BIOTEXFUTURE

CONSUMER PERCEPTIONS OF BIOPOLYMER-BASED GARMENTS

INSIGHTS FROM FIVE EMPIRICAL STUDIES

REPORT NO. 2 – JULY 2021

CONTENTS

The **goal** of this research is to investigate consumer perceptions of biopolymer-based garments by conducting five empirical studies

ABOUT THIS RESEARCH

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THIS STUDY PRESENTS FINDINGS FROM FIVE EMPIRICAL STUDIES CONDUCTED WITHIN A RESEARCH PROJECT AT THE UNIVERSITY OF BAYREUTH

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Research context

- This research is part of the 'Universität Bayreuth Workstream' within TransitionLab, a project within BIOTEXFUTURE.

- BIOTEXFUTURE is a 5-year, cross-industry R&D program, funded by the Federal Ministry of Education and Research (BMBF), focusing on transforming the textile industry from petrol- to biobased (>20 partners).

- BIOTEXFUTURE is jointly led by RWTH Aachen University and adidas.

Goal

The goal of this research is to examine consumer perceptions of biopolymer-based garments by conducting five empirical studies.

What does 'bio-based' mean?

Biobased materials are 'wholly or partly derived from biomass, such as plants, trees or animals (the biomass can have undergone physical, chemical or biological treatment)'.* Materials derived from fossil sources are excluded.** Biobased materials are not necessarily biodegradable.

Sources: *European Commission,
** Biofabricate & Fashion for Good 2020 (Understanding "bio" material innovations: a primer for the fashion industry)

Methodology***

- **Study 1:** Linear regression analysis, quantitative online survey (n=441)

- **Study 2:** Mean comparisons (Kruskal-Wallis tests), online experiment with between-participant design (n=329)

- **Study 3:** Kano method, quantitative online survey with between-participant design (n=407)

- **Study 4:** Maximum difference scaling experiment, quantitative online survey (n=372)

- **Study 5:** Kano method, quantitative online survey (n=156)

*** In the Appendix, you will find more details on the five studies.

Limitations & future research opportunities

- Most studies are based on student samples. Future studies should use a broader sampling approach to increase generalizability.

- Studies in the context of sustainability and bio-based products often suffer from a social desirability bias. Future research is needed to further validate our initial findings.

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

RESULTS

When purchasing biopolymer-based garments, established brands do not have a 'brand advantage'

If the price is not too high, the main purchase barrier for consumers is their current lack of knowledge

When product descriptions about environmental facts are lacking, consumers are most likely to become dissatisfied

A corporate sustainability label can enhance purchase intention for biopolymer-based textiles

A very promising incentive for consumers to return their used clothing is when brands donate to charity

IMPLICATIONS

Keep in mind that market entry barriers for new/unknown brands are decreasing, as consumers are not necessarily loyal to familiar brands when purchasing biopolymer-based products

Provide transparent and authentic information on biopolymer-based products to drive consumers' purchase decisions

In order to avoid negative consumer reactions, provide information on how materials of biopolymer-based garments are made and where they come from
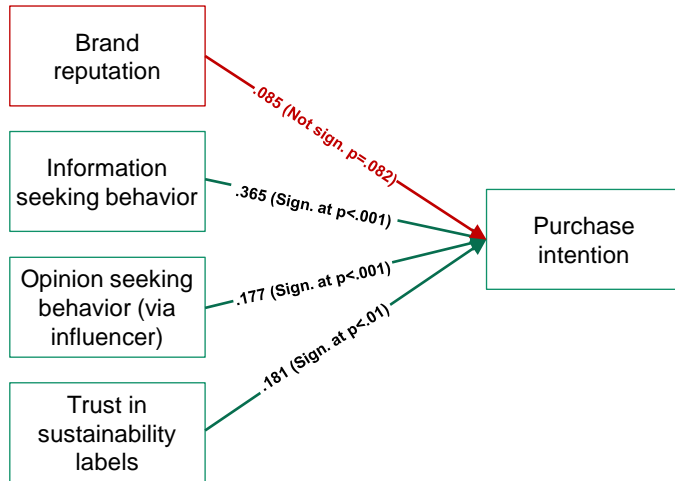
Use a meaningful sustainability label to mark biopolymer-based products as such

To successfully implement a circular business model, create effective incentives for consumers to return their used clothing that combine both a monetary as well as a social component

DETAILED RESULTS

WHEN PURCHASING BIOPOLYMER-BASED GARMENTS, ESTABLISHED BRANDS DO NOT HAVE A 'BRAND ADVANTAGE'

WHAT DETERMINES CONSUMERS' PURCHASE INTENTION FOR BIOPOLYMER-BASED TEXTILES?

Brand reputation → .085 (Not sign. p=.082) → Purchase intention

Information seeking behavior → .365 (Sign. at p<.001) → Purchase intention

Opinion seeking behavior (via influencer) → .177 (Sign. at p<.001) → Purchase intention

Trust in sustainability labels → .181 (Sign. at p<.01) → Purchase intention

n=441, Study 1 (Online panel sample, 50% female, age mean 30.2; for further information on study details, please see Appendix)

Research context

- Participants were asked how likely they are to purchase biopolymer-based textiles

- We explored the influence of brand reputation (we used adidas as example for a brand with established brand reputation), consumers' information seeking behavior, consumers' opinion seeking behavior, and consumers' trust in sustainability labels on purchase intention

KEY RESULTS

- Brand reputation has no influence on consumers' purchase intention for biopolymer-based garments. In simple words, when purchasing biopolymer-based garments, established brands do not have a 'brand advantage' compared to new/unknown brands.

- Consumers' proactive search behavior for information on biopolymer-based garments (e.g., in product descriptions, blogs) strongly determines their purchase decision. Therefore, transparent as well as authentic information provided by retailers and manufacturers can be decisive for making (or not making) a purchase.

- Consumers also rely their purchase decision on external sources such as sustainability labels/certifications as well as influencers' opinions, yet their impact on consumers' purchase decision seems to be smaller than information provided by retailers or manufacturers.

- Further research is needed to better understand these influences.

IF THE PRICE IS NOT TOO HIGH, THE MAIN PURCHASE BARRIER FOR CONSUMERS IS THEIR CURRENT LACK OF KNOWLEDGE

TOP 3 BARRIERS TO PURCHASING BIOPOLYMER-BASED PRODUCTS

Top 3 (out of 14 possible) barriers to purchasing biopolymer-based products checked across four of our studies

- **Study 1**
  1. **Lack of knowledge**
  2. **Habit**
  3. **Too expensive**

- **Study 2**
  1. **Lack of knowledge**
  2. **Too expensive**
  3. **Habit**

- **Study 3**
  1. **Too expensive**
  2. Limited choice
  3. Lack of aesthetics

- **Study 4**
  1. **Too expensive**
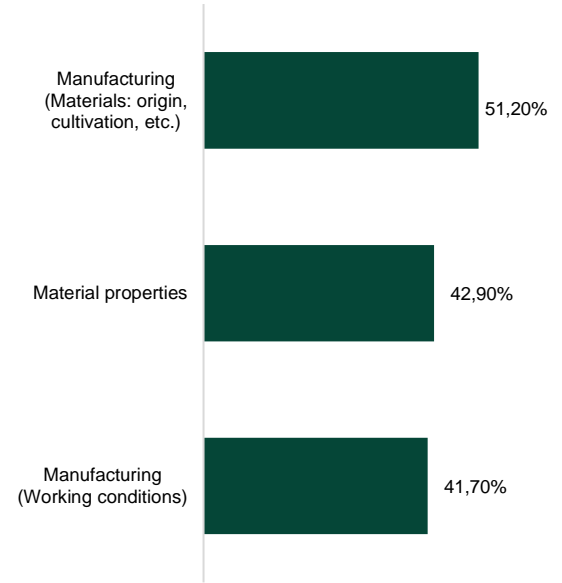 2. **Lack of knowledge**
  3. Lack of longevity

PREFERRED INFORMATION SOURCE

Source	Value
Product description	56,20%
Label	47,20%
Video	32,20%
Influencer	7,50%
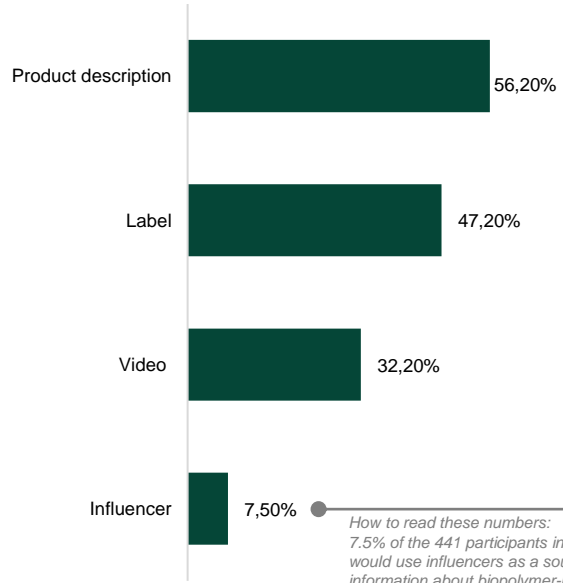
How to read these numbers: 7.5% of the 441 participants indicated they would use influencers as a source of information about biopolymer-based products

n=441, Study 1 (Online panel sample, 50% female, age mean 30.2; for further information on study details, please see Appendix)

PREFERRED INFORMATION CONTENT

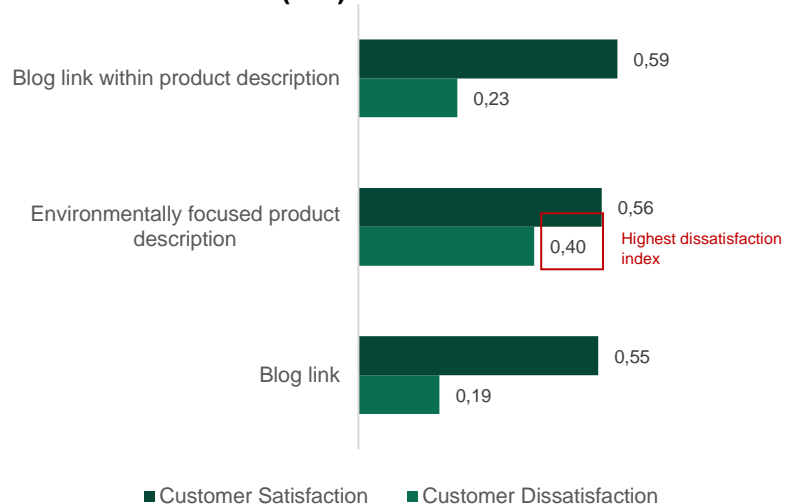| Content	Value
Manufacturing (Materials: origin, cultivation, etc.)	51,20%
Material properties	42,90%
Manufacturing (Working conditions)	41,70%

n=441, Study 1 (Online panel sample, 50% female, age mean 30.2; for further information on study details, please see Appendix)

WHEN PRODUCT DESCRIPTIONS ABOUT ENVIRONMENTAL FACTS ARE LACKING, CONSUMERS ARE MOST LIKELY TO BECOME DISSATISFIED

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EFFECT OF DIFFERENT INFORMATION SOURCES ON CONSUMER SATISFACTION

Which type of information source increases customer (dis-)satisfaction the most?

Blog link within product description
- 0,59
- 0,23

Environmentally focused product description
- 0,56
- 0,40 — Highest dissatisfaction index

Blog link
- 0,55
- 0,19

■ Customer Satisfaction ■ Customer Dissatisfaction

n=407, Study 3 (German student sample, 58.2% female, age mean 24.9;
for further information on study details, please see Appendix)

Research context

- Participants were randomly assigned to different fictitious online shop scenarios, each showing different information sources (blog, influencer content, product description) with varying length, content, and position within the online shop

- In total, participants were asked about the effect of presence and absence of 33 different information sources on their satisfaction

KEY RESULTS

- Blogs and product descriptions addressing environmentally friendly aspects as well as the benefits of biopolymers have the potential to educate the mainstream consumer and encourage the formation of positive attitudes for future purchases

- At the same time, the absence of an environmentally focused product description triggers consumer dissatisfaction the most

- Further research should contribute to a detailed understanding of the most optimal communication content, scope, and granularity of information, depending on the information channels

A CORPORATE SUSTAINABILITY LABEL CAN ENHANCE PURCHASE INTENTION FOR BIOPOLYMER-BASED TEXTILES

EFFECT OF THIRD-PARTY CERTIFICATIONS AND LABELS ON PURCHASE INTENTION

"I would purchase this sneaker if I happen to see it in an online shop"

Sign. diff. (p<.01)

- Corporate label
- Third party certification
- No label/certification
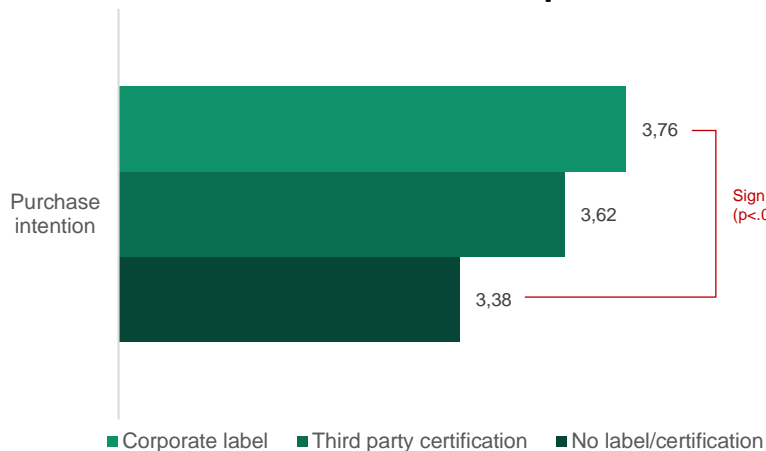
n=329, Study 2 (German student sample, 60.8% female, age mean 28.5; for further information on study details, please see Appendix), Significance levels for pairwise comparisons were adjusted (Bonferroni)

Research context

- Participants were randomly assigned to one of three different fictitious online shopping scenarios exhibiting biopolymer-based sneakers, each certified a with different label:

  1. **Corporate label (adidas: End Plastic Waste)**

  2. **Third party certification (Blauer Engel)**

  3. **No label/certification (Control group)**

- We then inquired their likelihood of purchasing the biopolymer-based sneaker ("I would purchase this sneaker if I happen to see it in an online shop" from 1=extremely unlikely to 5=extremely likely)
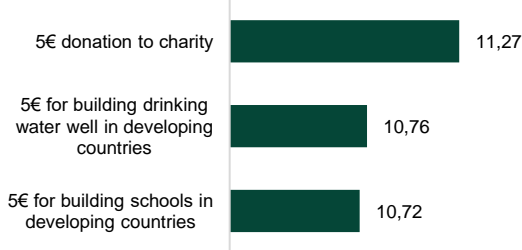

Corporate label used as an example in the study

KEY RESULTS

- A corporate label can significantly increase consumers' purchase intention for biopolymer-based sneakers compared to sneakers without any label or certification

- In contrast, a third-party certification does not necessarily enhance consumers' purchase intention for biopolymer-based products compared to products without any label or certification

- It remains unclear whether it is the corporate label's message (End Plastic Waste) or another aspect, such as the label's modern design appeal, to increase consumers' purchase intention

- Further research is needed to better understand the underlying mechanisms of labels' influence on consumer perception and behavior

A VERY PROMISING INCENTIVE FOR CONSUMERS TO RETURN THEIR USED CLOTHING IS WHEN BRANDS DONATE TO CHARITY

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WHAT MOTIVATES CONSUMERS TO RETURN THEIR USED GARMENTS TO MANUFACTURERS?

Relative importance of incentives (Top 3)

Incentive	Value
5€ donation to charity	11,27
5€ for building drinking water well in developing countries	10,76
5€ for building schools in developing countries	10,72

n=372, Study 4 (International student sample, 58.3% female, age mean 25.5; for further information on study details, please see Appendix)

Research context

- Participants were repeatedly asked to choose the best and the worst incentive from a selected choice set of different incentives out of a total of 15 incentives

Which type of incentive increases customer (dis-)satisfaction the most? (Top 3)

Incentive	Customer Satisfaction	Customer Dissatisfaction
10€ voucher	0,86	0,21
Donation to charity	0,82	0,38 — Highest dissatisfaction index
15% discount	0,81	0,16

■ Customer Satisfaction ■ Customer Dissatisfaction

n=156, Study 5 (Sportsmen sample, 60.3% male, age mean 25.6; for further information on study details, please see Appendix)

Research context

- Participants were asked about the effect of presence and absence of 11 different incentives on their satisfaction

KEY RESULTS

- Socially oriented and monetary incentives are the best option to motivate consumers to return their used garments (e.g., donations to charity, building drinking water wells, building schools in developing countries)

- Of all incentives considered, consumers are most likely to become dissatisfied when a donation to charity is lacking

- A promising approach could be to offer consumers the option of choosing between social and monetary incentives

- Further research is needed to better understand the drivers (and underlying mechanisms) of consumers' motivation to return their used clothing

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APPENDIX

METHOD
QUANTITATIVE ONLINE SURVEY - LINEAR REGRESSION ANALYSIS

SAMPLE

- n=441
- **Gender:** 50% female, 50% male
- **Age:** Mean 30.2 (SD 5.3), Min. 16, Max. 39, Median 30
- **Education:** 62.5% Bachelor's degree
- **Job:** 47.8% employees, 10.9% students
- Data collection via an **online panel**

RESEARCH QUESTION(S) AND DESIGN

- Research question: Which factors influence the purchase intention for biopolymer-based textiles?
- Dependent variable: purchase intention for biopolymer-based textiles
- Independent variables: Brand reputation, information seeking behavior, opinion seeking behavior (via influencers), trust in sustainability labels

DATA ANALYSIS

- Confirmatory factor analysis in R
- Linear regression analysis in SPSS

LIMITATIONS & FUTURE RESEARCH

- Only respondents within the age range from 16 to 39 were considered
- Opportunities for further research include searching for further effects that may influence the purchase intention of biopolymer-based textiles (e.g., influence of non-profit campaigns/activism campaigns)
- Results indicate that nano and micro influencers are better suited for increasing awareness on biopolymer-based textiles, however, this was not specifically tested and could be a field for future research

STUDY 2

METHOD
ONLINE EXPERIMENT – CONFIRMATORY FACTOR ANALYSIS AND ANOVA

SAMPLE

- n=329

- **Gender:** 60.8% female, 38.9% male

- **Age:** Mean 28.5 (SD 10.7), Min. 16, Max. 73, Median 25

- **Education:** 61.4% Bachelor's degree

- **Job:** 68.4% students

- **Income:** 33% between 501 and 1,000 Euros, 21.3% less than 500 Euros

- Data collection at University of Bayreuth and via Social Media (convenience sample)

RESEARCH QUESTION(S) AND DESIGN

- Research question: Does the use of an official versus a corporate seal enhance the purchase intention for a biopolymer-based sneakers?

- 2 (attitude: positive versus negative) x 3 (seal: official versus coporate versus no seal) between-participant design

DATA ANALYSIS

- Confirmatory factor analysis in R
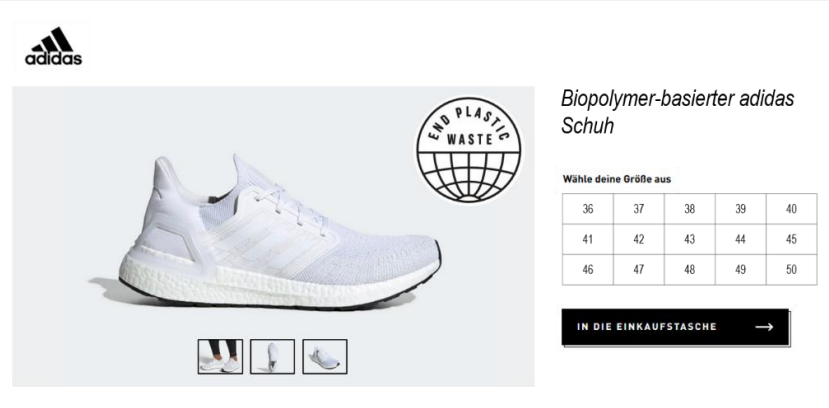
- ANOVA in SPSS

LIMITATIONS & FUTURE RESEARCH

- Use of a rather small and concentrated sample (limited generalizability)

- Use of running shoe as experimental stimuli: future research needs to confirm the effects across other product categories

- Future research might evaluate the effectiveness by changing the placement and/or design of the quality seal

IN OUR EXPERIMENT, WE USED THREE DIFFERENT SCENARIOS

Scenarios:

- Corporate label (End Plastic Waste)
- Third party certification (Blauer Engel)
- Control group (no label)

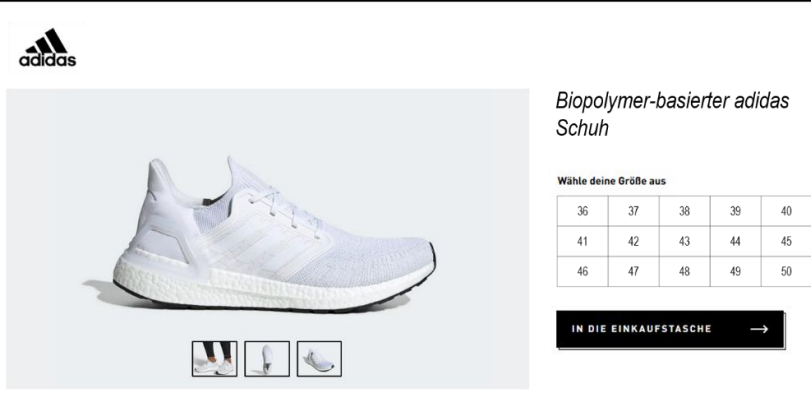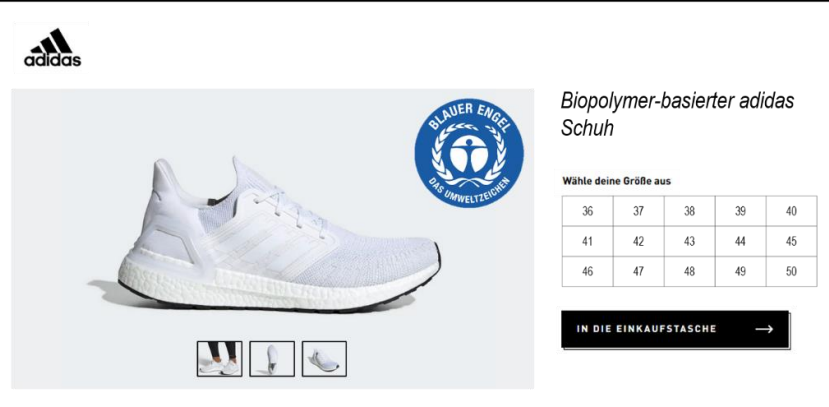STUDY 3

METHOD
QUANTITATIVE ONLINE SURVEY – KANO METHOD

SAMPLE

- n=407

- **Gender:** 58.2% female, 41.3% male

- **Age:** Mean 24.9 (SD 4.6), Min. 16, Max. 77, Median 24

- **Education:** 73.8% university degree

- **Job:** 87.5% students

- **Income:** 36.1% between 501 and 999 Euros, 28% less than 500 Euros

- Data collection at University of Bayreuth and via Social Media (convenience sample)

RESEARCH QUESTION(S) AND DESIGN

- Research question: Can content of influencers, product descriptions, or the integration of a blog in the adidas online shop enhance customer satisfaction and thus, help overcoming the attitude-behavior gap?

- Respondents were randomly assigned to differing presentation formats of the aforementioned features (content of influencers, product description, integration of a blog)

DATA ANALYSIS

- Kano method

LIMITATIONS & FUTURE RESEARCH

- Majority of the respondents were students from the University of Bayreuth (limited generalizability)

- Future research should provide ways of how to increase the awareness and knowledge of biopolymers in the apparel industry in general (for the mainstream consumer)

- Future research should focus on the opportunities of influencer marketing in this context

METHOD

WITHIN OUR SURVEY, WE ANALYZED THREE POTENTIAL FEATURES WITH DIFFERENT PRESENTATION FORMATS ADAPTED TO THE GENDER OF PARTICIPANTS

USE & ORDER of influencer content (e.g., in form of a picture with quote & at the end of the product preview)
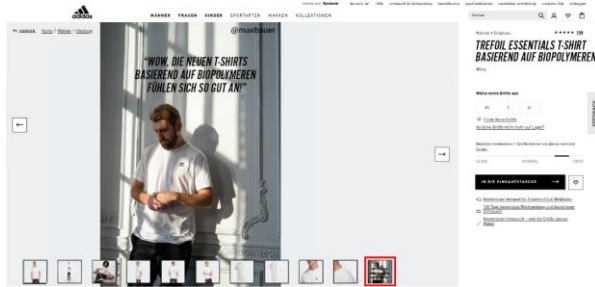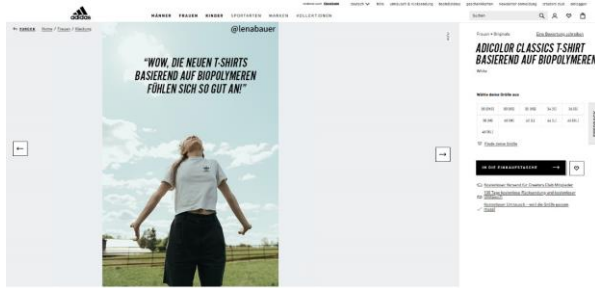
CONTENT & LENGTH of the product description (e.g., focusing on sustainability aspects & long text)

BLOG LINK & PREVIEW (e.g., mouse-over pop-up & continuous text)

RESULTS

BIOTEXFUTURE
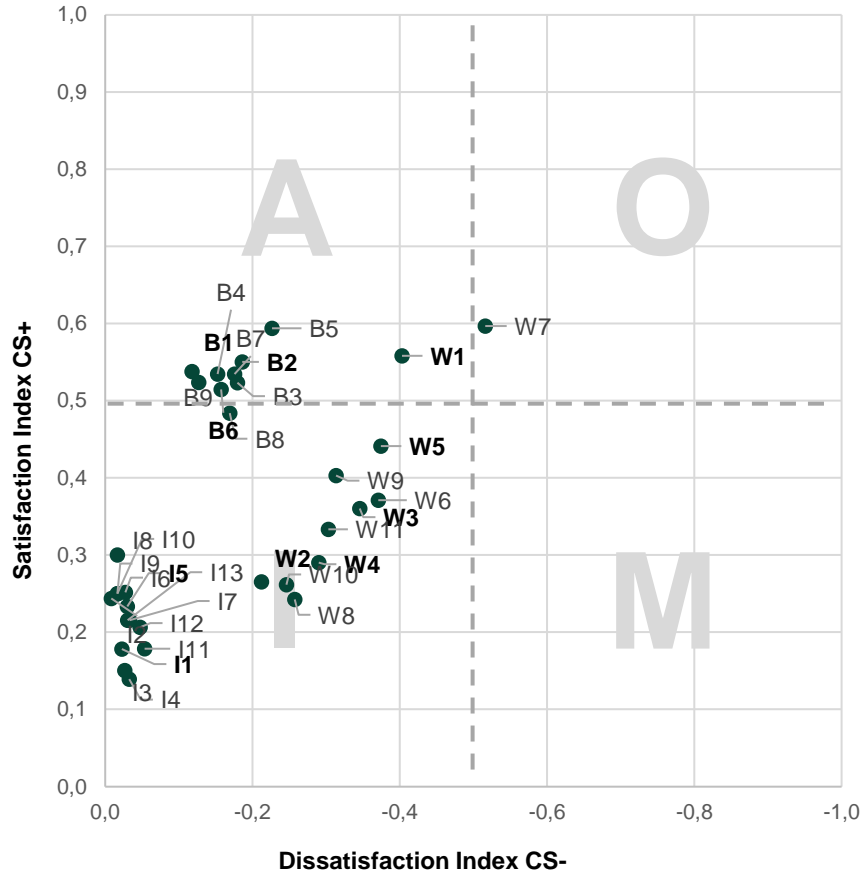
MI1	Influencer content		MW5	Product description long
MI2	Influencer pic		MW6	Product description, environmentally friendly, short
MI3	Influencer pic with quote		MW7	Product description, environmentally friendly, long
MI4	Influencer video		MW8	Product description, traditional, short
MI5	Photo preview of the Influencer content		MW9	Product description, traditional. long
MI6	Influencer content in the middle		MW10	Product description, mixed approach, short
MI7	Influencer content at the end		MW11	Product description, mixed approach, long
MI8	Influencer pic in the middle		MB1	Blog
MI9	Influencer pic at the end		MB2	Blog link
MI10	Influencer pic with quote in the middle		MB3	Blog link as product picture
MI11	Influencer pic with quote at the end		MB4	Blog link as pop-pp
MI12	Influencer video in the middle		MB5	Blog link within the description
MI13	Influencer video at the end		MB6	Blog preview of content
MW1	Product description environmentally friendly		MB7	Blog preview as title
MW2	Product description traditional		MB8	Blog preview as bullet points
MW3	Product description mixed approach		MB9	Blog preview as continuous text
MW4	Product description short			

STUDY 4

METHOD
QUANTITATIVE ONLINE SURVEY – MAXIMUM DIFFERENCE (MAXDIFF) SCALING

SAMPLE

- n=372

- **Gender:** 58.3% female, 41.7% male

- **Age:** Mean 25.5 (SD 8.6), Min. 11, Max. 65, Median 24

- **Job:** 51.1% students, 32.5% employees

- Data collection via Social Media (convenience sample)

RESEARCH QUESTION(S) AND DESIGN

- Research question: Which incentive does consumers motivate the most to return their used garments in order to enable a circular business model?

DATA ANALYSIS

- Anchored MaxDiff using probability scores with Sawtooth Lighthouse Studio

LIMITATIONS & FUTURE RESEARCH

- The sample mainly comprises students and younger generations, which does not completely cover all potential consumers

- Social desirability bias could have been an issue

- MaxDiff method is very time-consuming for respondents, which might lead to fatigue; thus, future research should focus on the most important items to encounter the exhausting and repeating character of the method

- There is no information about why certain items are more important than others → qualitative research necessary

METHOD
IN OUR MAXDIFF, WE USED FIFTEEN DIFFERENT INCENTIVES

Monetary Incentives
- 5€ voucher for sustainable products only
- 5€ voucher for all products
- 15% instant discount for in-store return
- 100 bonus points for the company's bonus system
- 5€ Refund

Raffle
- Participating in a raffle for a 100€ voucher
- Participating in a raffle for a meet & greet with a sports professional

Specials
- Pre-sale access (for new product launches)
- Goodies (e.g., a water bottle)

Return Logistics
- Free-of-charge return bag for used clothes

Social Incentives
- Plant a tree for every tenth returned item
- Supply of sport clubs with equipment
- 5€ for building schools in developing countries
- 5€ donation to charity
- 5€ for building drinking water well in developing countries

METHOD
... AND TEN ITEMS FOR THE COMMUNICATION CHANNELS

Website/App

- Information during purchase process in the online store/app (pop-up)
- Information on product pages in the online store/app
- Information on corporate website

In-Store

- Information via employee
- Information screens in stores

E-Mail

- Information in order confirmation
- Corporate newsletter

Social Networks

- Social media advertisements
- Information from influencers
- Social media posts on corporate accounts

RESULTS

RANKING OF INCENTIVES

Incentive	Score
5€ donation to charity	11,27
5€ for building drinking water well in developing countries	10,76
5€ for building schools in developing countries	10,72
5€ refund	10,36
Plant a tree for every tenth returned item	9,51
5€ voucher for sustainable products only	9,32
15% instant discount for in-store return	9,30
5€ voucher for all products	8,32
Free-of-charge return bag for used clothes	6,41
Supply of sport clubs with equipment	4,14
Goodies (e.g. a water bottle)	3,83
Participating in a raffle for a 100€ voucher	2,41
100 bonus points for the company's bonus system	1,64
Participating in a raffle for a meet & greet with a sports professional	1,50
Pre-sale access (for new product launches)	0,48

Research context

- The probability scores can be interpreted as the relative importance of each incentive (e.g., 5€ donation to charity (11.27) is almost twice as important as a free of charge return bag for used clothes (6.41))

RANKING OF COMMUNICATION CHANNELS

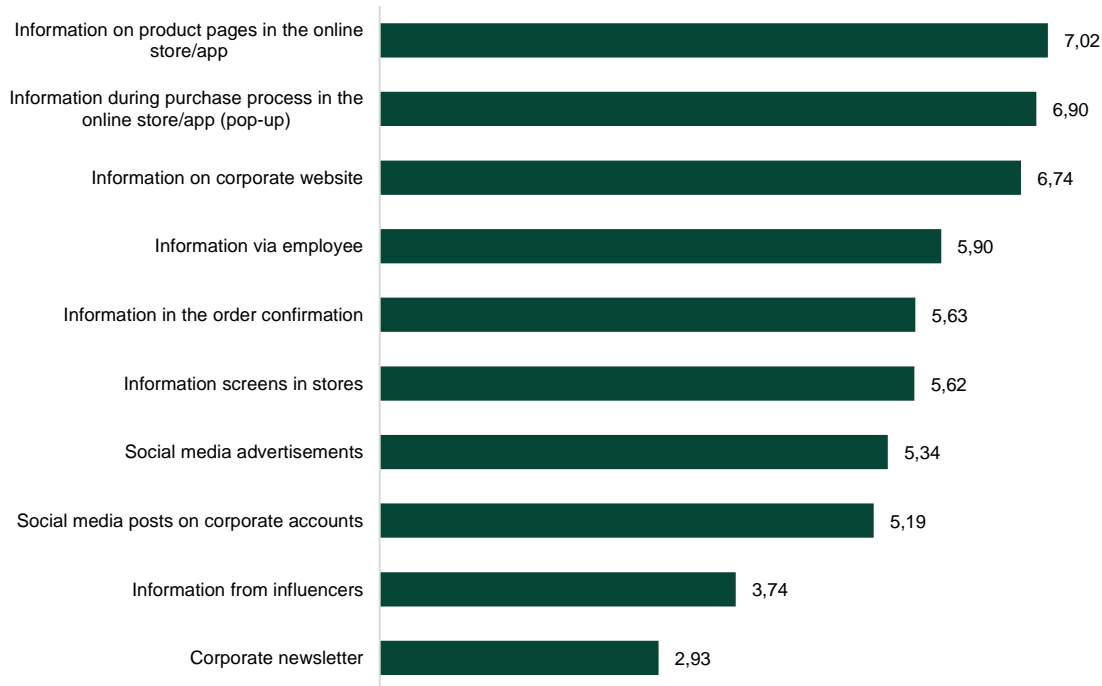| Channel	Score
Information on product pages in the online store/app	7,02
Information during purchase process in the online store/app (pop-up)	6,90
Information on corporate website	6,74
Information via employee	5,90
Information in the order confirmation	5,63
Information screens in stores	5,62
Social media advertisements	5,34
Social media posts on corporate accounts	5,19
Information from influencers	3,74
Corporate newsletter	2,93

Research context

- The probability scores can be interpreted as the relative importance of each incentive

STUDY 5

METHOD
QUANTITATIVE ONLINE SURVEY – KANO METHOD

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SAMPLE

- n=156

- **Gender:** 39.7% female, 60.3% male

- **Age:** Mean 25.6 (SD 8.0), Min. 15, Max. 58, Median 23

- **Education:** 39.7% high school diploma (A-levels), 22.4% Bachelor's degree

- **Job:** 46.2% employees, 34% students

- **Income:** 18.6% between 501 and 1,000 Euros, 17.3% less than 500 Euros

- Data collection at sports clubs via mail or Social Media

RESEARCH QUESTION(S) AND DESIGN

- Research question: Which incentive enhances customer satisfaction the most for the return of used garments in order to enable a circular business model?

DATA ANALYSIS

- Kano method

LIMITATIONS & FUTURE RESEARCH

- Kano method is limited to current consumer opinions → future research should continuously examine current acceptance of measures to motivate return of used garments

- Future research should also focus on international consumers and cultural differences

RESULTS

SATISFACTION AND DISSATISFACTION INDICES
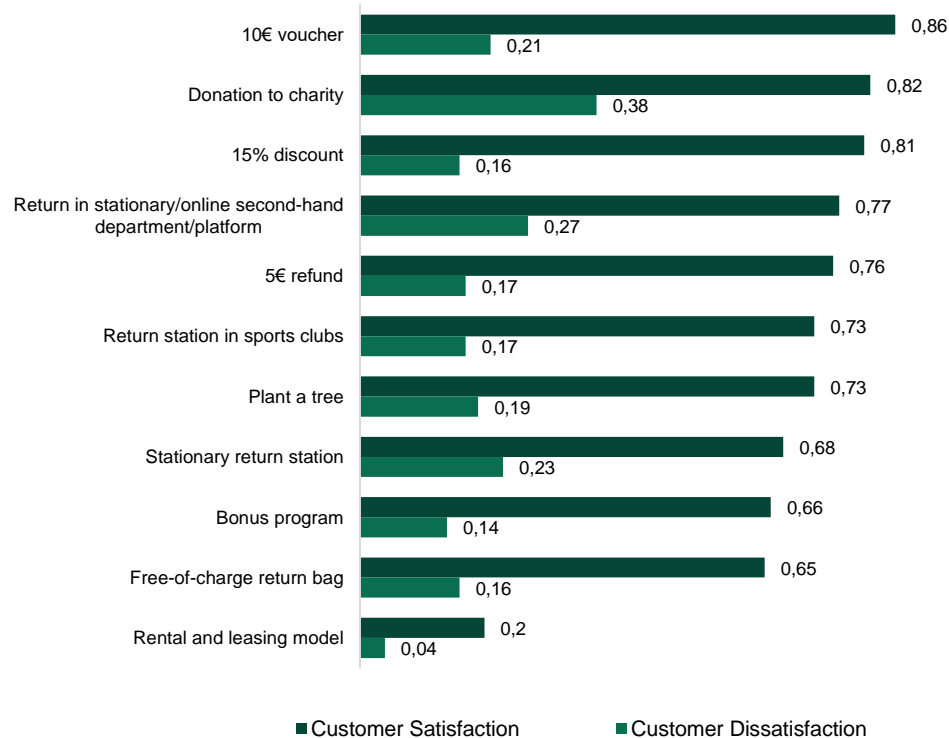
Research context

- The following measures generate the highest satisfaction:
  1. 10€ voucher
  2. Donation to charity
  3. 15% discount

- The following measures generate the highest dissatisfaction when they are not present:
  1. Donation to charity
  2. Return in stationary/online second-hand department/platform
  3. Stationary return station

Chart data (Customer Satisfaction / Customer Dissatisfaction):

- 10€ voucher: 0,86 / 0,21
- Donation to charity: 0,82 / 0,38
- 15% discount: 0,81 / 0,16
- Return in stationary/online second-hand department/platform: 0,77 / 0,27
- 5€ refund: 0,76 / 0,17
- Return station in sports clubs: 0,73 / 0,17
- Plant a tree: 0,73 / 0,19
- Stationary return station: 0,68 / 0,23
- Bonus program: 0,66 / 0,14
- Free-of-charge return bag: 0,65 / 0,16
- Rental and leasing model: 0,2 / 0,04

■ Customer Satisfaction   ■ Customer Dissatisfaction