and 52% female respondents.
Graph 2 shows the extent of the purposes of respondents' bicycle travels. For this question respondents were allowed to choose up to 3 answers since people can go cycling for multiple purposes at different times (or at the same time).

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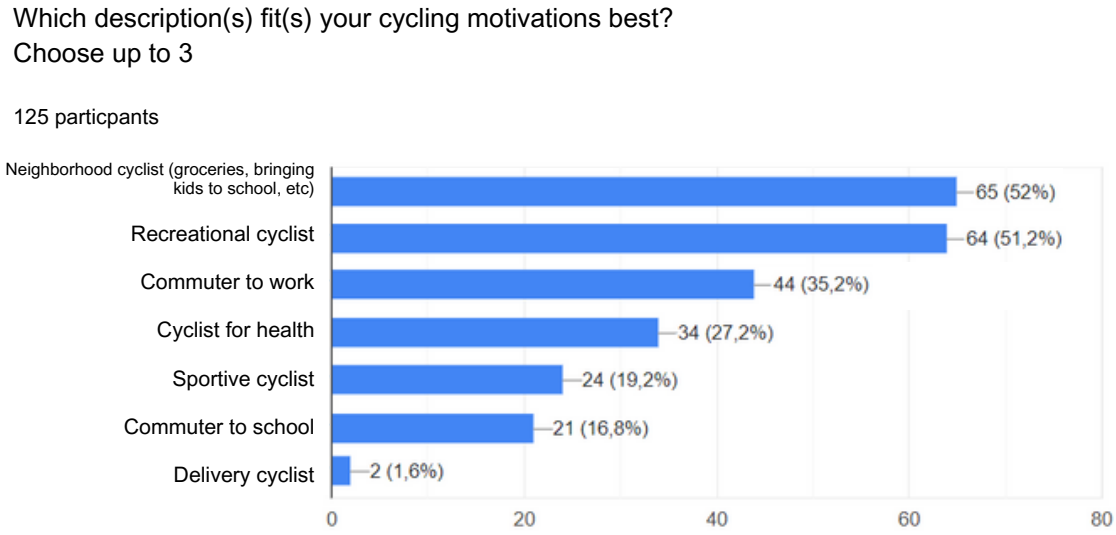


Graph 2. distribution of travel purposes amongst participants

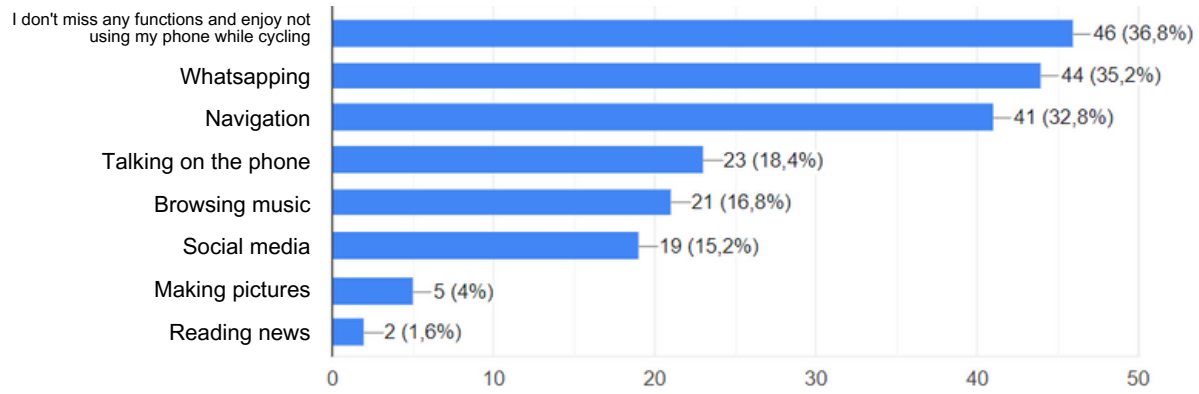
In order to study R1, participants were asked to rate the importance of features of a hypothetical product that would be designed especially for them in order to improve their cycling situations, on a seven point scale. One being 'not important at all' and seven being 'very important'. The proposed features are listed below and ranked on their average scores:

- Enjoying the environment: 5,90
- To unwind (tot rust komen in Dutch): 5,01
- Talking to a fellow cyclist: 4,48
- Navigation that doesn't require me to look at my phone: 4,38
- Being more alert to the environment than I already am: 4,29
- Get feedback on what is happening in my body (like calories burned): 4,17
- Being recognizable: 4,15
- Having a phone conversation with someone who is elsewhere: 3,67
- Cycling unnoted (while blending in and not standing out): 3,67
- Being socially active and exchange information: 3,49
- Listening to music/podcasts: 3,46
- Performing optimally sportively: 3,36
- Preparing for the destination while cycling (like studying for a test through audio): 2,84
- Being unrecognizable: 2,69
- Flaneren (being proud of one's appearance/possessions and going outside in public to be admired and looked at): 2,57
- Gaming elements during cycling: 1,83

Appendix 3.1 shows a graph which compares the average scores per travel purpose. And Appendix 3.2 shows a stackchart which compares the average scores per age group.
In addition, R1 was further studied by asking participants which two mobile phone features they missed the most while cycling. Having these features come from a phone rather than an imaginary product might produce different results and can further strengthen the validity of the results from the previous question. The proposed features along with their scores are listed in Graph 3.

Cycling while holding a mobile phone in your hand is illegal in the Netherlands.
Which mobile phone functions do you miss the most while cycling?
Choose up to 2

125 particpants



Graph 3. Scores of which mobile phone features participants miss the most while cycling

R2 was studied by asking the two choice question whether cyclists rather cycle alone or together. 73,6% of the respondents stated that they rather cycled together, while 26,4% stated they rather cycled alone.
R3 was studied by having participants rate how safe they feel while cycling on a seven point scale: one being 'not safe at all', and seven being 'very safe'. This resulted in an average of 5,06.

Next, in order to study R4 and R5, participants were asked the three choice question whether they always, sometimes, or never wear bicycle helmets while cycling. The results were that 2,4% always wear a bicycle helmet, 18,4% sometimes wear a bicycle helmet and 79,2% never wear a bicycle helmet.
R4 was then studied by using the data of the participants who never or only sometimes wear a helmet for the following question. In this question, participants had to rate how applicable the listed reasons are why they do not (always) wear a bicycle helmet. This was rated again on a seven point scale in which one is 'do not agree at all' and seven is 'fully agree'. The reasons are ranked with their average scores below:

- Bringing and storing a bicycle helmet is inconvenient: 4,75
- The chance of being in an accident is very small: 4,08
- My hair looks bad after wearing a bicycle helmet: 3,99
- Wearing a bicycle helmet is uncomfortable: 3,86
- Wearing a bicycle helmet makes me look unattractive: 3,83
- Nobody wears a bicycle helmet and I don't want to stand out: 3,82
- Bicycle helmets are too expensive: 2,78

R5 was studied by asking participants whether they would use a bicycle helmet that would freely come with an E-bike if they would buy or win one. This results in 21,6% answering 'yes', 35,2% answering 'sometimes' and 43,2% answering 'no'.

Finally, R6 was studied by showing participants several luxury branded bicycle helmets that were AI generated for this study. This concerns helmets branded as Balenciaga, Gucci, Calvin Klein, and Versace which can be seen in Figure 13. The models in the images were consciously chosen to be attractive and beautiful like models on advertisement posters from these brands to further increase desirability. Participants were then asked if they would like to own one (the word own was specifically chosen as buying one would mean having to pay for it). This resulted in 31,2% answering yes, and 68,8% answering no.

Figure 13. AI generated bicycle helmets from Balenciaga, Gucci, Calvin Klein, and Versace

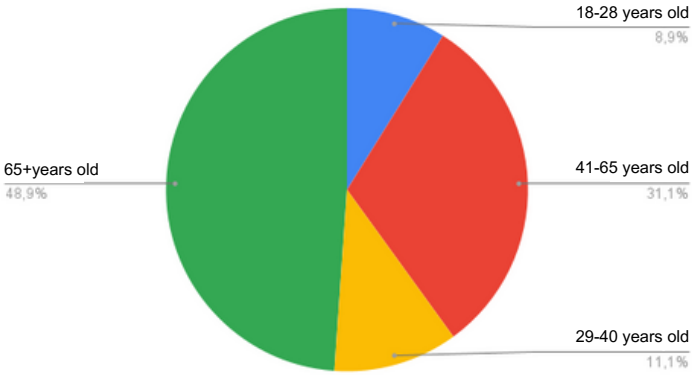
3.3 Conclusions

Results show that for R1, the feature 'Enjoying the environment' is rated significantly higher on average than other features with an average of 5,90. 'Unwinding' had the second highest score (avg=5,01), and 'Talking to a fellow cyclist' was rated the third highest (avg=4,48).
By far the lowest rated feature was 'Gaming elements during cycling' (avg=1,83), though this could be explained by the conceptions people might have with the English word 'gaming'. Participants could have had the impression this referred to console/mobile-style video games, and not have been open to the idea that this could be something as simple as setting a new time record for a cycling route.
Furthermore, the features 'Flaneren', 'Being unrecognizable', and 'Prepare for the destination' were rated <3 on average and should therefore not be considered for inclusion in a helmet design.

Appendix 3.2 shows how age influences feature preference. For this study, age discrepancy is considered significant when it concerns a difference of 1,5 points or higher. This is the case for four features:

- Listening to music/podcasts (with avg=2,5 for 65+ year olds, and avg=4,23 for 18-28 year olds)
- Being socially active and exchange information (with avg=2,77 for 41-65 year olds, and avg=4,52 for 18-28 year olds)
- Enjoying the environment (with avg=4,5 for 29-40 year olds, avg=6,24 for 41-65 year olds, and avg= 6,25 for 65+ year olds)
- Preparing for the destination (with avg=1,97 for 65+ year olds, avg=2,09 for 41-65 year olds, and avg=4,13 for 18-28 year olds)

Appendix 3,1 shows how travel purpose influences feature preference. However, a cyclist can have multiple travel purposes at different times or at the same time. Only 29 out of 125 participants stated to have only one travel purpose. Therefore, it is a complex exercise to link desired product features to specific travel purposes. For this study, it was chosen to compare the cyclists that are more destination focused (School, Commuting, Neighbourhood or a combination thereof), with cyclists who are more self focused (Sports, Health, Leasure, Neighbourhood, or a combination thereof). In this comparison, no significant discrepancy >1,5 points was found.
The results from which mobile phone features cyclists miss the most in Graph 3 shows that 36,6% do not miss any mobile phone features at all while cycling. Filtering these 46 respondents from the database shows an age distribution as shown on the next page in Graph 4:



Graph 4. Age distribution of participants who do not miss mobile phone features while cycling.

Looking at how participants miss human contact while cycling, 45,3% of all participants stated that they miss calling and Whatsapping while cycling. And interestingly enough, 'Talking to a fellow cyclist' was not rated high (but still positive) as a product feature (avg=4,48), but 73,6% of respondents did prefer to cycle together with someone. From this, it can be concluded that there is decent support to include communication/social interaction features in the bicycle helmet design.

Furthermore, this study provided further evidence that safety is not a valuable marketing feature to emphasize as cyclists feel quite safe already (avg=5,06 out of 7). And respondents rated the reason 'The chance of getting in an accident is small anyway' for not wearing a bicycle helmet with an average of 4,08. This is the second highest score after Bringing and storing a bicycle helmet is inconvenient (avg=4,75). This was also the biggest reason for not wearing a helmet in the study by the Fietsersbond. This problem should therefore be explored in the design process.

The results from R5 show that 56,8% of participants would always/sometimes wear a bicycle helmet if it came freely with a matching E-bike. Since 79,2% of all participants never wear a bicycle helmet, this can be considered a substantial potential gain.
Similarly, 31,2% of all participants showed interest in the luxury branded AI helmets. Filtering the data to participants who never wear bicycle helmets (n=99), 28,3% of these participants stated that they would like to own one of these helmets. So according to this study luxury branding and aesthetics contribute to helmet desirability.

3.4 Discussion

It should be noted that this study was mainly distributed on WhatsApp channels through friends of Delft University students and doctors. Also, flyers were put in a Delft University faculty and bicycle store in Rotterdam. This means that a large number of respondents are likely to be highly educated and living in urban environments. Whether or not this influences cyclists' behavior and needs and wants is a potential topic for a follow-up study but outside of this project's scope.
Finally, people did not know that this research concerned bicycle helmets in particular until they reached the halfway point of the questionnaire. If participants had to imagine certain proposed features in a bicycle helmet, this would probably have yielded different results. Instead, the questionnaire was named: Cycling, what does it mean to you? (translated from Dutch).

4. Qualitative user research

4.1 Emotion capturing exercise

The aim of this study is similar to the quantitative research: gaining user understanding and insights into cyclists' needs and wants. But by doing the emotion capturing exercise allows for digging deeper into user motives and assessing latent needs. All the positive and negative emotions that are experienced in the context of using a product are viable entry points to understanding what people really want, need, and expect in that situation (Desmet, 2020).
Bicycle helmets seem a suitable product to conduct this research with, as they come with several (mostly negative) emotions. The exercise is structured as follows:

- Prior to the exercise emotion capture cards are printed out. An example of one can be seen in Figure 14. These are to be filled in by the researcher during the exercise.
- A participant is asked to use a bicycle helmet in a context they are already familiar with. The researcher observes and interviews the participant while taking an active part in the activity as well.
- A stimulus event can be an action, behaviour, statement, or reaction of the participant. These events are to be written out on the emotion capture cards as they happen. Participants are then (or right after the activity) asked about which emotion they are/were feeling in that moment. To make this easier, participants are provided with an overview of positive and negative emotions using Desmet's Human Experience catalog (2021). Since this exercise was mostly done while cycling, most of the emotion identifying was done afterward. (It was not easy making notes while cycling).
- Next, participants are asked to elaborate on why they were feeling this emotion and to keep on elaborating by going down the motive ladder consisting of goals, expectations, needs, standards and values.
- After this, the participants have completed the exercise. And research continues by searching for the 'sweet spot' in each card's motive ladder. This sweet spot is where the most interesting opportunities are for design interventions.

This research was taken one step further by doing the exercise twice with different participants in different contexts. The first exercise was performed with a 22-year-old female student who does normally not wear a helmet. This participant had to wear a helmet while cycling to university in Delft, and take it inside with her as she would have if it was hers.
The second exercise was performed with a 60+-year-old couple that do usually wear bicycle helmets, and started on a camping in Hoeven (small village in Noord-Brabant) from their mobile home (stacaravan in Dutch). The purpose of this bicycle ride was to get fresh strawberries from a closeby farm's strawberry machine.
By doing these two exercises, differences and similarities between these respondents' motives can be identified and explored. Appendix 4.1 and 4.2 show a selection of the statement cards with the most interesting opportunities for design interventions.

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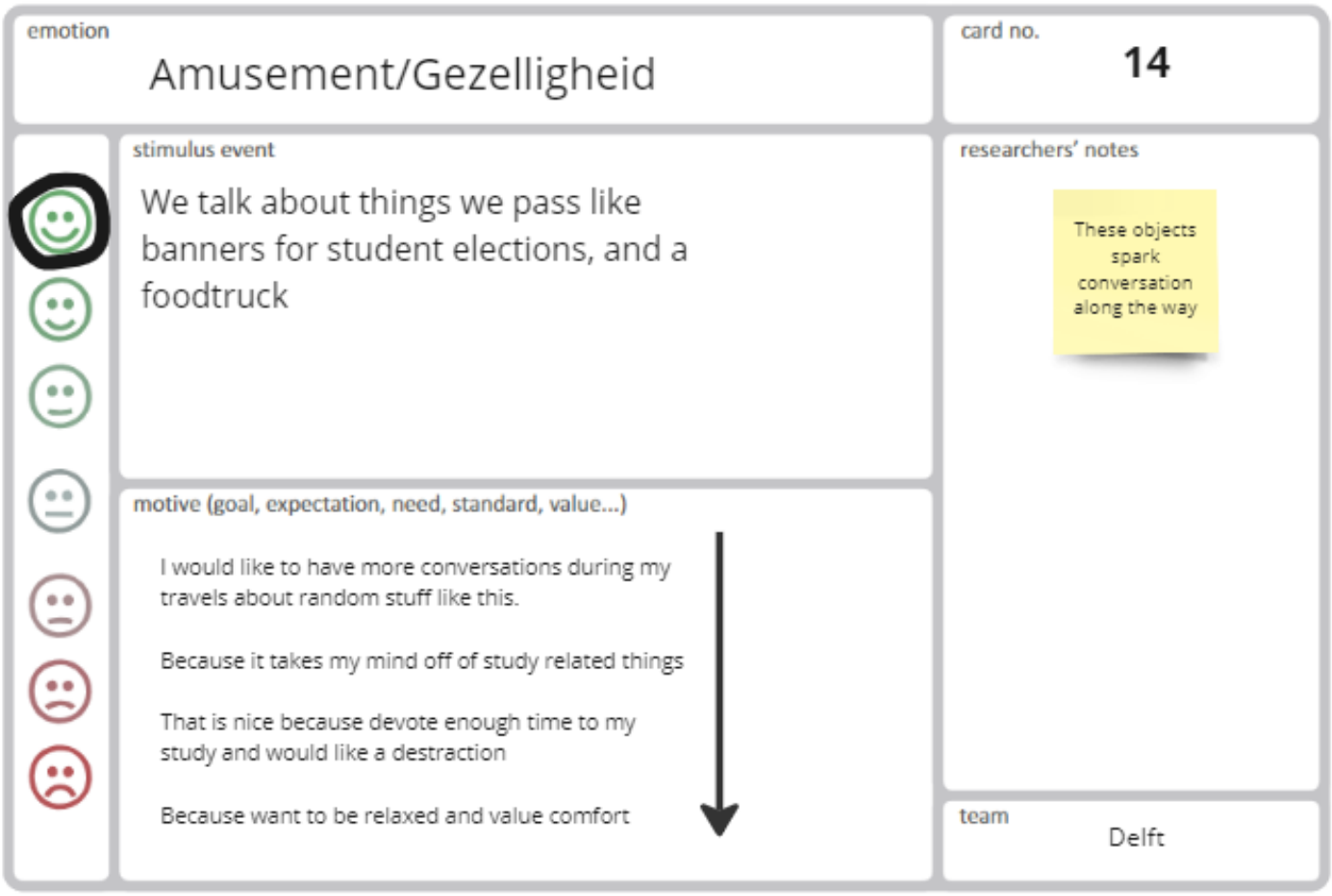

Figure 14. Filled in emotion capture card.

4.2 Conclusions

Looking at the similarities of both respondent groups, it was noticeable that both enjoyed talking about things that we passed in the environment. These environmental elements are great conversation starters and allow for increased social interaction. This also combines two of the highest-rated values from the quantitative research: enjoying the environment and talking to fellow cyclists.

Looking at the differences between respondent groups it was noticeable that the young female participant was much more embarrassed to wear the bicycle helmet and wanted to take it off before going inside the school doors after which she put the helmet in her locker. She felt annoyed that she had to carry the helmet with her when not wearing it. For this participant, it would have been ideal if the helmet could either be stored with/in the bicycle or be less inconvenient to carry around. It should be noted that if it was as foldable as the Closca bicycle helmet, this would have made no difference to the inconvenience as her backpack was too full to fit anything bigger than a Cola can. Also, if wearing a bicycle helmet was more fashionable and personalisable to her outfit, she stated that she wouldn't mind wearing it that much. What can be deduced from this is that a lot of people are still probably embarrassed to wear a bicycle helmet. Although this reason to not wear a helmet was rated negatively and the second lowest in the quantitative research. The young female participant also partook in the quantitative study and remembered she scored the question with a four out of seven which does not seem to represent her feelings in this emotion capturing exercise.

I hypothesize that people unconsciously believe they don't mind wearing a bicycle helmet until they actually have to wear one. A follow-up study could investigate this hypothesis by asking people to rank how embarrassed they are to wear a bicycle helmet before and after wearing one.

The older couple lacked the sense of embarrassment that was present in the younger female participant and said that they didn't care much about how they looked while wearing a bicycle helmet. They also had no issue with storing the helmet at all because they simply didn't take it off until they returned home. Furthermore, it was nice to see that they were happy for a moment that they wore the bicycle helmet when a car passed them at high speed. Desmet calls this a 'rich experience': a positive emotion that is triggered by a negative prior emotion. Due to the unsafety of the situation, however, this particular experience is of course something to be avoided.

Finally, it was interesting that the husband said that 'the way back is always less fun' because you repeat the stimuli encountered in the environment, in this case immediately after the way to the destination. This feeling would be less occurring with commuters who have more time between their travels to and from their destination, and don't cycle for the purpose of leisure.
Commuters typically want to make their travels as quick and efficient as possible (Rijkswaterstaat, 2019). When I asked the husband why not take another route back, he responded that would take too long (I estimate the route I proposed was about 5 minutes longer). So leisure cyclists might actually have a desire for fast efficient routes as well.
It is interesting and almost contradictory that people (both commuters and leisure cyclists) enjoy cycling to unwind, enjoy the environment and talk to fellow cyclists, but their routes have to be as efficient as possible.
In any case, the idea of offering a different experience on the same route through some kind of augmented reality or audio might have been potentially valuable in this case and could be interesting for commuters who travel the same route daily as well.

5. Future contextual research

5.1 Trend analysis

Several trends were identified and organised with the DEPEST method (Demographic, Economical, Political, Ecological, Social and Technological factors). This method served as a checklist and way of structuring findings: Van Boeijen et al, 2010, Helmold, 2019. These trends were explored through literature, news, (social) media, talking to experts like a design director at Urban mobility design studio Springtime and my project mentor, and trendspotting (what I notice changing around me). Appendix 2 shows an overview of the trends and their relations. A lot of these trends are valuable conclusions on their own; such as that E-bikes are most popular in urban environments, or that the boundaries of sports and fashion are blurring in combination with the popularity of products with bio sensors. But clustering trends allowed me to create more meaning. Figure 12 shows the four main trendclusters:

Figure 12. Trendclusters

The first cluster 'Be cheap or expensive, otherwise you don't matter' refers to the decrease of middle-class targeted products and stores. This is especially visible in fashion. If it is not cheap or luxurious, it probably won't sell well unless it has strong branding (Hanbury, M, 2019). In regards to bicycles, it is likely that soon most cities will be filled with cheap second-hand bicycles and expensive E-bikes. If the same logic can be applied to bicycle helmets is worth researching. Would people be willing to pay more for added technological features or luxury branding? And does this apply to both owners of cheap and expensive bicycles?

The second cluster 'People want to explore the world in new ways' refers both to how we travel and perceive the world. The variety of short distance transportation has increased in the last few years with electric bicycles, steps, skateboards, monowheels, and other wheeled products that haven't been categorized yet like the Stint 'urban mobility vehicle'. Many of these products lack regulations or a user knowledge thereof. The steps as a service are quite popular for touristic purposes. I remember driving very carefully in a car on vacation in Aruba when large groups of people on steps were riding in front of me on a 50km/h road. And I've been passed by some while grocery shopping in an Albert Heijn here in the Netherlands more than one time. I can imagine these steps becoming popular in tourist hotspots like Amsterdam as well. The point is that perhaps this project shouldn't be about designing a new bicycle helmet, but an urban mobility helmet. This helmet can influence the way travelers perceive the world through different sensory technology and add value to the experience. This doesn't have to be limited to tourism, but can even make commuting more interesting.

The third cluster 'The urban race: people want to get to their destination the fastest and most efficient way', refers to how the car is losing its place in the city as it is often not the most time efficient way of travel. Cars are slowly being substituted by the previously discussed various modes of short-distance transportation, as well as public transportation and a combination of short distance and public transportation. This is also the reason why industry giant Volkswagen has invested heavily in the bicycle leasing and financing business (Volkswagenag, 2021).

The fourth and final cluster was an insight gained from interviewing a design director at Springtime; a design studio specialised in urban mobility located in Amsterdam. According to him, the vehicles that people choose to travel in becomes a lifestyle choice. And with new emerging urban mobility vehicles, new lifestyles will emerge as well. This theory is supported by Thøgersen. (2018) who did a literature study on the subject. This study also pointed out that 'people may not have just one, but perhaps several interconnected lifestyles and that rather than one overall lifestyle it is more meaningful to speak about domain-specific lifestyles'. These domains change during traveling (for example traveling by train after a transportation switch is made to an E-bike). This creates different lifestyles with different needs and values during the same travel, which is an interesting design opportunity. The challenge here is to make products adjustable and/or customizable.

5.2 Future context mapping

Using the conclusions from trend analysis, a future context map is created (see Figure 13) as a visual overview which includes Elements, Properties, and Relations (Suathoon, 2015). According to Dorst (2013), mapping out the context visually allows a designer to immerse him/herself in it, and identify its challenges and opportunities.

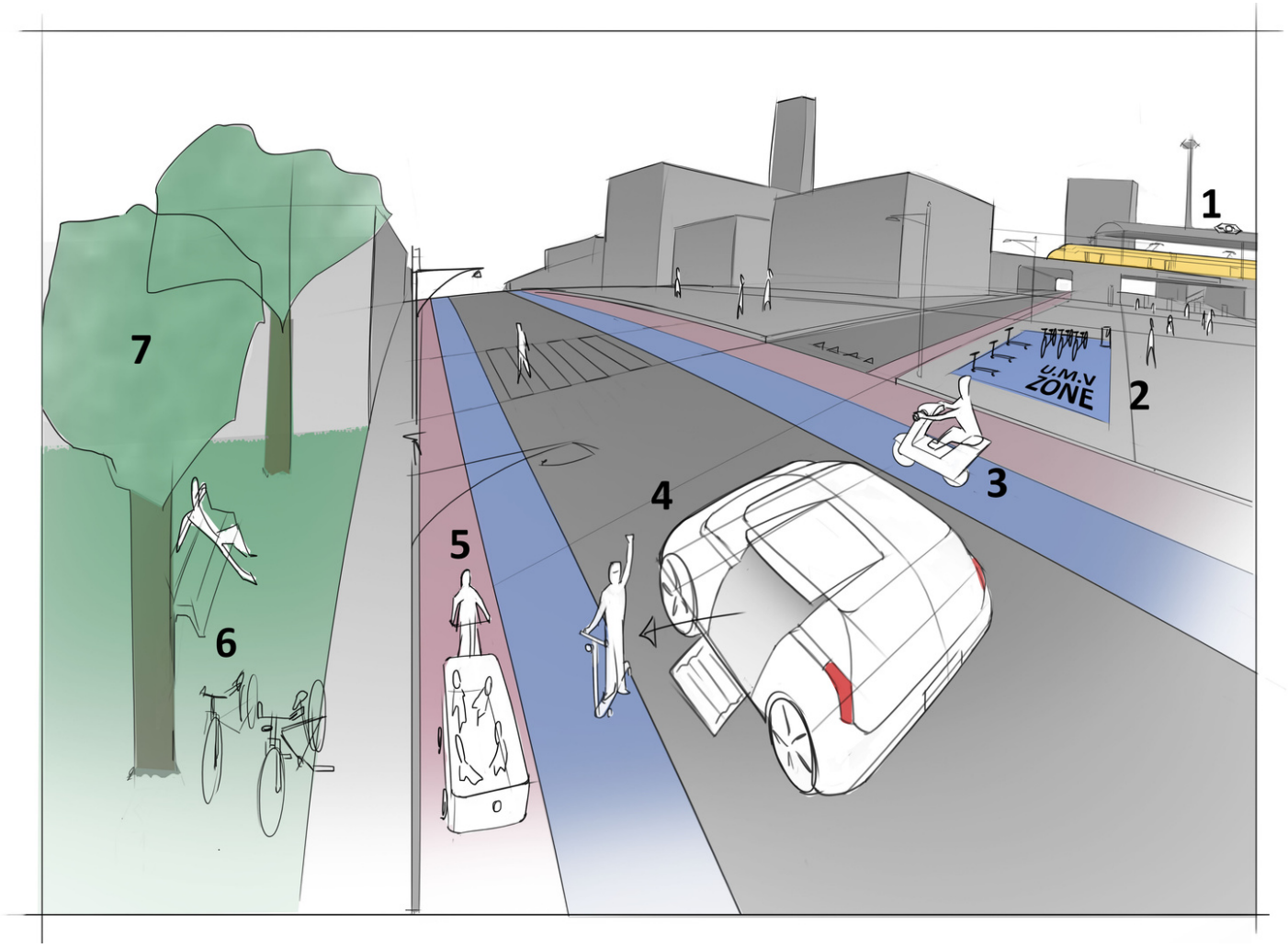

Figure 13. Future context map

The context map depicts an urban environment. This was chosen for this project's context because most of the identified trends originate from such environments. Urban areas tend to be centers of innovation through new technologies, products and services, which provide fertile ground for the emergence of new behaviors and lifestyles. Urban areas also have better social infrastructure for disseminating and amplifying trends.
The context map consists of the following elements:

- 1. Public transportation: it is expected that the use of public transportation (either by train, metro, tram or bus) in urban areas will increase. Traveling by public transportation will often be combined with bicycles and other urban mobility vehicles for time efficiency. A challenge here is where to store the bicycle helmet during traveling with public transport.

- 2. Urban Mobility Vehicle (UMV) zones: Most UMV's will be part of a sharing system, consisting of regular bicycles and E-bikes as well. These will be made available in UMV zones located next to train stations and city hotspots. The size of UMV zones will be

variable and depend on how much visited the surrounding area is. Right now there is a fusion of shared bicycle providers according to the expert designer at Springtime. And I expect that all the shared UMV providers will be fused/collaborate to make one central service that can be used with a OV-chipcard (OV is the Dutch abbreviation for public transport). A challenge here is how to provide helmets for UMV users. In an ideal situation (financially and logistically for UMV companies), users would bring their own helmets. Helmets get dirty and lost. Having to have a lockable case on UMV's would take up a lot of the vehicle's space, negatively impact the vehicle's agility (especially on small steps), and increase the number of actions a user would have to undertake to use a vehicle (which would increase exponentially if the user uses multiple UMV's in one travel). Urban travelers want to get to their destination in the most efficient way. This creates an opportunity for individually owned helmets to be the instrument through which people can check in and out effortlessly.

- 3. UMV lanes: along with the way that people transport themselves, the Urban infrastructure will change as well. The car will lose space on the road which will be given to cycle/UMV lanes. UMV lanes will exist in certain areas next to regular cycle lanes and can be used with higher speeds (let's say 45km/h) to overtake the regular cycling lane users (who are allowed to go up to 30km/h like the current situation). The car lanes next to the UMV lanes will remain 50km/h roads. Smart UMV's can detect which lane they are on and adjust the top speed accordingly. It is likely that wearing a helmet is mandatory on these lanes, which will have a positive effect on helmet usage. The Fietsersbond shares this vision of additional faster lanes. When discussing this context map with the ANWB, they pointed me to their vision called 'Verkeer in de stad' (2020). This vision is similar except for the UMV lane elements. ANWB proposes that these lanes are raised grass areas to separate cars from cyclists from a safety perspective (see Figure 14).

Figure 14. ANWB's future vision of urban infrastructure: 'Verkeer in de stad'

I disagree with this solution because sacrificing an entire car or cycle/UMV lane for greenery has detrimental effects on traffic flow and efficiency. It would for example be quite difficult to overtake larger UMV's on these narrow cycle lanes like children's cargo bikes (see Figure 15). This could potentially create dangerous situations as well. In this situation, faster UMV's aren't allowed to go faster than 30km/h on cycling lines either. If the Dutch government wants to reach its goal of having 100.000 more people commute to work on a bicycle (or UMV) instead of by car (Rijksoverheid, 2023), creating an efficient infrastructure that supports all forms of mobility through the use of UMV lanes makes more sense

Figure 15. Various children cargo bikes

- 4. Cars in the city: as mentioned before, the car will lose some of its usable space in the city, especially in city centers. Parking spots in city centers will also become scarcer so most people will park their cars on the city outskirts. Here is a potential for the combination of cars with small UMV's that fit inside the car. A similar concept was tried back in the 1980's with the Honda City turbo/Honda Motocompo combination which was aimed at Japanese cities like Tokyo which are difficult to get through by car as well (see Figure 16).

Figure 16. Honda City turbo with Honda Motocompo combination

- 5. Increase in variety of UMV's: as mentioned before the variety in electrical short-distance transportation has increased a lot in recent years. It can be expected that this increase will continue and the infrastructure needs to be prepared for this. A curious example is this E-bike/camper/boat combination (Figure 17).

Figure 17. Zeltini Z-Triton E-bike/camper/boat combination

- 6. Derelict shared UMV's: a big challenge for shared UMV providers is to make sure that their vehicles aren't left unmanned in undesignated parking spaces. This would have negative effects on the street scene and become a nuisance for pedestrians. These problems are already present with shared scooters right now (AD, 2022). Currently shared bicycles like the OV-fiets have a different system where they have to be returned within 24 hours to avoid a fine (NS, n.d.).

- 7. Cities will have more nature: this will not only have a positive environmental and public health impact but also increase the use of bicycles and UMV's. traveling will become a little more pleasant due to increased natural elements for sensory stimulation, and cleaner air from increased amounts of trees and a reduction in CO2-emitting vehicles.

6. Design mission

6.1 Target group definition

When deciding on which group to target in the previously described urban context, several considerations have to be made:

- Which target group is most likely to get in an accident, and how is this relative to their remaining lifespan? For example, 90-year-olds are about six times more likely to experience an accident than 20-year-olds (see Figures 8 and 9 on page 10), but 20-year-olds still have a long remaining lifespan.
- Which target group is most likely to have a large influence and has the ability to start a trend to reach an audience as large as possible?
- Which target group is most likely to be willing to wear a bicycle helmet? It should be noted that this depends on what the helmet design turns out to be. But the potential of the benefits in urban mobility and customizability to people's lifestyles should be considered for this.

With these considerations in mind, it was chosen that this project will target urban commuters, consisting of two groups: Young professionals, and Bikes & Blazers (see Figure 18).

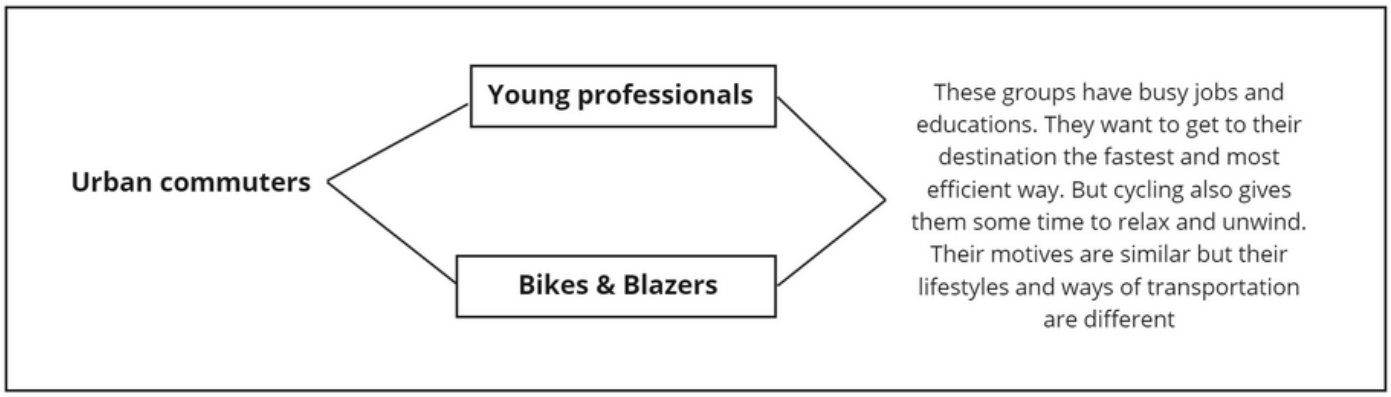

Figure 18. Overview of target groups

The Young professionals group concerns people between the ages of 18 and 27 who travel to the city to get their education/jobs at the beginning of their careers. The Bikes & Blazers group concerns people between the ages of 27 and 40 who travel the city to get to their jobs. They have made a successful career for themselves and can often be seen cycling around formally dressed in suits (hence the target group name). Figure 19 depicts this target group. They are often used in marketing material for E-bikes due to their successful and stylish image, suggesting you can be successful and stylish too by owning an E-bike.
Although these groups are statistically the least likely to be injured in bicycle accidents (Krul et al, 2022), they have quite a long remaining lifespan. They were primarily chosen for their influential roles and ability to start trends. Young professionals are at the age where they are the most socially active (both physically and digitally) (Kemp, 2023) and start to shape their lifestyles by watching trends and amplifying them. The target groups are further described in their respective personas.

Teenagers on the other hand are less likely to start a trend for bicycle helmet usage. According to the stakeholder interview with Abus, they are the hardest group to target as they don't want to wear helmets out of fear of standing out. Elderly people are the least likely to start trends or follow new ones as their lifestyles have become pretty fixed. This is already true to some degree for middle-aged people which is why the Bikes & Blazers age range was chosen to be up to 40.

The reason two target groups were chosen to design for instead of one is because through designing, I will experiment to which group a bicycle helmet could provide the most potential value and if perhaps customizability features would allow a single helmet to be marketed to the different target groups in different ways.

Figure 19. The Bikes & Blazers target group as depicted in E-bike marketing material (note that this design project's target group has a more evenly distributed gender distribution)

6.2 Personas

Two personas were created that represent the Young professionals and Bikes & Blazers target groups respectively. These can be seen in Figure 20.

Name: Thomas
Age: 34
Occupation: Marketing manager

- Lives in the city because it is close to work and he can afford it
- Travels every day by E-bike proudly in his suit
- He likes to look stylish and successful by wearing formal clothes and shoes. He loves fancy watches and gadgets like the latest smartphones.
- His looks change very little day to day
- He enjoys unwinding during cycling by being alone with his thoughts for a moment
- His shoulderbag contents consist of a laptop and some paper. He gets his food and drinks at work.
- Only uses his bicycle for commuting. Grocery shopping is done once to twice a week by car. Occasional socialising also happens by car.
- Bad weather? Then he travels to work by car.

- His bicycle

- His bag

Name: Jenny
Age: 20
Occupation: Biology student

- Lives outside of the city because it's cheaper
- Travels every day by train combined with a shared bicycle for flexibility
- She likes streetwear fashion like sneakers, oversized hoodies and sweatshirts and jeans
- Her looks are different from day to day
- She enjoys unwinding during cycling and listens to music on her airpods.
- Her backpack contents consist of her laptop, small notebook, pencil case, lunch box, and water bottle.
- Uses her bicycle for everything: commuting, almost daily grocery shopping, and a lot of socialising.
- Bad weather? She will cycle through it even though she gets wet.

- "Her" bicycle

- Her backpack

Figure 20. Persona's representing the Bikes & Blazers and Young professionals target groups

It should be noted that like personas typically do, they represent a majority of the target groups. But there are exceptions. For example, a lot of students live in the city where they study and are therefore less likely to need public transportation depending on how far they live from their schools. On the other hand, I know some people who live in Amsterdam-west but study medicine at Amsterdam UMC, which takes them about 35 minutes to travel to by combining the bicycle with the metro. But as cities are growing fuller and the number of students that sign up every year keeps increasing (NOS, 2021), it seems that more and more students will live outside the cities that they study in (NOS, 2022).

6.3 Design mission

Now that both present and future cycling contexts have been studied, cyclist's needs have been assessed through quantitative and qualitative research and an optimal target group has been specified that would have the largest effect on bicycle helmet usage through their influential characteristics, a design mission can be created which incorporates and combines all of the insights from the respective researches. This mission is as follows:

The Urban mobility helmet will have emphasized symbolical attributes which cater to the dynamic lifestyles of the target groups as the product allows them to **aesthetically express their values** and allows **customizability** and **adjustability** before and after the helmet's purchase. The functional attributes of the product will have to **reward** the user for using it, give the product **functionality when it is not being used as a helmet**, let the user **unwind** and **enjoy the environment**, and **stimulate social interaction** with fellow cyclists.

Along with these design guidelines, there are a number of safety-related boundary conditions the product will have to adhere to:

- The helmet must include an inner foam layer which creates an offset of about 3 cm from the helmet surface to the user's head.
- The helmet must cover most of the user's forehead (up to about 1.5 to 3 cm above the eyebrow), and cover most of the user's rear head, but no further than the base of the skull (the cranial base).
- The helmet must include chin straps which are directed to the top of the head and rear of the head to keep the helmet securely on the user's head.

There are of course more safety standards that bicycle helmets have to adhere to in terms of material and construction, but the conditions listed above are the most relevant ones to work with in developing a user value-based strategic helmet concept.

6.3 Collages

In order to discover the aesthetic elements to design the urban mobility helmet with, collages were created of the target groups' fashion styles, as well as which elements from fashion to include in the bicycle helmet design. The images were sourced from the internet as well as a bit of field research (in clothing stores and fashion I encountered around me). The most interesting fashion principles to me to design with are the idea of using textiles to create layers and using small details like stitches and various types of buttons/small accessories to create a fashionable look.

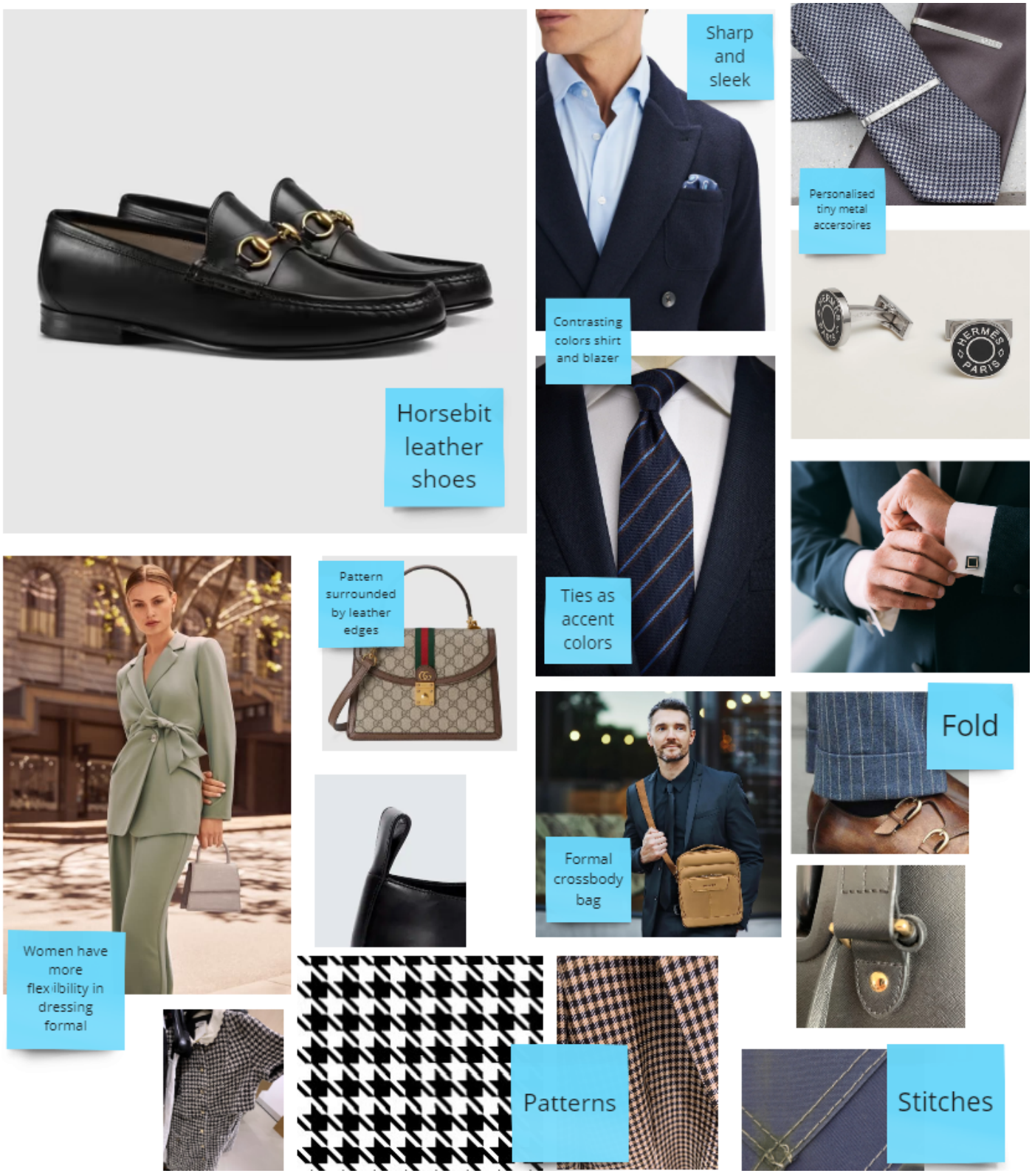

Figure 21. Bikes & Blazers moodboard

Figure 22. Young professionals moodboard

7. Ideation

7.1 Initial ideas

Figure 23 shows the initial ideas resulting from the design vision. Each idea contains one or more product attributes.

Figure 23 . Initial ideas

The ideas are further discussed below:

- Idea 1. GPS-based messaging system: A helmet that receives audio messages when passing a certain location such as a restaurant or crossroad similar to a museum guide headset. You can speak an audio message in the helmet's chinstrap-mounted microphone which is then stored in that location. Other people using such a helmet (or maybe walkers with an app) can then encounter your message in the location you spoke it. Leave a message everywhere you go! This goes back to how I noticed during my emotion research on the bicycle that most of our conversations were reactions to things we encountered in the environment. This idea can also be valuable for tourists who explore a city on their urban mobility vehicles or for navigation in general. It can even contribute to safety by warning people about dangerous situations.

- Idea 2. Red means let's talk: This idea aims to stimulate social interaction by color coding whether or not people want to talk. Other users of the same type of helmet can then recognize this and engage in conversation. Similar products have been developed for dance parties (FIXME you probably know which one I mean Ianus, it's an IDE thing but I couldn't remember). It does however require specific conditions to be effective like people cycling the same way and both wanting to talk to strangers.

- Idea 3. The helmet becomes a backpack: This idea is the opposite of the Closca bicycle helmet. It extends to make space for storing items. This way it can be used after it is being used as a bicycle helmet. Taking your helmet on public transportation becomes much less inconvenient. However, it does have the problem that when it is being used as a helmet it can not hold storage anymore. It is therefore mostly suitable for items that are used during cycling like gloves, scarves, bicycle lights and water bottles. Or if the bicycle has a basket, the items can be stored there.

- Idea 4. Helmet becomes a hood: a textile hood is added that can drop down for protection from rain, and to give that urban hoodie look. Usually, it is almost impossible to wear a hood over a helmet because the helmet does not fit under it. Integrating a hood in a helmet makes this easy, and allows the user for full head movement which is good for safety and comfort. Or like often is the case with hoodie sweaters, the hood doesn't actually have to be used but can just be there as a fashion element.

- Idea 5. AR helmet: AR has the potential to give all sorts of experiences to cyclists, navigating them, or displaying information about the environment for entertainment or safety. Ar can also be as unobtrusive as possible and not require any interactions from the user.

- Idea 6. Helmet with display: By adding a display to a helmet it becomes customizable and is able to exchange simple messages to other cyclists like 'hello'. It is an attention grabber, but it also can be used after it is worn as a display object in a room. Here it could portray a clock or fish like it is an aquarium.

- Idea 7. Reversible/swappable textile border covers: Using textile covers that are reversible/swappable allows the user to customize their helmets to their outfits on each travel and adjust the helmet to the weather (thick textiles which can cover the user's ears for when it is cold for example).

- Idea 8. Adjustable textile border cover to make air vents optional: Air vents aren't always desired. Especially in winter, people don't need to have cold air going to their heads. By putting a piece of textile in front of the air vents which can be adjusted at any time, you give people the choice to have air ventilation or not. This is a much cheaper and less complicated solution than trying to implement adjustable air ventilation mechanically.

- Idea 9. Bar-/QR code on a helmet to check in and out for using shared UMV services: A way that helmets can reward people who use UMV's is by making checking in and out and switching from one UMV to another seamless and effortless. The UMV just has to scan the helmet. This is easier than having to reach for a phone or chipcard in a pocket. And if some faster UMV's are only allowed to be used in combination with a helmet this can be a potential control factor. The barcode can also be placed on the underside of the helmet above the user's brow area so that it is mostly invisible for aesthetic reasons. Because this code contains the user's subscription ID it would have to be safe. It might be worth considering E-ink which can change at any time and is used in electronic shelf labels already in grocery stores like Albert Heijn. Options like NFC's were also considered but this would require the user to bend over and place its head on the scanner because NFC technology typically has a maximum range of about 4 cm.

7.2 Idea combinations and detailing

The ideas were explored further by making detailed product sketches. By making detailed sketches, one can gain a better understanding of a design and discover new opportunities and problems. Several ideas were also combined to explore how they can strengthen each other and potentially provide more value than the sum of their parts. Some ideas were so similar to each other that it felt natural to combine them, like ideas 7 and 8 which both use textile borders. And idea number 9 is to be combined with all the ideas as it offers a lot of value with minimal impact on the product design. The first idea combination to be explored is 2+6+9 called: The display helmet. See Figure 24:

Figure 24 . Display helmet

This idea combines the display functionality with the idea to start conversations, in this case by a simple 'Hi'. Other options include a thumbs up and turn signal, but the possibilities are endless. A button box on the steering wheel can be button mapped to the desired display image.

The second idea combination is 1+5+9, called the AR helmet. Two versions of this helmet have been visualised: a more traditional version in which the visor and helmet are separate elements (See Figure 25) and a more futuristic 'Apple style' helmet in which the helmet and visor are seamlessly integrated (See Figure 26).

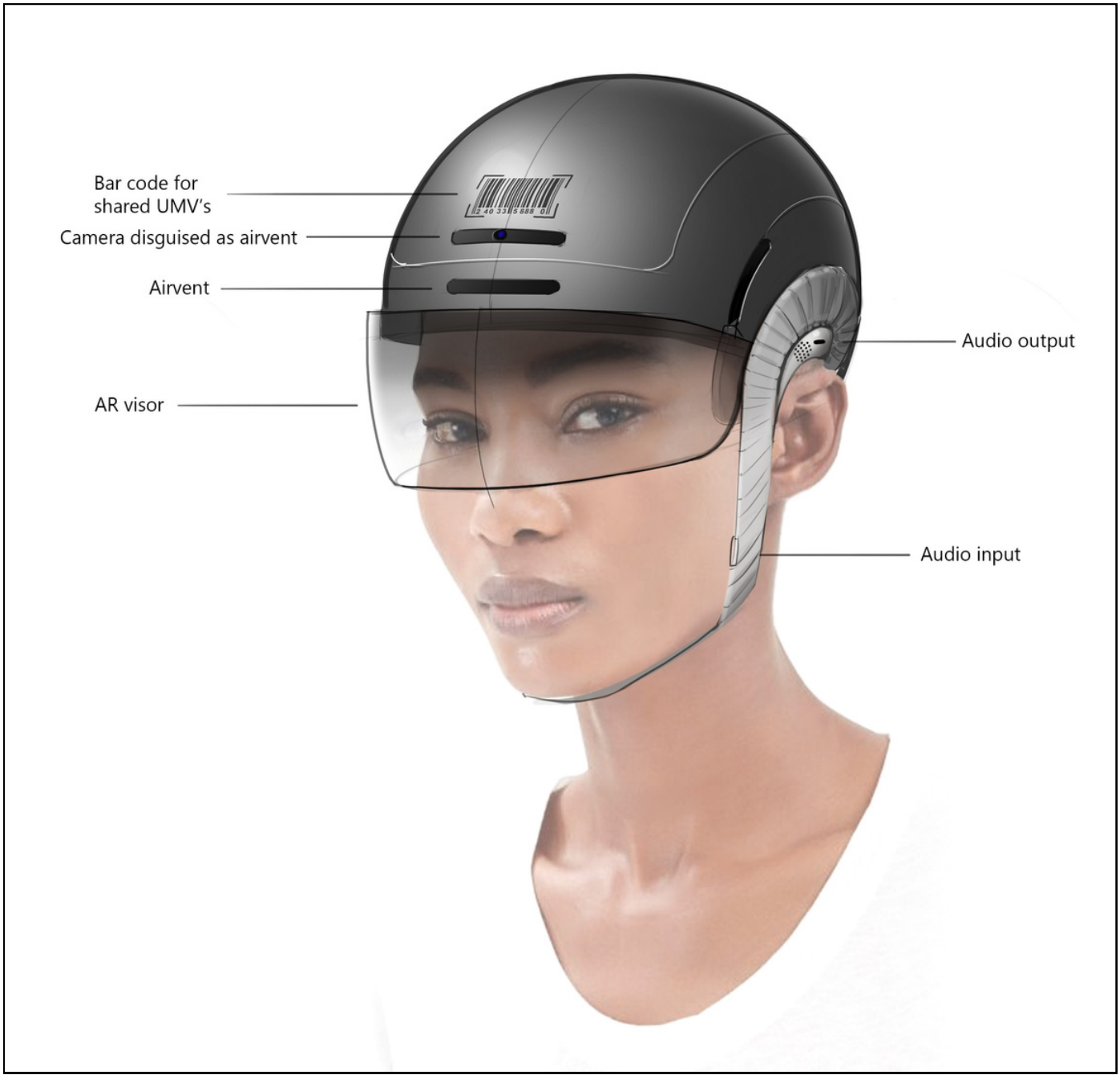

Figure 25 . AR helmet version 1

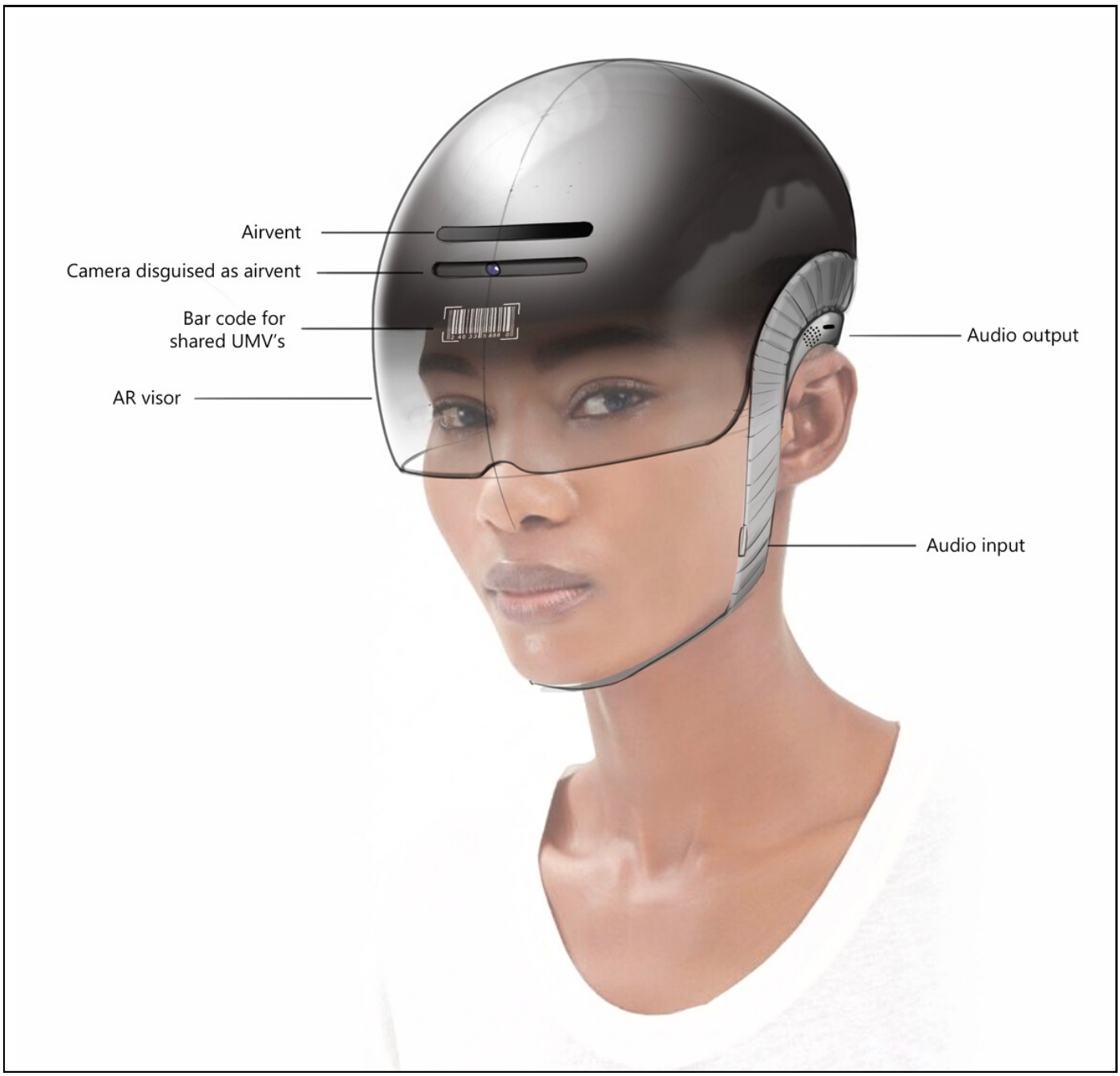

Figure 26 . AR helmet version 2

This AR helmet rewards the user by offering both audio and visual GPS -based augmented reality for entertainment, exchanging location-based messages, travel information like traffic jams or delays in public transportation, and navigation.

The third idea combination is 3+4+9, called the Flex helmet (See Figure 27). This helmet has a fabric wrap-around that seamlessly transitions into the chinstrap. The wrap gives the helmet a distinctly fashionable look and contains folded fabric underneath which can be pulled out (see Figure 28). This allows for the helmet to be changed into a cross-body styled backpack, and a hood (see Figure 29). Cross-body styled messenger bags are popular with both target groups, and the helmet can be customized with different colors and patterns before purchase and has the potential to be customized after purchase by buying differently styled fabric wraps. Appendix 5 shows a suggestion of how this helmet's mechanics can work. This Flex helmet can be categorised as a hybrid product as it is both a bicycle helmet, a hood and a kind of crossbody bag.

The danger of hybrid products like this is that they are difficult to understand for consumers as they might not recognize what product category they belong to and what value they provide (Van Kasteren, 2001). In order to make the Flex helmet's functionality more understandable, the fabric wrap has been made a separate part that distinguishes itself from the underlying plastic helmet by a different color and texture. This wrap also has folded wrinkles in the back as a use cue that it is supposed to be pulled out.

Figure 27 . Flex helmet

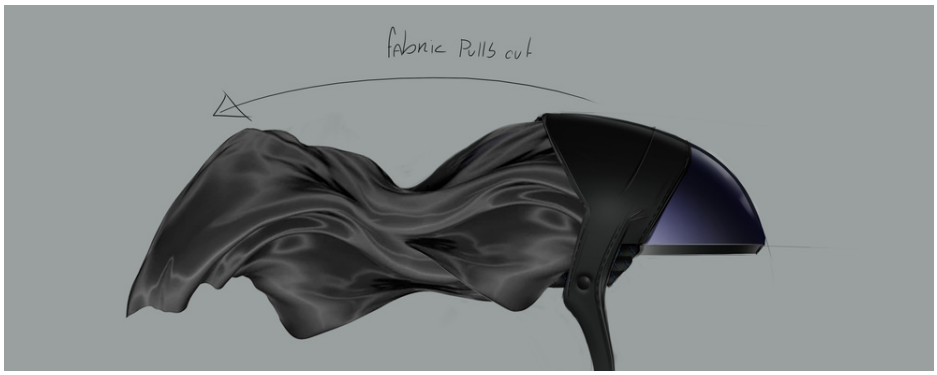

Figure 28. Fabric can be pullet out

Figure 29 . Flex helmet being used as a hoodie

The fourth idea combination is 7+8+9, called the Fabriqué (See Figures 30 and 31 for the male version and Figure 32 for the female version). This helmet has a swappable fabric border which can be adjusted by moving it up and down (or partially removed for the male version) to expose air vents when desired. When sketching these helmets, I noticed that the shaping of helmets can have male and female properties. Similar to car styling, giving a helmet straight lines, and more geometric shapes makes the product appear more masculine. And giving a helmet curving lines and organic shapes makes it appear more feminine.

Figure 30 . Fabriqué helmet

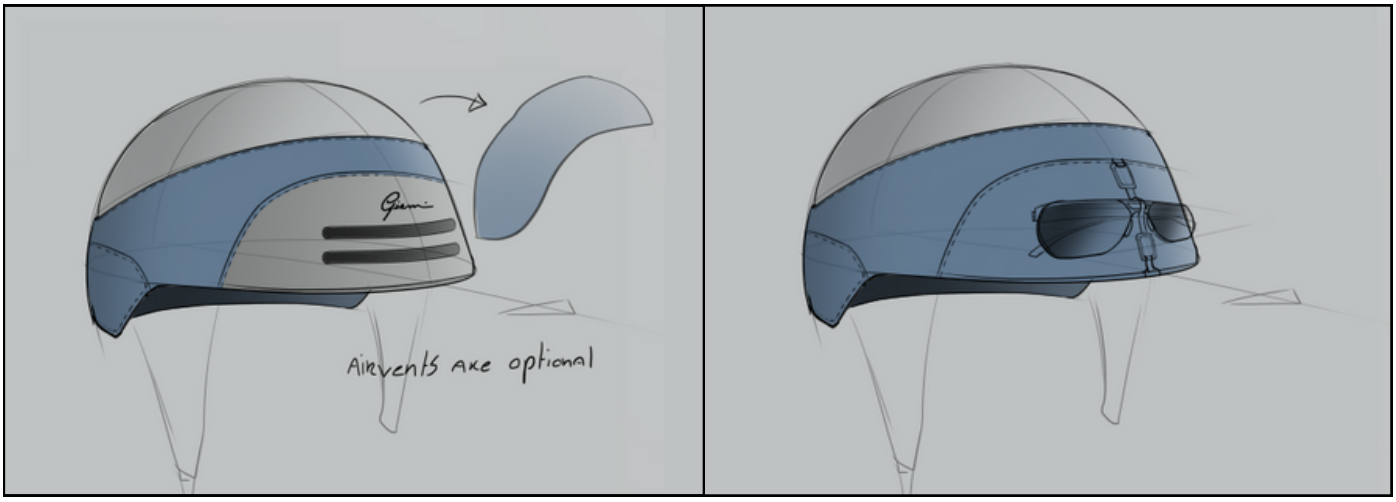

Figure 31. Fabriqué helmet different configurations: open airvents and holding sunglasses

Figure 32 . Female version of the Fabriqué helmet with different fabric borders

7.3 Idea screening

In order to get feedback to improve the ideas, and get input which will be considered in the idea selection, the ideas were screened to 10 (7 female and 3 male) people who fall in the Young professionals target group and 3 (1 female and 2 males) people who fall in the Bikes & Blazers target group. This was done through a combination of Whatsapp messages, Zoom meetings, and physical meetings (see Figure 33). Every participant was given a rich description of the idea and the context in which it would function (using the future context map from page 30). Participants were then asked to write down their feedback about individual design elements on post-its (statement cards). They were also asked about which helmet they liked the most. The following could be taken away from the idea screening:

- Most female participants were enthusiastic about the female Fabriqué helmet, including the female participant from the Bikes & Blazers target group (who is a doctor from Erasmus MC that collaborates in this project). From this, the discussion manifested about whether or not there should be gender specific (not just in terms of colors but the product's form language) bicycle helmets and whether they should be marketed as such. From a financial point of view, it is more expensive to manufacture two versions. But the Fabriqué ideas were designed from a fashion point of view which mostly separates male and female fashion as well. The consideration should be made whether to create separate gender helmets or a create a helmet that is unisex in design. The Flex helmet was considered unisex by 7 out of 9 participants, and male by 2 out of 9 participants (9 out of 13 participants were asked this question as the discussion manifested later in the screening exercise). The male Bikes & Blazers participant was amused by the idea to include accessories like cufflinks in a helmet but noted that for him 'the aesthetic design wasn't quite there yet'.

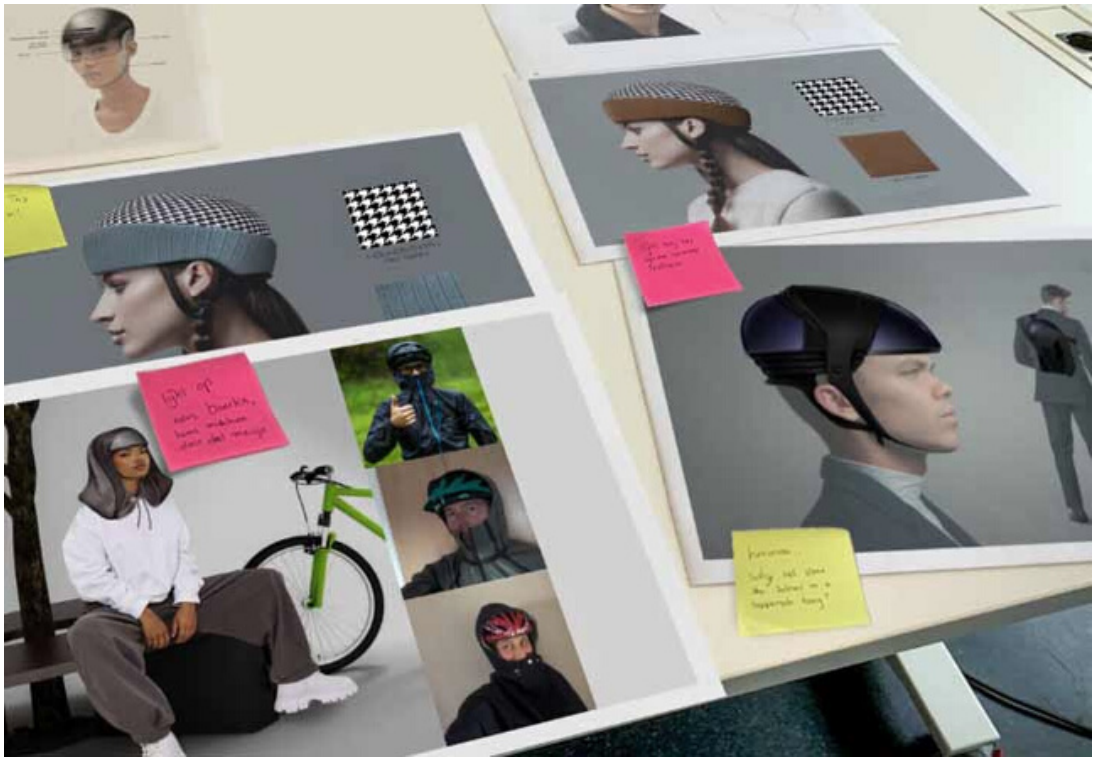

Figure 33. Physical idea screening

- The Display helmet was considered gimmicky by most participants. 'It is even more flashy than a sports bicycle helmet'. All participants considered the Display helmet's functionalities to be negative.

- Both versions of the AR helmet were shown and 9 out of 13 participants preferred the sleek helmet with an integrated visor over the traditional looking helmet with a separate visor. The overall consensus was that about half of the participants would like to experience using such a helmet, but would not be interested in owning an AR helmet yet. The other half was not interested at all. The idea was often compared to the Apple vision pro which participants also were not enthusiastic about.

- The backpack element of the Flex helmet was considered mostly favorable. Even though it was noted that it is inconvenient that the helmet bag could not hold storage when it was being used as a bicycle. 'I already have a really nice bag, so if I wanted to buy a bicycle helmet I probably wouldn't buy this one' was a valid point one participant made. Two other participants noted that they wouldn't use the bag function a lot. but that it would be nice to have in certain situations as a back up when your backpack is full or when you don't bring a bag at all and suddenly have to store something you picked up.

- The hoodie element of the Flex helmet was considered mostly favorable as well. Several participants noted that they would only use it in rain, and sometimes for warmth in winter: 'It's a bad weather feature which is nice for winter'. Several participants also made the connection to religious headwear like burqas. Finally, 'This hood would be a giant windcatcher' was noted by one participant.

- Finally, 7 out of 13 participants stated that they favored the Flex helmet (some noted: 'if it comes with the materials and pattern of the female Fabriqué helmet, or if the design can be closer to the Fabriqué helmet), 5 out of 13 stated that they favored the female Fabriue helmet 'because it looks really beautiful', and 1 participant favored the AR helmet.

7.4 Idea selection

Keeping the feedback from idea screening in mind, the idea selection method Weighted objectives is used to motivate the choice of helmet design to continue developing (Roozenburg, 1995). This is done by giving weight factors to the product attributes listed in the design mission, and scoring how well each product idea contributes to each product attribute. The results of this exercise can be seen in Appendix 6.

The weight factors of the different attributes were kept as close to each other as possible with three exceptions. The attribute 'Aesthetically expresses user values' was weighed higher. This is the most subjective attribute due to it being purely symbolic, whereas the other attributes were more/completely functional. And the importance of symbolic attributes has previously been discussed.

The attributes 'Let's the user unwind and enjoy the environment' and 'Stimulate social interaction' were weighed lower. This is because these are attributes that are already present/possible while cycling without a bicycle helmet. Enhancing these attributes on a bicycle helmet doesn't add much more value compared to the other attributes.

Note: since Idea number 9 'Barcode on the helmet to check in and out for using shared UMV services' was included in every idea combination, this element was not considered in scoring the attribute 'Rewards the user for using it' to have the other elements like AR rate more relatively (Otherwise all scores would have been higher for this attribute).

The total scores of the ideas were as follows:
Display helmet: **475**
AR helmet: **610**
Flex helmet: **640**
Fabriqué helmet: **605**

According to the weighted objectives method, the Flex helmet incorporates the product features from the design mission the best. But it is very close to the AR and Fabriqué helmets. This corresponds largely to the insights of the idea screening. There are however more considerations to be made when selecting which idea to continue with.
First of all, the Flex helmet was found very desirable by participants if it would 'look more like the Fabriqué helmet': combining fashionable and functional flexibility. This combination was explored as shown in Figure 34:

Figure 34. Flex helmet with Fabriqué helmet fashion features

With this appearance (the leather, patterns, and chrome/gold details) it fits better with the Bikes&Blazers target group. However, the Flex helmet's functionality doesn't really fit that target group. If we look back at the personas, the Bikes&Blazers don't need a hood as they are unlikely to cycle through bad weather in their fine suits. Some might enjoy the crossbody bag functionality to 'hide' their helmet when they arrive at work. But they likely would rather show off a fancy-looking helmet because it expresses their values and lifestyle.
The Flex helmet is much more suitable for targeting the Young professionals who do cycle through bad weather. The hoodie function is also meant to reflect their taste in baggy fashion and (just like an actual hoodie sweater) doesn't actually have to be used often/at all to be a desirable fashion statement. Furthermore, the crossbody bag function is ideal for public transportation, or arriving at school without garnering too much attention for having a bicycle helmet.

Looking at the AR helmet and seeing how participants stated they would be interested in experiencing an AR travel experience, the AR helmet idea should be considered as an optional shared service for shared bicycles. I hypothesize that shared services are the best way to introduce AR as a travel feature. The technology has currently not yet become popularised outside of mobile phone use. Industry giant Apple has yet to release its first AR-centered product, the Vision Pro, of which the public's initial reactions were seemingly mixed (sourced from going over comments in the product announcement video as well as reviews from journalists with early access. It can be considered to target the shared AR helmet at commuters, which can bring new experiences to their largely similar daily routes, or at tourism who can use the helmet to explore cities in which they are unfamiliar. It would be recommendable that the AR helmet has an adjustable visor and can be carried in a specialised backpack so that tourists can take the helmet with them without wearing it in places like restaurants or stores. Shared helmets have the disadvantage of getting lost and dirty, and being inconvenient to store. Considering a shared helmet as a premium service which people have to return undamaged to the pick up point, where it will be cleaned, has the potential to solve this. Think of how careful you would be if you would rent a Ferrari.

Ultimately, the Fabriqué helmet targeted at Bikes&Blazers is the best idea to continue with for several reasons. When participants (and other people whom I casually showed some of my work) first saw the female Fabriqué helmet, I noticed that they had very positive immediate reactions to it. The design is simple and yet new and original. But most of all, it just looks really good. The target group of Bikes&Blazers also seems more likely to wear a bicycle helmet as they often ride E-bikes which are perceived as more dangerous due to their higher maximum speeds. This target group is also more likely to invest in a bicycle helmet due to their financial capabilities. Young professionals have very low financial capabilities as they often have debts and low incomes. It seems unlikely that they would be willing to pay an amount of money for a bicycle helmet, for which they can also buy a cheap second hand bicycle or even some clothes.

Lastly, it is important to consider what message I want to give to the bicycle helmet industry and how I do this through the selected idea. Flexibility in the shape of hoods and bags in a bicycle helmet surely is interesting and has potential for more market diversification, but flexibility won't make bicycle helmets desirable without really catering to the target groups' lifestyles and values and representing this visually. That is the message which needs to be told. And the Fabriqué helmet is the best way to convey this message.

7.5 Idea validation

In order to validate the idea choice (and general research conclusions), the ideas were screened by stakeholders who sell/produce bicycle helmets. This concerns the same people from Abus and the ANWB who were interviewed in chapter 2.4, in addition to an import agent from Closca. The following could be taken away from the screenings:

- The targeting of the Bikes&Blazers target group was considered logical and lucrative by both Closca and Abus. Interestingly enough, this is very similar to Closca's target group in Spain (where the company is located) which was described as more stylish individuals who have creative jobs. Closca chose to target elderly people in the Netherlands instead as this group provided a low risk. This was done in collaboration with the ANWB. Abus noted how they are aware of the growing demand for E-bikes in cities and how this will continue to grow in the next few years. The Bikes&Blazers group would be a large part of the E-bike target group that Abus is currently developing products for. Abus estimates that about 6% of all E-bikes right now are sold together with a bicycle helmet.

- I was surprised to learn that Closca had some difficulty in explaining their foldable bicycle helmet to consumers. Apparently, they want to improve this as a portion of potential consumers in physical stores do not recognize the helmet's foldable functionality. Closca wants to solve this by displaying both folded and unfolded helmets next to each other so that consumers can immediately understand the product. It is likely that a similar phenomenon would occur if the Flex helmet would be sold in physical retail, and to some extent in online retail as well. Webshop pages like Bol.com and ANWB only show pictures with a single helmet in their overview (see Figure 35). For more pictures, you have to press on the product. A design that takes more time to understand because it has different configurations for different uses would have a disadvantage in this regard.

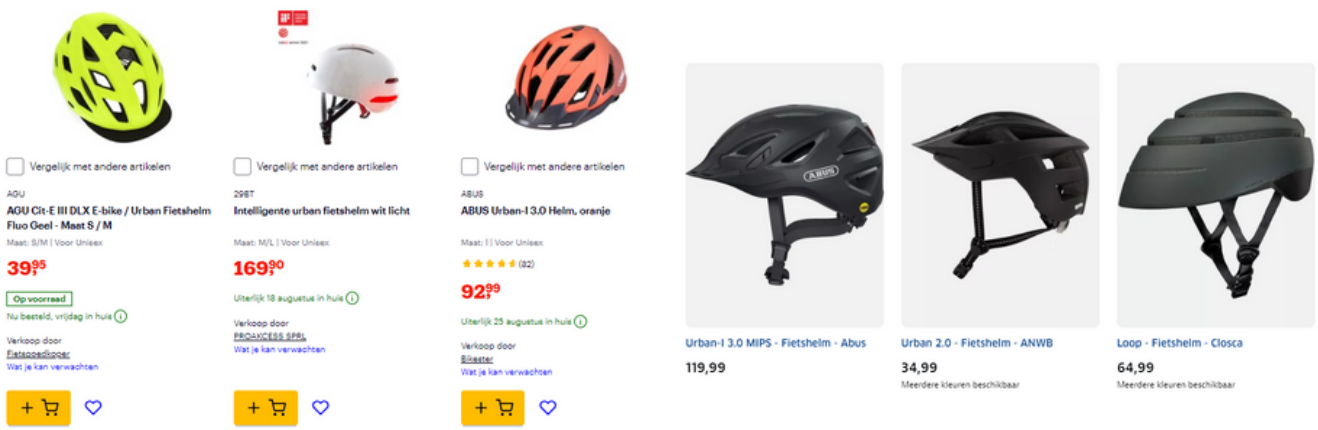

Figure 35. Webshop pages of Bol.com and ANWB respectively

- It was interesting to see that Abus had some very similar strategy ideas on how to target urban commuters, and has taken some small steps in integrating this in their upcoming HUD-Y urban bicycle helmet design. This involves a catchy product name derived from urban fashion (the same type of fashion which inspired the Flex helmet design), and the use of a small piece of a certain fabric as an accent color/material on the helmet's chinstrap. The product has not been revealed yet at the time of writing so no more information will be revealed. But it was nice to see that my Fabriqué and Flex designs were going in the same direction as Abus.

- Reactions from Closca and Abus on the Fabriqué and Flex helmet designs were definitely positive. ANWB had some safety related concerns for the Flex helmet and seemed to be less enthusiastic about the user values the helmet designs could provide. All three companies did discuss with me how the biggest challenge that would come with these helmet designs would be allowing for customizability. Every option that you add to a helmet in terms of textiles and accessories would cost the manufacturer time and money. Closca being a relatively small company mentioned how they are a niche company in the bicycle helmet market which is a niche market on its own. They currently sell about 70 to 120 helmets per week. Allowing for customizability is definitely something they are interested in. Currently, they provide printing services for their helmets so that other companies can buy helmets with their company logo on them to give to employees. And Closca also sells separate textile borders for their helmets called Nordic visors. These come in two colors. The fact that Closca can offer these customizable features makes me confident that these features are not too unrealistically expensive. But it should be noted that an advantage of fabric borders is that they are flexible and can fit multiple helmet sizes. Leather borders do not have this flexibility and would have to come in different sizes which would make them more expensive. Then again, my goal is not to make a cheap helmet for people with little to spend. Bikes&Blazers love luxury items which are often desirable because they are expensive and high quality. Abus being a large company of which bicycle helmets are a side business, discussed with me that as bicycle helmets become more popular, customizability will become increasingly cheaper with the more helmets you sell. Abus was also very interested in collaborations with other brands that can be achieved through customizability.

7.6 Final product proposal

Having selected the Fabriqué helmet as the final product proposal, the design was redone to cater to both male and female users. This was done by drawing nuanced shapes which are not too curvy and not too straight. The result can be seen in Figures 36 and 37. The fashion features from the male helmet were included. And the way the chinstrap is visually attached to the helmet is inspired by luxury leather bag straps. The back of the helmet is inspired by the back of leather derby shoes which often have a little strap on the top as well. Furthermore, the feature of the removable leather cover over the air vents was kept. When it is removed it should easily fit in a blazer or trouser pocket. The last small but important detail is the signature which is printed on the plastic part of the helmet. This gives the helmet a human touch and implies to consumers that this helmet was designed by a 'designer' with a pen, not an 'engineer' with CAD modeling software. This little print also gives the helmet a tiny bit more visual interest while keeping its sleek character.

Figure 36. Fabriqué helmet redesign

Figure 37. Fabriqué helmet redesign: back view

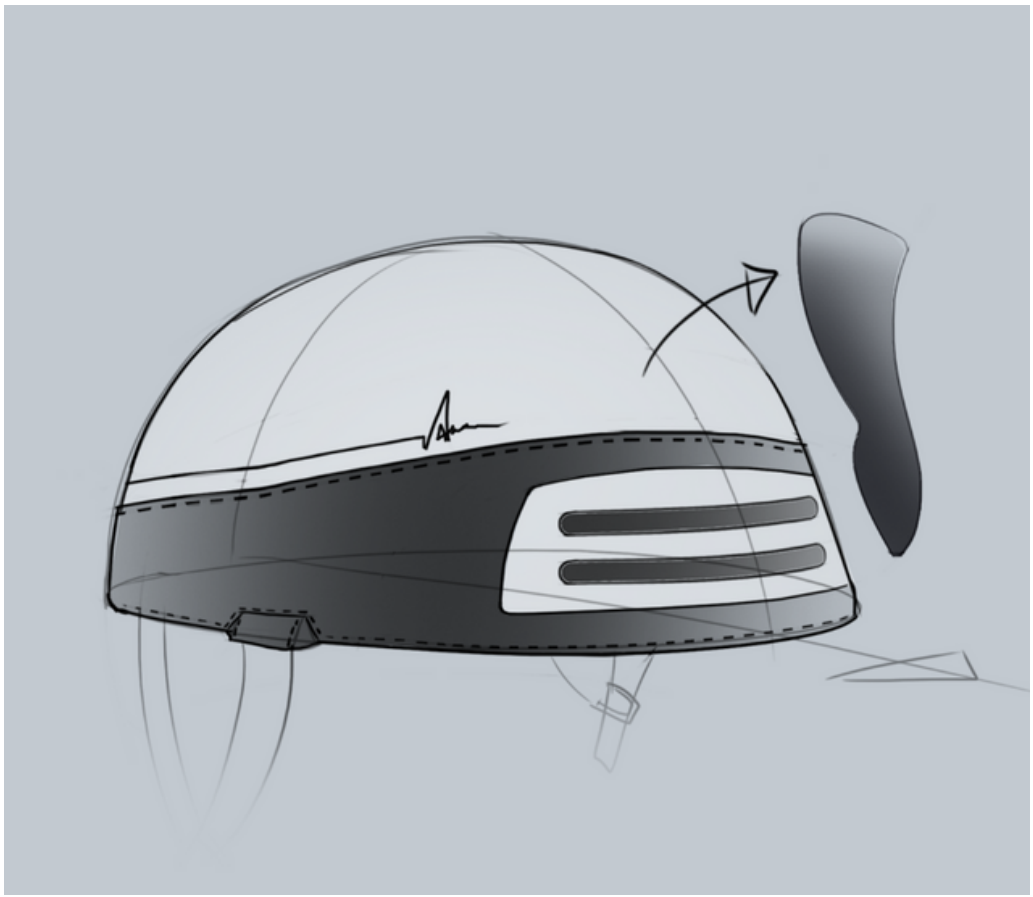

Figure 37. Fabriqué helmet redesign: removable cover for air vents

8. Product marketing

8.1 Positioning and sales channels

In this chapter, recommendations are given for how to market the Fabriqué bicycle helmet starting with positioning and sales channels. As explained before, emphasizing safety related product attributes is not an effective way to reach Dutch audiences. Instead, the product's symbolic attributes will be communicated consisting of the following words: **Style, Fashionable, Luxury, Design, Beauty, Designed in Paris** (give an employee in the design department a paid trip to Paris, let him do a small amount of design work there, and you will be able to make this claim). The Fabriqué helmet should not be positioned as a protective bicycle helmet, but rather as a luxury accessory for cycling.

The price can and should be on the high end of the bicycle helmet market. This is because the Bikes&Blazers target group has a high income and prefers to wear high quality/luxurious products. These products are so expensive because people want to pay high prices for the exclusivity (Radon, 2012) and social status (Berger, 2017) that comes with owning these items. As explained in the trend analysis in Chapter 5.1, the market for personal luxury goods is booming. The market is likely to reach a size of €530-570 billion by 2030, which is more than double its size in 2020 (Bain&company, 2023). A price of around €160 for the Fabriqué helmet would be advised. This is more expensive than most helmets, but not too expensive to where it would compete with actual high-end luxury goods.

The product's sales channels should reflect its target audience and positioning. Awareness should be created at places where the target audience is likely to go: such as suit stores, the Dutch warehouse the Bijenkorf, and bicycle stores (where they go because E-bike maintenance is required every once in a while). Selling the helmets in suit stores and the Bijenkorf will increase the perception that this is a luxury/fashion item. Selling bicycle helmets can be considered a moral thing to do (because you contribute to injury and death prevention). This can be used to persuade sales officers to dedicate some shelving space to the Fabriqué helmet. Note that it is not the intention to sell large amounts of units in these physical retailers, but rather raise awareness and contribute to the product's perception. Online platforms such as the product company's own webshop and the Bijenkorf's webshop are where the majority of sales will happen. The product will not be sold on websites like Bol.com or the ANWB webshop to retain a sense of exclusivity and luxury, and to retain control over how the product is shown (which images are used, and what the graphic design language of the website is). Furthermore, it should be considered to sell through combination deals where the bicycle helmet is offered at a reduced price when consumers buy a new E-bike. In 2022 almost half a million E-bikes were sold in the Netherlands (Hoitink, 2023). The quantitative research in Chapter 3 pointed out that 56,8% of participants would always/sometimes wear a bicycle helmet if it came freely with a matching E-bike. But instead of the helmet matching the E-bike, consumers get a bicycle helmet that matches their fashion values as the helmet is designed for people, not E-bikes.

8.2 Customer conversion journey

Figure 38 shows what a conversion journey of the Fabriqué helmet customer looks like, following this project's recommendations. Note that a marketing budget was not considered. However, the recommendations are not too different from which channels bicycle helmet companies currently use, with the exception of selling the product in the Bijenkorf. This might be challenging to achieve.

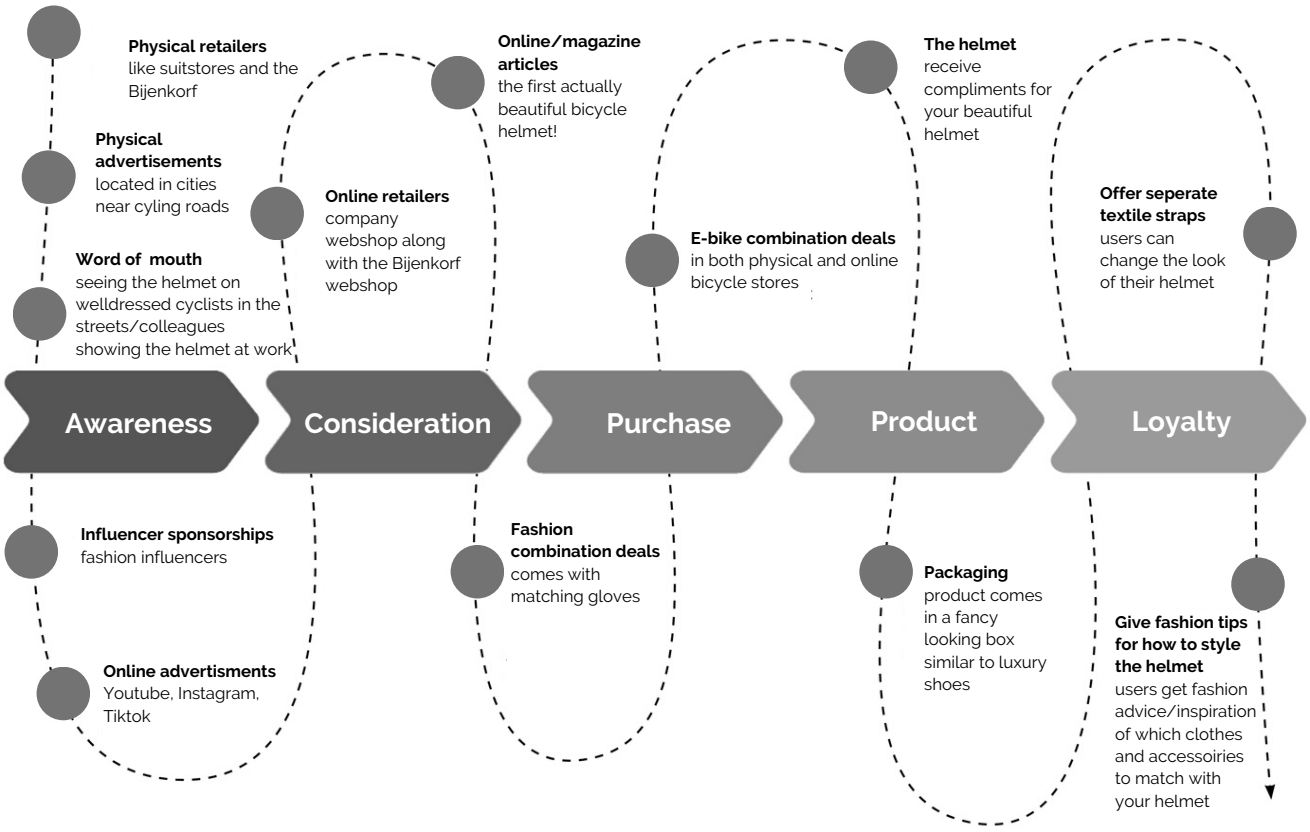

Figure 38. Customer conversion journey

8.3 Advertisement design

Figures 39 and 41 show what visual advertisement material should look like. Attractive models are used whose clothes express the Bikes&Blazers target group's fashion values and match the Fabriqué helmet. There is minimal text: only the brand name and the phrase designed in Paris. Figure 39 in particular mimics what some luxury advertisements look like (see Figure 40). What is noticeable from these advertisements is that they do not focus on the individual products as much, but rather on the brand and the lifestyle that one buys into when one buys products from that brand. Figure 41 is a secondary advertisement in the way that it will only be shown when the primary advertisement is present near it (like on the next page of a magazine, or it is automatically shown after the primary advertisement on Instagram). This secondary advertisement shows the viewer the customizable feature of the product. It was chosen to portray a split with half of a man and half of a woman to show that this is the same product.

Figure 39. Primary Fabriqué helmet advertisment

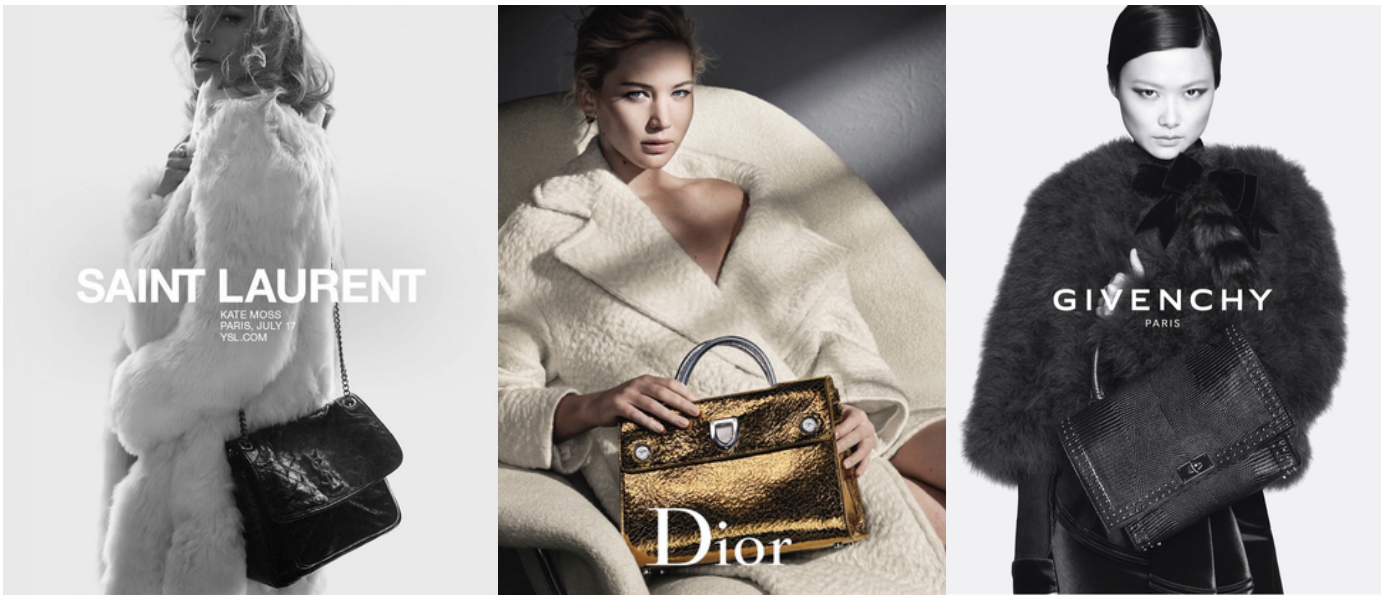

Figure 40. Luxury fashion advertisments from Yves Saint Laurent, Dior and Givenchy Respectively

Figure 41. Fabriqué helmet secondary advertisment

9. Discussion & Conclusions

9.1 Discussion

The idea of choosing the Fabriqué over the Flex helmet was made rather late in this project (about two and a half weeks before the deadline). Up until then, I had chosen to continue with the Flex helmet as I felt like the Fabriqué was aesthetically strong, but less interesting because it didn't have the different configurations the Flex helmet had. A lot of reflection and feedback from stakeholders however changed my mind. As a designer, it can sometimes be easy to fall for the trap that a simple design is not good enough. Especially when one tackles a project in which the ultimate goal is to create a large cultural behavior change. Metaphorically speaking, instead of reinventing the wheel, I aimed to change the perception of the wheel with the Fabriqué design.
Furthermore, there was not enough time left in this project to validate the Fabriqué concept by having a large scale screening of the concept to the Bikes&Blazers target group. It is recommended to conduct such a screening to gain valuable feedback and further validate the concept.

Something that has not yet been discussed in this report is what kind of designers are currently employed in bicycle helmet companies. I did not ask about this to my contacts at Abus and Closca, so what follows is a bit speculative but should be mentioned. Looking at what the current bicycle helmet market has turned into, it is most likely that current bicycle helmet designers are engineers with a deep understanding of material sciences, CAD modeling, and safety regulations. Let me make it clear that I do not want to put these people in a bad light in any way. Their skills are great and without them, bicycle helmets could not exist. But it is likely that these designers were provided an assignment that did not leave much creative space to work with, and had rather tight constraints with which they had to puzzle. My contact at Abus said that they were very happy to learn from my research as they do not have the time to conduct it. So the quality of the assignments that their designers get may be questionable. And Abus is one of the biggest players in the bicycle helmet market.
It should be noted however that this graduation project lasted 20 weeks. If I were paid a decent designer's salary for this work it would cost a company at least €10.000. This is no small investment for a project which might not pay off in the end. But I urge bicycle helmet companies to connect with strategic product designers and get their input in design strategies. Additionally, it would be a great idea for companies to come together and contact young design students to organise a bicycle helmet design contest at the Dutch Design Week, with models wearing the helmets on a catwalk-like fashion show. This will inspire the industry and can have a positive effect on public bicycle helmet perception.

Finally, the contribution of AI text-to-image-converters in this project has been invaluable. The software DreamStudio by Stability.AI was used as a generative research tool to create visuals of luxury bicycle helmets. This was my first time using this kind of AI software, but I was pleasantly surprised that the AI was able to design unconventional-looking bicycle helmets. Figure 42 shows a wild asymmetric design which to me looks like hair flowing. The AI-generated images inspired me a lot when designing bicycle helmets. I can highly recommend bicycle helmet designers to try out the software as it is relatively easy to use but has great inspirational value.

Figure 42. Wild assymetric AI generated bicycle helmet

9.2 Conclusions

This project has developed a new strategic design approach for bicycle helmets in the Netherlands. The cultural phenomenon that very few Dutch cyclists wear bicycle helmets which can prevent injuries, has been researched from a product/context perspective as well as a user perspective. Present/past contextual research has pointed out that the bicycle helmet is oversaturated with very little differentiation between products. Bicycle helmets up to now have been predominantly functional products related to safety. Little to no consideration has been given to involving symbolic product attributes which according to research is an effective way to reach audiences when the functional attributes are too similar between competing bicycle helmets. Research into behavior science has also shown that emphasizing safety is not an effective way to stimulate voluntary bicycle helmet usage. Instead, bicycle helmets should **emphasize symbolic attributes** and **express/cater to the users' lifestyles**. This project has identified considering bicycle helmets as **fashion pieces** as an effective design approach.

User research has shown that 28,3% of participants who do not wear bicycle helmets, would be interested in owning one of the proposed **luxury branded** bicycle helmets which were portrayed on stylish fashionable models. Furthermore, user research has proposed several other product features for Dutch cyclists such as navigation, being socially connected, and preparing for the destination while cycling. However, results show that cyclists from all age groups and travel purposes value **unwinding, enjoying the environment** and **talking to fellow cyclists** the most. This was further reinforced by qualitative research. Adding intrusive technologies to their cycle trips like AR is more likely to be detrimental to people's enjoyment of cycling. However, the potential of AR to offer a one-time (instead of daily or weekly) experience as a shared service has been discussed as potentially valuable, especially for tourism.

Future context research has shown that the bicycle helmet will become increasingly more relevant due to new emerging electrified modes of short-distance transportation. Especially in urban environments, more and more people will prefer the use of smaller **urban mobility vehicles** (which are often shared) over their cars, due to UMVs being the fastest and most efficient way of transportation in cities. Bicycle helmets have the potential to offer new values for this urban transportation like being a tool for seamless checking in and out on UMVs through a small barcode at the underside of the helmet above the user's brow area so that it is mostly invisible. Additionally, wearing a bicycle helmet can come with advantages like allowing for higher maximum speeds of UMVs and being allowed to enter certain cycling lanes.

Furthermore, two target groups were identified as having the potential to popularise bicycle helmet usage: Bikes&Blazers and Young professionals. These urban commuters have similar travel purposes but differ in their travel approaches and lifestyles. Both groups' lifestyles and fashion values were analysed, and along with the results from user and context research, were used as design input. This resulted in several detailed product ideas in terms of functionality and aesthetics.

If bicycle helmet manufacturers want to target the group of Young professionals, the design features of Flex helmets are recommended to implement. The most important feature is flexibility during their travel which shifts from cycling to public transport, to walking in a supermarket. The Flex helmet's fabric wrap allows the user to transform the helmet into a kind of crossbody bag which makes carrying the helmet easier, hides the helmet, and allows for some small items to be stored momentarily. This wrap can also be transformed into a hoodie that fits the target group's fashion style, and additionally, keeps hair of any length dry when it is raining. A big challenge in targeting this target group however is that bicycle helmets are relatively more expensive to them. Convincing them to spend their often tight budgets on a bicycle helmet instead of a set of clothes would be a hard task. This might change if this group is targeted in the previously described future context.

Finally, the bicycle helmet concept Fabriqué targeted at Bikes&Blazers has the most potential to popularise bicycle helmet usage in the Netherlands. This design was made **from a fashion perspective** and **is a critique on the way bicycle helmets have been designed up to now: for accidents instead of people**. This helmet is a tribute to the very Dutch phenomenon of formally dressed cyclists and expresses this lifestyle by involving all kinds of elements from their fashion to create a new and unique design. Besides being designed as a fashion piece, it is important that such a helmet is also marketed and sold as such. This means avoiding conventional bicycle helmet webshops like Bol.com and the ANWB, and instead going to suit stores and the Bijenkorf to create awareness from consumers who would otherwise not have considered a bicycle helmet, and further cement the perception that this helmet is a fashion piece. The Fabriqué was validated by stakeholders Closca and Abus as beautiful and a lucrative direction to pursue.

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Appendix

Appendix 1: Market research overview

Appendix 2: Stakeholder interview with Abus

Abus is a german manufacturer of security products like key locks that expanded its product portfolio to bicycle helmets for non-sports oriented cycling in particular. As the Abus sales director said: "There is nothing more important to secure than one's head". He also noted that most companies that manufacture bicycle helmets started off with sports bicycle helmets and then later included urban helmets in their product line up. What you see happening now is that more companies and startups start with urban helmets.
What follows are selected parts from the interview in which the participant is referred to as 'Abus'. This has been translated to English.

Interviewer: Do you wear a bicycle helmet yourself when you go cycling?

Abus: Yes, when I go about on my racing bike or when I travel long distances on my E-bike. For short distances it is not really necessarry because the risk of accidents is much lower and it a helmet is inconvenient to take into the supermarket.

Interviewer: Has Abus ever considered including any other features in their helmets that provide values besides security?

Abus: Yes we looked into communication and how to integrate that. There is always a desire to communicate. But communication on the bicycle can be considered both safe and unsafe. It is safe because you are not using a phone and audio has the potential to communicate navigational information and warn you about certain situations. But on the other hand, audio can also be considered a distraction or you may not hear a car driving towards you or a cyclist using their bell to warn you. This is why we did not choose to go into this direction. Abus is safety first.

Interviewer: Bicycle helmets come with chin straps. I think they don't look very good and in many bicycle helmet reviews they are often a point of contention. They can be real deal brakers if they are uncomfortable or difficult to adjust or put on. Are they really necessary?

Abus: Yes absolutely. Otherwise you will fail the safety tests. We offer one-size-fits-all straps that are easy to put on and very comfortable. They have a certain sliding mechanism. The 'click clack' things of competitors are quite annoying yes.

Interviewer: E-bikes are a big trend right now. How does your company respond to that?

Abus: Yes that is one of the reasons we see a rise in sales of our bicycle helmets. E-bikes go faster so E-bike users are more likely to buy a helmet. We also have a lot of contact with bicycle stores who sell our helmets. When people take a test ride on an E-bike (and other bicycles too), we encourage the stores to let these people wear one of our helmets. This way people can experience that wearing a helmet is not uncomfortable at all and it is also good for safety during the test ride. These stores don't want people to get hurt while using one of their products.

Interviewer: Abus sells bicycle helmets that are labeled as 'urban'. What makes these helmets urban?

Abus: Hmmm, these helmets are more design, and a bit more sleek.
(Note: obviously this would be difficult to explain for him since he is not the designer)

Interviewer: Can you tell me something about your marketing?

Abus: We do a lot of marketing for our helmets. We go to events, give samples to influencers...

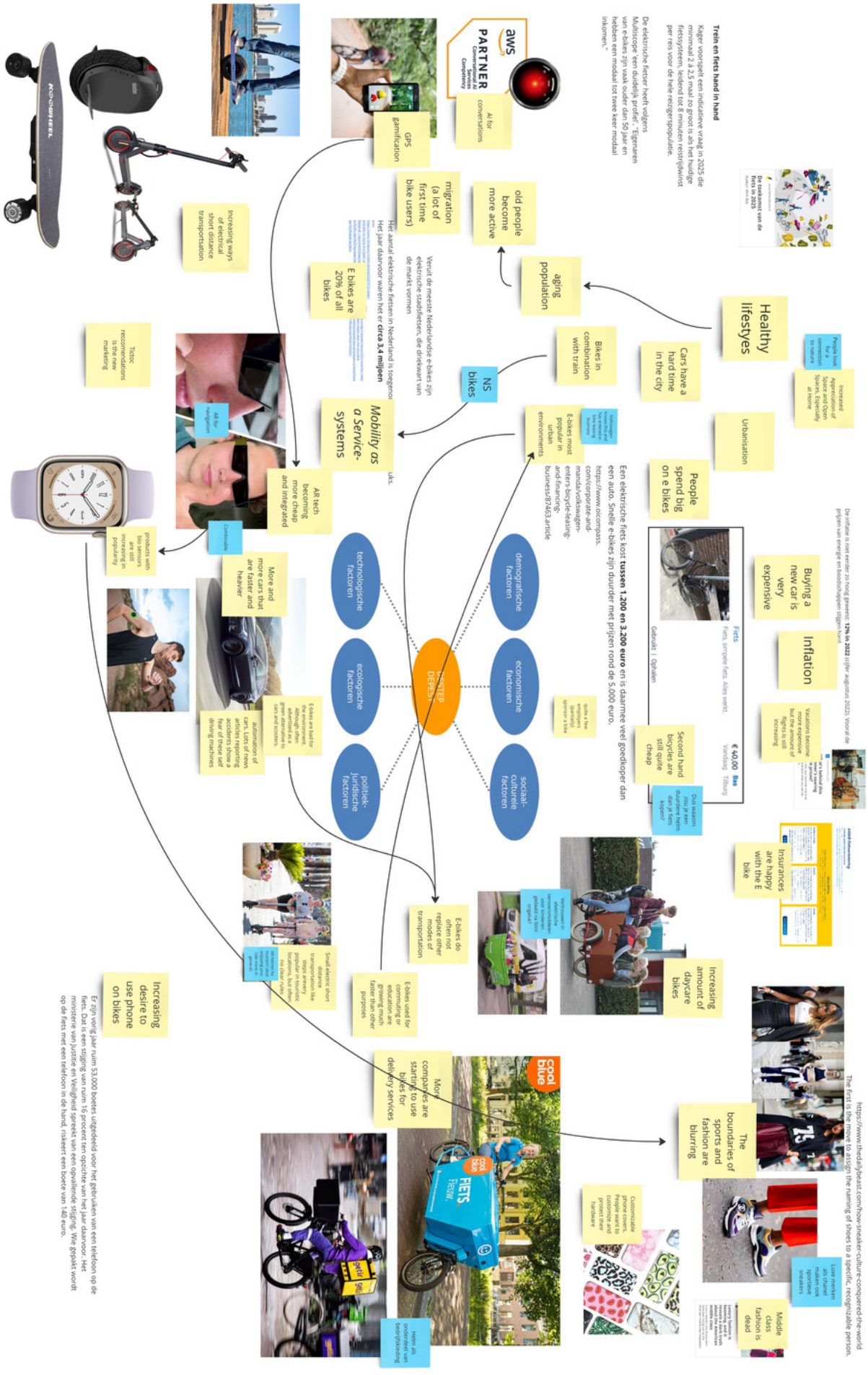
Interviewer: what kind of influencers?

Abus: Sports influencers. We also pay to have a presence in bicycle stores. And the ANWB is a partner. Their Kampioen magazine is distributed amongst 3 million Dutch households.

Interviewer: Do you have any tips for my project? What would you do if you were tasked to design a new bicycle helmet for the Netherlands?

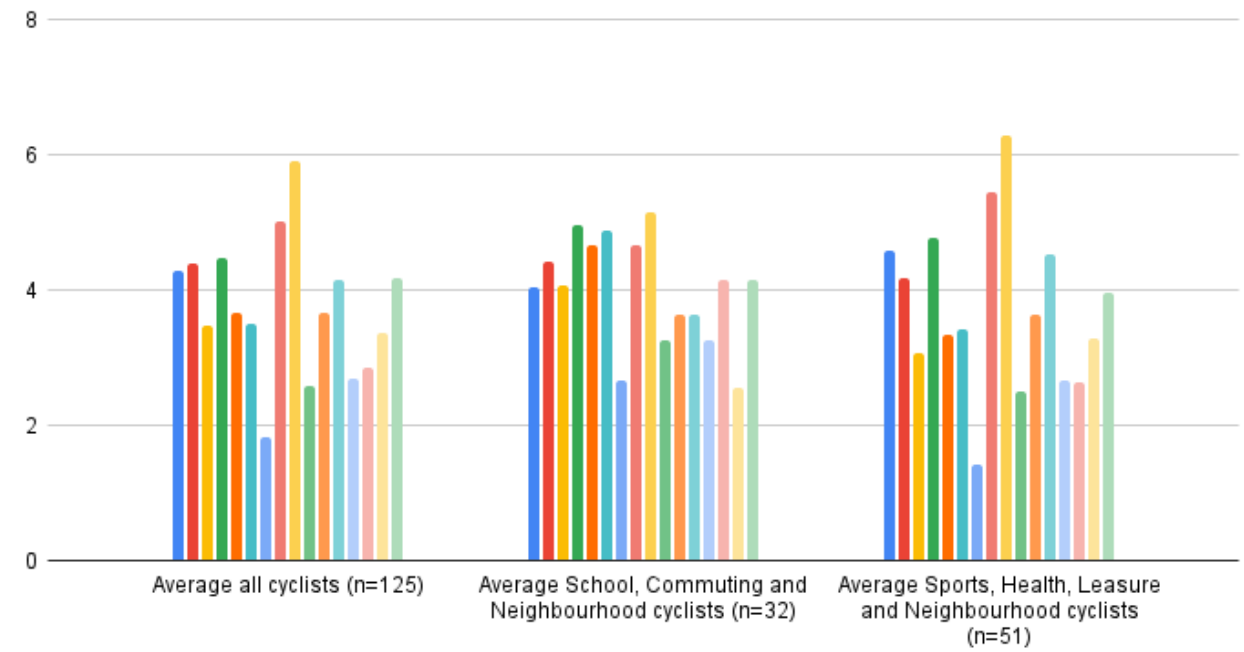
Abus: Maybe something that fits with people's clothing. A while ago we asked highschoolers to design a helmet they would want to wear and they came up with a helmet that looks like a New York Yankees cap. Make it fashionable, so that people from 50 meters away can't see that it's a helmet. But do know that teenagers are by far the most difficult target group.
Also think of technical features like communication possibilities like we discussed earlier.

Appendix 3: Trend analysis



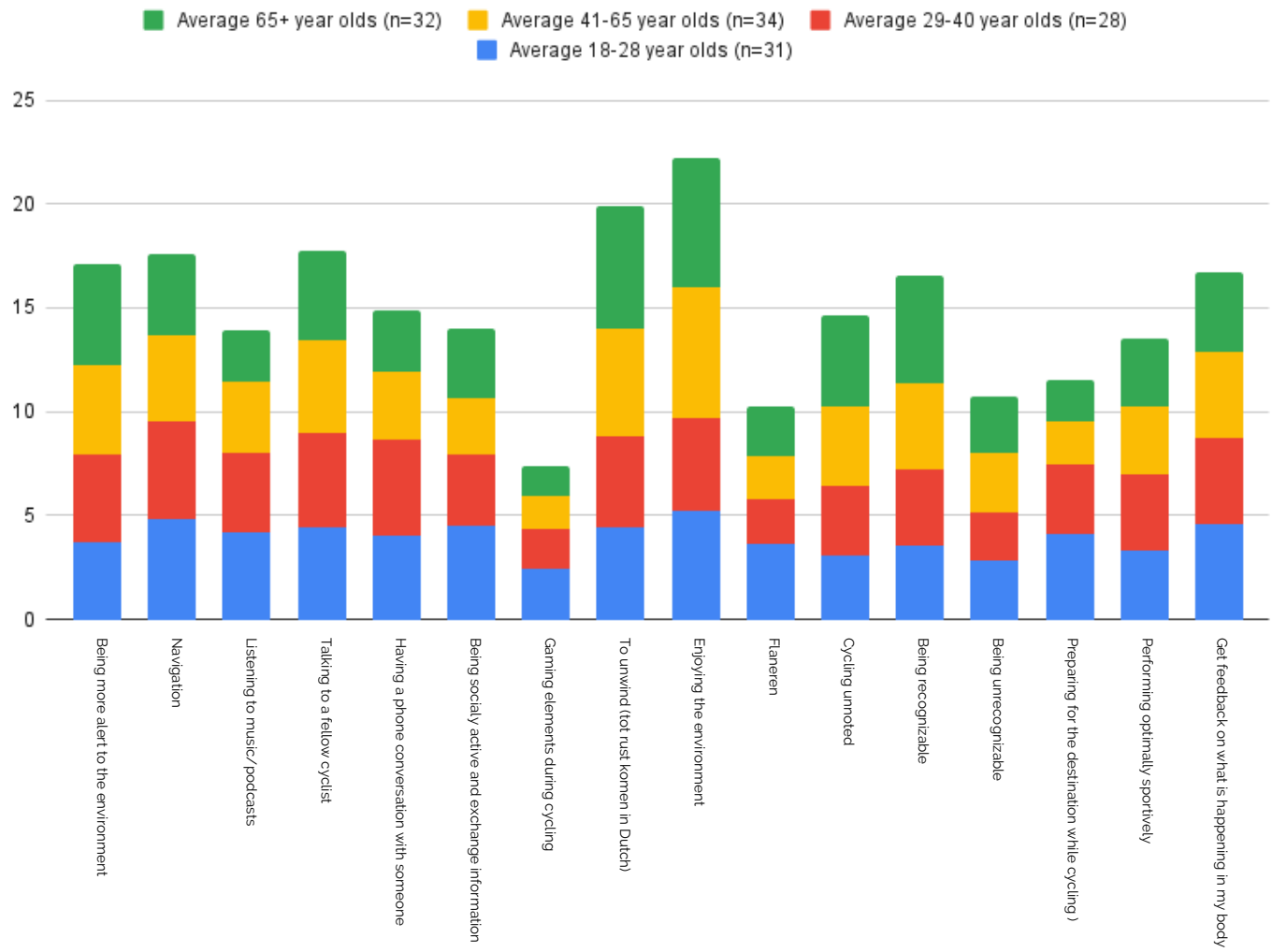
Er zijn vorig jaar ruim 53.000 boetes uitgedeeld voor het gebruiken van een telefoon op de fiets. Dat is een stijging van ruim 16 procent ten opzichte van het jaar daarvoor, het ministerie van Justitie en Veiligheid spreekt van een opvallende stijging. Wie gepakt wordt op de fiets met een telefoon in de hand, riskeert een boete van 140 euro.

Appendix 3.1: Comparison average scores of proposed product features per travel purpose

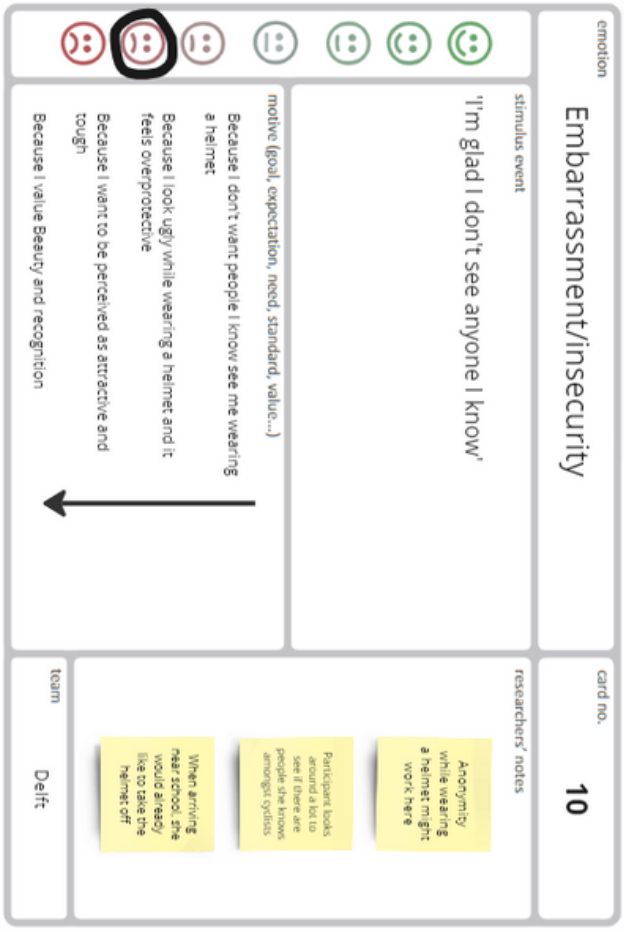


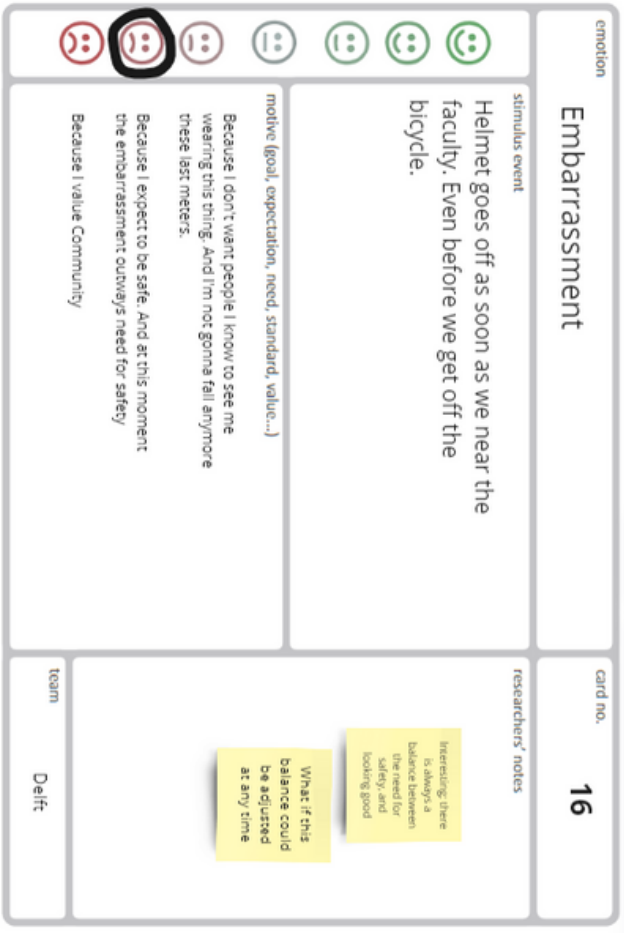
- Being more alert to the environment than I already am
- Navigation that doesn't require me to look at my phone
- Listening to music/podcasts
- Talking to a fellow cyclist
- Having a phone conversation with someone who is elsewhere
- Being socialy active and exchange information
- Gaming elements during cycling
- To unwind (tot rust komen in Dutch)
- Enjoying the environment
- Flaneren
- Cycling unnoted (while blending in and not standing out)
- Being recognizable
- Being unrecognizable
- Preparing for the destination while cycling)
- Performing optimally sportively
- Get feedback on what is happening in my body

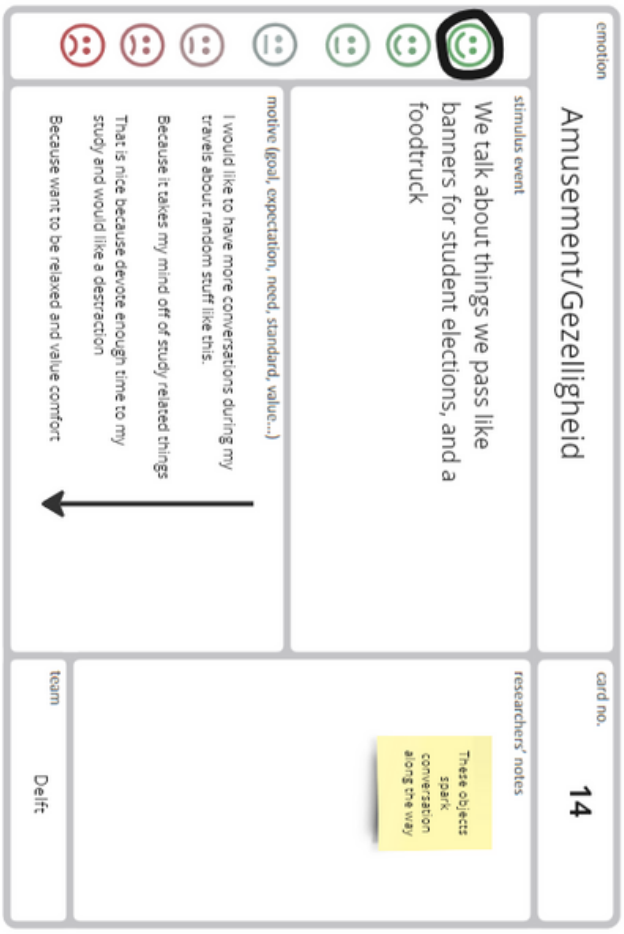
Appendix 3.2: Stackchart comparison of average scores of proposed product features per age group

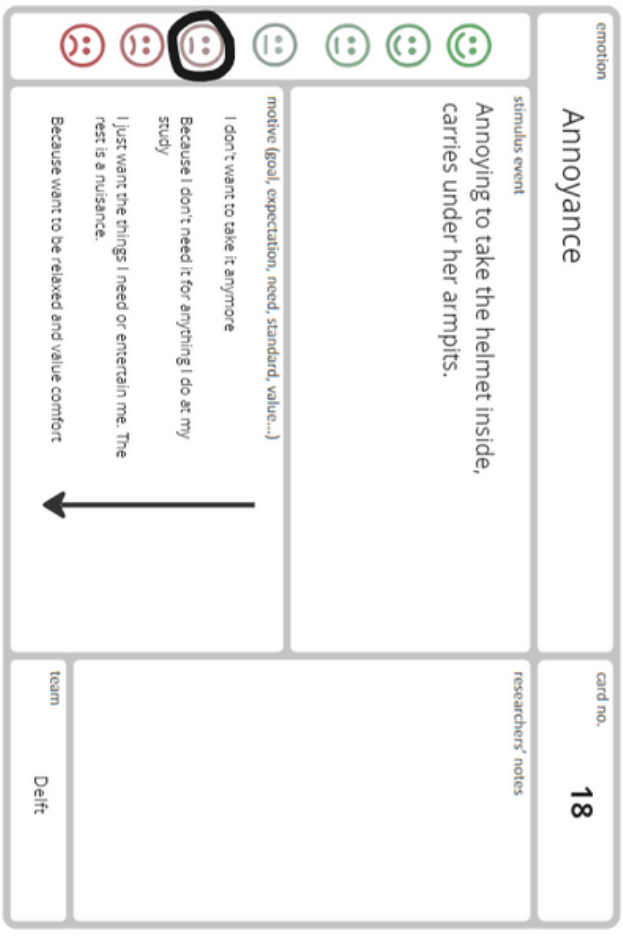


Appendix 4.1: Selected emotion capturing cards from the exercise in Delft

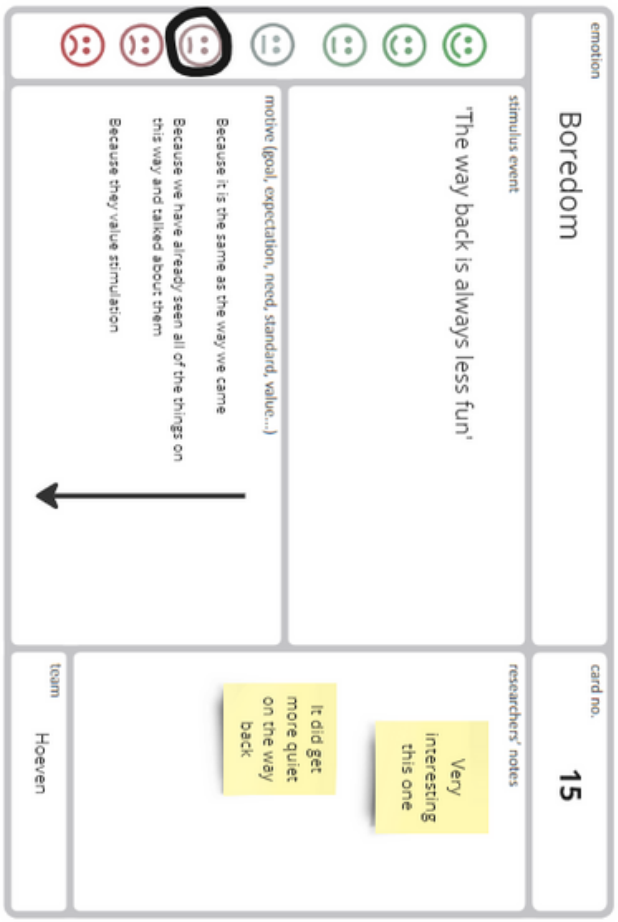


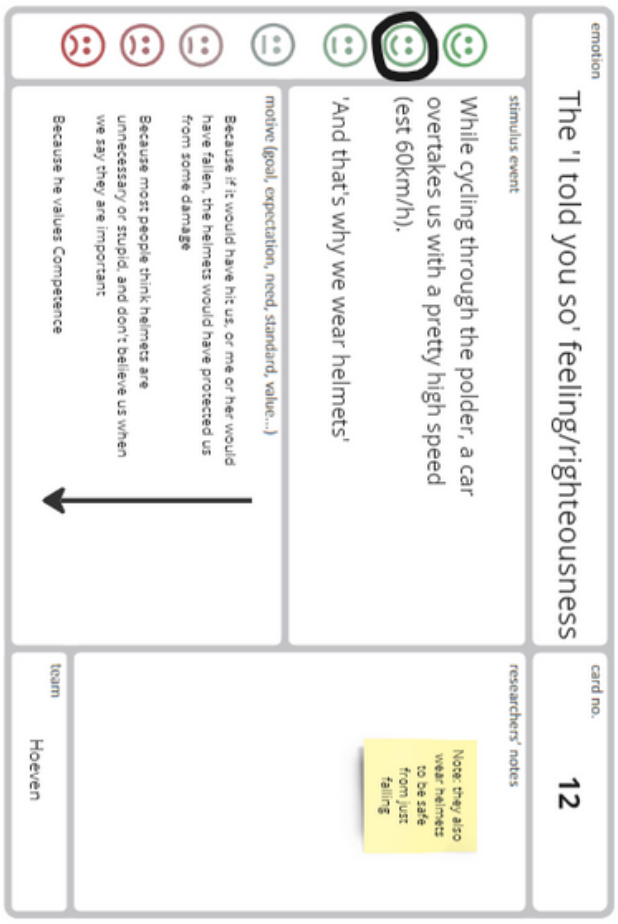


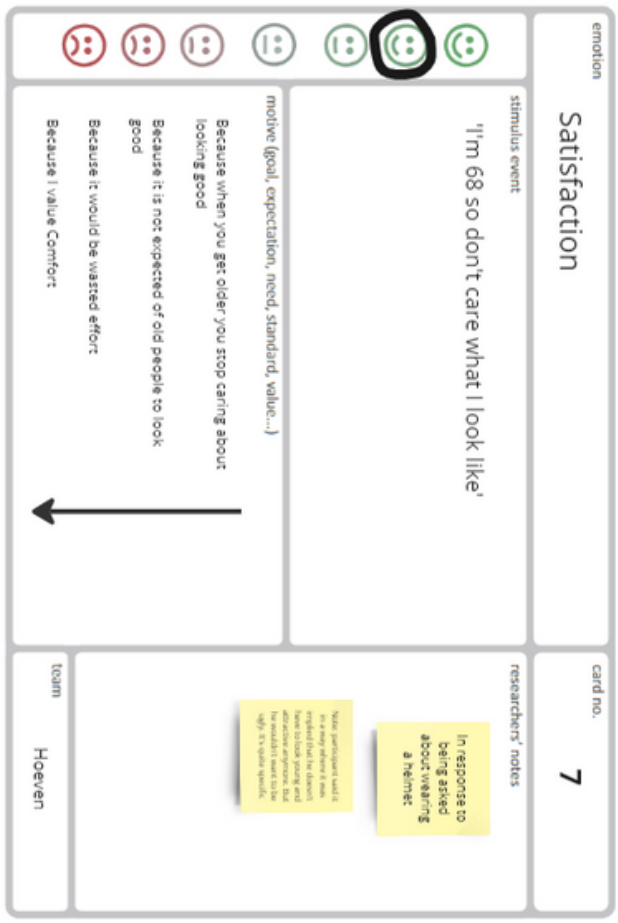




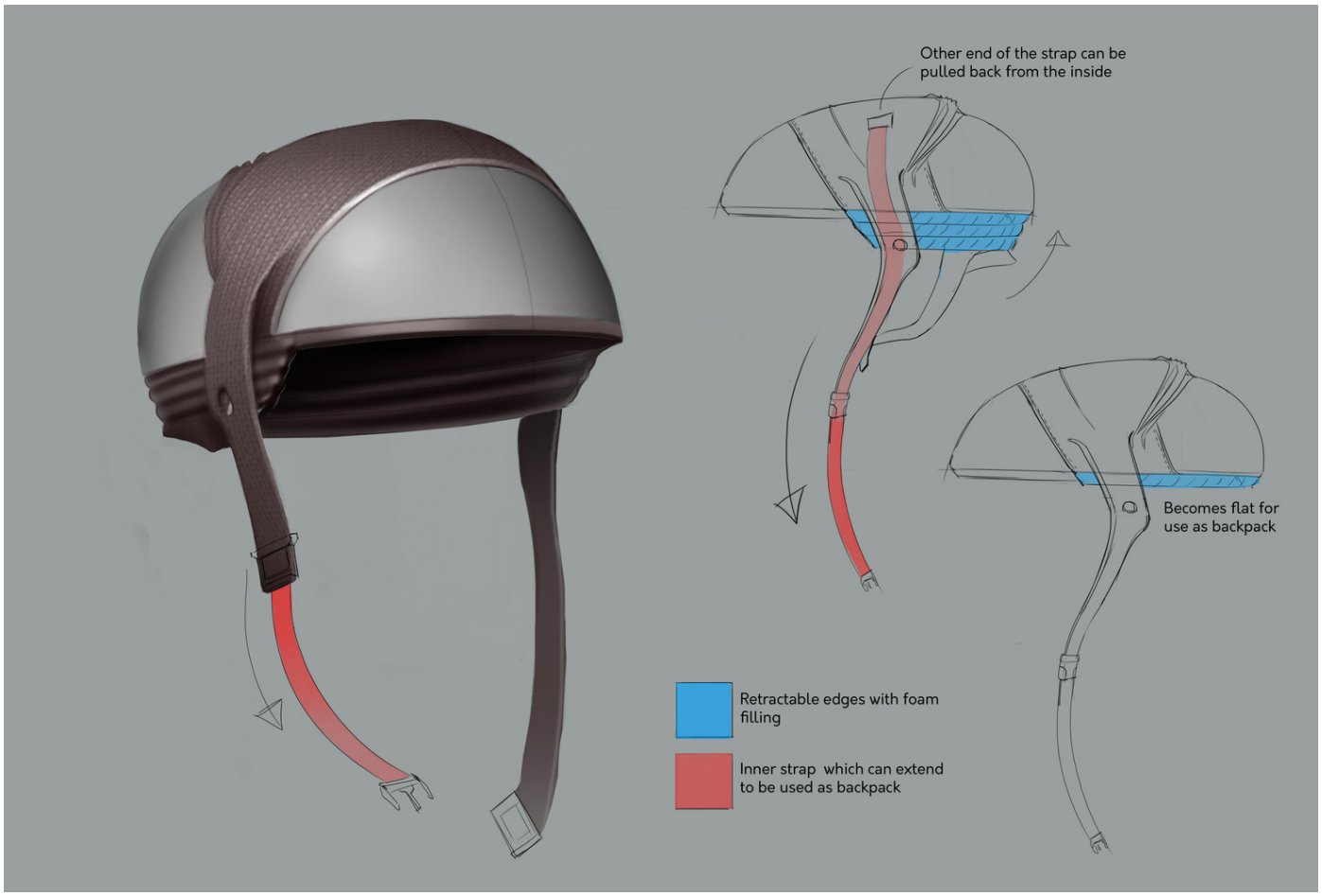
Appendix 4.2: Selected emotion capturing cards from the exercise in Hoeven

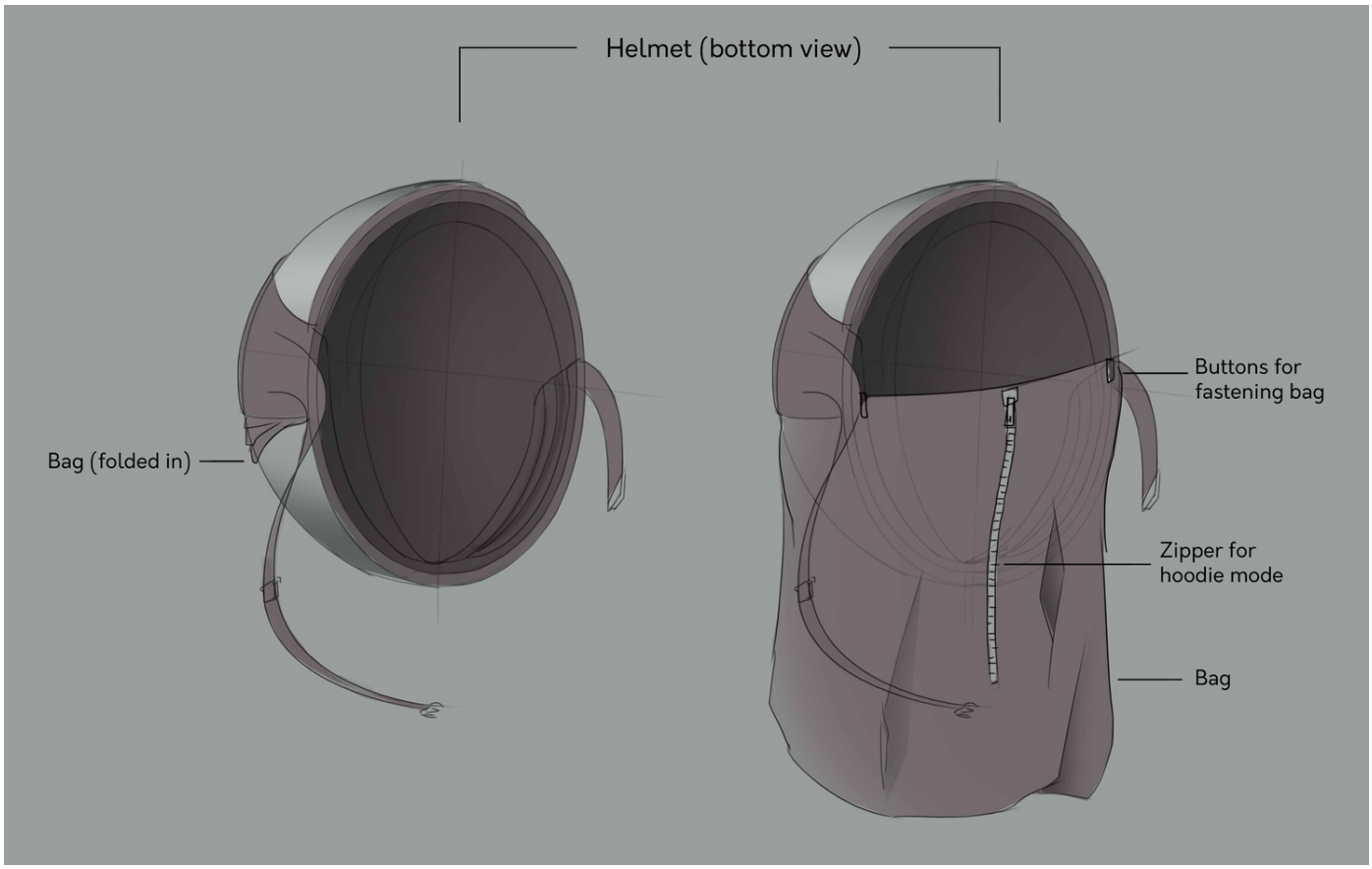






Appendix 5: Flex helmet product mechanisms





Appendix 6: Weighed objectives method to motivate idea selection

	Weight	Display helmet		AR helmet		Flex helmet		Fabrique helmet	
		Score	Total	Score	Total	Score	Total	Score	Total
Aesthetically expresses user values	25	4	100	3	75	7	175	10	250
Customizability (in appearence or features)	15	6	90	8	120	8	105	10	150
Adjustabilty to situation	15	2	30	7	105	10	150	6	90
Rewards the user for using it	**15**	6	90	10	150	4	60	4	60
Functionality when product is not being used as a helmet	15	7	105	2	30	8	120	2	30
Lets the user unwind and enjoy the environment	10	2	20	9	90	2	20	2	20
Stimulate social interaction	5	10	50	8	40	1	5	1	5
Total score	**100**	**475**		**610**		**640**		**605**	