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Reducing uncertainty regarding customer expectations for a sustainable car interior design integrated in a data-informed design approach

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Abstract

Sustainability is influencing the automotive industry. Car manufacturers are increasingly prioritizing sustainable materials. The production of these still pose environmental challenges. This paper addresses the trends related to sustainable car interiors. It emphasizes the importance of understanding how customers perceive these new materials. Seven in-depth interviews were conducted, followed by a survey with 106 participants to obtain generalized insights. The results will reduce the uncertainty regarding customer expectations for sustainable car interiors.

Keywords: *sustainability, sustainable design, characteristics and properties, material engineering, data-informed design*

1. Introduction

Sustainable products and transparent actions are currently more important than ever. Demand for sustainably manufactured products is high and will probably continue to rise in the future. For many, the issue of sustainability has become a decisive element in purchasing decisions across all branches. This change in society requires several measures for the economy that brings both, opportunities, and challenges. Many companies have already recognized and responded to this. (White et al., 2019)

The topic of sustainability will also be essential in the automotive industry as the transport sector is responsible for roughly 25% of the world's greenhouse gas emissions. (Ajanovic and Haas, 2018) Customers, investors, employees, society, and politics demand sustainable business practices. Manufacturers and suppliers, or executives thereof, envision sustainability as a core element in the future for their business. (Deloitte, 2021) This includes the switch from combustion engines to e-mobility as well as the use of sustainable materials in the entire car, e.g. the car interior.

When considering automotive materials textiles come into play, as they encounter for approx. 35 kg (or 45 sqm in terms of surface area) today. (Fisher, 2020) The textile industry is often criticized as one of the dirtiest industries in the world, mainly produced outside Europe for the fashion industry. What may be unknown to many is that most textiles produced in Europe are innovative and more and more sustainable, technical textiles, including automotive textiles. (BMUV, 2021)

The development and design processes for these new demands of sustainable materials are evolving. Methodologies like Design for manufacturing, Design for recyclability, Design to minimize material usage, Design for durability, Design for energy efficiency or vehicle design for end-of-life are known since decades. (Mayyas et al., 2012) The main objective is to meet the customer expectations which are

in a constant change due to the dynamic of the topic. (Varadarajan, 2017) Customers have become increasingly concerned. This has resulted in a demand for sustainable textiles as well as a demand for sustainable vehicle propulsion systems. This must now be combined in the automotive industry, as sustainable drives are no longer sufficient to satisfy the customer. A study of Wellbrock et al. shows that a majority of 74% of their study respondents agree that the car manufacturer should place more emphasis on the selection of sustainable and natural materials in the interior. (Wellbrock, 2020) A major challenge that needs to be overcome is the uncertainty surrounding customer expectations regarding this new topic. (Riverso, 2023)

This paper gives an answer to the following research question: How can the uncertainty regarding customer expectations for a sustainable car interior design be reduced? The information gathered are input for a sustainability-driven Data-Informed Design process. To cover this topic, the paper gives within the following background section a baseline understanding of current automotive sustainability trends and the Data-Informed Design process. Afterwards the methodology of the research performed gets introduced following with a discussion and conclusion.

2. Background

2.1. Current situation and developments in the automotive industry

Since the year 2000 onwards, the automotive industry has been undergoing a transformation towards a new type of mobility. Electromobility was expected to play a significant role in automotive development for the future. (Bormann et al., 2018)

In that process, the industry has focused heavily on Battery Electric Vehicles to increase market penetration. According to the Paris Declaration on Electromobility and Climate Change, the defined goal is that more than 100 million electric vehicles will be available worldwide by 2030. (Ajanovic and Haas, 2018) Change in the automotive industry is influenced by both environmental and social factors. This poses challenges for the automotive industry, as manufacturers are under pressure to meet political guidelines and customer requirements. (Wellbrock et al., 2020) Regardless of whether an electric vehicle is fundamentally CO₂-neutral or not, it is the first step of the automotive industry.

But what does the customer say. Mobility has a high priority in society and the trend toward sustainability has been evident for several years. This includes the fact that owning an own vehicle is becoming less important. The car seems to lose its importance, but not its function. The change in customers' awareness is causing the car to be seen less as a status symbol. Especially among younger generations, the car is said to have had its day as a status symbol, as they define themselves through other objects. (Seeberger, 2016) The terms "shared mobility" and "car sharing" are gaining in importance. Within the "Automotive Zeitgeist Study" in 2015 by Ford a full of 43% said that protecting the environment would be a good reason for the private shared car. Similarly, 46% of respondents said they would like to use environmentally friendly vehicles more often. (Mundolf and Rauch, 2015). Researchers must evaluate if this mindset shift has an impact on current interior design guidelines and frameworks.

2.2. Importance of interior and current trends

It is expected that engine performance, exterior design and vehicle propulsion will decrease in importance as vehicles become more electrified. The interior experience instead will be valued more. This will result in new trends dealing with both, the increased use of textiles and new technologies. (Seeberger, 2016) Shared mobility concepts are placing different demands on vehicle interiors as well. Several different users demand a high durability and resiliency of the interior while still being appealing and adaptable. The impact of mobility trends and the dynamic in the ever-changing needs of customers means that a focus on vehicle interiors is necessary for original equipment manufacturers. (Möller et al., 2021) Environmentally friendly interiors are expected to contribute to decarbonization goals. Ecological sustainability, including interior is increasingly demanded by customers. Consumers are becoming more aware of the effects of climate change. Therefore, they expect producers to change their behavior and

thinking as well. (Taylor-Smith, 2021) When it comes to implementation, two features are of importance. The first is materials from environmentally compatible sources and the second is lightweight materials. (Gosh et al., 2019), (Fisher, 2022) Novel and environmentally friendly materials are already playing a significant role in vehicle interiors. There is a chance that the interior will be made entirely of natural materials by the end of this decade. These are also increasingly requested by high-end customers to emphasize their individual lifestyles. According to McKinsey, customers consider sustainable materials to be the future, high-end and modern. (Möller et al., 2021)

In this context, the biggest industrial challenge for automotive manufacturers is to find high quality materials that can also be produced in large quantities. Researchers are tasked with determining whether the design of new materials should differ from that of traditional materials to meet evolving customer expectations. (Alfuraty, 2020)

2.3. Use of textiles in the automotive industry

Textiles in the automotive industry are referred to as automotive textiles or transport textiles. Automotive textiles include all types of fibers, filaments, yarns, and fabrics in various structures that are used in the transportation industry and belong to the group of technical textiles. (Patnaik, 2019) They can be classified into four categories, including comfort, aesthetics, safety, and specific material properties. Comfort includes physical and physiological aspects of textiles, such as in seats and vehicle interiors. The aesthetics of automotive textiles also play a major role in vehicle interiors. (Kiron, 2022) Automotive textiles can also be divided into visible and concealed components. Visible textile components include upholstery, carpets and covers, which play an important role in terms of aesthetics. Tire cord, composites and airbags are referred to as concealed components. These are not visible from the outside and have important functional properties. (Khatkar et al., 2020) Automotive textiles can appear as woven, knit, nonwoven, coated, laminated or other. The method of manufacture does not play a role in the classification. Likewise, these textiles can be made from natural or synthetic fibers. Commonly used synthetic fibers include acrylic, nylon, polyester, and polypropylene. Examples of natural fibers include wool, hemp, flax, kenaf, and sisal. (Patnaik, 2019), (Ahmad, 2020)

The changes in owners' lifestyles have also triggered a shift in the design of vehicles. Despite many innovations in the automotive industry, large amounts of non-renewable resources are consumed. Recycled materials can suffer from a quality deficit making their usage less desirable. This has led to the use of new materials being used or old materials being given a new use. The focus is on replacing environmentally harmful materials with less harmful materials. (Burgess, 2016)

Natural fibers come to mind first. These have a decisive advantage over petroleum-based materials because the base material is biodegradable. Natural fibers can come from animal or plant sources, but not every natural fiber is ecologically harmless. Cotton cultivation, which requires large amounts of water and pesticides, serves as negative example. Furthermore, large amounts of water and chemicals are also used in the further processing of cotton, such as in the dyeing of fibers. (Suárez Garía et al., 2021) Textiles also serve as material for leather alternatives. Materials like “Nordico” or “Piñatex” are more sustainable alternatives to leather. (Magnusson, 2022), (Meyer et al., 2021) Also, synthetic and regenerated fibers can be offered in a sustainable alternative. Therefore plastic “waste” or cellulose based fibers from different sources get either mechanically or chemically recycled. (Egan and Salmon, 2022) These different materials are used in different interior applications already. Mainly for seat covers, roof liners, carpets, or door panels. (Albini et al., 2019) The remaining research questions are, how do customers perceive these materials, what are their baseline requirements and how can these information be integrated in an interior design framework?

2.4. Data-Informed Design

The field of design for sustainability (DfS) methods is quite mature with over 75 methods floating around, but the uptake in industry is quite slow. (Arnette, 2014), (Schöggl et al., 2024). Just to name a few methods: Design for manufacturing, Design for recyclability, Design to minimize material usage, Design for durability, Design for energy efficiency or vehicle design for end-of-life are known since for a long time. (Mayyas et al., 2012) Schöggl et al. investigated the main barriers to sustainable and circular product design. They compiled 15 main barriers which hinder a comprehensive implementation of DfS

methods. One of these is the uncertainty and missing customer demand. (Schöggel et al., 2024) The customers are not able to express their real demands.

Data-Informed Design (D-I-D) can aid in this regard as a design methodology underpinned by data and insights. The objective of D-I-D is to drive decision-making in the design and development of products, services, and systems through a thorough understanding of available data. As data becomes more accessible and analytical capabilities advance, this process is gaining in significance. Data-Informed Design can help within a DfS framework to identify patterns and trends as well as to make predictions about future trends. This can help designers and engineers to create products that are better aligned with the needs and wants of their customers. The data can also be used to test and validate design decisions, providing a more objective basis for making design choices at very early stages of product development. It's important to note that while data can inform design decisions, it should not dictate them. Designers must use their expertise and intuition to find creative solutions that align with the project's goals while using data as a tool to support those decisions. (Diels et al., 2022), (Kvan, 2020) The study of Schöggel et al. shows that there is a research gap in a reliable customer sustainability data set.

3. Methodology

This paper is based on a qualitative and quantitative research methodology, investigating customer perception and wishes regarding sustainability in electric cars. In the qualitative research, structured interviews were conducted sitting in an electric vehicle with the aim of recording the impressions of the interviewees and drawing possible conclusions for the following quantitative research. The quantitative research was conducted with the help of an online survey tool to obtain generalizable information from a bigger quantity of people.

The qualitative research part should show the positive and negative impressions of the participants in an electric vehicle with sustainable interior. The interviews were conducted with just a small sample group to gather first insides as baseline for the later quantitative research. The exploratory study is evaluated inductively by means of descriptive statements. Subsequently, the result is interpreted and is context sensitive. The "Qualitative Content Analysis" according to Mayring was used, which assigns categories to the given statements following Mayring's approach of Paraphrasing, Coding, First reduction and Second reduction (example given in chapter 4). (Mayring, 2000) It should be noted that the focus here is on the elaboration of relevant content and resulting text evaluations. The data collected is therefore not quantifiable. The present research was conducted sitting in a vehicle (Volkswagen ID.3), which fulfils the proximity to the subject matter. The natural environment of the interviewees was also considered. Thus, the structured interviews were handled in the residential area of the participants. The research question was: "How do potential customers perceive the sustainable interior of an electric car?". 16 questions were asked during the interview (see Tab. 1) To minimize the bias by the researchers already during the interview questions formulation they were purposely elaborated quite generally.

Following the qualitative research and establishing a customer baseline, the gathered information were transferred to the quantitative research which was performed to further address the research topic of reducing the uncertainty regarding customer expectations for a sustainable car interior design. For this quantitative research a positivist methodology was chosen because sustainable interiors already exist in electric cars.

The positivist approach gets often applied by natural scientists. Observations are elaborated and related to the generality. To produce credible data, only observable phenomena are consulted for research. Positivist research is conducted in a largely value-free and unbiased manner. The focus is on measurable observations that can then be statistically analyzed. The phenomenological paradigm emerged from interpretivism and relates to understanding human behavior. As a result, the challenge is that in an interpretivist approach, the researcher must take an empathetic position and should understand the research subjects' point of view. (Saunders, 2009) The researchers are aware that even though applying a positivist approach due to the performed transfer from the qualitative to quantitative research by applying Mayring's Content Analysis an introduced bias by the researchers cannot be fully ruled out. With this deductive approach the interests, experiences, and requirements of customers in the automotive industry with regard to sustainable textiles in electric cars were explored in a survey. Data was collected through an online survey tool "empirio". The questionnaire was elaborated based on a

comprehensive literature review and the interview results. It includes 16 closed questions (see Tab. 1), which had several answer choices represented by a Likert scale. Expressions were used in the form of fully verbalized scales and are based on the positive and negative impressions given during the qualitative interview. This form of scale leads to easier completion of the questionnaire for the participant. Reliability is higher with fully verbalized scales, compared to endpoint-named scales, where only the outermost points of the scale are verbalized.

Table 1. Questions for qualitative and quantitative study

Qualitative Study	Quantitative Study
What was the first thing you looked at when you got into the vehicle?	To what extent do you agree with the following statements? E.g. I try to take sustainability into account in my purchasing decisions
How would you describe the design of the vehicle?	How important are the following aspects to you when buying a vehicle? E.g. Body, Interior, Performance
What do you like the most and what are the things you do not like so much?	Assuming you are interested in an electric car, how important are the following aspects in terms of the vehicle interior to you? E.g. Sustainable materials, design, feel of materials
Would you think that the materials used are sustainable and/or environmentally friendly and why (not)?	Are there certain things that often bother you in vehicle interiors? If so, which?
If you were to buy an electric car, would it be important to you that the materials are environmentally friendly and/or sustainable and why (not)?	To what extent do you agree with the following statements? E.g. sustainable materials are modern and future-oriented
What do you imagine a sustainable vehicle interior to be?	How do you rate the importance of sustainable materials in vehicle interiors in the future?
Would you say that the theme of sustainability is reflected in the look of the vehicle interior?	What characterizes sustainable design in vehicle interiors for you? E.g. high quality, timeless design
Would you like the topic of sustainability to also be visually noticeable in the vehicle interior?	How likely do you think it is that the following trends will prevail? E.g. natural fiber materials instead of plastic
What is particularly important to you with regard to the textile vehicle interior?	Which components would you rate more important to be sustainable?
How would you describe the materials used?	Which interior modules would make sense to you to be sustainable?
How do the car seat covers affect you? (such as comfort, feel, look, quality...)	Which are your preferred optics in a sustainable vehicle interior?
Do you think that the sustainable materials tend to be more expensive and would you be willing to pay more for them?	Rate how relevant these characteristics are for you: appearance, feel, smell, quality, comfort, individuality, security
Would you say that the sustainable materials are visually indistinguishable from non-sustainable ones?	Which of these materials do you think has the potential to be sustainable?
Would you say that the sustainable materials are haptically indistinguishable from non-sustainable ones?	Which of these more sustainable materials sound most interesting to you?
Would you say that the sustainable materials appear to be of higher quality than non-sustainable materials that you know from other vehicles?	Would you be interested in more information about sustainably produced components in the electric vehicle (e.g. through seals or labels)?
Would you accept a reduction in quality for the use of sustainable interior materials?	Would you be willing to pay a surcharge for a sustainable vehicle interior in the electric vehicle?

4. Results

The qualitative research was conducted in a neighborhood of a residential area in Germany. A Volkswagen ID.3 electric car was rented to interview participants on site. A total of seven people took part in the interviews, five male and two female with an average age of 48 years. The interview participants were asked to enter the car one by one to get acquainted with the interior and the materials used. During the interviews, the participants were asked the questions of the interview sheet chronologically, so that there was little room for other topics. Applying the principle of Mayring a total

of eleven categories were formed: (C1) First impressions, (C2) Describing the interior design, (C3) Evaluation of the interior, (C4) Imagination of sustainable interior, (C5) Relevance of sustainable interior when buying an electric car, (C6) Visual aspects of sustainable interior, (C7) Textiles in car interiors, (C8) Prices and willingness to pay, (C9) Differences between sustainable and conventional materials, (C10) Quality of sustainable materials and acceptance of quality losses, (C11) Further notes. (Coding example in Fig. 1). For the scope of this paper to answer the research question of reducing the uncertainty of customers' expectations regarding sustainable car interiors the categories C4, C5, C6, C7 and C10 get further investigated.

Case	No.	Paraphrase	Generalization	Code	Reduction
1	1	<i>Where is the gearshift hidden?</i>	The gearshift lever was missed when getting in.	C1: First impressions	Gearshift lever is missing.
1	2	<i>Spartan, simple, okay</i>	The found interior is perceived as spartan and simple.	C2: Describing the interior design	The design is spartan and simple.
1	3	<i>Positive: the large display center. Negative: Gearshift lever behind the steering wheel.</i>	The display center was particularly appealing. On the other hand, it was noticed negatively that the shift lever is behind the steering wheel.	C3: Evaluation of the interior	The display looks good, but the hidden gearshift is not.
1	4	<i>No, because everything looks like plastic</i>	It is not assumed that the interior is sustainable because there is a lot of plastic.	C4: Imagination of a sustainable interior	Because of the plastic, it is not assumed that the interior is sustainable.
1	5	<i>No, the emissions decide. A car is not sustainable anyway.</i>	It is not important that sustainable materials are used in the electric car, because a car is not sustainable from the ground up.	C5: Relevance of sustainable interior when buying an electric car	Sustainable materials are not a must in an electric car.

Figure 1. Coding example according to Mayring's principle

For the purpose of the paper an extract of the results will be presented. Within category C4: "Imagination of a sustainable interior" six of the seven interviewees did not think the interior in the VW ID.3 was sustainable. Their assumption was that the high percentage of plastic parts cannot be sustainable. Plastic as a synthetic material obviously do not convey a feeling of sustainability to the customer. Four of seven interviewees imagine a sustainable interior is using recyclable materials or using renewable raw materials, such as wood. One of the interviewees also imagines that natural materials should be used such as wool or raffia. In addition, according to the interviewees, the materials should be easily separable and no composite material, stated another interviewee. Regarding the design, an interviewee imagined brown and natural tones for a sustainable interior but did not indicate whether this would also appeal. Another one stated that a sustainable interior could look like the interior of the ID.3. Interviews revealed that the interviewees would like to get information from manufacturers about the sustainability of the products. Information about the CO2 emissions from production and seals or labels that indicate the sustainability of the components used in the interior.

For C5: "Relevance of sustainable interior when buying an electric car", the interviewees were asked if it would be important to them that the materials are environmentally friendly and/or sustainable when buying an electric car. Basically, it can be stated that the tendency is towards sustainable interiors. Five of the seven interviewee indicated a positive tendency for a sustainable interior to play a role in the electric car. Three of the interviewees regard a sustainable interior as part of the overall concept. A sustainable interior is not a purchase criterion but would be preferable in the comparison of two products. Category 6: "Visual aspects of sustainable interior" focusses on sustainability in terms of whether it reflects in the appearance of the interior and whether the interviewees would like sustainability be reflected visually. Six of the seven interviewees stated that sustainability is not visually reflected in the

VW ID.3. These also stated that they would not want sustainability to be reflected in the appearance either. Declaration of sustainability through certificates or information brochures is desirable.

The usage of "Textiles in the car interior" is handled in category 7. To the interviewees functional aspects were most important for textiles in the interior, e.g., surfaces are insensitive and easy to clean. They pointed out that the textiles should be in plain colors or muted patterns. The most frequently mentioned factor is the importance of durability and longevity in the textiles used, which was stated as a condition of sustainability.

Within C10: "Quality of sustainable materials and acceptance of quality loss" participants always reflect to their experience with conventional materials. The participants in the interview were divided over the quality of sustainable materials. One of the interviewees is convinced that the materials in the ID.3 are of a higher quality than other known materials. Two others indicated that they did not believe that the sustainable materials in the found electric car were of higher quality than others. Two interviewees answered the question only in general terms. One believes that sustainable materials are not necessarily of higher quality and the other indicated that in his opinion, sustainable materials must be of high quality to be sustainable. Since the remaining two of the seven subjects did not answer the question, no trend can be determined. This disagreement was also visible for the acceptance of quality loss.

Based on these results and the underlying literature research the quantitative study was elaborated. The survey was conducted as a cross-sectional study. Only persons aged 18 and over were surveyed in the sample as it was assumed that younger persons would not buy a car, as the driving license is not recognized in Germany until the age of 18. A sample size of 106 participants was achieved with an average age of 39.59 years. Gender-wise the sample is balanced 50:50.

Firstly, the participants were asked regarding their general personal interest in sustainability. To the statement "I am interested in sustainability", 93.4% responded with a positive agreement (3 or higher/ tend to agree or better) (Mean = 1.99, StdDev = 1.0). Only 6.6% of respondents indicated that they were rather not interested, not interested, or not interested at all in sustainability. When secondly asked if the respondents think it is important that companies act sustainably, 85.85% respond with agreement (M = 1.75, SD = 0.90). A full 45.28% of respondents strongly agreed. There is a tendency for sustainability to be most important to the youngest age group.

Afterwards the survey shifted focus to electric vehicles. Survey participants were asked about the importance of various purchasing aspects (body, interior, performance, type of drive, technical equipment, manufacturer, quality, price). They were able to rank these from "very important" to "not important at all". The interior can be seen as a relevant aspect when buying a vehicle (M = 2.17, SD = 1.03). A full 39.62% of respondents indicated that the interior is "important" when buying a car. By further 28.3% it is rated as "very important". The interior is rather more important to men than to women, but the difference is small. Tendentially, significantly more 20- to 29-year-olds (12.26%) than the older age groups voted that the interior is an important aspect when buying a car.

To go more in detail the participants were asked how important the use of sustainable materials would be if they aim on buying an electric car. The use of sustainable materials is already important to most respondents (36.79%) when buying an electric car (M = 2.75, SD = 1.33). However, many respondents also indicated that it is rather important to them (27.36%). The result is that most respondents find it important, but it probably is not a decisive argument for or against the purchase of an electric car. About one fifth of the respondents would rather not think that it is important or not important (21.7%). In general, sustainable materials are perceived as "modern and future-oriented" by the participants (M = 2.04, SD = 1.04), but the participants show an imbalanced opinion if sustainability should be distinguishable to conventional material. Most respondents agreed (30.19%) or rather agreed (28.30%) (M = 2.47, SD = 1.18). However, 17.92% also showed rather disagree or disagree. Contrary to the interviews the study participants clearly state that sustainable materials should be of the same quality or even higher than conventional materials (M = 1.85, SD = 0.95). The next point of interest was the design of a sustainable interior. Therefore, a question about the characteristics of sustainable designed interior was asked. The respondents rated the characteristics "use of sustainable raw materials", "free of harmful substances" "produced in a resource-saving way" and "recyclable materials" highest. A functional design was rated lowest (see Fig. 2).

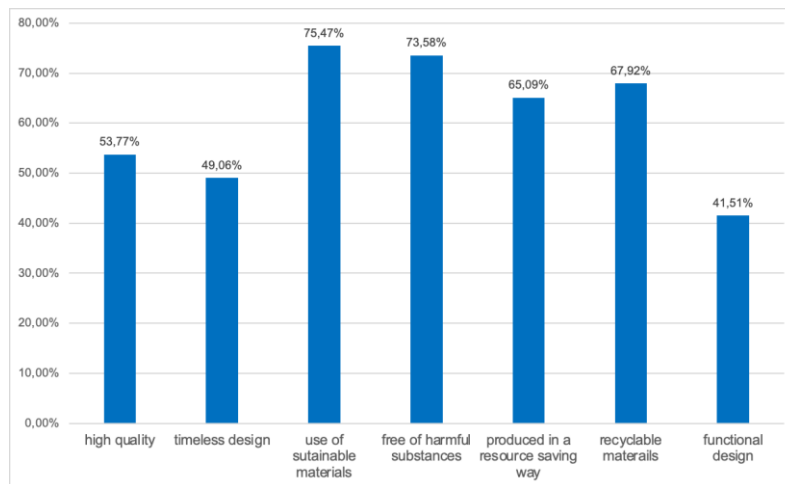


Figure 2. Characteristics of sustainable interior design

This sustainable design should be optically “classic & simple” (65.09%) and not “futuristic & innovative” (27.36%) or with “natural tones & natural in itself” (7.55%).

The participants also do have a clear picture which interior modules should be sustainable and which materials could be used. The seat covers and the car carpets were selected by most respondents and received 86.79% of the votes each. The roof lining was second with 81.13%. Material-wise the respondents consider natural fibers (86.79%) as the most sustainable material followed by wood (54.72%). (see Fig. 3)

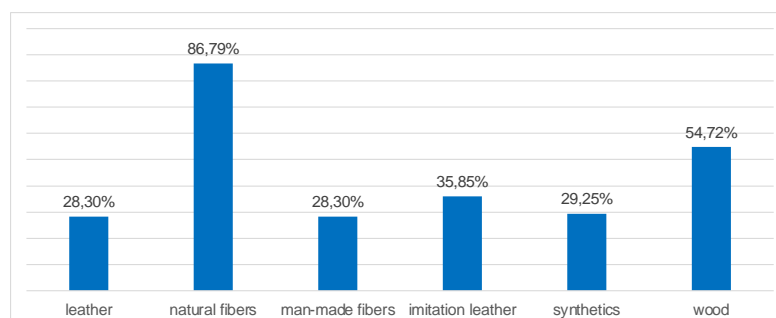


Figure 3. Materials of sustainable interiors

5. Discussion and conclusion

The research aim of this study was the reduction of uncertainty regarding customer requirements to sustainable interiors in electric vehicles and to establish a corresponding data set for a Data-Informed Design approach. Vehicles should fit the new cultural, economic, and environmentally conscious lifestyle of consumers. The qualitative and quantitative research implies that consumers view the vehicle as a whole and sustainable interior is important to meet customer demands. The automotive industry faces developments that bring new opportunities and challenges: e-mobility, shared mobility, and autonomous driving. These developments influence the future driving experience and demands of customers. Especially, driving experience and interior become more relevant to customers and offer potential for manufacturers to differentiate (Möller et al., 2021). The automotive industry already uses existing materials, e.g., natural fibers as well as newly developed materials, that are lighter and less harmful to the environment. The research at hand has shown that potential customers of electric cars on the German market are not averse to a sustainable interior. According to the findings, the sustainability design should aim for the entire vehicle to be sustainable. The key findings reducing the uncertainty of this sustainability car interior data set are:

- Taking automotive sustainability into account the interior plays a major role for the sustainability assessment.

- In general, sustainable materials are perceived as future-oriented, but they should be design-wise indistinguishable from conventional materials.
- These materials should be at least of the same quality (Durability, longevity, and wear resistance) as common materials.
- Visually, a classic and simple interior design is preferred.
- Natural tones are less demanded in the interior.
- Materials play an essential role. Sustainable design should use sustainable and pollutant-free raw materials, the use of recycled materials and through resource-saving production.
- No plastics, but natural fibers. Start with seat covers, carpets and roof linings.

All these customer information are of great importance for the future design of sustainable interiors and therefore need to be integrated as one data-set in a Data-Informed Design approach. The aim of Data-Informed Design is to provide design practitioners with a solid foundation to make informed decisions, and to bring a level of objectivity to the design process. It's important to note, that Data-Informed Design strikes a balance between using data to inform design decisions and allowing designers to use their expertise and intuition to create meaningful and engaging products. At the same time, by introducing more objectivity into the design decision-making process, design management can make more informed and strategic decisions about the direction and development of projects. This can lead to more effective and efficient design processes, and ultimately, to better products and services for customers. The introduced data set needs to be further validated and expanded to different customer regions. With the automotive industry as being a role model for different other industries, the research findings are eligible to be transferred to other design areas. The design of private and public furniture, aviation seats or even fashion can benefit from these results.

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