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Marketing Research Field Lab

SELECTION OF ATTRIBUTES AND LEVELS FOR A CONJOINT ANALYSIS ON E-BIKE PREFERENCES OF GERMAN BUYERS

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Abstract

Pedelecs, or e-bikes, have surged in popularity recently and especially during the COVID-19 pandemic. Despite its strong growth and high levels of competition and innovation, no academic marketing-related literature has yet examined the underlying dynamics in German buyers' purchasing decisions. Using established marketing research methods including perceptual mapping and conjoint analysis, this work investigates motives for purchase, perception of brands, and the influence of brand, price, and technical attributes of e-bike models on purchasing decisions. Results indicate that the market is in threat of commoditization with buyers showing indifferences for brands and purchasing decisions dictated by prices.

Keywords

Marketing Research, E-bikes, Business-to-Consumer, Conjoint Analysis, Perceptual Map, Brand perceptions, Attribute preferences

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e-MTB	electrified Mountain Bike
MTB	Mountain bike
SRP	Suggested Retail Price
WH	Watt-hours
ZIV	Zweirad-Industrie-Verband e.V.

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1 Introduction – Group

The golden years of the bicycle industry during the pandemic are over now – or so it seems. In March 2023, Süddeutsche Allgemeine Zeitung, one of Germany's largest daily newspapers, headlined *Corona boom for bikes is over* (2023). While the world stood still under COVID-19 restrictions, the bicycle industry prospered as individuals sought outdoor activities. In the first year of COVID-19, bicycle sales in Germany grew by 30% compared to 2019 (Rothengatter, 2022), and expectations for the industry were ecstatic, with the European Cycling Federation predicting annual bike sales of 30 million units by 2030 (Reibold, 2020). Even though the European market for e-bikes is still young and only started growing in the last decade (Ling et al., 2017), the e-bike is the driver of growth in the bicycle industry (Müller, 2022). Further, with a total revenue of 6.2 billion €, Germany alone contributed nearly half of the total e-bike revenue in Europe in 2022 (Dr. Mohr & Dr. Zuberer, 2023).

It is crucial to know what bike brands and retailers need to do to break the expected figure of 30 million annual unit sales by 2030 and how much of a role e-bikes will play in this. E-bikes clearly are an important trend in the personal mobility space but the recency of e-bikes becoming widely adopted, means that existing research is limited. In fact, a first literature reviews showed that marketing and business-related literature on the topic of e-bikes in Germany is close to non-existent. Therefore, more insights into the consumers' desires for e-bikes would be helpful. In such a promising market, it is important for e-bike manufacturers and brands to realize higher revenue by building products which are most desirable for consumers, yet still viable for e-bike manufacturers. E-bikes are – compared to normal bicycles – more technically complex vehicles, which leads to higher cost of production and, in turn, higher retail prices to be able to remain profitable (Contò & Bianchi, 2023). The strong industry growth and little amount of published marketing research provide a place for interesting and potentially new

insights into existing and upcoming e-bike brands in Germany and beyond. Technological advances related to electrification unlock seemingly unlimited opportunities for manufacturers but also beg the question of what consumers actually value in an e-bike.

Based on the previously mentioned aspects that emerged during the research, this work project will analyze some of the potentially most influencing aspects for buyers and owners of e-bikes in the German market. This work is built upon three research questions to cover the most important marketing-related aspects. Brands and manufacturers can build on these or adopt single findings to their existing strategies. The three research questions, which will serve as a basis for analyzing the results of the research methods, are:

- *What drives German customers to buy e-bikes?*
- *How do Germans perceive e-bike brands?*
- *How important are selected attributes for German consumers in an e-bike purchasing decision?*

In order to gain a better understanding and a clear connection between important theories of marketing, the following steps in this thesis will be highlighted. First, a market overview of the German e-bike market is provided, followed by a literature review and the preliminary research section, both of which form the basis for the methodologies used in the primary research. After detailing the survey design for the perceptual map and conjoint analyses, the results are presented in detail and discussed in comparison with the literature and the preliminary research.

Overall, the results show a tendency among buyers to follow the guiding principle of *form follows function,* with brand loyalty being lower than it is, for instance, in the automotive or luxury industry. Buyers slightly favor upgrading to the next price level to prevent potential quality compromises with a budget model. Preferences and perceptions on e-bikes seem to be impacted by ownership, as the appreciation of attributes seems to change after a purchase of an e-bike.

2 Product and Market Overview – Group & Individual

2.1 Definition and Taxonomy of E-Bikes – Group

Electric bicycles have surged in popularity over the last ten years (Statista, 2023) and are often seen as an alternative to cars and traditional bicycles (Van Cauwenberg et al., 2022). While traditional bicycles rely entirely on the rider's physical effort for propulsion, these newer types of bikes integrate electric motors to assist riders in moving forward, greatly transforming the cycling experience.

A fundamental classification based on the nature of the propulsion offered by the vehicle distinguishes between throttle-controlled *e-bikes* and pedal-assist bikes – known officially as *pedelecs*. Pedelecs operate by providing electric assistance only when the rider pedals, enhancing the overall cycling experience without entirely replacing human effort. Conversely, throttle-controlled bike models feature a mechanism where riders can engage the electric motor without pedaling and are thus classified as their own distinct type of personal mobility vehicle according to German law. Hence, they are subject to different regulations and policies than pedelecs (Fishman & Cherry, 2016). German law also distinguishes pedelecs depending on the speed at which riders are assisted. Speed-Pedelecs – or *S-Pedelecs* – offer electric support up to 45 km/h, while conventional pedelecs are treated just like bicycles with electric support up to only 25 km/h in speed (Cherry & Fishman, 2021). Due to the difference in speeds and the related implications on safety, S-Pedelec riders are required to possess a driver's license and are prohibited from riding on certain types of streets and paths.

Of the three subcategories presented, pedelecs are by far the most widely adopted and most commonly referred to as e-bikes in the German language despite not being the technically correct term (Marincek et al., 2020). This is so common that not just consumers but also brands use the word e-bike to refer to pedelecs (Gazelle GmbH, 2023b). Considering the differences in regulation, target group, and potential use cases, this research focuses solely on conventional

pedelecs, which electrically support riders up to a maximum speed of 25 km/h only while pedaling. Because of the public's clear, albeit inaccurate, association of the term e-bike with pedelecs, the group uses the term e-bike instead of pedelec in the experiments to facilitate participants' understanding. It is also because of this, that in the following sections, the terms e-bike and pedelec are used interchangeably.

2.2 Market Overview – Individual (Other)

2.3 Bonus Task: Technological State and Features of E-Bikes

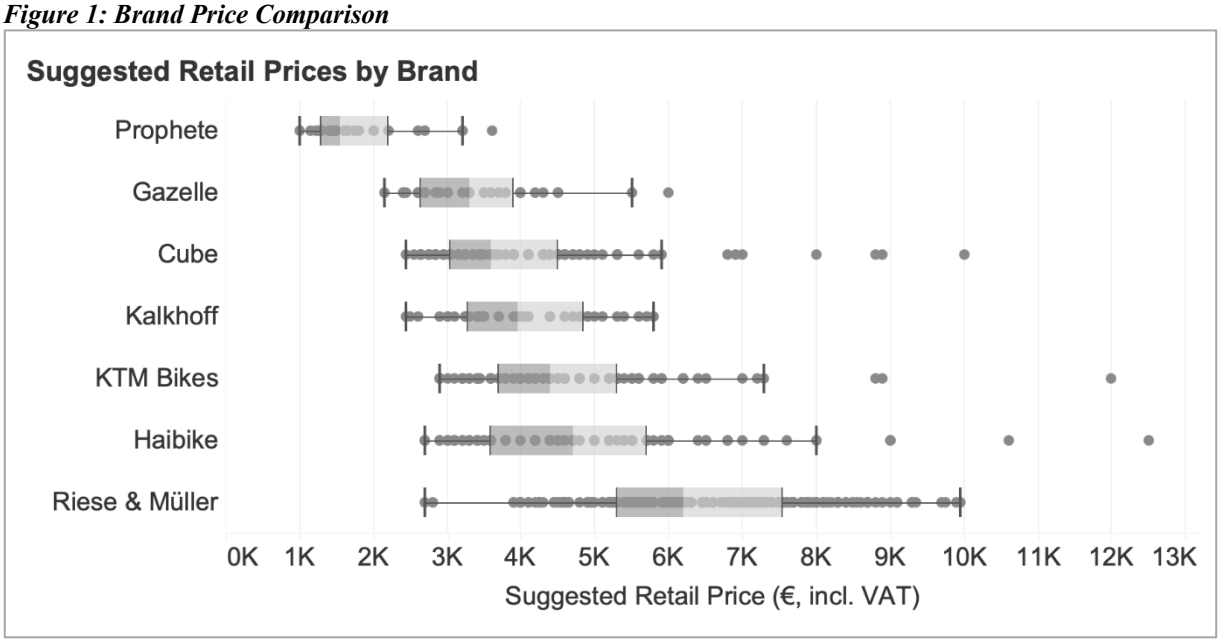
The 2022 market report by Germany's bicycle industry association Zweirad-Industrie-Verband e.V. (ZIV) states average sale prices for e-bikes are around 5.6 times higher than those of bicycles. In light of this price premium, it is important to examine the technical differences between electric and non-electric bikes and consider how these shall translate into added value for the manufacturer as well as, ideally, the buyer. Further, understanding in what aspect – or *attribute*s – individual e-bike models differ from another and what specifications – or *levels* – are typical is essential for designing the conjoint experiment as discussed in Section 5.1.3: *Conjoint Experiment: Selection of Product Attributes and Levels.*

The group developed a web scraper using a Google Chrome browser extension to systematically scan manufacturers' websites and gather product information, such as brand, bike segment, model name, price, weight, battery capacity, etc. The brands that were attempted to be scraped were those top 10 brands mentioned in the CHECK24 insurance report (CHECK24 GmbH, 2023). As each website is structured differently, some were more complex to scrape than others. This results in the final dataset containing seven brands following final data cleaning, standardization, and transformation in Python and Power Query: Cube, Gazelle, Prophete, KTM Bikes, Haibike, Kalkhoff, and Riese & Müller. It includes product data for 540 uniquely configured e-bikes selectable on manufacturer websites.

Pricing

Figure 1 visualizes e-bike suggested retail prices (SRPs) for seven of the top ten brands in the CHECK24 statistic. It shows how SRPs typically start between 2,000€ and 3,000€, with the exception of the low-cost brand Prophete. Median SRPs of models listed online range from just over 3,000€ to more than 6,000€ in the case of Riese & Müller. Prophete, again, is the exception, with its most expensive bike model costing around the median SRP of many other brands.

Figure 1: Brand Price Comparison

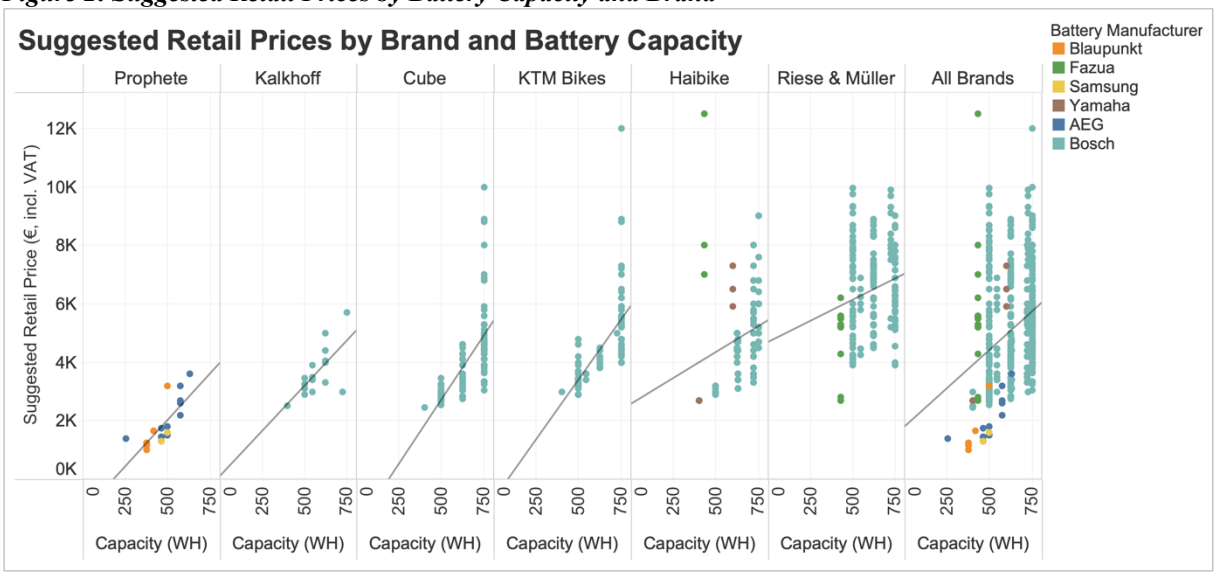


Source: Own analysis of manufacturer websites

Battery

Figure 2 below depicts the relationship between battery capacity and SRP for each brand included in the dataset, as well as the battery manufacturer. Not only does Prophete offer its bikes at more affordable prices, but it also uses smaller battery capacities to do so. Further, Figure 2 clearly illustrates Robert Bosch GmbH's strong position as an e-bike battery supplier, with Prophete being the only brand in the dataset that does not source most, if not all, its batteries from Bosch. Instead, it opts for batteries produced by AEG and Blaupunkt.

Figure 2: Suggested Retail Prices by Battery Capacity and Brand



Source: Own analysis of manufacturer websites

The points spread also shows some typical levels of battery capacity at 500 Watt hours (WH), 625 WH, and 750 WH. The regression lines indicate a positive relation between battery capacity and SRP, but the strength of this varies. This hints at how brands have differently constructed product portfolios and follow distinct pricing strategies. Compared to KTM Bikes or Prophete, SRP seems to be much less strongly dependent on battery capacity with Riese & Müller bikes, for example. Their prices might be less strongly impacted by features directly related to measurable performance and rather depend on other factors like the product segment.

Drivetrain

Just like with the batteries, a few standardized levels of maximum pedal assistance can be identified in the dataset. As expected, the stronger the maximum pedal assistance, the higher the SRP. Further, more powerful drivetrains are installed more frequently in bike categories that benefit more from higher torque in their intended use cases (Kalkhoff Werke GmbH, n.d.). For example, e-MTBs and cargo bikes would offer stronger assistance for the use on uphill trails or transportation of heavier loads in the case of cargo bikes (Peace, 2023).

Batteries, drivetrains, and displays often form an integrated bundle of components that are closely linked. The display serves as the interface to the user with which they can adjust the

strength of pedal assistance and see their current ride speed, mileage, and battery charge level. As the drivetrain draws energy from the battery in varying levels depending on pedal assist levels, these two components interact especially closely. Bosch's dominance can therefore be observed not only as a battery supplier but also as a supplier of drivetrains. While there are some brands that source different drivetrains from other manufacturers for some specific e-bike categories, many e-bike brands rely solely on Bosch components – this is the case with three out of six brands using Bosch components in the dataset – and openly advertise those on their website a quality selling point.

If a brand uses multiple suppliers for its e-bike propulsion systems, this is largely due to segment-specific needs. For example, electric road bikes are just now becoming a more attractive category as drivetrains are getting smaller, more lightweight, and can be installed in the rear wheel hub in an unobtrusive way. Rose Bikes, for example, just recently introduced their electric road and gravel bike lines featuring a Mahle X20 drivetrain, which is currently the lightest on the market (MAHLE GmbH, 2023). For such product lines, brands specifically communicate the drivetrain's unique features, weight, and invisible integration of the battery inside the frame. This is clearly seen on US manufacturer Trek's product page, characterizing its newest top-of-the-line electric road bike as a "category-redefining, high-speed assist carbon e-road bike that doesn't look, fit, or feel like a standard e-bike" (Trek Bicycle Corporation, 2023). For recreational riders, brands focus more on communicating the advantages (such as lower physical effort required), while more performance-oriented customer segments, such as road cyclists, see nuanced approaches to alleviate perceived drawbacks and stigmas associated with electrification, such as weight concerns, design perceptions, and an association of e-bikes as a means of "cheating". The way brands communicate these attributes suggests that different groups of cyclists perceive the electrification of bikes differently.

Smart Features & Displays

The possibility to interact with the e-bike and its constant supply of electricity enables e-bikes to have smart features and a level of integration of components on a scale not seen in bicycles before. Modern high-end e-bikes typically offer GPS tracking, smartphone connectivity as well as intelligent light systems and brakes, and digital theft protection. Especially smartphone connectivity unlocks a potentially unlimited set of features, as new features can be implemented after purchase through over-the-air software updates.

Dutch e-bike manufacturer VanMoof, known for its leadership in this space, uses connectivity features to clearly differentiate itself from its competitors and generate new revenue streams. For example, it offers *Peace of Mind Services* as a form of theft protection. Once an owner reports their bike as stolen, it is digitally locked, and a team of agents, *Bike Hunters*, is deployed to retrieve the bike based on its GPS location. If found, it is returned to its owner and unlocked, while in case it is not found, the stolen bike will be permanently immobilized, and the owner is guaranteed a replacement bike in the same or better condition. With its sophisticated, proprietary features, VanMoof is a clear outlier, however, as the vast majority of e-bike brands rely on existing components, which are most often offered by the drivetrain and battery supplier. With most e-bike brands active in the German market, this happens to be Bosch.

E-Bikes versus Traditional Bicycles

All of the aforementioned attributes are exclusive to e-bikes. It is, however, visible on the market that e-bikes and traditional bicycles also differ in several other ways. Cable-operated rim brakes, which have long been the standard, are now mostly replaced with hydraulic disk brakes in E-bikes, whereas traditional bicycles tend to lag behind in this trend. Hydraulic disc brakes are advertised as offering better braking performance, which could be seen as especially relevant given the higher weights and average speeds that e-bike riders ride at (Redfield, 2013). With *Anti-Lock brakes*, the market is now also seeing automotive technology entering the bicycle market. Of the top 10 brands, Cube, Kalkhoff, Riese & Müller, KTM Bikes, and Pegasus

offer this feature and data shows that it is still very much a premium component. Those e-bike models included in the dataset that are equipped with such braking systems range between 4,500€ and 5,800€. Riese & Müller, in line with its premium positioning, extends this range up to about 10,000€. However, data shows that the brand offers such braking systems throughout its entire price range, considering all models instead of reserving them for its top product lines. As a drawback of such more advanced features described in this section, e-bikes are more expensive to maintain due to higher complexity and more expensive components (Raleigh UK Ltd., n.d.). Furthermore, manufacturers recommend yearly servicing, adding to the cost of ownership (Gazelle GmbH, 2023a).

To conclude this bonus section, e-bikes are not simply electrified bicycles but could essentially be considered a testing ground for new technology. Considering the stark price premium of e-bikes over traditional bicycles reported by ZIV, however, the question arises to what extent this abundance of new features and the resulting increase in complexity is desired by the consumers. Conversely, to what extent this is a result of manufacturers trying to differentiate their brands and skim consumers' willingness to pay.

3 Literature Review – Group & Individual

3.1 Overview of Academic Literature – Group

A large part of the scholarly attention that e-bikes receive is coming from Asia, which is likely to be explained by the fact that China is by far the most established global market for e-bikes, both in sales numbers and societal acceptance (Zuev et al., 2019; Ling et al., 2017). In the late 2000s and the early 2010s, 20 to 30 million e-bikes were sold annually in the Chinese market (Ling et al., 2015). Compared to Chinese sales of e-bikes, only 310,000 e-bikes were sold in Germany in 2011 (Dudenhöffer, 2015). Because of their wide distribution and the high interest in e-bikes in China, research on e-bikes has continued to grow since the early 2000s (Melia & Bartle, 2022).

In their literature review, Zhou et al. analyzed over 2,000 articles published between 1976 and 2023 to visualize the evolution of academic research on e-bikes over time. Their work identifies three stages of e-bike research: (1) the *initial development stage of e-bikes* from 1976 to 2010, (2) the *stable development stage of e-bikes* from 2011 to 2014, and (3), the *rapid development stage of e-bikes* since 2015 (Zhou et al., 2023).

Research in stage one revolved heavily around the e-bike as a technical product, with the most frequently used keywords being *Fuel cell*, *Electric bike*, and *Battery*. Stage two used keywords such as *China*, *Cyclist*, *Policy*, and *Behavior*, which shows how scholarly attention moved from technological research and development to issues and topics that arose following the initial adoption of e-bikes. The focus on societal issues intensified in the third and current stage, with the strongest keywords being *Electric bike rider*, *Health*, *Safety*, *Intersection*, and *Signalized intersection*, driven by the overall more hazardous behavior of e-bike riders in traffic, as shown in multiple studies including Weber, Scaramuzza, and Schmitt (2014).

Research on the motives for e-bike adoption does exist, but its interest in academia overall does not seem to be particularly high based on these findings. A set of papers analyzes motives, perceptions, and usage as well as general factors related to the adoption and possession of e-bikes. However, to the group's best knowledge, no scientific articles exist that examine the topic of e-bike adoption from a business and marketing perspective. For example, no articles were found that explore success factors for e-bike manufacturers, which is surprising given the extraordinary growth the market has seen over the last few years. Online archives like Sage Journal, JSTOR, ResearchGate, Academia, and De Gruyter have been used to get the best possible outcome for essential scientific research. In addition to specific search commands, important keywords such as *e-bike marketing*, *e-bike market*, *pedelec*, *marketing German e-bike*, *electric bike marketing*, *e-bike Germany,* or *marketing electric bike* were used to narrow down the literature search thematically and geographically. Topics related to e-bike traffic, such as

urban mobility, *urban cycling,* or *cycling,* were searched for using the relevant literature archives. While the research identified a more-or-less clear set of motives for purchasing an e-bike, it would certainly be valuable to analyze what specific factors lead a prospective buyer to choose one brand over another and how firms can establish competitive advantages.

Furthermore, researchers found that motives for e-bike adoption, as well as usage of e-bikes (intended and actual) and societal issues related to e-bikes, vary significantly by country (Zhou et al., 2023). In this respect, it is noteworthy that there is little research on the German market and consumers.

3.2 Academic Research on E-Bikes – Individual (Other)

3.3 General Research on Marketing and Consumer Psychology – Individual (Other)

3.4 Conceptual Background on Research Methods – Group & Individual

3.4.1 Interviews – Individual (Other)

3.4.2 Perceptual Map – Group

The perceptual maps analysis was selected as a central method of the primary research of this work in order to explore how Germans perceive e-bike brands.

In a market with numerous companies offering products and services with comparable functionalities, brand differentiation has become essential (Nigam & Kaushik, 2011). The perception of a brand depends on the consumer's values, beliefs, needs, experiences, and environment (Gigauri, 2019a). Thus, communicating the brand's worth and quality can be crucial for standing out from the competition and winning over customers (Nigam & Kaushik, 2011). Furthermore, substantial brand equity benefits the market positioning (Aaker, 1996) and diminishes the company's exposure to activities from competition.

For assessing the brand positioning in the market, marketers use a perceptual map to indicate the relationship between different brand characteristics. Furthermore, it illustrates gaps in the

market, i.e., where no brands are positioned yet. In addition, the perception of various brands and products can reveal where consumers might perceive substitutes (Iacobucci et al., 2019). Based on the evaluation of the result, marketing actions can be adjusted and redefined to assemble a more suitable market positioning for the brand. As products mostly have more than just two attributes, Gigauri (2019b) suggests two approaches: the attribute rating and the overall similarity. While the first method is designed for easily identifiable qualities, the second is used for challenging characteristics. Hence, brands are being compared by being presented to interviewees in pairs. For participants to assess the items, the Likert scale is a valuable tool for visualizing the similarities and opposites by multidimensional scaling (Mishra & Mohanty, 2013). The measurement range can be individually modified on a scale from 0 to 10, depending on the evaluation profundity of the research question. The 5-point Likert scale ranges from (1) strongly disagree, (2) disagree, (3) neither agree nor agree, (4) agree, (5) strongly agree (Opuni & Alhassan, 2023).

To understand the psychological associations of consumers with different brands, the attribute rating method technique will be used for the survey because the chosen brand characteristics are rather effortless to recall. For the evaluation of the study, a 5-point Likert scale proved to be a suitable medium between the level of detail and clarity.

3.4.3 Conjoint Analysis – Group

Besides perceptual map analysis, this research also relies on conjoint analysis to uncover the importance of selected attributes for Germans when purchasing an e-bike. Conjoint analysis is a powerful and multivariate market research technique uniquely suited to understand the complex web of consumer preferences and decision-making processes. By evaluating the respondents' choices, conjoint analysis uncovers the implicit trade-offs individuals make when selecting from a priorly selected set of product bundles (Smith & Albaum, 2005). In contrast to traditional survey methods, it simulates real-world purchasing scenarios by presenting respondents with

various product profiles composed of different attribute levels (Alp & Öz, 2020). In a choice-based conjoint experiment, participants are asked over multiple rounds to select the one profile they would purchase based on its unique characteristics and the participant's personal preferences. In conjoint analysis, products have *attributes* such as price, battery capacity, and smart features. Each attribute has different *levels,* such as specific prices or battery capacities offered in the market (Kuzmanovic et al., 2012).

The conjoint analysis conducted in this research is brand-specific, meaning that all data is available on brand granularity. This unlocks insights into the impact and overall importance of brands which is essential to draw richer conclusions by combining the results from both the perceptual map as well as the conjoint analysis. By further segmenting participants based on demographic and preference-related factors, one can gain a better understanding of potential buyer clusters and develop a more solid marketing strategy. Typical output of conjoint analysis includes attribute partworths and preferences for levels (Sänn, 2017).

Attribute Partworths

Conjoint attribute partworths, also known as relative attribute importance, provide a quantitative measure of the impact each attribute has on consumers' overall preferences within a conjoint analysis. These values represent the degree to which variations in preferences for specific levels, such as price, contribute to the perceived value of a product or service. Partworths are essentially coefficients assigned to different attribute levels, reflecting the utility or desirability associated with each level. A higher partworth indicates a greater influence of that attribute level on overall preference. Attribute partworth values add up to 100% for each brand, illustrating how the lower importance of one attribute results in the higher importance of other attributes. Analyzing these partworths allows researchers to identify key drivers of consumer choice, helping businesses understand the relative importance of different product features and tailor their offerings to align with customer preferences through segmentation (Kuzmanovic et al., 2012).

Preferences for Levels

While attribute partworths are useful in gaining an overall picture of which attributes are most or least important to consumers, analyzing preferences for levels is essential to understand consumers' actual preferences and the choices resulting from them. Level analysis helps marketers understand the desirability of specific product features – in this case, specific battery capacities or e-bike categories. Also, the question of how brands promote their products can impact the preferences for features of their product. The perceived values and subjective preferences for specific attributes are mostly based on perceived benefits for the purchase in contrast to the cost of the purchase. This can lead to unviable product preferences (Khalifa, 2004).

4 Preliminary Research – Group & Individual

4.1 Expert Interviews – Individual (Other)

4.2 Consumer Interviews – Individual (Other)

4.3 Consumer Survey – Group & Individual

4.3.1 Survey Design & Selection of Respondents

To gain a general overview of which attributes might be the most or least interesting to include in the conjoint, the group conducted a preliminary survey. The goal was to get a better, more quantitative basis for selecting the relevant attributes to be included in the conjoint analysis and to understand which brands are the most well-known in a sample that was expected to have a similar demographic structure to the participants of the main surveys (Ding et al., 2005). The latter is especially important for the perceptual map analysis, which requires that participants are familiar with the brands included in the survey (Sondhi & Chawla, 2021).

The preliminary survey consisted of three sections: (1) *product attributes*, (2) *brand familiarity*, and (3) *demographic information* and had a final sample size of 38. It was created via Google

Forms and sent mostly to first-degree contacts of the group, including friends, family, neighbors, and work colleagues. The respondents were chosen by the group members for either already owning an e-bike or for being interested in purchasing one in the short- to mid-term.

In the product attributes section, participants were asked to rate a selection of 20 product attributes in their subjective importance in a purchasing decision on a Likert scale of one to five (*1 = very low importance, 5 = very high importance*). These attributes come from a longlist that was created based on the research conducted for Chapter 2 as well as the interviews. All these attributes in the longlist were deemed as generally relevant related to the product and the purchase process or purchase conditions and could potentially be included in the conjoint analysis.

In the brand familiarity section, participants were asked to state whether they were familiar with a set of 18 brands in a single-choice field with two possible answers: *Yes* and *No*. To improve brand recognition, the logos of all brands were displayed on the top of the page.

Finally, the demographics section included questions about e-bike ownership and future intentions of purchasing or leasing a bicycle or e-bike, as well as the respondent's age group, gender, and information about their location.

4.3.2 Demographics – Group

Of the final sample size of n=38, 25 participants identified as male and 13 as female. Nine respondents were between 18-25 years old, another nine respondents were between 26 and 30, seven respondents were between 31 and 40, and four respondents were between 41 and 60. The remaining nine respondents reported an age above 60 years. Eleven respondents live in rural areas, and 16 are in small to medium-sized cities. The remaining eleven respondents live in large cities. Regarding e-bike ownership, 13 respondents (34.21%) stated that they already own an e-bike, with the remaining 25 not owning one. Only one respondent stated that he did not consider buying a bicycle within the next five years. The rest was split between 13 participants who can imagine buying any type of bicycle, i.e., would consider buying either electric or non-

electric, and the other 24 participants who would only consider buying an e-bike in the future. Further, 100% of e-bike owners would consider purchasing one, either again or purchase their first e-bike, assuming they did not yet own one in the first place. It is noted that 100% of e-bike owners specifically answered that they would only consider purchasing e-bikes in the future.

4.3.3 Results on Attribute Importance

In the attributes section, respondents were asked to rate their subjective relevance of a given attribute in a purchasing decision. Regarding the sample size, the results are not expected to be representative of prospective e-bike buyers. However, they allow for interesting insights and serve as a first indication of consumer interests and needs. Table 1 shows the attributes included in the longlist ranked by average rating.

Table 1: Preliminary Survey Attribute Comparison

Rank	Attribute	Avg.	Std. Dev
1	Riding experience	4.41	0.74
2	Category (e.g., City, Trekking, MTB etc.)	4.38	0.70
3	Frame geometry / seating position	4.24	0.82
3	Battery capacity / range	4.24	0.78
5	Price	4.15	0.78
6	Size / maneuverability	4.09	0.87
7	Weight	4.03	0.94
8	Availability of spare parts / Ease of maintenance	3.85	0.82
9	Design	3.79	0.88
10	Battery removable	3.76	1.10
11	Store network for purchase and maintenance	3.47	1.05
11	Smart features	3.47	1.16
13	Availability in store / delivery time	3.29	0.84
14	Frame color	3.26	1.05
15	Technical details (knowledge about exact components used)	3.24	1.39
16	Sustainable production (e.g., recycled materials, ethical production, climate-neutral operations)	3.12	1.04
17	Brand	3.00	0.85
18	Alternative financing methods (e.g., leasing)	2.79	1.17
19	Location of production (e.g., “Made in Germany”)	2.71	1.17
20	Possibility of online purchase	2.50	1.16
Total		3.57	1.13

Looking at the entire sample, it seems like attributes related directly to the utility arising from the use of the bikes, such as bike category, riding experience and battery capacity are more important to e-bike buyers than the brand. In addition, the size and weight of the bike, as well

as purchasing-related factors, for instance, price and availability (temporal and spatial), are also highly influential to customers.

Most highly rated is the riding experience, with a low standard deviation of 0.74. Of all respondents, 55.3% stated that this attribute is important or very important in their purchasing decisions. This is in line with the consumer interviews, as for almost all participants, the most prominent association with e-bikes is the effortless riding experience. It is closely followed by bike category and frame geometry, and it could be argued that these top three attributes are very closely linked. After all, frame geometry, or the seating position, is dictated to some extent by the bike category (Sani et al., 2016). Similarly, the riding experience arguably also depends strongly on the category, as each category is best suited for specific use cases. MTBs generally cater to riders who prefer a more sportive riding experience, while trekking bike riders might prefer comfort over long distances and a more upright seating position (Novović, 2023).

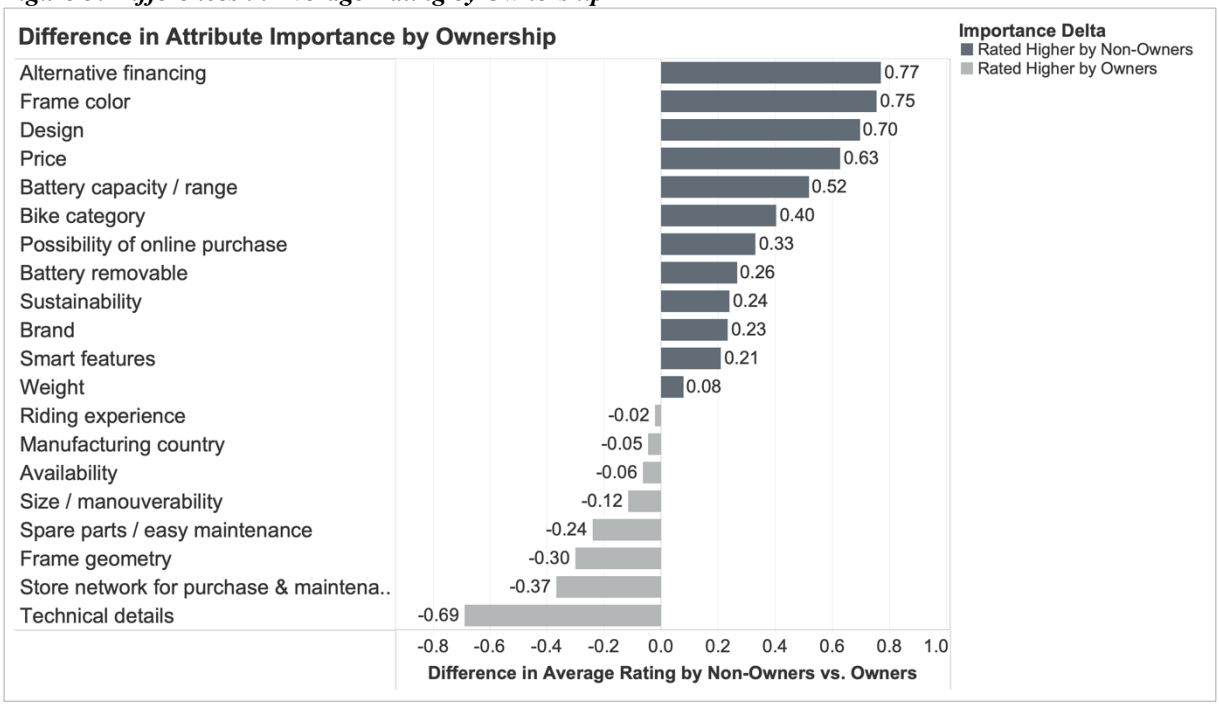
Rated together with the frame geometry in third place is the first e-bike-specific attribute, battery capacity. Whether or not the battery is removable, however, is rated lower, which might indicate that consumers care more about the range on a single battery charge being long enough in the first place rather than relying on a second battery as a backup. Besides the fact that a removable battery enables the owner to replace a discharged battery with a charged one easily, the possibility of removing the battery means that it can be charged within the owner's living spaces. This could be seen as a potentially strong benefit for consumers who do not have a garage or other safe place with access to a power outlet where they could charge their bikes. Thus, the benefit of a removable battery might also depend on the owner's living situation.

Notably, in line with the insights from the interviews, the brand seems to be of rather low importance, ranked in 16th place. Many interviewees did not recall having made the decision from a shortlist of brands or decided on a specific brand early in the process and did not put much interest into comparing different brands. Interviewees generally did not place emphasis on the

brand, and five out of ten interviewed consumers also stated that they did not seek much or any information outside of bike shops. The interviewees used local retailers as points of purchase as well as to seek information and do test rides. This supports the result that the possibility of an online purchase was ranked with the lowest relevance among all attributes tested.

While the price was rated to be of high to very high relevance with an average rating of 4.15, the possibility of alternative financing options, however, ranked among the lowest attributes, which was surprising given the high price of such e-bikes. Comparing the ratings given by owners with those given by non-owners provides an interesting context. Figure 3 below illustrates these differences in average ratings for each attribute. It shows how non-owners seem to be more interested in alternative financing, and the purchase price than current owners are, rating these attributes on average 0.91 and 0.49 points higher than owners, respectively. These differences, at least regarding price and financing options, might be explained by possible differences in income as well as differences in the stage of life they are in. For example, alternative financing options such as leasing an e-bike via the employer are likely not to be available to prospective buyers who are already pensioned.

Figure 3: Differences in Average Rating by Ownership



For other attributes such as *size/maneuverability, technical details,* and *battery capacity,* it might be that after the purchase and through regular use, owners experience a shift in how much they value different attributes. Prospective buyers might have certain expectations of what they require in an e-bike and overestimate the importance of some attributes as well as underestimate the importance of others (Hoyer et al., 2016). For example, battery capacity is ranked in second place among prospective buyers, while among e-bike owners, it only ranks in seventh position. The reason could be that they might not be able to effectively gauge what battery capacity really is sufficient because they do not yet have first-hand experience of their actual e-bike usage. Potentially, prospective first-time buyers might put more emphasis on a larger battery only to realize through regular e-bike use that a smaller battery might have also been sufficient.

4.3.4 Results on Brand Recognition – Individual (Other)

5 Primary Research – Group & Individual

5.1 Survey Design – Group & Individual

5.1.1 Selection of Brands – Individual (Other)

5.1.2 Perceptual Map: Selection of Brand Characteristics – Individual (Other)

5.1.3 Conjoint Experiment: Selection of Product Attributes and Levels

While a higher number of attributes provides a more realistic setting for participants, it greatly increases the mental effort required to evaluate the stimuli (Backhaus et al., 2023) and requires much larger sample sizes that are impossible to attain with the limited means of the group. Thus, a longlist of attributes included in the preliminary survey underwent a selection process to identify attributes that seemed most relevant for the experiment. The basis for evaluation was the preliminary survey's results, interviews, and other insights mentioned in the literature review.

Among other characteristics, the attributes chosen to be included in the conjoint experiment must generally be (1) *relevant for the consumer's decision-making*, (2) *independent*

of each other, (3) *realistic and feasible,* (4) *possible to be adapted by managers*, and (5) *limited in number* (Backhaus et al., 2023). Another relevant aspect considered for this experiment was the clear perception of differences between levels in a virtual setting. Participants had to understand the differences between just the level name and a short description, and there shall be little room for interpretation.

As illustrated in Appendix 1, the final set of attributes included in the conjoint experiment includes (1) *Brand*, (2) *Price*, (3) *E-Bike Category*, (4) *Battery Capacity*, (5) *Battery Removability*, (6) *Smart Features*, and (7) *Technical Details,* which denotes the degree to which technical details are communicated to prospective buyers (Jedidi et al., 1996).

Two attributes that clearly had to be included were brand and price. Even though brand as an attribute was ranked so low in importance in the preliminary survey, it was included in the perceptual map and conjoint experiment for two reasons. First, including it in the conjoint was done to validate the initial finding that the brand is of low importance. Second, as the name suggests, a brand-specific conjoint allows the group to analyze the relative importance of attributes and preferences for levels separately for each brand. It was assumed that even though the brand might not be a strong decision driver in the overall judgment, it could well be that preferences for levels varied by brand due to the brands' perceptions. For example, one brand might prominently advertise its innovative features, which could result in this attribute being more desirable in this brand than it is for others.

Price

Including *Price* in the conjoint experiment is essential for several key reasons. Firstly, price plays a crucial role in how consumers make purchasing decisions – it was rated among the most relevant attributes in the preliminary survey. Secondly, price was included to uncover trade-offs that participants face, providing deeper insights into what participants value most and how this affects their decision-making.

Category

From the interviews, it was clear that the riding experience is a crucial factor in the purchasing decision. All interviewees mentioned the great riding experience as an important feature of their bike, and with all interviewees, the riding experience was their first association with e-bikes in general. This is supported by the clear first-place ranking in the preliminary survey. However, as riding experience is a highly subjective matter, it could not be included in the experiment in a valid way because, with just the level name and a brief description, participants' interpretation might strongly depend on the specific wording. A seemingly better, just as important attribute that combines both riding experience and frame geometry is the e-bike's *Category*. The group agreed that the differences in riding experience and frame geometries across distinct e-bike categories are greater than those within the same category. The difference between MTBs and trekking bikes is greater than the difference between one MTB and another category. Thus, the third attribute included was the e-bike category.

Battery Capacity

Battery Capacity directly affects the range that one can ride on a single battery charge and is used by brands as a clear differentiator for price, as seen in Figure 2 of Section 2.3. It was mentioned by all interviewees and highly rated in the preliminary survey. More specifically, non-owners rated the battery capacity to be more important than owners, suggesting demographic differences in preferences. Considering these insights, it was a clear decision to include battery capacity in the experiment. For the levels, two typical battery capacities – 500 WH and 750 WH (Figure 2) – were chosen and complemented by a more premium third level: a 1,000 WH dual battery. Notably, batteries larger than 750 WH are currently rare, but component supplier Bosch will roll out a line of dual batteries from 2024 onwards (Bosch GmbH, n.d.). In light of this, it was included to test its desirability among consumers.

Battery Removability

The other attribute related to the battery is *Battery Removability*. It was chosen because it can have a significant impact on frame design as well as practical utility for the owner. As discussed in Section 4.3.3, a removable battery can be easily charged within the owner's apartment or house. It could be seen as an additional form of theft protection as e-bikes typically cannot be ridden without the battery inserted (Zuev, 2018). Removability could present an interesting trade-off between product design and utility.

Smart Features

As shown in Section 2.3, electrification enables new, smarter features, including simple ones like automatic and brake lights, but also more complex connectivity features such as digital theft protection, fitness tracking, etc. This attribute encompasses three levels: the *Standard Display*, the *Premium Display*, and a *Smartphone Holder* with a dedicated app. The Standard Display represents a large display that provides basic information such as speed, battery status, and the current level of pedal assistance levels. In contrast, the Premium Display boasts higher-resolution color and offers smartphone connectivity, enabling features like fitness tracking. Lastly, while discreet in design, the Smartphone mount offers the broadest range of functionalities, including wireless charging, navigation, user-friendly operation, and more. The preliminary survey indicated that smart features were a potentially polarizing attribute characteristic for e-bikes, and it was included to enrich the analysis with potential segmentations based on this. From the insights gained in Section 2.3, it was assumed that there might be a customer segment that simply wants an electrified bicycle. Meanwhile, another might see an e-bike as an intelligent, modern product that combines many more features and distinguishes it clearly from a traditional bicycle.

Technical Details

The inclusion of the attribute technical details in the conjoint experiment is motivated by insights derived from the preliminary survey, revealing a distinct division among respondents regarding their preferences for information about the components of the e-bike. Notably, this attribute taps into a fundamental aspect of consumer decision-making: the desire for transparency regarding the technical specifications of the product. Further, understanding to what degree knowledge (or the lack of knowledge) about installed components influences buying behavior is important for product development and marketing communication. For example, for segments not interested in technical details, a manufacturer might be able to install cheaper components in a bike to offer more aggressive prices.

Brand-Specific Levels

In the conjoint experiment, it was decided that virtually all brands should offer the same levels to avoid prohibitions and their negative effects on the analysis (Struhl, 2017). One exception from this, however, is Prophete, which was decided to have slight differences in prices and battery capacity to reflect its position as a low-cost provider. Specifically, it was selected to be the only brand offering the lowest price point of 999€ while not offering the highest price point of 4,499€. It was also decided that Prophete should not offer the 1,000 WH Dual battery.

5.1.4 Questionnaire Structure – Group

For the primary research, the marketing research platform *Conjointly* was used to construct one questionnaire that included both the conjoint and perceptual map sections. Initially, it was intended to collect data in two separate questionnaires, with Conjointly for the conjoint analysis and *Qualtrics* for the perceptual map. Both surveys were planned to be linked through automatic redirects, passing data in the links to map conjoint responses to perceptual map responses and vice versa. Comparing the benefits of keeping both research methods separate versus combining them into one larger questionnaire showed that the latter option seemed more beneficial for four reasons.

Firstly, despite well-structured redirects, the number of successfully mapped responses was estimated to be low. Participants were free to choose which questionnaire to start with, and they could not be forced to proceed with the other survey after completing the first. Consequently, responses from such participants who did not enter the second questionnaire through the redirect would be impossible to map. Secondly, to prevent participants from entering an infinite loop of surveys, the questionnaires would need a decision tree to distinguish between known and new respondents, adding further complexity. Third, combining both methods into one questionnaire means that participants only had to enter demographic information once and ensured identical sample structures for both methods. Finally, it was assumed that a single, longer questionnaire allowed for a more efficient data collection strategy, as participants did not have to be motivated twice to participate.

Accordingly, the final questionnaire included two main sections, plus the demographics section and other pages such as task instructions (see Appendix 2 for a translated version of the questionnaire). The first questions were about e-bike ownership. Participants were asked whether they already owned an e-bike and, if so, of which brand. If they stated that they did not own one, a follow-up question appeared, asking about current, past, or future intentions of purchasing an e-bike. In case they never had the intention of purchasing or were once interested in the purchase but decided against it, a follow-up question asked participants to elaborate on why they were not interested in purchasing an e-bike.

Instructions

Before the conjoint section, participants were shown a more detailed set of instructions explaining what they would see on the screen and what they were asked to do, as well as a remark explaining that the conjoint section is, after all, a simulation that cannot possibly include all factors that are relevant in a real-world purchasing decision. The pretest with 38 participants revealed several difficulties that participants, especially those of higher age, encountered with the first version of the questionnaire. Hence, this, as well as all other instructions, were rewritten

to provide more information and use simple language (Appendix 2). These difficulties mostly arose from a lack of understanding of the format and concept of conjoint analysis. Either they did not understand the task or what they saw on the screen. Some struggled to view the options shown on the screen as holistic "packages" and based their decision on single attributes rather than the combination of multiple different attributes. Some had initial difficulties understanding that the only options relevant for each decision round were those shown on the screen, and some did not realize that those options updated each time they chose one option. In this case, participants were confused because they clicked on an option and did not register that the next round began.

While the first instruction page covered the concept of conjoint analysis, the second instruction page detailed which attributes participants were about to see and included an overview of the brands incorporated in the block of conjoint questions. Participants were shown four screenshots of the brands' website landing pages and logos. This was done to increase brand recognition and allow the participants to become more familiar with the brands. The alternative solution of displaying brand descriptions posed the risk of introducing biases. Showing the websites appeared to be the most neutral way to educate participants in this case, as the information displayed is primary information, i.e., it is generated by the brand itself and not a third party like an online retailer. It is a richer medium than plain text, as it includes text, imagery, and other visual elements that convey information. Hence, it should best reflect what the brand is trying to communicate and how it aims to position itself. Participants were again asked to carefully read the information before proceeding to the conjoint section.

Conjoint Section

Participants were shown the options sorted by price in ascending order from left to right. Below the options, further information on the levels displayed was shown. Initially, those level descriptions were also visible by hovering over the respective attribute, but the pretest showed

this to be distracting as it covered other information on the screen. On top of the page, participants were reminded that only the options shown on the page were relevant to the decision and that they would find descriptions for the levels at the bottom of the page. Conjointly automatically set the number of decision rounds to twelve.

Perceptual Map Section

After the conjoint section, participants saw an instruction for the upcoming perceptual map section. This included an explanation of the tasks as well as a brief overview of the traits and statements for which participants were asked to rate their opinions. On the second instruction page, they were shown the website screenshots again and asked to take a moment to familiarize themselves with the brands. Elaborating on the questions in advance allowed the participants to better judge the brands they saw. As described in Section 5.1.2, the perceptual map question block consisted of nine items about four brands, resulting in 36 judgments to be made by the participants. At the top of the page, participants saw all items and their explanations. Below this, the website screenshots were displayed, followed by the Likert-based rating element. Participants were asked to rate the extent to which they agreed with the statement on a Likert scale of one to five (*1 = strongly disagree, 5 = strongly agree*) for each brand. To minimize the drop-off rate, participants saw their progress within this block of questions.

Demographics

Following the perceptual map section, participants were asked about their age, gender identification, education, employment status, and annual gross income. These questions were given in single-choice format and contained options for *Other* or *Prefer not to say.*

5.1.5 Data Collection Strategy – Group

The questionnaire was open for participation from 18 October 2023 to 12 November 2023. It was primarily spread to direct contacts of the group members who knew that their contacts already owned an e-bike or were considering purchasing one. Other participant sources include platforms such as SurveyCircle and SurveySwap, Facebook groups, Instagram, and LinkedIn.

Contributing to about 65% of participants, direct contact is the largest source of participants among the sample. Among these respondents is a rather large group of students who were personally asked to participate. All of them are close to completing their master's degree and, thus, about to enter their first full-time employment, earning their first proper income and were expected to be more likely to consider higher value purchases (Mankiw, 2020). With the high number of employers already offering JobRad leasing, it is likely that a significant share of those students will have such corporate benefits. Hence, they were considered an appropriate part of the target demographic. Most direct contacts received a link to the survey, as well as a brief description to give context about the survey. Some older participants were visited in person to aid in case of technical difficulties.

Platforms like SurveyCircle and SurveySwap allow students to reach a broader audience in a cost-effective way. The questionnaire was posted on both platforms, which operate in a circular, points-based incentive scheme. Users list their survey on the platform and, by participating in other surveys, earn points that improve the user's own survey ranking, improving visibility and the likelihood of collecting more responses.

5.2 Data Cleaning and Processing – Individual (Other)

5.3 Sample Demographics & Characteristics – Individual (Other)

5.4 Perceptual Map Results – Group

5.4.1 General Evaluation of Brand Perception – Group

In the following, the results of the perceptual maps will be presented, and their significance discussed in order to answer the research question. Clusters of items will illustrate the positioning of the individual e-bike brands according to the consumers' perceptions.

SPSS Output

Looking at the generated output in SPSS, the explanation of the total variance (Appendix 3) provides insights into the rotation sums of squared loadings as it illustrates the variance distri-

bution after the executed varimax rotation. The results demonstrate that the cumulative percentage of the first factor explains 68.188% of the variance. By including the second factor, both account for 98.929% of the total variance. Hence, the statistical requirement of a 95% variance explanation is fulfilled (McShane et al., 2023). The scree plot (Appendix 4) shows the eigenvalue against the factor number. The nearly flat line next to the second factor indicates a two-factor solution.

Regarding the rotated component matrix, Table 2 reveals the factor loadings resulting from the Pearson correlations between two data sets. Accordingly, the traits of user-friendliness, sustainability, quality, comfort, purchase probability, innovation, and uniqueness are closely related to component 1. In contrast, component 2 appears to correlate with the variables of diversified portfolio and price-performance. A closer glance at the items innovative and unique supports the theory because comparing both rotated factor loadings, they are positive (I: 0.927; U: 0.862) for component 1 and negative (I: -0.375; U: -0.497) for component 2.

Table 2: Rotated Component Matrix

Items	Component 1	Component 2
Usability	0.989	0.134
Sustainability	0.987	0.131
Quality	0.977	0.152
Comfort	0.929	0.350
Innovation	0.927	-0.375
Uniqueness	0.862	-0.497
Purchase Probability	0.828	0.557
Price-Performance	0.263	0.951
Portfolio Diversity	-0.091	0.992

As the second component expresses the ratio for a diversified portfolio and price performance, the values are reasonable because a high degree of innovation and uniqueness tends to contradict an adequate cost-benefit ratio as well as a large product range.

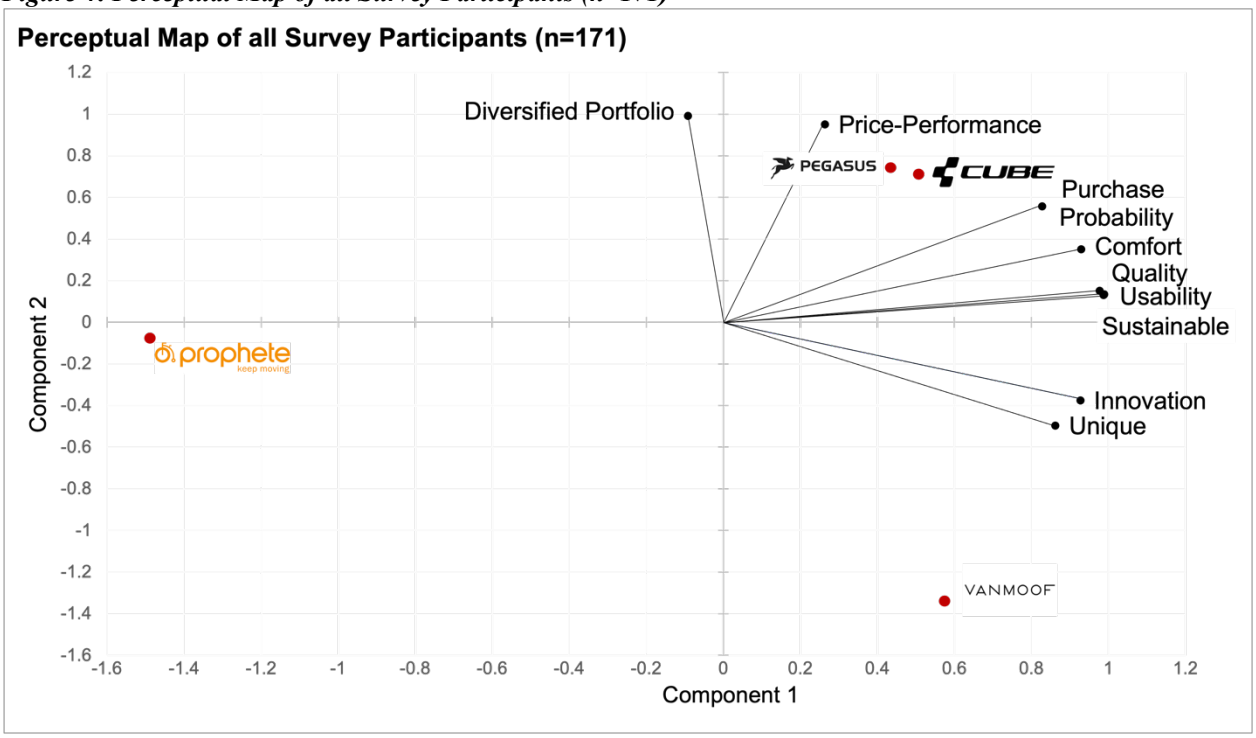
The communalities are based on the principal component analysis and express the amount of variance for each variable accounted for by the components. Moreover, they characterize the

sum of squared factor loadings for the variables (Appendix 5). The variance proportions of all variables can be explained mostly by the found components. This highlights the objectivity of these variables and that none of the components need to be excluded.

Perceptual Map Output

The component plot in rotated space (Appendix 6) displays the individual items on a graph with component 1 and 2 denoting the horizontal and vertical axes, respectively. In order to plot the coordinates of the analyzed brands on the graph, the factor scores were estimated using a multiple regression calculation. Specifically, the regression method was chosen because it enables finding a correlation between traits in component 1 and a correlation of items in component 2. The final perceptual map in Figure 4 below illustrates the disparity between the two components mentioned before and the positioning of the four brands.

Figure 4: Perceptual Map of all Survey Participants (n=171)



Component 1, represented by the horizontal axis, can explain most items. Component 2, however, is represented by the vertical axis. All items except for Diversified Portfolio are on the right-hand side of the vertical axis, concluding that no items in component 1 were perceived to conflict with each other. Taking into consideration the perceptual map (Figure 4) as well as the

rotated component matrix (Table 2), the complementation of items in component 1, as well as a high correlation of items in component 2 can be revealed. Thus, a total of three clusters can be identified, which were classified into three categories according to their relevance. The first cluster is called *Primary Focus,* and it incorporates closely correlated items with high values in the first component and low to medium values in the second component: user-friendly, sustainability, quality, comfort, and purchase probability. The indication is that those items represent the core elements that a brand's product should include. The *Secondary Emphasis* cluster can be pinpointed on the vertical axis and consists of two items: diversified portfolio and price-performance. As the items hold no direct counter-item, it is assumed that they serve as supporting components for a brand to the primary focus of the product. The last cluster is named *Tertiary Consideration,* and it encompasses innovative and unique, the two elements that have negative value in component 2 and are the farthest from the others (Appendix 6). Therefore, those are the most contrasting items perceived by survey participants, and the hypothesis is made that they provide additional context for brand individuality but generally have a lower priority than the items in the other clusters.

For the factor analysis, SPSS created two new variables, FAC 1 and FAC 2 (Appendix 7), which denote the brands' values for components 1 and 2, respectively. These values are computed based on the item ratings given by the participants. The combination of both factors characterizes the positioning of the four brands on the graph. Hence, a clear picture of the perceptual map, comprising all elements, emerges. At first glance, the examination manifests that Cube and Pegasus are located very close to each other between the first and second clusters. VanMoof, on the other hand, can be found in the bottom right corner below the third cluster. Meanwhile, Prophete is positioned opposite the map, not near any of the three clusters.

Taking the values of both factors (FAC 1 / FAC 2) into account, Cube and Pegasus had the highest participant ratings. The values were also comparable, so the assumption was that the

brands were perceived similarly. VanMoof is ranked based on the average ratings of respondents, who predominantly associated the brand with innovation and uniqueness near the proper cluster. The separate positioning of Prophete suggests a distinct brand perception compared to the other three brands.

As SPSS summarized all items in a rational way, it is likely that a brand has a more positive factor loading but performs worse in individual traits than a brand with a lower factor loading. Consequently, for a detailed analysis, the perceptual map will be continuously likened to the average values of the spreadsheet (Table 3).

Before diving into the analysis of each brand, the following section will first discuss the total averages of the brands' and items' perceptions of all participants. Afterward, a comparison to the analysis of the perceptual map strives to discover similarities and differences between the perceptions of the brand elements and interpret the outcomes precisely.

Excel Output

For better visualization of the results, conditional formatting at the row level is applied to highlight the best (green) and worst values (red) for each item.

Table 3: Brand Perception – Item Ratings of all Participants

Item	Cube	Pegasus	VanMoof	Prophete	Average (Total)
Price-Performance	3.842	3.965	3.287	3.497	3.648
Quality	4.345	4.047	4.058	2.865	3.829
Usability	3.965	3.977	3.930	3.462	3.833
Diversified Portfolio	4.275	4.152	2.766	3.784	3.744
Comfort	4.029	4.099	3.848	3.339	3.829
Innovation	3.848	3.772	4.392	2.842	3.713
Unique	3.339	3.427	4.058	2.632	3.364
Sustainable	3.310	3.240	3.240	2.836	3.156
Purchase Probability	3.854	3.725	3.187	2.637	3.351
Average (Total)	3.867	3.823	3.641	3.099	3.608

The quality of Cube, Pegasus, and VanMoof was favorably approved and overall above average. In comparison, Cube performed best in the category, averaging 4.345. In terms of a diverse portfolio, Cube and Pegasus were identified as producers with a broad range of e-bikes. In addition, the products of both brands were characterized as comfortable. Apart from that, it is again noticeable that VanMoof is the only brand being recognized as innovative and unique, as

both values are almost 0.7 above average. Meanwhile, the diversification of its product portfolio is perceived as insufficient as the value is 2.766, which is almost one point below average. In comparison to the other brands, Prophete has the poorest perceptions regarding quality, innovation, uniqueness, sustainability, and purchase probability. Furthermore, the brand performed below average in eight out of nine categories. Consequently, the brand emerged to have the lowest ranking, with 3.099 – compared to the average of 3.608.

Regarding the categories, price-performance, and usability were reviewed similarly for all brands, with a low standard deviation. Likewise, the standard deviation for sustainability was the lowest, with a minor total average of 3.156. At the same time, the most dispersed data in relation to the mean was registered for a diversified portfolio and quality.

Cube

Comparing the total averages of all items, Cube performed best as a brand valued at 3.867. By looking at the new variables created by SPSS while simultaneously reviewing brand item perception scores, Cube and Pegasus had the highest participant ratings. The factor loadings were also similar, assuming the brands were perceived similarly. The high score of both brands in component 2 can be justified by the participants' perception of a diversified portfolio and a good price-performance. However, looking at the perceptual map, Cube is further right on the horizontal axis than Pegasus, resulting from its higher rating score in product features, such as the predominantly perception of quality (Table 3). According to the CHECK24 report, based on the number of e-bike insurances taken out on the platform in 2021 (Figure 2), Cube is the most popular e-bike brand in the German market. As people generally rate familiar brands better than unknown ones (Chew et al., 2012), Cube's brand recognition and market positioning could have led to the highest average value of all brands.

Comparing the items identified on the perceptual map to the brand image targeted by Cube according to its website and other public contributions, the overall perception corresponds in most parts. For instance, Cube advertises its broad portfolio of high-quality e-bikes with a wide

range of functions and comfort, which can also be recalled in the perceptual map. Yet, the low score for sustainability (3.310) does not match the image, as Cube is one of the pioneers of alternative means of transport, has a wide range of cargo bikes, and actively promotes sustainable production.

Pegasus

In terms of total averages, Pegasus is the only brand that surpassed above-average ratings in all categories. Followed closely by Cube, who solely performed below average in the perception of uniqueness. Pegasus stands out for having the highest factor loading for the second component due to being ranked best for price-performance. Hence, Pegasus is positioned in the upper right-hand corner with a slightly lower score than Cube for component 1. Looking closely at the item varieties, Pegasus is perceived as the best brand for comfortable e-bikes. However, regarding quality, Pegasus is ranked behind Cube and VanMoof, indicating that its e-bikes are considered positively comfortable despite not having the highest quality. Regarding the overall brand perception, Pegasus is ranked second with a value of 3.823, slightly behind Cube's. Yet, the disparities are minor, and the brand perception is positive, as components 1 and 2 display. The top ten ranking of bicycle and e-bike manufacturers (Figure 2) indicates that Pegasus is the fifth most popular e-bike brand in the German market.

Again, comparing the items identified on the perceptual map to the brand image that is intended to be conveyed by the manufacturer's website and social media presentation, Pegasus specifically values its high-quality standards. This is emphasized, for example, through quality seals and affordable prices. Contrasting the self-positioning of Pegasus with the outcomes of the perceptual map, for instance, in terms of price performance, the results display similarities. On top of that, the perceptual map indicates a slightly smaller product portfolio than Cube, which also applies when exploring brand information. In the context of self-depiction, Cube attempts to present itself uniquely. However, the survey rating reveals that Pegasus had a more individual perception, although the brand does not use large marketing campaigns for promotion.

VanMoof

Examining the position of VanMoof on the perceptual map and comparing it with the spreadsheet, the brand ranking is predominantly based on the high item associations in the third cluster, including Innovative and Unique as well as high quality. In contrast, due to the negative value in the second component, VanMoof is set almost on the opposite of the second cluster, including diversified portfolio and price-performance, which most likely result from the below-average scores for these items. Another observation emerged from taking a closer look at the competitor Prophete. Despite a worse perception of price performance, VanMoof still has a higher purchase probability. As a consequence of VanMoof's high quality and innovative strength, the hypothesis can be made that consumers are willing to accept a poorer price-performance ratio if they receive a better e-bike in absolute terms.

Comparing the brand's target positioning – modern, stylish, and revolutionary with continuous improvement – according to its website with the perception of the participants, the outcome of the survey is in accordance. Nevertheless, an interesting and important insight is that respondents did not visibly penalize VanMoof in their ratings despite potential negative press about its bankruptcy. Hence, it was assumed that it does not affect the perceived quality of a brand.

Prophete

The isolated positioning of Prophete on the far left of the map suggests a distinct brand perception compared to the other three brands. Additionally, taking the overall performance of Prophete into account, a clear picture emerges. The negative value for the first component indicates that factor 1 is below average. The highest average score and the only criterion Prophete did not occupy last was diversified portfolio. Consequently, Prophete lags behind its competitors, even though it is the ninth most popular e-bike brand in the German market, according to Figure 2. While Prophete is trying to differentiate itself with a broad portfolio and a reasonable price-performance, respondents perceived these criteria only as average in relation to the other brands. In order to encounter the motivation for the perception, it was deduced that customers

probably associate the low prices proclaimed by Prophete with inferior quality despite Prophete, just like Pegasus, having several quality seals on their website.

5.4.2 Evaluation of Brand Perception: Ownership – Group

After analyzing the perceptual map of all respondents (n=171), the participants were split into two groups: (1) *e-bike owners and shared users* (n=117) and (2) *non-owners* (n=54) to get insights on disparities and similarities in the brand perception between both groups. Furthermore, the objective was to figure out distinct aspects of needs and seek potential misjudgment by the consumers before the e-bike purchase, which they, however, only became conscious of after, such as estimating battery capacity too high. The reason is that in the preliminary survey, as well as during the first evaluations of the primary survey, dissimilarities in brand perception based on ownership status were prominent, for instance, due to the divergent topic relevance. Therefore, as in the previous analysis, the average values of the two groups were calculated in separate tables (Appendix 9-16). In addition, all steps in SPSS were replicated to create two perceptual maps and evaluate the brand perception. On top of that, the delta (Δ) was computed to visualize the differences better (Appendix 8).

Looking at the total averages, all variables, except for innovation (Δ: -0.080), scored higher overall by owners and shared users, with 3.658 in total (Appendix 9), than non-owners, with 3.498 in total (Appendix 10). Then again, comparing the individual brand performance between the two groups, particularly Pegasus, stands out due to its higher perception (Δ: +0.459) by the owners and shared users' group. Going more in-depth into the examination, the superior rating can primarily be linked to the greater price-performance (Δ: +0.815), purchase probability (Δ: +0.789), diversified portfolio (Δ: +0.655), and comfort (Δ: +0.605). The underlying cause could be that group 1 obtained a better knowledge-based view due to their research prior to the e-bike purchase. In contrast, group 2 could only judge from the website screenshot provided in the

survey (Appendix 11) if the brands were unknown before and no further information was sought.

A comparison of both perceptual maps holds evidence to support the hypotheses (Appendix 12-13). At first glance, depending on the ownership level, a mixed positioning of Cube and Pegasus can be identified. While non-owners perceived both brands quite differently, Cube (FAC 1: 0.598 / FAC 2: 1.278) being considerably better than Pegasus (FAC 1: 0.009 / FAC 2: 0.005) (Appendix 12), owners and shared users encountered similarities in the brands' perception. Thus, both brands were placed closely (Appendix 12).

Non-Owners

Based on the evaluation, solely taking the screenshot into account (Appendix 11) as the leading cause for the disparities in the perception of group 2 displays that the websites' appearance genuinely differs (Appendix 10). Cube uses dark shades, such as deep forest green, which appear professional and dignified in the context of branding, advertising, and marketing of products, according to (Walker, 1999). Furthermore, earth shades like brown are associated with environmental quality, representing natural organisms, roughness, steadfastness, and reliability according to the theory described in Section 3.3.2. The illustrated page is divided into two sections. In addition, each section consists of two to four photos, making the parts more fragmented. Nevertheless, the imagery, colors, and arrangement make the website look clean. Meanwhile, the assembling of Pegasus' page is more neutral due to the particular use of white as a background, delivering a neutral effect of purity and innocence, and light grey, a blaze color, releasing a sense of elegance, simplicity, neutrality, and balance. Furthermore, red highlights essential objects on the website and advocates the brand, illustrating strength and passion (Section 3.3.2). The page is split into two sections, each showing one e-bike. Cube has a greater choice of e-bikes presented in the screenshot than Pegasus, so the perception of having a broader product range is relatable. Considering those insights, the implication is that the brand impression of Cube, being high quality and having a diversified portfolio, is heavily based on the look

and feel of the website. Consequently, the reasoning for non-owners to purchase a Cube e-bike rather than a Pegasus is logically comprehensible, as well as the clear distinction in the view of both brands according to the positions on the perceptual map.

Following that assumption for the analysis of the other brands, the perception of VanMoof, especially being innovative and high quality, comes from the simple, modern website appearance. The color selection of white, grey, and black and solely portraying a cutout of an e-bike, emphasizes, on the one hand, the image of power, style, modernity, and professionalism (color black) and, on the other hand, cleanliness, and purity (white) as well as elegance and balance (gray) forming an image of quality, high class (Section 3.3.2). In contrast, Prophete uses a broad color range of orange, white, green, blue, and red on its website, evoking several emotions simultaneously. Red, in particular, can strongly influence feelings and personality, symbolizing excitement, energy, and ambition. However, the color could also have a negative impact due to the power that inspires brain waves, encouraging individuals to make fast choices. Orange appears to be seen as playful, possibly with energy and gaudiness (Section 3.3.2), resulting in mixed feelings. Furthermore, the page is divided into six sections containing more fragmented details. Accordingly, the page could be interpreted as unorganized and chaotic, potentially leading to a perception of a lack of seriousness, modernity, and professionalism. Consequently, the negative perception of *Pegasus* through non-owners compared to owners and shared users (Δ: -0.065) could have emerged from the website deducting a worse quality and comfort, less innovation and uniqueness, causing a lower purchase probability.

Owners and Shared Users

In the preliminary consumer interviews, all owners stated that before purchasing an e-bike, they spent extensive time (up to half a year) seeking information about the products via local bike shops or the Internet (Section 4.2). Accordingly, the presumption that e-bike owners and even shared users have advanced knowledge about brands and their products compared to non-owners can be supported. Following that sense, the assumption was made that group 1 is probably

less affected by the impression of the brands' website screenshots compared to group 2, driving the different brand perceptions on the maps as well as in total averages.

Beginning by examining the performance of Pegasus, as mentioned before, owners and shared users perceived the brand substantially better than non-owners (Appendix 8). Looking at the categories that stand out the most, such as price-performance, diversified portfolio, and comfort, the higher rating could result from the superior brand expertise of the owners gained through prior market screening and a comparison of different brand and e-bike offers. As both perceptions are positive and price performance is a decisive variable in buying judgments, the high value for purchase probability can likewise be justified. Interestingly, Cube has been ranked first according to Figure 2. Nevertheless, owners and shared users would rather buy a Pegasus (Δ: -0.076), which only got fifth place.

Considering the perception of VanMoof, the relatively negative rating for the product range compared to group 2 (Δ: -0.477) can be attributed to knowing that the brand only provides six models. At the same time, the better rating for comfort and uniqueness can also be explained since VanMoof provides specific information on its website, such as for test rides and suitable e-bike models according to size. On the other hand, the overall unfavorable ranking for Prophete (-0.065) most probably comes from the perception of a low-cost provider, as Prophete actively promotes its *reliable mobility for excellent value for money*. Furthermore, Prophete is broadly diversified to serve various target groups, such as prospective buyers of (e-)bikes, e-scooters, and other means of transport (Prophete In Moving GmbH, 2023). This could imply a lack of focus on e-bikes, contributing to a worse perception of quality, innovation, uniqueness, and purchase probability.

5.4.3 Summary of Perceptual Maps Results – Group

The two previous sections explored the perception of the e-bike brands Cube, Pegasus, VanMoof, and Prophete based on specific items using a perceptual map. The responses of 171

survey participants provided insights into broad consumer perspectives as well as the impact of owning or using an e-bike on the image of those brands in contrast to non-owners.

The calculation of all items in SPSS explains 98.929% of the total variance. The program automatically divided all items into two components depending on their weight and correlation values to other characteristics. The first component included user-friendly, sustainable, quality, comfort, purchase probability, innovative, and unique, while the second incorporates diversified portfolio and price-performance. Additionally, using the multiple regression method revealed a correlation between items in component 1 and the correlation of items in component 2, identifying a total of three clusters on the perceptual map. Those were classified into three categories*:* Primary Focus, Secondary Emphasis and Tertiary Consideration. The first combines comfort, sustainability, quality, user-friendly, and purchase probability. The second incorporates diversified portfolio and price-performance, complementing the key essentials but with a slightly lower priority. The last one includes innovative and unique items that contribute additional value to e-bike brands, albeit with a lesser emphasis compared to the other clusters.

Cube and Pegasus were positioned between the first and second clusters. As a result, they are perceived as similar brands of high quality with a diversified portfolio and comfortable e-bikes. VanMoof, likewise observed as a quality brand, was ranked in third place, and particularly stood out for its identification as innovative and unique – the items of the third cluster. Accordingly, the brands' positioning on the map was right beside it. Prophete appeared to be seen as a brand without high quality, innovativeness, or uniqueness, contributing to being not considered when purchasing an e-bike. However, the example of VanMoof illustrated that even though the brand turned out to have a poorer price-performance ratio than its competitor, Prophete, customers are willing to pay a higher price for an innovative and unique product.

An in-depth examination of the answers split between (non-) ownership and e-bike user groups revealed that owners and shared users consistently ranked all items higher than non-owners

except the contemplation of innovation. Furthermore, a distinction in the perception of Pegasus and Cube was noticeable because the first group, consisting of owners and shared users, perceived more similarities than the second group, which characterized non-owners. While Pegasus reached the best average value of owners and shared users, group 2 had a considerably better picture of Cube. The image of VanMoof and Prophete almost had no deviation between both groups.

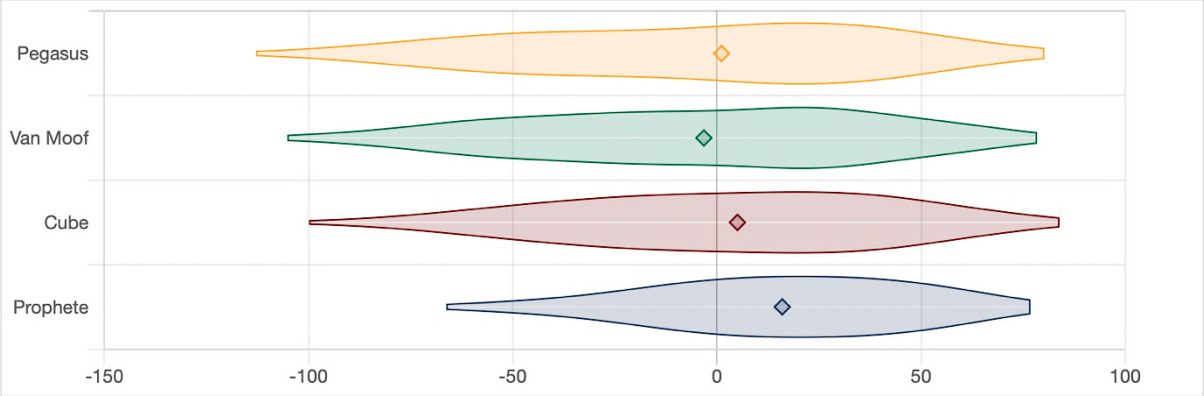
In conclusion, the perception of all four brands mainly depended on the ownership status. Yet, the survey highlighted that some brands could enhance their online presence to attract more potential buyers and increase the brand's appearance in terms of quality, product range, and price-performance.

5.5 Conjoint Data Results – Group

5.5.1 Preferences for Brands and Product Attributes – Group

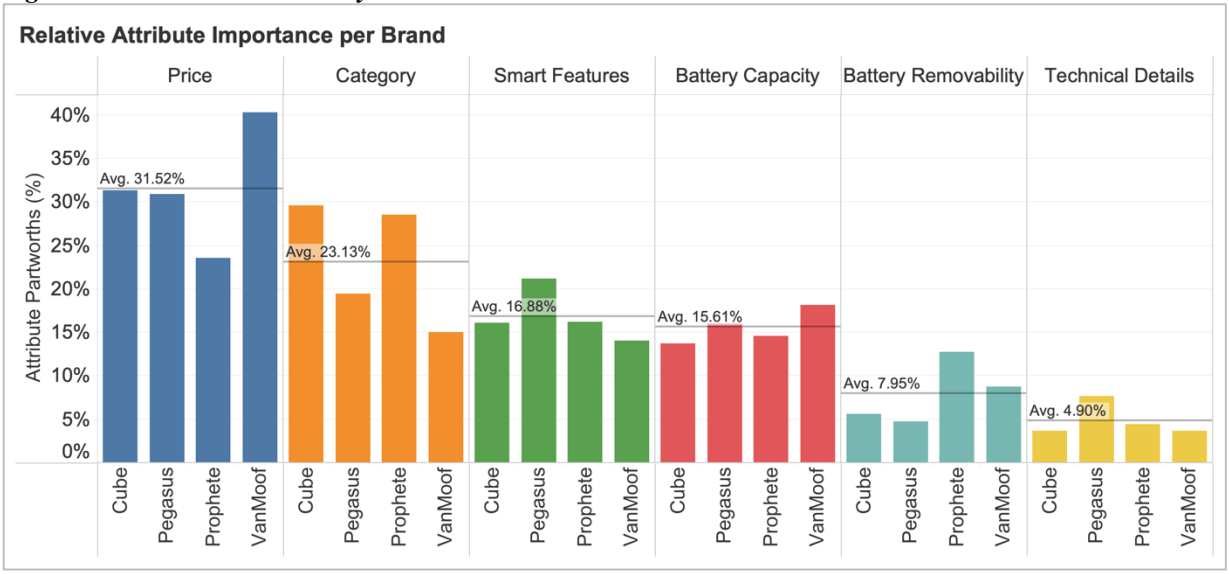
Despite the mixed perceptions observed in the previous chapter, the conjoint results clearly show how the brand seems to be of overall low importance to participants in the simulated purchasing decisions. Figure 5, exported from Conjointly shows for each brand the preferences for all possible combinations offered by the brand in the experiment. The further right, the more value a combination presents to participants, whereas the further a combination lies to the left end of the axis, the less valuable it is perceived by participants. The diamonds in the middle indicate the median value. Overall, the shape and positioning of the brands are very similar. Pegasus has the widest range between the most preferred and the most disliked model, whereas Prophete has the smallest range, which can directly be attributed to the fact that Prophete did not offer the most disliked price level of 4,499€.

Figure 5: Violin Plot – Brand Values Perceived by Consumers



Regarding the other, more directly product-related attributes, it can be seen that price is clearly most relevant in participants' decisions, followed by category as well as smart features (Figure 6). Battery capacity has almost identical average values as smart features. The least important attributes were the removable battery and technical details. Only slight differences between the brand were indicated by the participants' choices.

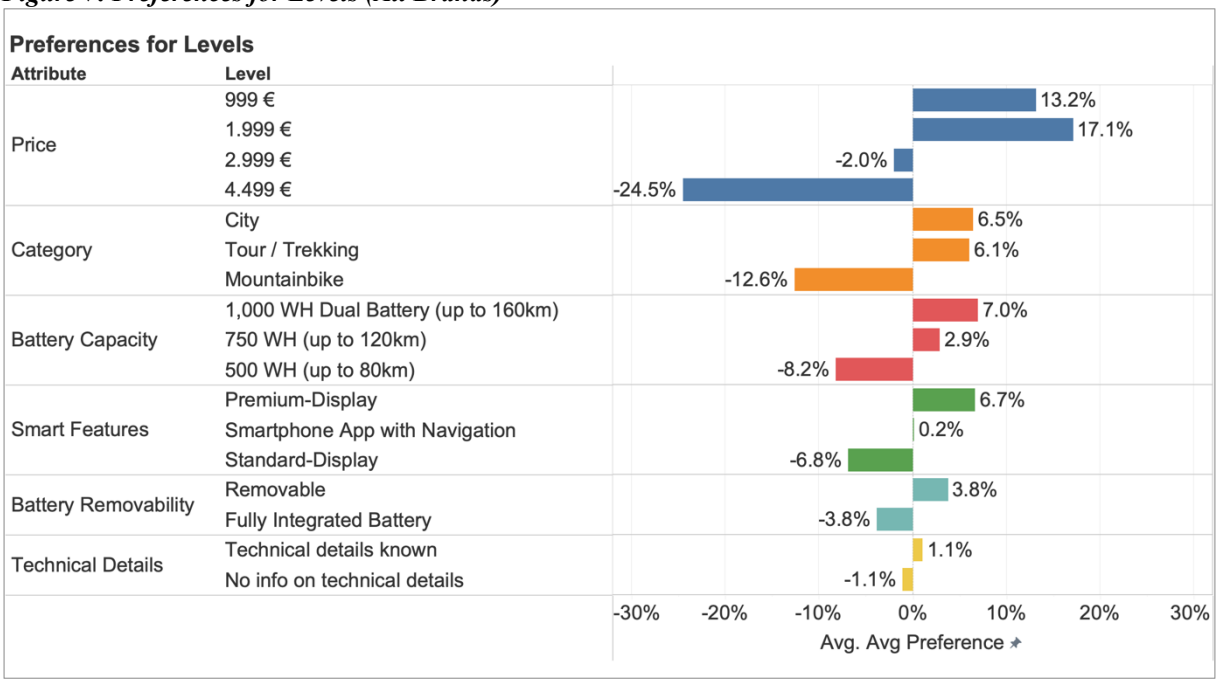
Figure 6: Attribute Partworths by Brand



5.5.2 Preferences for Levels – Group

Figure 10 illustrates the average preferences for levels recorded by the tool for all 171 participants in the final sample. It must be noted that as a result of the conjoint design, Figure 10 represents the average of the brand-specific values, and as a result, the bars for price and battery capacity do not average zero.

Figure 7: Preferences for Levels (All Brands)



As detailed in Section 5.1.1, the levels offered by Prophete differed slightly compared to the other brands to reflect Prophete's distinct brand positioning more accurately as a low-cost provider. Hence, the absence of some levels as well as the offering of the lowest price level slightly distorts the numbers.

Analyzing the data on a level of granularity shows similar results to the attribute preferences. Price dominates as the most important factor, with lower prices appearing more favorable to participants than higher prices. In short, considering the entire sample, consumers prefer lower prices as well as larger and removable batteries. They are also mostly indifferent between city and trekking bikes and only have a very slight preference for knowing technical details about their bike. As described in the rest of this section, analyzing the data on a brand granularity shows similar patterns for all brands, with those levels expected to offer the most utility being the most appealing overall. For a detailed breakdown by brands, see Appendix 14.

Price

As expected, lower prices are more attractive than higher prices. As shown in Appendix 14, price sensitivity seems to be very similar for Cube, Pegasus, and VanMoof. In contrast, the low-cost brand Prophete might indicate a lower price sensitivity in lower price regions followed by

a stronger drop for its highest price point. A possible explanation for the overall lower preference value for Prophete's lowest price point could be that the price range offered by Cube, Pegasus, and VanMoof is higher than Prophete's, and participants more strongly prefer the lowest price point to keep expenses low. With Prophete, participants might be less strongly inclined to choose the lowest price because price sensitivity might be lower in lower-price regions.

Category

With the full sample, it can be clearly seen that MTB is the least attractive segment across all brands. Between city and trekking categories, there seems to be no clear preference for any of the categories, which aligns with the data reported by the German bicycle lobby group ZIV, illustrated in Section 2.2.2 by Figure 1. Sales figures for electric trekking and city bikes are almost on par (ZIV, 2023). The rather strong dislike of e-MTB bikes indicates that, overall, the sample of participants does not include enough participants interested in the e-MTB segment. Hence, it is to be noted that insights from the Conjoint and Perceptual Map analysis shall not be applied to the field of e-MTB.

Battery Capacity

The data shown in Appendix 14 indicates a clear preference for higher battery capacities. While VanMoof shows a strong tendency towards dual batteries with 1,000 WH, the preference for the most powerful battery is not as pronounced for Cube and Pegasus. For Prophete, as a low-cost brand, the strongest battery was omitted in the conjoint, which means that the tendency of the respondents for the next strongest storage, the 750 WH battery, was more pronounced than for the other three brands. The equipment with a 500 WH battery was less preferred by the participants for all brands.

Battery Removability

Overall, the removable battery for an e-bike was preferred to the fully integrated battery for all brands. Participants showed almost identical preferences in favor of removable batteries across

the three premium brands: Cube, Pegasus, and VanMoof. For Prophete, on the other hand, there was more than twice as strong a preference for removable batteries.

Smart Features

Within the conjoint analysis, three displays were offered for e-bikes of the four brands in the Smart Features area. In addition to a standard display with only basic values for the rider, there was also a premium display with a more detailed presentation and analysis of important parameters for the rider. The third offer was a smartphone application with integrated navigation, which allows the rider to use their cell phone for detailed navigation.

While the standard and premium displays were offered for all brands, a smartphone application for *Prophete* was not offered to the participants. Despite the brand's offering of a smartphone app, a preference for or against the application was not determined, with an average of -0.2% to +0.4%.

At the same time, respondents across all brands indicated a strong preference for the premium displays in relation to the standard displays on offer. There was no significant difference between the cheaper brand Prophete, the more sports-oriented brand Cube and the high-quality brand Pegasus. This can be linked to the desire for a better display and analysis of the important parameters in all quality levels of the brands. In contrast, the participants indicated a 3% lower preference for premium displays and against standard displays for VanMoof.

Technical Details

For all product combinations available to the participants, knowledge, or lack of knowledge of all technical details of the e-bikes was indicated below the specified details. Preferences for knowledge of the specific technical details were relatively low for the three brands Cube, Pegasus and VanMoof, at 1.4% to 1.6%. Prophete represented a divergence, as Prophete was the only e-bike-brand with a slight preference of 0.3% against the knowledge of technical details. This can be interpreted to imply that there is a sublet preference for the three brands mentioned above. In contrast, the respondents showed an almost perfect indifference to Prophete.

5.5.3 Most Preferred Levels – Group

When analyzing the level preferences, participants' choices indicate several tendencies and differences in choice when comparing differences in the most preferred levels of attributes. The priorly defined attributes of the e-bike category, type of battery and the knowledge of technical details were for all four brands the same, while the price, the battery capacity and availability of smart features for Prophete were customized compared to the other e-bike brands. This resulted in interesting differences in the most preferred levels per brand. Appendix 15 shows the most preferred levels for each brand and attribute.

Price

The survey showed an overwhelming leaning toward German e-bike manufacturer Cube when focusing on the price level that participants were able to select. An impressive nine-tenths of respondents strongly preferred Cube's 1,999€ price point. A comparable, albeit slightly weaker, inclination towards the 1,999€ price point for the Pegasus brand was shown by 86% of participants. For Prophete, with its strategic focus on low-cost products, an adjusted price spectrum was indicated, ranging from 999€ to 2,999€. Significantly, more than 70% of Prophete respondents also showed a preference for the lowest price range, demonstrating a pronounced tendency towards a price-oriented pattern of behavior. However, the share of participants preferring the next higher price level is larger than for other brands. It is worth noting that although VanMoof's preferences for the 1,999€ category were somewhat less pronounced than those of Cube and Pegasus, they still showed a remarkably high concentration in this price category.

Category

A more detailed analysis of the e-bike categories revealed different preferences depending on the brand. With a preference of over 49% of respondents and a clear superiority over the mountain and trekking bike categories, participants preferred city bikes among those offered by Cube. On the other hand, the preference is more evenly distributed for Pegasus: 37% of respondents tended towards city bikes, while 41.9% expressed a preference for trekking or touring bikes.

Mountain bikes were preferred by Pegasus with just over 20%, which is the highest figure for mountain bikes with VanMoof. Respondents showed a notable preference for Prophete touring/trekking e-bikes, which would be chosen over the other categories by 43% of participants. This was closely followed by electrified city bikes. It is interesting to note that VanMoof, despite its urban-oriented product portfolio, 50% of participants clearly preferred touring or trekking e-bikes.

Battery Capacity

Preferences for battery capacity showed a congruent trend for Cube, Pegasus, and VanMoof, with around 70% of respondents preferring the 1,000 WH dual battery over the two weaker models. Pegasus had the largest relevant tendency, with a preference of almost 75% for the largest selectable battery. While 23.7% preferred the 750 WH battery, only a fraction preferred the smallest possible battery for their e-bike from Pegasus. In contrast, for Prophete, because of the focus on pragmatic pricing, the brand did not offer the 1,000 WH battery in the experiment, resulting in an even higher preference from respondents for the largest battery offered by the brand. Here, over 81% of respondents preferred the 750 WH battery.

Battery Removability

Participants showed the least inclination towards removable batteries when choosing among Pegasus e-bikes, with around 71% expressing a preference for this feature compared to Cube and VanMoof. For these brands, around 80% of participants expressed a preference for removable batteries. For Prophete, the most affordable brand that does not offer the largest battery, over 90% of the respondents indicated a preference for removable batteries, expressing a clearer tendency against the integrated batteries compared to the other brands.

Smart Features

In the area of smart features, the participants showed a striking affinity for the premium display, with almost 70% for Cube. Participants showed similar preferences with Pegasus, with 70% preferring the premium display. In contrast, one in five participants preferred a smartphone app

with navigation for a Pegasus, and only just under 10% of participants preferred e-bikes with a standard display. VanMoof stood out from the other brands in terms of preferred smart features, with almost 30% of respondents preferring a smartphone app with integrated navigation – a marked departure from the established consumer preferences of the other brands. It is also worth noting that VanMoof had the lowest preference for the premium display at 57.6%, indicating a slightly different preference for smart features across brands. For Prophete, only the standard and premium displays were available for selection. Almost 87% of participants preferred the premium to the standard display, illustrating the strongest desire to upgrade from the standard display between all four brands.

Technical Details

When asked about the importance of technical details, the participants stood out in their preferences for Prophete: they placed the lowest value (44%) on comprehensive information about the technical details. For Cube and Pegasus, respondents expressed a similar trend between both brands, with at least 70% of respondents highlighting the importance of technical information prior to purchase. For VanMoof, respondents' attitudes were similar to those of Cube and Pegasus. For all three brands, respondents placed a high value on the transparency of technical details before buying an e-bike. The results show that for brands that claim to produce and sell higher quality e-bikes, consumers tend to have a higher demand for technical transparency. In contrast, respondents are more willing to accept a lack of knowledge about technical details when it comes to e-bikes in the lower price segment – such as those offered by Prophete.

5.5.4 Influence of Demographic Factors on Preferences – Group

Analyzing attribute importance and level preferences by segments defined by demographic factors does not show any big differences between different participant groups. While the preliminary survey indicated differences in attribute importance between owners and non-owners, the conjoint results do not entirely support these differences. As Appendix 16 shows, attribute importance varies only slightly across ownership groups. Price is slightly more important among

those who neither own nor use an e-bike. These participants earn lower incomes overall and might be a bit more price sensitive. For smart features, there is a more visible difference in importance shown by users (those who do not own but use an e-bike). Splitting by gender reveals slightly higher partworths in smart features among female participants than male participants, with average attribute partworths of 16.2% and 13.6%, respectively. For all other attributes, female participants showed lower partworths as compensation. Splitting by age showed strong decreases in partworths for price with increasing age, as well as partworths for the e-bike category increasing with age. The other partworths show smaller variations in partworths.

5.5.5 Most and Least Valued Profiles – Group

Analyzing the profiles, the participants perceived most and least valuable yields unsurprising results. The profiles with the highest value to consumers are city or trekking bikes with the largest – and, at the same time, removable – batteries and a premium display. These bikes shall cost no more than 1,999€, and technical details shall be communicated clearly. In line with this, the least value is perceived from MTBs offering the smallest, fully integrated batteries, and a standard display at 4,499€ with a lack of transparent communication regarding components. When analyzing the profiles developed from the survey preferences, it must be noted that the brands and bike stores cannot implement them. As shown in Figure 3, market data suggest this would not be viable at the price point of 1,999€ given that this is for many brands even below the base price of their e-bikes. The desired installation of a small removable battery would risk the viability of an e-bike, according to the most valued profile. However, the largest possible battery is the most highly valued and desired by the respondents. Installing the largest removable battery at 1,999€ would make the product's viability impossible for the brands due to material costs.

5.5.6 Summary of Conjoint Results – Group

This chapter analyzed conjoint results on attribute and level granularity for each brand. It provides a clear conclusion that participants are pragmatic in their decision-making and emphasize attributes directly linked to the costs and benefits provided by an e-bike. Price is clearly the most important factor, followed by the e-bike category. As expected, lower prices are generally perceived more favorably than higher prices and price sensitivity seems to increase from prices above 1,999€. For Prophete, the highest share of consumers would prefer the price one level above the base price, which might be linked to concerns about product quality, as seen in the perceptual map analysis. Averaging the brand-specific values, smart features, and battery capacity scored almost identical attribute partworths, indicating similar importance in the purchase decision. This is also supported by the stronger preference for removable batteries when participants choose Prophete bikes, which do not offer the largest battery. Knowledge of technical details scored the lowest importance among all attributes. However, participants generally showed a slight preference for knowing about the components installed in the bike.

6 Discussion – Group

6.1 Drivers for E-Bike Purchases – Group

This work focuses, among two other aspects, on the question: *What drives German customers to buy e-bikes?* The literature suggests that personal health and sustainability are the most relevant reasons for purchasing an e-bike. The findings from Kroesen (2017) and McQueen et al. (2020) about the positive environmental aspects of e-bike usage over that of cars could be a strong reason for choosing an e-bike for shorter distances. The preliminary consumer interviews partly validated their findings, where five out of ten participants stated that they associated e-bike usage with sustainability because of the reduced use of their cars. Kroesen (2017), as well as Haustein and Møller (2016), provided similar findings in Denmark and the Netherlands. In both countries, participants stated that they purchased an e-bike to replace the car daily. People

can also use subscription models with several methods. While companies like Deutsche Bahn Connect GmbH or TIER provide short-term rentals, startups like Swapfiets challenged the traditional market with monthly subscription models for conventional bicycles and e-bikes. This is also driven by the financial barriers prospective buyers face when considering the purchase of an e-bike.

As the literature and participants' responses clearly show, price is still a significant deterrent for buyers considering a purchase. Particularly non-owners rated the price of e-bikes as well as alternative financing models higher than e-bike owners. Other commonly stated reasons for deciding against a purchase collected in the questionnaire were related to other modes of transportation being more suitable for participants' use cases, with which most were referring to their commutes. Also, fear of theft seems prevalent, as mentioned by the interviewee from Karlsruhe, who ended up not using her e-bike as much as she had expected. Among those who would not consider purchasing an e-bike in the first place, health and age-related reasons also dominate together with price. Participants felt physically fit enough to ride without pedal support and perceived that e-bikes are still targeted exclusively toward older demographics.

This insight may give new brands a higher chance of overcoming market entry barriers in the e-bike market. Studies from Mosca, Casalegno and Gallo (2021) come to a similar conclusion that the market entry for new brands in the e-bike market is easier compared to markets like luxury products or automobiles because the customers make their purchasing decisions based on the brand's positioning. Young brands can focus on developing features that are valued by the customer. The almost complete absence of brand names as purchasing factors can lead to increased pressure to innovate, as existing companies in the market cannot rest on their laurel.

6.2 Perceptions and Relevance of E-Bike Brands in Germany – Group

The second research question was *How do Germans perceive e-bike brands?* The results revealed that brand awareness is primarily influenced by ownership status and can thus lead to different brand perceptions.

The perceptual map analysis illustrated the three clusters of brand traits, or items, that participants associated with each other and the corresponding cluster's implications. Cube had the highest item scores overall, which could be traced back to its high brand recognition. Furthermore, Cube and Pegasus were perceived similarly overall between the first and second clusters, indicating that both brands successfully convey essential information such as high-quality but also benefits for consumers, for instance, a reasonable price-performance and diversified portfolios. VanMoof was recognized as a brand with innovative and unique e-bikes, in line with its intended positioning. This leads to the perception of being highly individualistic with less emphasis on basic product specifications. Yet, the example of VanMoof demonstrated that consumers are willing to pay a higher price for an innovative and unique product, which not only encompasses vital components but also contributes additional value to the product. The location of Prophete on the left side of the map presumably comes from its perception as a low-quality brand that participants will most likely not consider for e-bike purchases.

Furthermore, the in-depth investigation of brand comparison based on the perception of owners and shared users versus non-owners exposed a discrepancy in the image of Pegasus and an overall more conservative perception by non-owners. Owners and shared users generally rated the perceived items better than non-owners except for contemplating innovation. Accordingly, among owners and e-bike users, Pegasus received a better rating for price-performance, the diversification of its product portfolio, product comfort, and the likeliness to purchase an e-bike of the brand. In an attempt to comprehend the origins of the discrepancy in the brand image, it

was assumed to be caused by a lack of knowledge. In contrast, owners could have spent extensive time looking closely at various brands and e-bike models for research prior to their e-bike purchase decision-making process, as seen from the consumer interviewees in the preliminary interviews (Section 4.2). Hence, they likely had an advantage by having a higher brand awareness overall. At the same time, non-owners might not have known some e-bike brands in advance. Thus, their brand evaluation was presumably solely based on their interpretation of the look and feel of the website screenshot shown in the questionnaire.

Similar to those findings are the results from the preliminary survey, where owners had a stronger brand awareness across nearly all brands displayed. Three brands emerged with the highest overall awareness, attracting the attention of both groups equally, indicating a collective understanding of e-bike companies or previous brand knowledge based on their conventional bike portfolio.

To discover the reasoning for the perceived fluctuation range, the intended positioning of each brand according to their websites and other public contributions was compared to the total average perception values of non-owners. Based on that hypothesis, Cube successfully established its intended image as a high-quality brand with a broad product range at a reasonable price point for (non-) owners and shared users. The distinct impression of Pegasus was attributed to its website, which had a different structure than Cube. In the non-owners' perception, the brand's quality and broad product portfolio were not recognized sufficiently, leading to a different brand image. On the other hand, VanMoof's modern and innovative self-appearance was claimed on its website. Hence, the impression of both groups came close to the intended positioning. According to the sample, Prophete, at the lower end of the perceived quality and price-performance ratio, does not live up to its proclaimed marketing of good quality at a reasonable price. This could come from the choice of varied colors because they account for up to 90% of the evaluation, according to Singh (2006), and the website structure. Compared to the other three brands,

Prophete uses multiple colors that implicate playfulness and gaudiness, which could have resulted in a perception of a lack of quality and credibility.

The lack of clear preferences for any brands is notable, given the different ratings the brands received. Although Prophete was clearly perceived as having the worst quality and had the lowest purchase probability in the perceptual map, conjoint data showed no obvious dislike for the brand. In contrast, Prophete's median value is the highest among all brands, which can be traced back to its lower price range.

However, the results are not surprising overall, considering the large number of brands serving the market as well as the insights generated through the interviews and the preliminary survey. Brand was rated 16th among the 20 attributes tested in the survey, highlighting the relatively low importance of brands in purchase decisions for potential e-bike buyers.

For consumers, aspects such as the price of the e-bike and its attributes like battery and smart features are more important during the purchase decision. The emphasis on price is clearly visible when bringing the best and worst-rated product profiles back in mind. When it comes to potential buyers, e-bikes should be affordable. The selection of higher prices would only be reasonable when the quality and integrated features correspond to a higher price. The brand Prophete validated these assumptions during the analysis. This shows that the respondents do not look that much at the brand during the purchasing process compared to the price, the quality of the product and the functions of the features like the e-bike connectivity.

Further, most of the interviewees neither sought much information outside of their local retailer nor were they able to name other brands besides their own because they put little emphasis on the e-bike brand. Buyers often simply visited their local retailer and asked for expert advice as well as a test ride. According to ZIV (2023), 73% of all e-bikes sold in Germany were bought in specialized retail stores. However, the range of e-bike brands and models offered by the local retailer varies and depends on the size of the store. Therefore, buyers might not be able to recall

several different e-bike brands as they solely know the brands suggested by the retailer. These findings are consistent with those of the preliminary interviews. At a stationary retailer, only a few brands are available to the customers, and potential buyers are naturally restricted in choosing various brands. A survey finding supports this statement because, among 117 survey participants, e-bikes from 32 brands were purchased, revealing high fragmentation. This suggests that many brands are perceived as desirable or at least good enough.

In conclusion, the experiment shows that all brands' perceptions primarily differ due to a lack of interest and knowledge. Unlike other goods, the brand is generally not decisive in e-bike purchase decisions. Quite the opposite, more important product attributes and features will be examined in the following. Accordingly, owners and shared users had a better knowledge basis, and thus, the brand perception of Cube, Pegasus, VanMoof, and Prophete varied among ownership statuses.

6.3 Importance of Selected Attributes on Purchasing Decisions – Group

One aim of this study was to investigate whether and to what degree selected attributes influence German consumers when purchasing an e-bike based on their perceived importance. When looking at the third research question: *How important are selected attributes for German consumers in an e-bike purchasing decision?* – some differences within the preferences throughout the queried attributes were found among the 171 participants of the primary survey. The low number of decisions for brands is also shown for the distribution of brands during the primary survey. Of the 117 participants who use e-bikes, 32 brands were mentioned, showing a broad spread between the brands of e-bikes and their products.

Based on the conjoint analysis, the price of the e-bike and the specific category of the e-bike were the two most relevant attributes based on the participant’s decisions throughout all four brands. As expected, participants tended to choose the lowest prices of the brands, which were 999€ and 1,999€, respectively. As with the other brands, participants strongly preferred

Prophete bikes' base price of 999€. However, compared to the other brands, the share of participants who most strongly were interested in the next higher price level (1,999€) is higher for Prophete than was the case with the other three brands. The still good preferences for the second of the third prices for Prophete show one significant difference to the other three brands: when choosing among e-bikes from Prophete, participants were more inclined to upgrade their e-bike to the next higher price. This decision for the price, which is the entry-level price for the other brands, potentially reduces the risk of drawbacks when buying an e-bike, as indicated by the rating on quality in the perceptual map section. Further, this will likely be facilitated by a lower price sensitivity in lower price ranges – resulting in a less pronounced preference for the lowest price – and the desire to upgrade if a higher price is associated with somewhat higher quality.

The strong preferences for lower prices might also result from the group of respondents. Due to the high number of personal contacts that filled out the primary survey, students have been a large proportion of the 171 participants. Bourne et al. (2022) also mentioned the high importance of price, whose research found that price-intensive investments in e-bikes are a main concern for potential e-bike owners during decision-making and the purchasing process.

The category of e-bikes showed one of the strongest differences between the specific levels. While the city- and trekking-e-bikes were preferred by participants across all four brands, e-MTBs were by far the most disliked e-bike category of the three to be selected, starkly contrasting to official market numbers. The ZIV (2023) showed in its analysis of bike sales for 2022 that e-MTBs account for around 90% of all MTBs in Germany. While conventional bikes were the most sold category of bicycles, electrified city bikes were only sold in 528,000 units, around 62% of the e-MTBs sold in Germany in 2022. Also, the Trekking-e-bikes were far behind the more than 835,000 sold e-MTBs in the German market. These findings are congruent with the expert interviews, where the three experts of Bosch mentioned that there is a growing

interest in substituting the car with an e-bike. Still, electrified bicycles are mainly used for extreme sports, which they see as the driver for sales of e-MTBs. These differences in the findings of the most preferred e-bike category might come from the fact that the main groups of respondents were students and people of higher ages. Based on that, the group concludes that the potential target group of those interested in e-MTBs might simply not be represented enough in the final survey.

With regards to e-bike battery capacities, the respondents of the primary survey rated the battery as the third most important attribute. The respondents clearly associated stronger batteries with a better user experience or utility offered by the bike. In turn, participants clearly disfavored the 500 WH battery with an approximate range of 80 km. This supports the findings by Bourne et al. (2022), who mentioned that the greatest concerns of their participants were about the battery of the e-bike, which they traced back to users' uncertainty about the remaining range with electric support. After all, literature and consumer interviews suggest that customers are buying an e-bike to receive support to make their rides less strenuous and, in turn, ride longer distances. Hence, it is not surprising to see the strong interest in the largest battery capacities in the experiment. However, the literature, as well as the interviews, also showed that there can be discrepancies between intended and actual usage. The preliminary survey further indicated that prospective buyers value rate battery capacity as more important than owners did.

This is also supported by the higher partworth observed for battery removability for prospective buyers. Overall, the partworth of battery removability is considerably lower than that of battery capacity, which suggests that consumers are primarily concerned with having a sufficient range on a single charge in the first place. The respondents preferred the removable battery for e-bikes over the fully integrated battery for all brands. Prophete had a particular position within this attribute. Participants showed a more than twice as strong preference for removable batteries compared to the other three brands. The higher preference for removable batteries observed for

Prophete can likely be explained by the smaller, albeit still large, maximum battery capacity offered by Prophete. Most likely, the removable batteries are perceived to compensate for the smaller capacities with the option of changing the battery to a charged one. In view of the participants' price preferences and the high costs of e-bike batteries, however, it is questionable whether this would be a realistic and common use case during ownership. As another, likely more useful benefit, the battery can be recharged indoors, which could be especially valuable for e-bike owners who do not have a garage or alternative place with convenient access to electricity. Removing the battery is also an effective means of preventing bike theft, as many e-bikes cannot be ridden without the battery. Also, once a battery degrades towards the end of its life, it can be replaced with a new battery, which extends the bike's overall lifespan and saves the owner costs in the long run.

As shown in the technical analysis of e-bikes (Section 2.3), electrification brought bicycles into the digital age. Smart features like displays and smartphone applications help cyclists see data like speed, distance, battery levels, and the level of pedal support, which is particularly useful to riders who want to adjust their riding experience to different terrains, weather, and the intended purpose of the ride. While the smartphone application was intended to be the "smartest" and feature-rich option of the three, the premium display was clearly more strongly preferred among participants across all brands. This leads to a key takeaway of this study, which is that while it shows that there is indeed an interest in smart features, participants overall seem to follow a philosophy of "form follows function." The premium display was likely perceived as offering the best combination of smart features, usability, and practicality. With the smartphone app, participants might have had concerns regarding smartphone battery life, usability of their e-bike as an independent product, as well as damages to the phone in case of a crash or bad weather. Interestingly, those using another person's e-bikes were found to have a higher part-worth for smart features than owners as well as prospective buyers. One interpretation could be

that they appreciate this feature slightly more than the owners because they did not have to bear the purchasing costs themselves yet are already taking advantage of such features.

With this insight in mind, e-bike brands might increase their profit when selling to younger customers by including well-developed smart features like premium displays or apps in their e-bikes. Smart features like those mentioned before also have high importance in measuring health-related data of navigation during long tours. Because of these essential tracking and navigation, smart features are gaining more and more significance for e-bikes, which is also acknowledged by Stilo et al. (2021).

In light of the price premium brands charge for e-bikes, the question arises to what degree this is driven by buyers' active interest in advanced features or in how far it is a case of buyers willing to accept the prices in exchange for some features they might not need. The analysis showed that interest in more technical and functional aspects of the bikes, battery details, as well as smart features do matter overall. The team lead in batteries and displays at Bosch stated during the interview that customers who are looking for a higher possible range, especially in southern Germany, are specifically seeking e-bikes with a battery from Bosch or other high-quality manufacturers to reduce concerns about the power and quality of the battery which is integrated in the e-bike. A better battery is subjectively associated with longer service life and fewer repairs during the operating lifetime. Indeed, there is a visible overall preference for knowing technical details on the bikes. However, the importance of this attribute is clearly the lowest among those tested in the conjoint analysis. An interpretation of this attribute's partworth being so much lower than those related to the battery and smart features is that buyers are interested in the components of their e-bike but are more focused on getting essential factors about their e-bike right. Knowledge of the components in this sense might just be a small value-add with purchasing decisions driven by affordable prices and essential fundamental technical features. Notably, the expert's statement implies that e-bike buyers are more concerned with

the technical components than the bike brand. When comparing all four brands with each other, it seems like participants were more open-minded to accept not knowing about the details of their bikes, which could be driven by the lower prices offered by Prophete. It is assumed that for more affordable options, expectations on quality are not as high, and thus, the interest in what components are installed in a bike does not matter as much as if the bike was more expensive. The low emphasis on brand found in the conjoint experiment might indicate a notion that prospective buyers generally perceive any e-bike as "good enough" and as overall similar products, even if they perceive brands differently. E-bike technology might just have become mature and standardized enough so that consumers place more importance on more subjective aspects like riding experience and design, as well as good expert advice. After all, many brands use the same components, such as Bosch's drivetrains, displays, and batteries. As seen by the strong dominance of specialist retailers as distribution channel, it could be the case that participants simply do not have many touchpoints with a brand beyond the product itself. This is reinforced by the fact that in 2022, 73% of all e-bikes sold in Germany were bought in specialized retail stores (ZIV, 2023). The low number of e-bike brands in the retail stores compared to the high number of brands in the market, shows the importance of adjusted measurements by e-bike brands in the German market to achieve advantage. From what was tested in the conjoint and perceptual map analyses, brands must focus on installing attributes to their product portfolio that their potential customers most value. With providing a portfolio of e-bikes with a highly valued combination of attributes, customers will potentially prefer the e-bike from one brand's portfolio over other those of other brands during a purchase at a local retail store.

7 Conclusion – Group

7.1 Managerial Implications – Group

Both the conjoint analysis as well as consumer surveys and interviews have indicated that consumers attach little value to brands and make decisions based on rational facts. Even though a

strong brand image is important, companies should put enough emphasis in their marketing efforts on the technical features of their e-bikes. Further, it is essential for a brand to be state-of-the-art in its marketing communication.

The perceptual map revealed the importance of marketing material, such as website design, for non-owners in forming their opinion. Professionalism in design seems to significantly impact consumer perception, particularly for brands without a strong distribution network that instead rely more heavily on online information. Lessons from Prophete suggest that low prices must be complemented by an appealing brand design to avoid associations with low product quality. While it was not tested in the perceptual map, Sushi Bikes might be a promising example of a marketing strategy for a low-cost brand with a radically different and more modern brand language compared to Prophete's. Overall, value-focused brands, such as Prophete and Sushi Bikes, must maintain perceived quality through active marketing efforts as well as quality standards and controls. From the example of VanMoof compared with Prophete, the recommendation can be concluded that for new or previously undifferentiated brands, customers are willing to pay disproportionately more for high perceived quality, functionality, and uniqueness. Further, consumers seem to welcome upgrade options within the lower price segments, opening up the opportunity for upselling campaigns that communicate clear benefits from upgrading.

Addressing the matter of price, the conjoint analysis revealed a preference for lower price segments due to pronounced price sensitivity. Manufacturers should carefully consider their pricing strategy, recognizing that not all features contribute to consumer value equally. An example of this is the display. For potential cost-saving measures, saving on a premium display cannot be recommended. Even if a smartphone holder is more economical to manufacture, the conjoint analysis indicated that buyers have a strong preference for a premium display, likely for practical reasons. Considering the rationality of consumers, the battery size and range of the e-bike

are examples of what is particularly important for customers. Manufacturers should leverage this knowledge to differentiate themselves from the competition with targeted marketing campaigns that address the functional benefits of the bikes.

Portfolio diversity correlated with the price-performance ratio perceived by participants and the e-bike category ranked as the second most important attribute in the conjoint experiment. Recognizing this, offering e-bikes in different categories becomes crucial to capturing diverse segments of the total market. Not only should a product portfolio be diverse, but it should also be accessible in stores. Regarding distribution strategy, it was found that consumers particularly like to experience the brand and its bikes on-site at a dealer through a test ride and consultation. In this sense, Prophete's strategic focus on expanding its presence among trade customers seems promising.

Further, this work identified multiple barriers that hinder e-bike adoption, which brands should address. For those not interested in e-bikes, the reasons for this still lie in the price and a stigma around e-bikes being a product for elderly people, which is why younger demographics especially do not feel like they are the target group for e-bikes. Consumers also seem to have range anxiety, which could lead them to believe that entry-level bikes do not offer a sufficient range, despite studies showing that range is seldom fully used. With the premium price charged for larger batteries, some prospective buyers might be priced out of the market. Hence, targeted marketing could address range anxiety specifically. Lastly, manufacturers should allay buyers' potential concerns about environmentally damaging battery production by demonstrating the overall added value and, at the same time, promoting more sustainable production. Even though the e-bike has great potential to contribute to environmental protection and the reduction of CO_2 emissions, e-bikes and their brands are perceived as less sustainable than they might be.

7.2 Limitations and Future Research – Group

As with any other study, this work also presented limitations that should be addressed in future research. Firstly, it must be noted that with 171 respondents in the final sample, the sample size is rather small, and hence, it is impossible to claim representativeness. Further, related to the sample, it is likely that younger age groups are overrepresented when considering the entirety of potential e-bike buyers. After all, market data and literature show that e-bike buyers tend to be of higher age. Further, it could be the case that more knowledgeable participants show stronger preferences for or against certain brands or levels. While all respondents in the final sample either have direct experience with e-bikes (through ownership or regular usage) or stated that they are considering buying an e-bike in the near future, the questionnaire did not collect information on the respondent's perceived knowledge or immediate purchase intent. Hence, the preferences shown might be more pronounced in a study with a narrower sample consisting only of respondents directly engaged in a purchasing process at the time of participation.

Related to this, the experiment did not directly analyze the importance of more abstract or subjective attributes such as riding experience or bike design because more objective attributes, such as quantitative or binary ones, are better suited for conjoint analysis. Hence, the focus is on technical aspects of the bikes instead of descriptions of design or riding experiences.

As indicated in the preliminary survey and the interviews, riding experience might make a crucial difference in a purchasing decision, as potential buyers tend to do test rides before a purchase. Compiling these limitations, the group recommends an ethnographic study to examine buyer behavior in a real purchase setting just before their purchasing decision. Observation and in-depth interviews of a more narrowly defined sample could provide a holistic picture of the dynamics of the factors tested in this study together with those that were not.

References

Aaker, D. A. (1996). Measuring Brand Equity Across Products and Markets. *California Management Review*, *38*(3), 102–120. https://doi.org/10.2307/41165845 (accessed 13. November 2023).

Alp, S., & Öz, E. (2020). Customer Oriented Product Design with Conjoint Analysis. In C. Kahraman & S. Cebi (Eds.), *Customer Oriented Product Design* (pp. 401–416). Springer International Publishing. https://doi.org/10.1007/978-3-030-42188-5 (accessed 27. November 2023).

Backhaus, K., Erichson, B., Gensler, S., Weiber, R., & Weiber, T. (2023). *Multivariate Analysis*. https://ashcards.springernature.com/login (accessed 5. November 2023).

Backhaus, K., Erichson, B., Plinke, W., & Weiber, R. (2018). *Multivariate Analysemethoden*. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-56655-8 (accessed 11. November 2023).

Bosch GmbH. (n.d.). *Voller Energie - Bosch eBike-Akkus*. Retrieved December 18, 2023, from https://www.bosch-ebike.com/de/produkte/akkus (accessed 26. November 2023).

Bourne, J. E., Kelly, P., & Mutrie, N. (2022). Demographics of e-bike users and reasons for use. In B. van Wee, E. Heinen, & T. Götschi (Eds.), *Advances in Transport Policy and Planning - Cycling* (Vol. 10, pp. 32–37). Academic Press. (accessed 10. November 2023).

CHECK24 GmbH. (2023). *Die beliebtesten Fahrrad- und E-Bike-Marken 2022 | CHECK24*. https://www.check24.de/fahrradversicherung/die-beliebtesten-fahrradmarken/ (accessed 15. November 2023).

Cherry, C. R., & Fishman, E. (2021). *Cycling for Sustainable Cities* (R. Buehler & J. Pucher, Eds.). The MIT Press. https://doi.org/10.7551/mitpress/11963.001.0001 (accessed 26. November 2023).

Chew, S. H., Ebstein, R. P., & Zhong, S. (2012). Ambiguity aversion and familiarity bias: Evidence from behavioral and gene association studies. *Journal of Risk and Uncertainty*, *44*(1), 1–18. https://doi.org/10.1007/s11166-011-9134-0 (accessed 26. December 2023).

Contò, C., & Bianchi, N. (2023). E-Bike Motor Drive: A Review of Configurations and Capabilities. In *Energies* (Vol. 16, Issue 1). MDPI. https://doi.org/10.3390/en16010160 (accessed 13. November 2023).

Ding, M., Grewal, R., & Liechty, J. (2005). Incentive-aligned conjoint analysis. *Journal of Marketing Research*, *42*(1), 67–82. https://doi.org/10.1509/jmkr.42.1.67.56890 (accessed 17. November 2023).

Dr. Mohr, S. & Dr. Zuberer. J. (2023). *EY Fahrradstudie - Entwicklung des europäischen Fahrradmarktes 2018-2028*. https://www.ey.com/de_de/news/2023/06/ey-fahrradstudie-2023 (accessed 9. September 2023).

Dudenhöffer, K. (2015). *Akzeptanz von Elektroautos in Deutschland und China*. Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-09118-7 (accessed 10. November 2023).

Fishman, E., & Cherry, C. (2016). E-bikes in the Mainstream: Reviewing a Decade of Research. *Transport Reviews*, *36*(1), 72–91. https://doi.org/10.1080/01441647.2015.1069907 (accessed 13. November 2023).

Gazelle GmbH. (2023a). *E-Bike Insprektion*. https://www.gazelle.de/beratung/e-bike/inspektion (accessed 15. November 2023).

Gazelle GmbH. (2023b). *Was ist der Unterschied zwischen E-Bike und Pedelec?* https://www.gazelle.de/beratung/e-bike/unterschied-pedelec-und-ebike (accessed 1. October 2023).

Gigauri, I. (2019a). Applying Perceptual Mapping Method for Successful Positioning Strategy. *International Journal of Management and Business Sciences*, *1*(1), 14–23.

Gigauri, I. (2019b). Perceptual Mapping as a Marketing Research Tool for Brand Positioning. *International Journal of Economics and Management Studies*, *6*(4), 73–79. https://doi.org/10.14445/23939125/IJEMS-V6I4P110 (accessed 16. October 2023).

Haustein, S., & Møller, M. (2016). Age and attitude: Changes in cycling patterns of different e-bike user segments. *International Journal of Sustainable Transportation*, *10*(9). https://doi.org/10.1080/15568318.2016.1162881 (accessed 9. October 2023).

Hoyer, W. D., MacInnis, D. J., & Pieters, R. (2016). *Consumer behavior*. 525. https://books.google.com/books/about/Consumer_Behavior.html?hl=de&id=5Oa5DQAAQBAJ (accessed 3. October 2023).

Iacobucci, D., Grisaffe, D., & DeSarbo, W. S. (2019). Statistical Perceptual Maps: Using Confidence Region Ellipses to Enhance the Interpretations of Brand Positions in Multidimensional Scaling. *SSRN Electronic Journal*. https://doi.org/10.2139/SSRN.3425977 (accessed 7. November 2023).

Jedidi, K., Kohli, R., & Desarbo, W. S. (1996). Consideration Sets in Conjoint Analysis. *Journal of Marketing Research*, *33*(3), 364–372. https://doi.org/10.1177/002224379603300310 (accessed 24. October 2023).

Kalkhoff Werke GmbH. (n.d.). *Bosch-Antriebe: Die Motoren im Überblick*. Retrieved November 29, 2023, from https://www.kalkhoff-bikes.com/de_de/e-bike-drive-systems (accessed 19. October 2023).

Khalifa, A. S. (2004). Customer value: a review of recent literature and an integrative configuration. *Management Decision*, *42*(5), 645–666. https://doi.org/10.1108/00251740410538497 (accessed 24. October 2023).

Kroesen, M. (2017). To what extent do e-bikes substitute travel by other modes? Evidence from the Netherlands. *Transportation Research Part D: Transport and Environment*, *53*. https://doi.org/10.1016/j.trd.2017.04.036, (accessed 9. November 2023).

Kuzmanovic, M., Savic, G., Popovic, M., & Martic, M. (2012). A New Approach to Evaluation of University Teaching Considering Heterogeneity of Students' Preferences. *Procedia - Social and Behavioral Sciences*, *64*, 402–411. https://doi.org/10.1016/j.sbspro.2012.11.047 (accessed 14. October 2023).

Ling, Z., Cherry, C., MacArthur, J., & Weinert, J. (2017). Differences of Cycling Experiences and Perceptions between E-Bike and Bicycle Users in the United States. *Sustainability*, *9*(9), 1662. https://doi.org/10.3390/su9091662 (accessed 29. October 2023).

Ling, Z., Cherry, C. R., Yang, H., & Jones, L. R. (2015). From e-bike to car: A study on factors influencing motorization of e-bike users across China. *Transportation Research*

Part D: Transport and Environment, *41*, 50–63. https://doi.org/10.1016/j.trd.2015.09.012 (accessed 5. December 2023).

MAHLE GmbH. (2023). *Innovative bicycles are created with e-bike drive systems from MAHLE*. Mahle GmbH Website, (accessed 5. December 2023).

Mankiw, N. G. (2020). *Principles of Economics, 9th Edition*. Cengage Learning Custom Publishing.

Marincek, D., Ravalet, E., & Rérat, P. (2020). The cycling trajectories of e-bike users: a biographical approach. In J. Schreiner & H. Rau (Eds.), *Mobility and Travel Behaviour Across the Life Course: Qualitative and Quantitative Approaches*. Edward Elgar Publishing Limited, (accessed 15. November 2023).

McQueen, M., MacArthur, J., & Cherry, C. (2020). The E-Bike Potential: Estimating regional e-bike impacts on greenhouse gas emissions. *Transportation Research Part D: Transport and Environment*, *87*, 102482. https://doi.org/10.1016/J.TRD.2020.102482, (accessed 24. November 2023).

McShane, B. B., Bradlow, E. T., Lynch, J. G., & Meyer, R. J. (2023). Statistical Significance" and Statistical Reporting: Moving Beyond Binary. *Journal of Marketing*. https://doi.org/10.1177/00222429231216910, (accessed 13. November 2023).

Melia, S., & Bartle, C. (2022). Who uses e-bikes in the UK and why? *International Journal of Sustainable Transportation*, *16*(11), 965–977. https://doi.org/10.1080/15568318.2021.1956027 (accessed 2. November 2023).

Mishra, M., & Mohanty, S. (2013). *Impact of Corporate Social Responsibility Communication on Corporate Brand Personality Assessment*. The IUP Journal of Management Research, 12 (4). https://www.researchgate.net/publication/288256496_Impact_of_Corporate_Social_Responsibility_Communication_on_Corporate_Brand_Personality_Assessment (accessed 26. October 2023).

Mosca, F., Casalegno, C., & Gallo, R. (2021). *Developing Successful Global Strategies*. IGI Global. (accessed 16. November 2023).

Müller, M. (2022). Fahrradhandel in Deutschland. *Die Aktiengesellschaft*, *67*(17), r246–r247. https://doi.org/10.9785/ag-2022-671725 (accessed 8. December 2023).

Nigam, A., & Kaushik, R. (2011). Attribute Based Perceptual Mapping of Prepaid Mobile Cellular Operators: An Empirical Investigation Among Management Graduates in Central Haryana. *International Journal Oh Computational Engineering & Management*, *11*, (accessed 11. November 2023).

Novović, R. (2023, November 20). *Setting up riding position – bike fitting | BikeGremlin*. https://bike.bikegremlin.com/360/setting-up-riding-position-bike-fitting/ (accessed 5. December 2023), (accessed 26. November 2023).

Opuni, F., & Alhassan, I. (2023). *THE LIKERT SCALE: EXPLORING THE UNKNOWNS AND THEIR POTENTIAL TO MISLEAD THE WORLD*. *9*, 867–880. https://doi.org/10.47740/586.UDSIJD6i, (accessed 10. November 2023).

Peace, R. (2023). *Just how much can you carry by e-bike? | Cycling UK*. https://www.cyclinguk.org/article/just-how-much-can-you-carry-e-bike, (accessed 4. December 2023).

Prophete In Moving GmbH. (2023). *Mehr über Prophete - Fahrradkompetenz seit über 100 Jahren*. https://www.prophete.de/de/ueber_uns/unternehmen.php, (accessed 11. December 2023).

Raleigh UK Ltd. (n.d.). *ELECTRIC BIKES VS REGULAR BIKES*. Raleigh UK Ltd. https://www.raleigh.co.uk/gb/en/electric-bike-knowledge/electric-bikes-vs-regular-bikes/, (accessed 4. December 2023).

Redfield, R. C. (2013). *Routledge Handbook of Sports Technology and Engineering* (F. Fuss, A. Subic, M. Strangwood, & R. Mehta, Eds.). Routledge. https://doi.org/10.4324/9780203851036, (accessed 30. November 2023).

Reibold, A.-K. (2020, December 3). *Get Ready for the Cycling Boom - Experts Predict 30 Million Bicycle Sales by 2023*. ECF - European Cyclist Federation. https://ecf.com/news-and-events/news/get-ready-cycling-boom-experts-predict-30-million-bicycle-sales-2030, (accessed 18. November 2023).

Rothengatter, W. (2022). *Transportation Amid Pandemics: Lessons Learned from COVID-19* (J. Zhang & Y. Hayashi, Eds.). Elsevier Science, (accessed 6. November 2023).

Sani, M. S. M., Nazri, N. A., Zahari, S. N., Abdullah, N. A. Z., & Priyandoko, G. (2016). Dynamic Study of Bicycle Frame Structure. *IOP Conference Series: Materials Science and Engineering*, *160*(1), 12009. https://doi.org/10.1088/1757-899X/160/1/012009, (accessed 21. November 2023).

Sänn, A. (2017). *The Preference-Driven Lead User Method for New Product Development*. Springer Fachmedien Wiesbaden. https://doi.org/10.1007/978-3-658-17263-3, (accessed 24. October 2023).

Singh, S. (2006). Impact of color on marketing. *Management Decision*, *44*(6). https://doi.org/10.1108/00251740610673332, (accessed 7. December 2023).

Smith, S. M., & Albaum, G. (2005). *Fundamentals of marketing research*. Sage.

Sondhi, N., & Chawla, D. (2021). Positioning Implications for Chocolate Brands: An Attribute-based Approach. *Global Business Review*, *22*(1), 184–196. https://doi.org/10.1177/0972150918795360/ASSET/IMAGES/LARGE/10.1177_0972150918795360-FIG1.JPEG, (accessed 17. November 2023).

Statista. (2023, March 8). *Electric bicycle sales EU | Statista*. https://www-statista-com.eu1.proxy.openathens.net/statistics/397765/electric-bicycle-sales-in-the-european-union-eu/, (accessed 15. November 2023).

Stilo, L., Segura-Velandia, D., Lugo, H., Conway, P. P., & West, A. A. (2021). Electric bicycles, next generation low carbon transport systems: A survey. *Transportation Research Interdisciplinary Perspectives*, *10*, 100347. https://doi.org/10.1016/j.trip.2021.100347, (accessed 01. December 2023).

Struhl, S. (2017). *Artificial Intelligence Marketing and Predicting Consumer Choice : An Overview of Tools and Techniques Ed. 1*. https://api.semanticscholar.org/CorpusID:69440637, (accessed 24. November 2023).

Süddeutsche Allgemeine Zeitung. (2023, March 15). *Corona-Boom bei Rädern vorbei - E-Bike als Hoffnungsträger*. Süddeutsche Allgemeine Zeitung., (accessed 29. November 2023).

Trek Bicycle Corporation. (2023). *Domane+ SLR 9 - Trek Bikes*. https://www.trek-bikes.com/us/en_US/bikes/electric-bikes/electric-road-bikes/domane-slr/domane-slr-9/p/36742/, (accessed 4. December 2023).

Van Cauwenberg, J., Schepers, P., Deforche, B., & de Geus, B. (2022). Effects of e-biking on older adults' biking and walking frequencies, health, functionality and life space area: A prospective observational study. *Transportation Research Part A: Policy and Practice*, *156*, 227–236. https://doi.org/10.1016/j.tra.2021.12.006, (accessed 11. November 2023).

Walker, M. (1999). *The Power Of Color*. B. Jain Publishers (P) Limited.

Weber, T., Scaramuzza, G., & Schmitt, K.-U. (2014). Evaluation of e-bike accidents in Switzerland. *Accident Analysis & Prevention*, *73*, 47–52. https://doi.org/10.1016/j.aap.2014.07.020, (accessed 27. November 2023).

Zhou, J., Li, Z., Dong, S., Sun, J., & Zhang, Y. (2023). Visualization and bibliometric analysis of e-bike studies: A systematic literature review (1976–2023). *Transportation Research Part D: Transport and Environment*, *122*. https://doi.org/10.1016/j.trd.2023.103891, (accessed 11. November 2023).

ZIV. (2023). *2022 Market Data - Bicycles and E-Bikes*. https://www.ziv-zweirad.de/fileadmin/redakteure/Downloads/Marktdaten/ZIV_market-data-presentation_2023_for_year_2022.pdf, (accessed 23. September 2023).

Zuev, D. (2018). *Urban Mobility in Modern China*. Springer International Publishing. https://doi.org/10.1007/978-3-319-76590-7, (accessed 4. October 2023).

Zuev, D., Tyfield, D., & Urry, J. (2019). Where is the politics? E-bike mobility in urban China and civilizational government11We are grateful to the UK's Economic and Social Research Council (ESRC) for funding this project (ES/K006002/1), 2013-17. *Environmental Innovation and Societal Transitions*, *30*, 19–32. https://doi.org/https://doi.org/10.1016/j.eist.2018.07.002, (accessed 8. December 2023), (accessed 9. September 2023).

Appendix

Appendix 1: Final Attributes and Levels for Conjoint Analysis

Attribute	Levels	Note
(1) Brand	Cube	
	Pegasus	
	Prophete	
	VanMoof	
(2) Price	999€	Exclusive to Prophete
	1,999€	
	2,999€	
	4,499€	Not offered by Prophete
(3) Category	Mountain Bike	
	City Bike	
	Trekking Bike	
(4) Battery Capacity	500 WH (up to 80km)	
	750 WH (up to 120km)	
	1,000 WH Dual Battery (up to 160km)	Not offered by Prophete
(5) Battery Removability	Removable battery	
	Fully integrated battery	
(6) Smart Features	Standard Display	
	Premium Display	
	Smartphone Mount with app	
(7) Technical Details	Technical details clearly communicated	
	No information about technical details	

Appendix 2: Primary Research Questionnaire Design

Q1: Survey Introduction

For user-friendliness, we strongly recommend that you participate in this study via your laptop, desktop, or tablet ❗

Hello and welcome to our study! 🚲
We are a group of students at the Nova School of Business & Economics and are currently working on our master's thesis on marketing research on the e-bike market. Specifically, we want to understand the most important factors that influence a potential customer's purchasing decision and develop a product and marketing strategy for a fictitious manufacturer based on the findings we have gathered.
After briefly answering whether you already own an e-bike, in the first part of our survey (approx. 8-10 min) you will see a selection of 4 different fictitious bikes in several rounds of decision-making. We ask you to choose one of these bikes in each round. In the second part (2-5 minutes) we want to understand your perception of these brands and how strongly you would agree with certain statements.
Before both main parts, we will show you detailed instructions and ask you to read them carefully.
We assure you that all responses to this survey will be treated confidentially and your personal data will remain anonymous. The collection of your data is for research purposes only.
We look forward to your participation and hope you enjoy it!😊

SurveyCircle & SurveySwap users will receive the survey code after completing the survey.
We are also giving away 4x €5 Amazon vouchers. To take part, please enter your email address on the last page.

Q2: Do you already own or use an e-bike?
( ) Yes, own e-bike
( ) Yes, e-bike of another person in the household
( ) No

Q3: Of which brand is the e-bike? *(conditional, if answer to Q2 was not "No")*

Input Answer

Q4: Are, or were you interested in buying an e-bike? (In the past, currently, or in the future) *(conditional, if Q2 was answered with "Yes, e-bike of another person in the household" or "No")*

( ) Yes, I can imagine buying one currently or in the future
( ) Yes, but I decided against a purchase
( ) No

Q5: You have decided against buying an e-bike or are not considering it. Why is this the case? *(conditional, if Q4 was answered with "Yes, but I decided against a purchase" or "No")*

Input Answer

Q6: Conjoint instructions

- Important for your understanding -

You will not be able to press "Continue" for another 20 seconds. Please take the time to read the instructions below

We want to find out which aspects are of particular importance to you in a simulated purchase decision. Please imagine that you are faced with the decision to buy an e-bike and have the choice between four **fictitious** bikes displayed on the screen.

What you will do on the following pages:

- In each decision round, please choose the bike that you would be most likely to buy from the options shown.
- If none of them meet your expectations, you can also click on "None of the displayed products".
- There are a total of 10-15 decision rounds.
- Please forget the bikes you saw in a previous round.

About the displayed options:

- Please view the profiles as "complete packages" with the characteristics shown. It may be that the bikes differ only in the brand. The bikes could just as well differ in every feature.
- After each decision you will see new bikes. The models from the previous round are then no longer relevant.
- **You keep comparing new bikes with each other.** These are selected at random and generated on the basis of certain characteristics. **This is the purpose of the research method.**

This is a simulation:

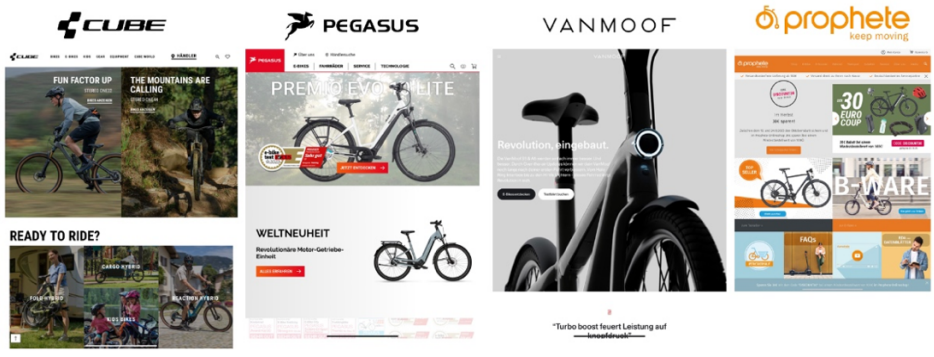
In reality, a large number of factors flow into the decision, which is why we ask you to make your decision based on the displayed characteristics as far as possible. We have selected these characteristics based on the results of a previous survey.

- **Assume that all bikes are available in your desired size and do not differ from each other except for the features shown.**
- **You are welcome to make your own assumptions for features that are not shown here.**

At the end of the survey, you have the opportunity to provide more detailed information about your personal, genuine decision-making process. We look forward to your insights!

Q7: Brands

Please take a moment to look at the websites of these manufacturers.



On the following pages you will see fictitious bicycles, which differ in the following points:

- Brand
- Price
- Battery capacity / range
- Removability of the battery
- Type of display / smart features
- The degree to which you know which components are built-in

Q8: Block of Conjoint Questions

Which of the e-bikes below would you choose?

Imagine these are the only options and these bikes only differ in those aspects you see on the screen.

Hint: on the bottom of the page you will find further information about the options shown below.

	E-Bike 1	E-Bike 2	E-Bike 3	E-Bike 4
	prophete keep moving	PEGASUS	CUBE	VANMOOF
	999 €	1.999 €	2.999 €	2.999 €
	City Bike	Tour / Trekking	City Bike	Tour / Trekking
	500 WH (up to 80km)	500 WH (up to 80km)	750 WH (up to 120km)	500 WH (up to 80km)
	Batterie is removable	Batterie is removable	Batterie fully integrated into the frame	Batterie fully integrated into the frame
	Smart Display with App Connectivity 	Standard-Display 	Standard-Display 	Smartphone Mount with App 
	No further information on components	No further information on components	Details on components available	Details on components available
	Choose	Choose	Choose	Choose

Go back

None of the above

Q9: Perceptual Map Instructions

- Important for your understanding -
You can press "Continue" in 10 seconds. Please take the time to read the instructions below
In the second part, we want to understand your perception of these brands. On the following pages you will see the same brands as in the first part and we ask you to indicate to what extent you agree with the statements shown.
So please rate your agreement on a **scale of 1-5 (1 = strongly disagree | 5 = strongly agree)**.

- **We do not expect you to be perfectly familiar with the brands**; you probably have no personal experience with the brands. One brand in particular is considered rather unknown.
- This is only about your assessment based on your first impressions. Accordingly, there are no right and wrong answers.
- If in doubt, feel free to make your own assumptions.
- If you are unable to make a statement, please click on option 3 (neither).

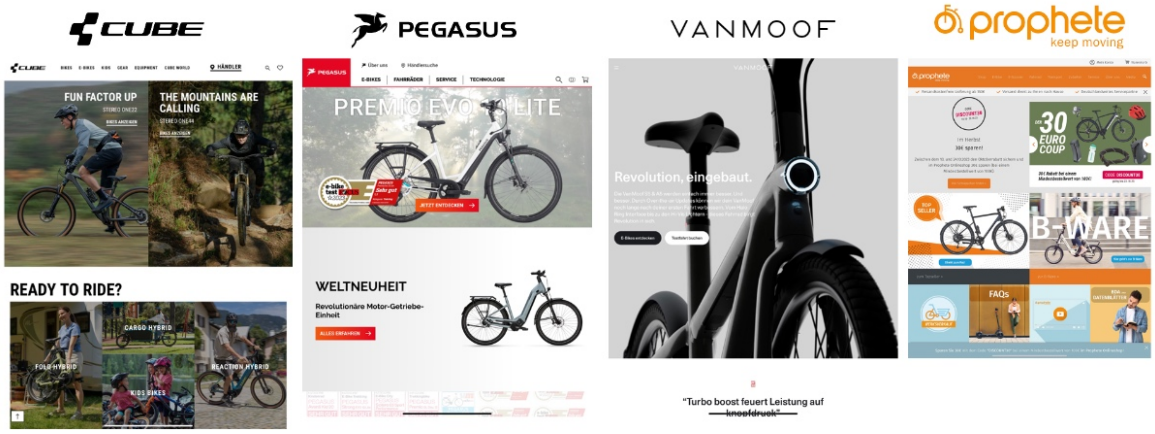
<u>The statements refer to:</u>

- Price-performance ratio
- Quality of the product
- User-friendliness
- Diversity of the product portfolio
- Comfort
- Innovation
- Uniqueness
- Sustainability
- Likelihood of purchase

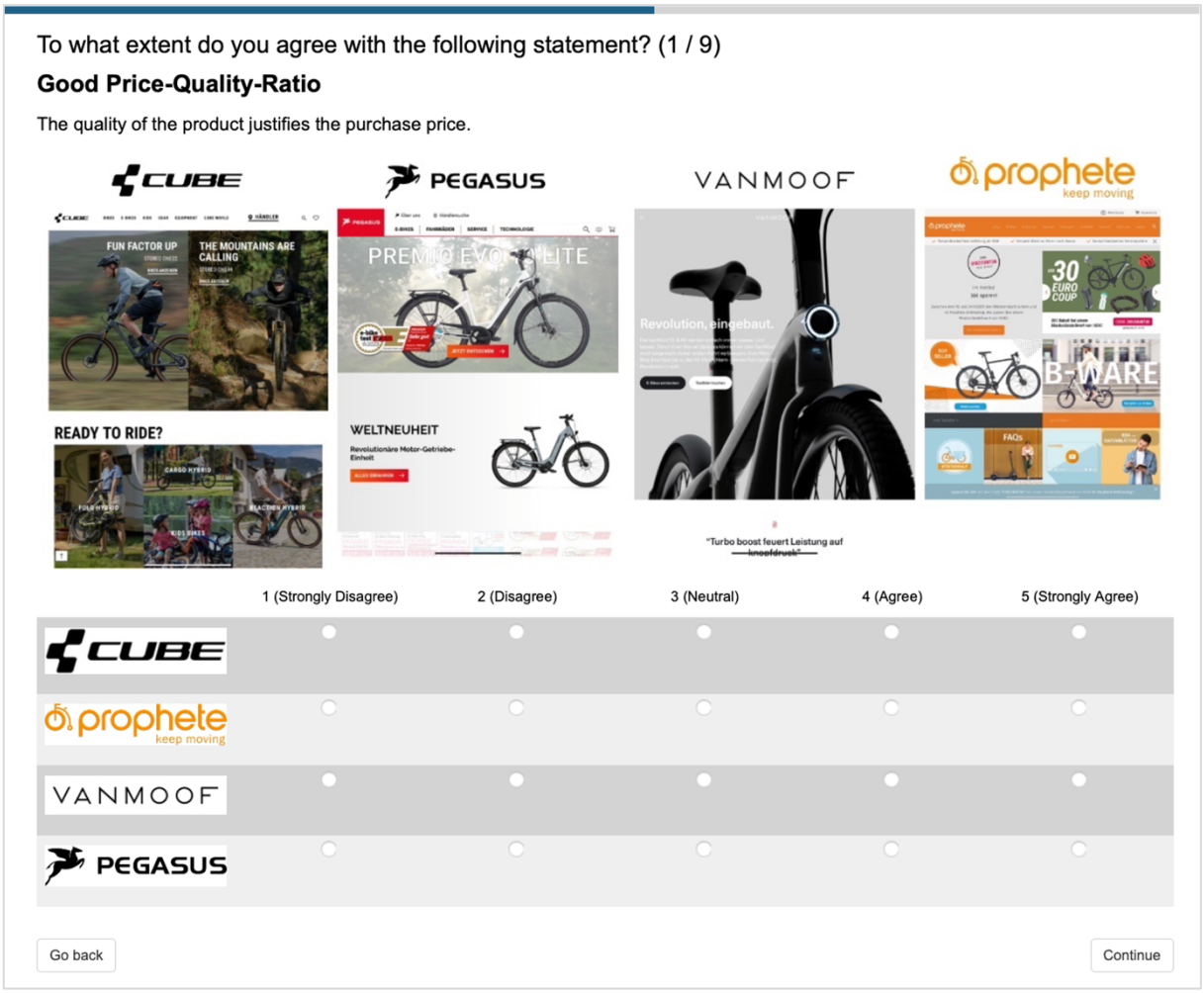
This section should not take longer than 4 minutes.
To give you a better picture of the brands, please see the manufacturers' websites on the next page.

Q10: Manufacturer website evaluation

Please take another moment to look at the manufacturer's website.



Q11: Perceptual Map Survey



Q12: Final information: Which age group do you belong to?
( ) under 18 years
( ) 18-24
( ) 25-34
( ) 35-44
( ) 45-54
( ) 55-64
( ) 65-74
( ) 75+
( ) Prefer not to answer

Q13: Which gender do you identify with?
( ) Female
( ) Male
( ) Diverse
( ) Prefer not to answer

Q14: What is your highest level of education?
( ) Lower school leaving certificate
( ) High school diploma or equivalent
( ) Apprenticeship
( ) Bachelor
( ) Master
( ) Doctor / PhD
( ) Other
( ) Prefer not to answer

Q15: Which status best describes your current employment?
( ) Full-time
( ) Part-time
( ) Student
( ) Trainee
( ) Retired
( ) Other
( ) Prefer not to answer

Q16: What is your annual gross income in euros?
( ) 0-9,999
( ) 10,000-19,999
( ) 20,000-29,999
( ) 30,000-39,999
( ) 40,000-49,999
( ) 50,000-59,000
( ) 60,000-69,999
( ) 70,000-79,999
( ) 80,000-89,000
( ) 90,000-99,999
( ) 100,000 or more
( ) Prefer not to answer

Q17: Do you have any other thoughts about e-bikes or would you like to share our survey? (Optional)

Input Answer

End of the survey

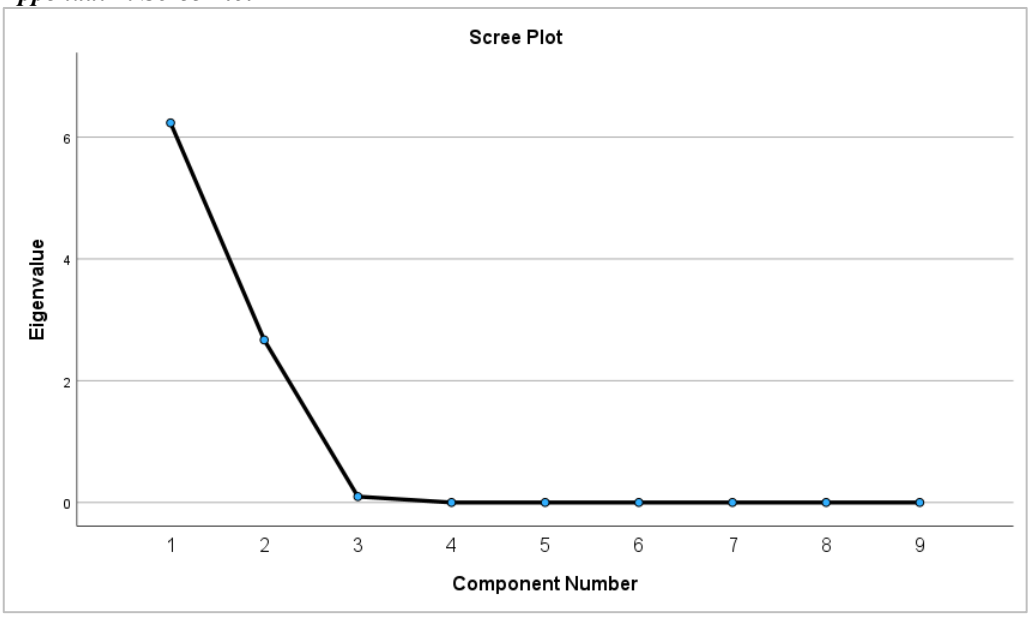
Appendix 3: Total Variance Explained

Total Variance Explained

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6,234	69,266	69,266	6,137	68,188	68,188
2	2,670	29,663	98,929	2,767	30,741	98,929

Extraction Method: Principal Component Analysis.

Appendix 4: Scree Plot



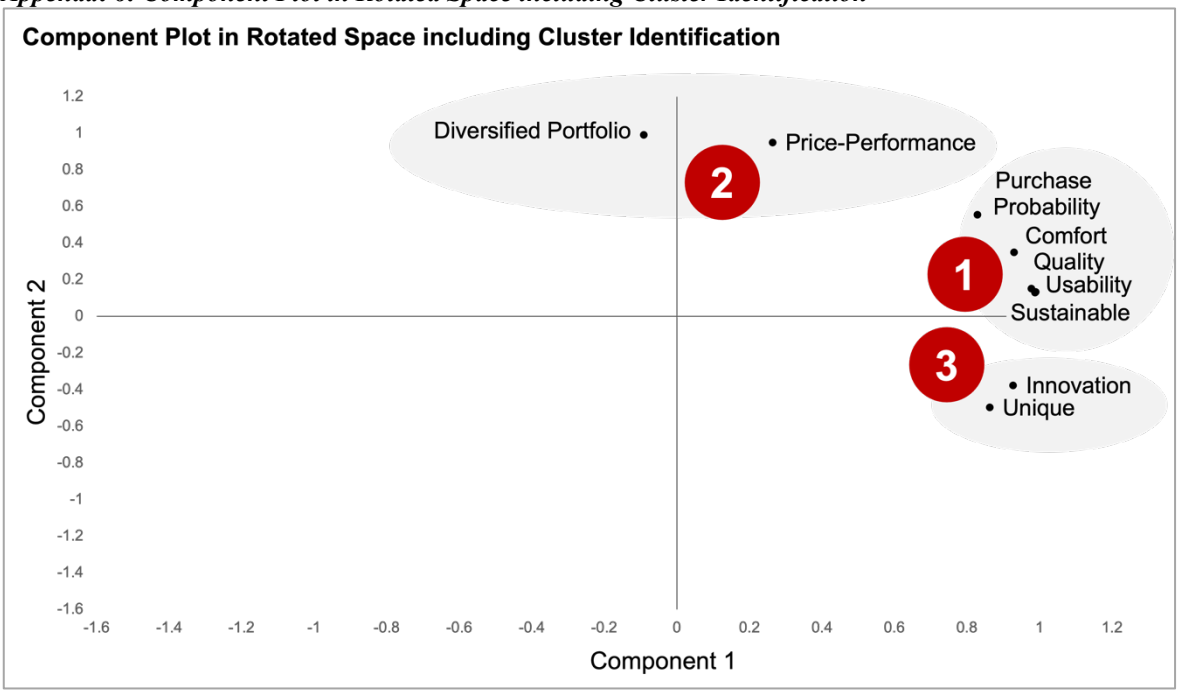
Appendix 5: Communalities

Communalities

	Extraction
Price_Performance	,973
Quality	,978
Usability	,997
Diversified_Portfolio	,993
Comfort	,986
Innovation	1,000
Unique	,990
Sustainable	,991
Purchase_Probability	,995

Extraction Method: Principal Component Analysis.

Appendix 6: Component Plot in Rotated Space including Cluster Identification



Appendix 7: Data Set with Factors

Brand	Price_ Performance	Quality	Usability	Diversified _Portfolio	Comfort	Innovation	Unique	Sustainable	Purchase_Probability	FAC1_1	FAC2_1
Cube	3,84	4,35	3,97	4,28	4,03	3,85	3,34	3,31	3,85	,50736	,72323
Pegasus	3,97	4,05	3,98	4,15	4,10	3,77	3,43	3,24	3,73	,41139	,74489
VanMoof	3,29	4,06	3,93	2,77	3,85	4,39	4,06	3,24	3,19	,57776	-1,38383
Prophete	3,50	2,87	3,46	3,78	3,34	2,84	2,63	2,84	2,64	-1,49651	-,08429

Appendix 8: Delta of Group (1) and (2)

Item	Cube	Pegasus	VanMoof	Prophete	Average (Total)
Price-Performance	+0.256	+0.815	+0.013	+0.077	0.290
Quality	+0.369	+0.420	+0.113	-0.061	0.210
Usability	+0.030	+0.182	+0.222	+0.053	0.122
Diversified Portfolio	+0.077	+0.655	-0.477	+0.117	0.093
Comfort	+0.097	+0.605	+0.617	-0.046	0.318
Innovation	-0.168	+0.073	+0.085	-0.312	-0.080
Unique	-0.370	+0.137	+0.519	-0.105	0.045
Sustainable	+0.291	+0.459	+0.269	-0.023	0.249
Purchase Probability	0.111	+0.789	+0.138	-0.286	0.188
Average (Total)	0.077	0.459	0.167	-0.065	0.159

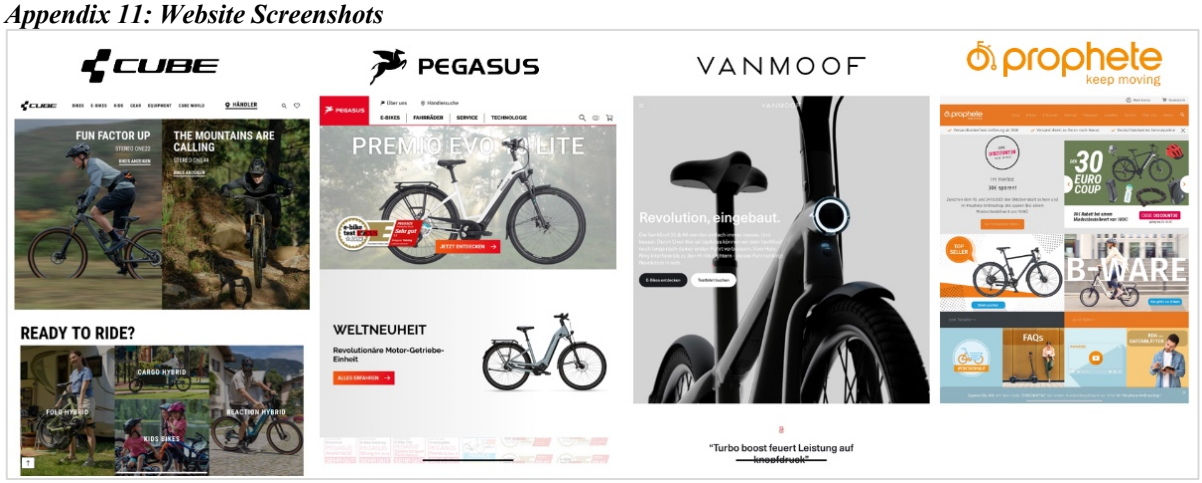
Appendix 9: Group (1) Owners and Shared Users (n=117)

Item	Cube	Pegasus	VanMoof	Prophete	Average (Total)
Price-Performance	3.923	4.222	3.291	3.521	3.739
Quality	4.462	4.179	4.094	2.846	3.895
Usability	3.974	4.034	4.000	3.479	3.872
Diversified Portfolio	4.299	4.359	2.615	3.821	3.774
Comfort	4.060	4.291	4.043	3.325	3.929
Innovation	3.795	3.795	4.419	2.744	3.688
Unique	3.222	3.470	4.222	2.598	3.378
Sustainable	3.402	3.385	3.325	2.829	3.235
Purchase Probability	3.889	3.974	3.231	2.547	3.410
Average (Total)	3.892	3.968	3.693	3.079	3.658

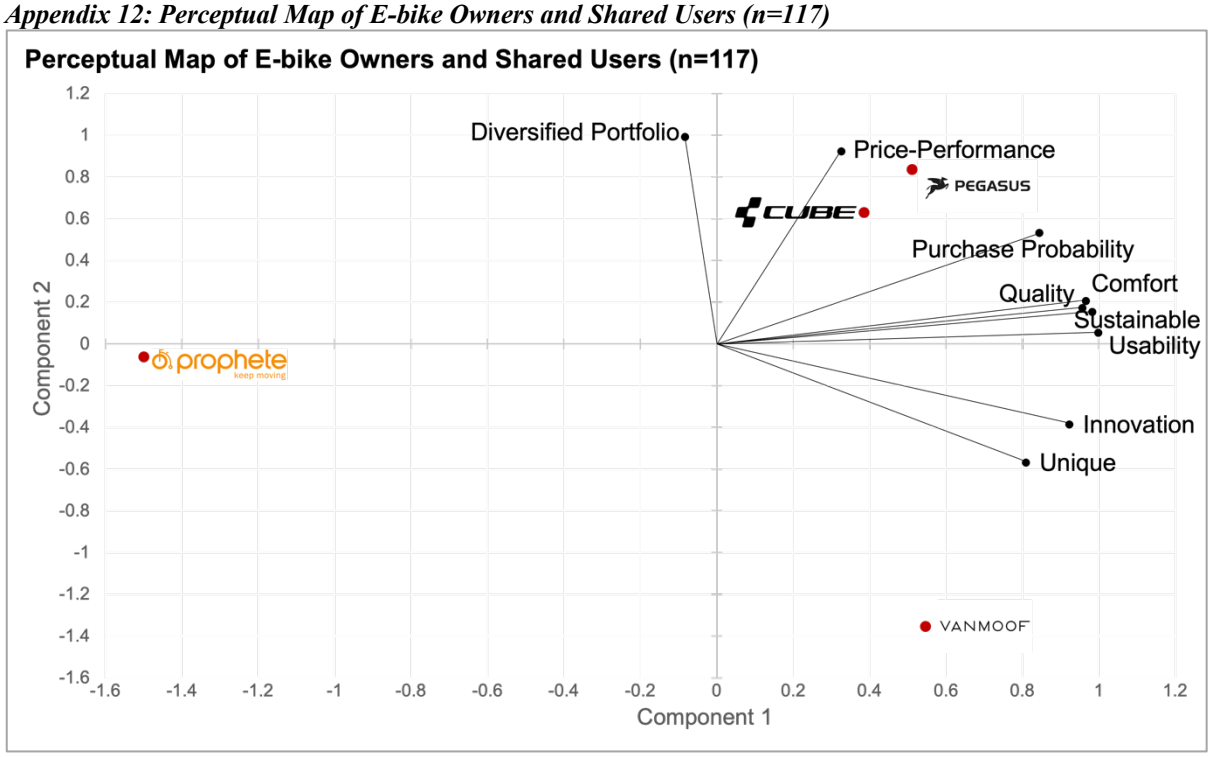
Appendix 10: Group (2) Non-Owners (n=54)

Item	Cube	Pegasus	VanMoof	Prophete	Average (Total)
Price-Performance	3.667	3.407	3.278	3.444	3.449
Quality	4.093	3.759	3.981	2.907	3.685
Usability	3.944	3.852	3.778	3.426	3.750
Diversified Portfolio	4.222	3.704	3.093	3.704	3.681
Comfort	3.963	3.685	3.426	3.370	3.611
Innovation	3.963	3.722	4.333	3.056	3.769
Unique	3.593	3.333	3.704	2.704	3.333
Sustainable	3.111	2.926	3.056	2.852	2.986
Purchase Probability	3.778	3.185	3.093	2.833	3.222
Average (Total)	3.815	3.508	3.527	3.144	3.498

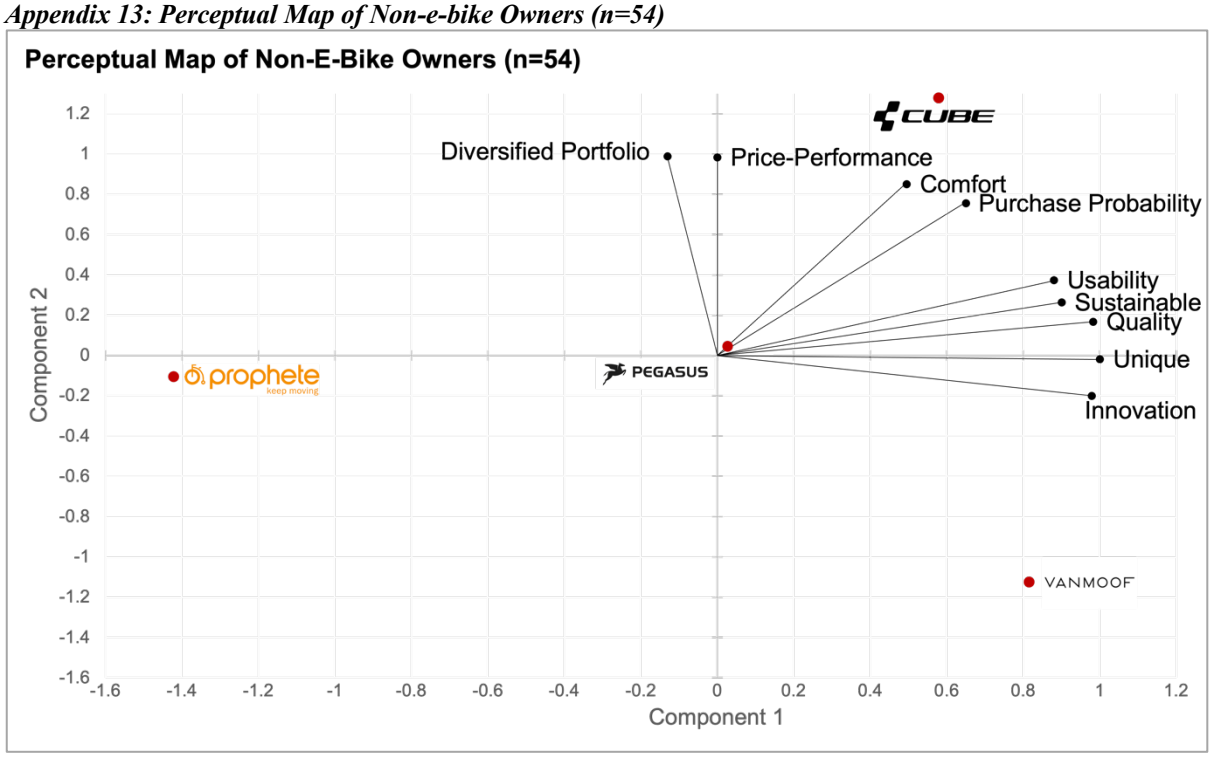
Appendix 11: Website Screenshots



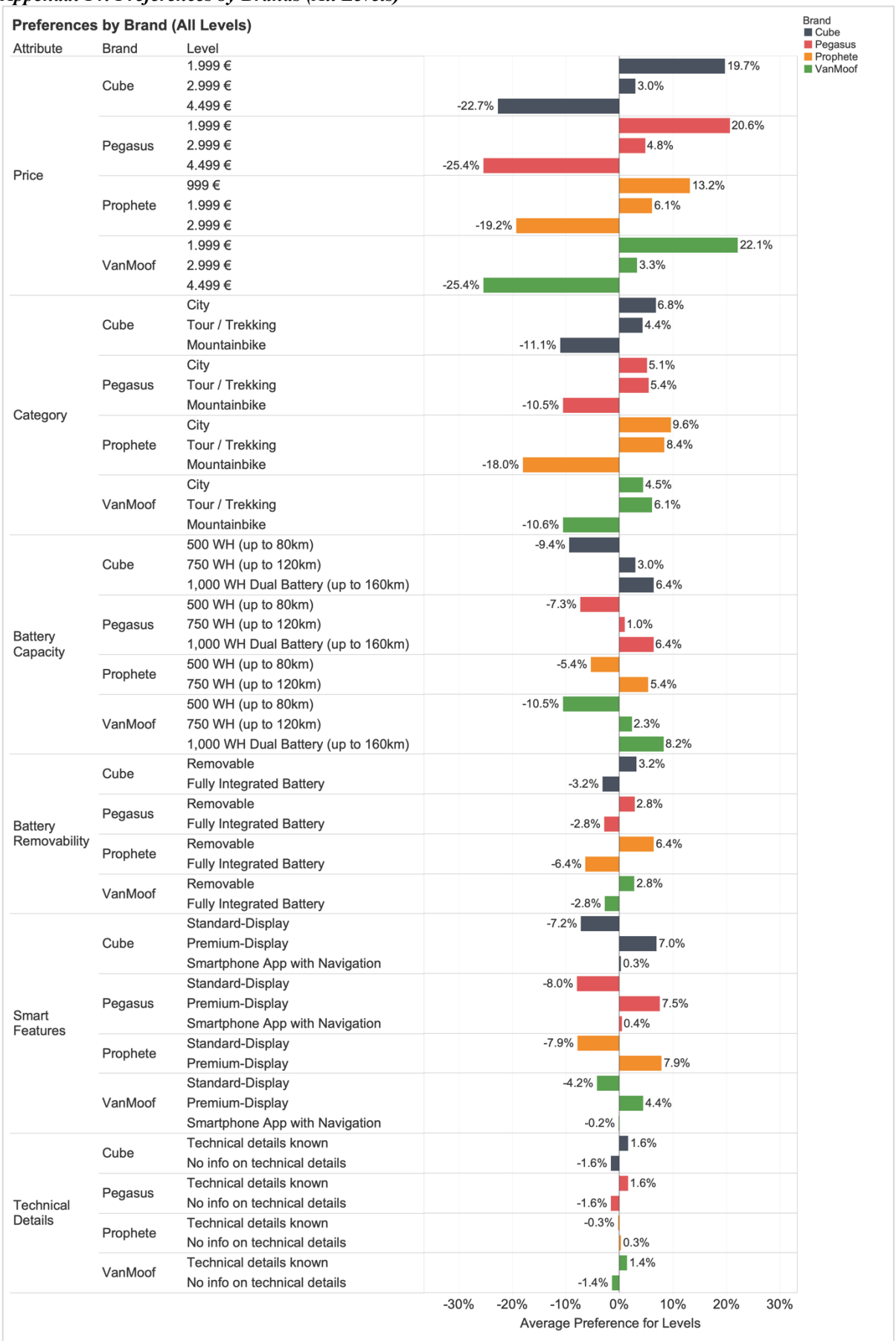
Appendix 12: Perceptual Map of E-bike Owners and Shared Users (n=117)



Appendix 13: Perceptual Map of Non-e-bike Owners (n=54)

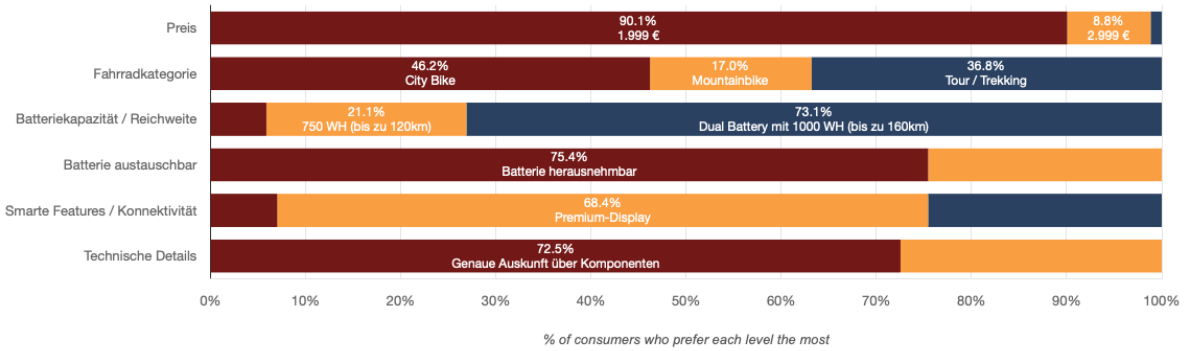


Appendix 14: Preferences by Brands (All Levels)



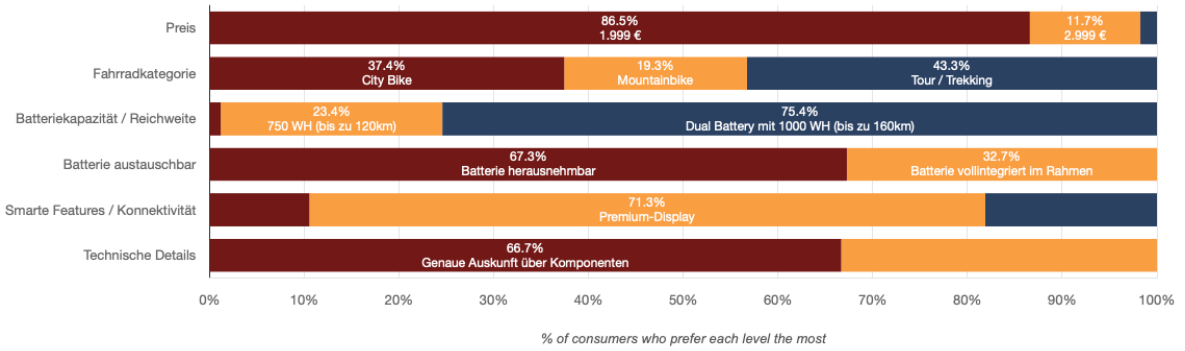
Appendix 15: Most Preferred Levels by Brand

Cube



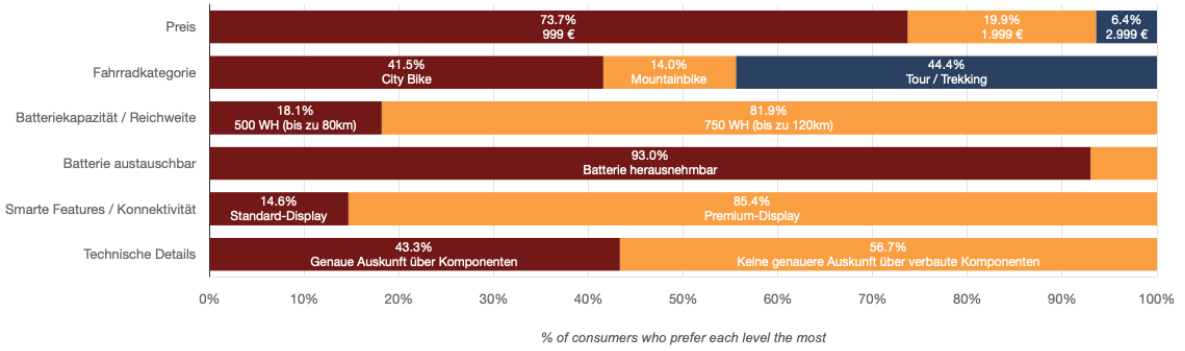
% of consumers who prefer each level the most

Pegasus



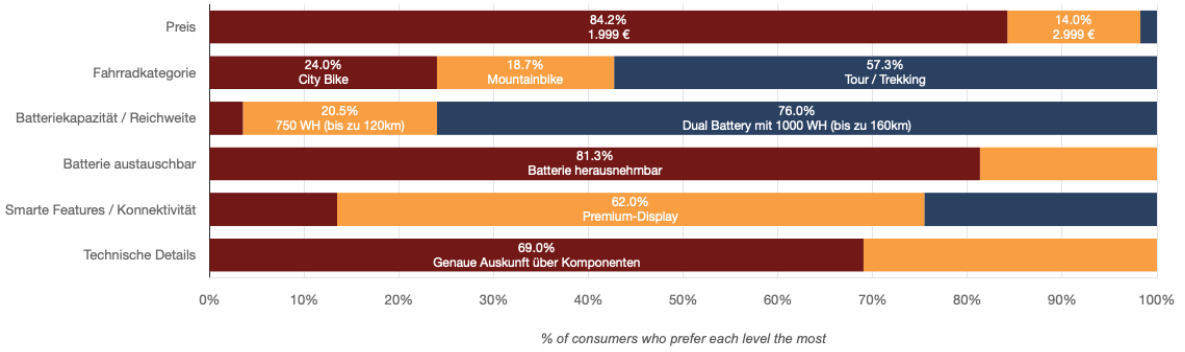
% of consumers who prefer each level the most

Prophete



% of consumers who prefer each level the most

VanMoof



% of consumers who prefer each level the most

Appendix 16: Relative Attribute Importance by Demographic Groups