



BIOTEXFUTURE

Deriving product innovation potentials from online customer reviews

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TRANSITIONLAB, TP C: THE TEAM OF THE BAYREUTH WORKSTREAM

A PROJECT WITHIN BIOTEXFUTURE

TRANSITIONLAB → TP C (THE BAYREUTH WORKSTREAM)



WHY? Tackle the societal challenges for the transformation of the textile industry

HOW? Create knowledge about
- **success factors** as well as
- **ethical, legal and social implications (ELSI)**
of this transformation

Success factors of bio-based textile product innovations

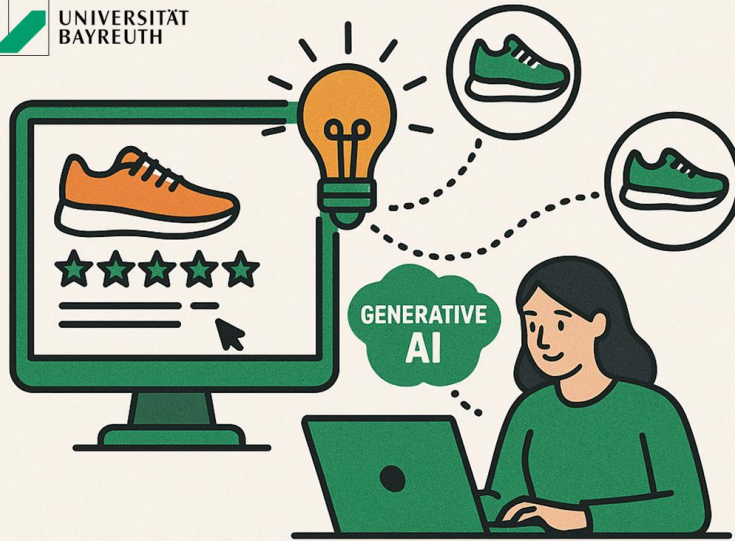
Acceptance and communication of bio-based textile product innovations, communication guideline (work in progress)

Additional topic: Further application areas





UNIVERSITÄT
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DERIVING PRODUCT INNOVATION POTENTIALS FROM ONLINE CUSTOMER REVIEWS

1 INTRODUCTION

2 GOAL

3 METHODOLOGY

4 RESULTS

5 IMPLICATIONS

6 SUMMARY

1 INTRODUCTION

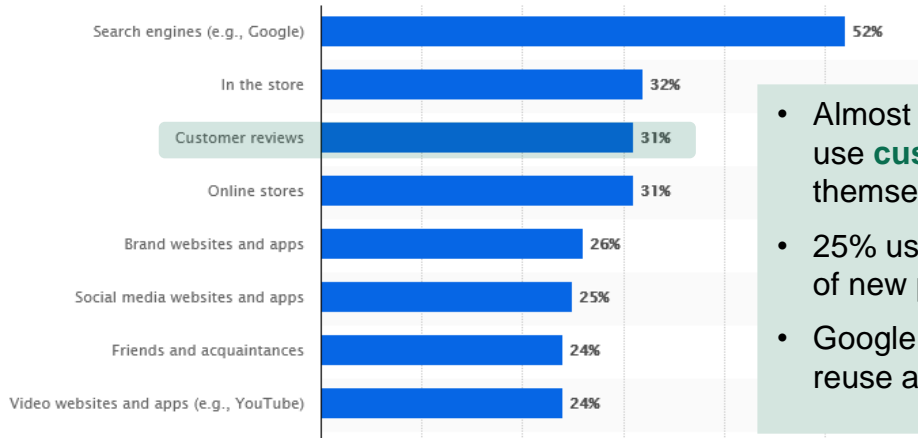
INTRODUCTION

ONLINE RETAILING AND CUSTOMER REVIEWS

Online retailing dominates the market (Statista March 2025)

- Fashion makes up 20% of online retailing volume (see right figure)
- More than a billion U.S. dollars are spent on **online fashion**

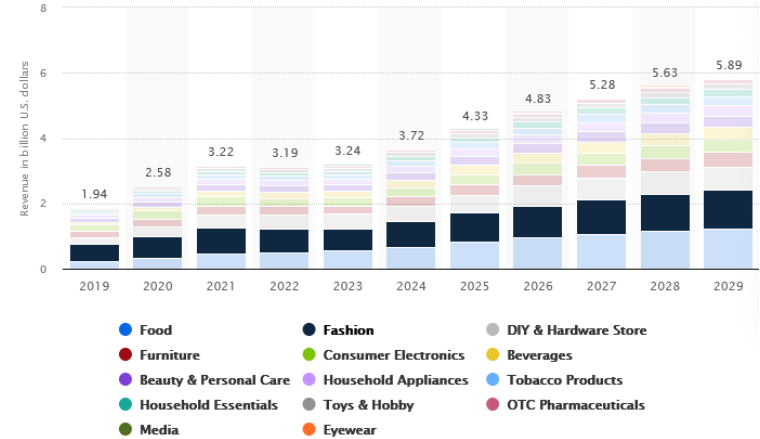
Sources of inspiration for new products in the U.S. (Statista December 2024)



- Almost a third of people aged 18-64 use **customer reviews** to inform themselves about products
- 25% use online reviews for sources of new products to buy (Statista 2024)
- Google and other online sites often reuse and aggregate reviews

Important sources of online customer reviews

- Adidas product page
- Competitor product page
- Amazon
- Other online retailers

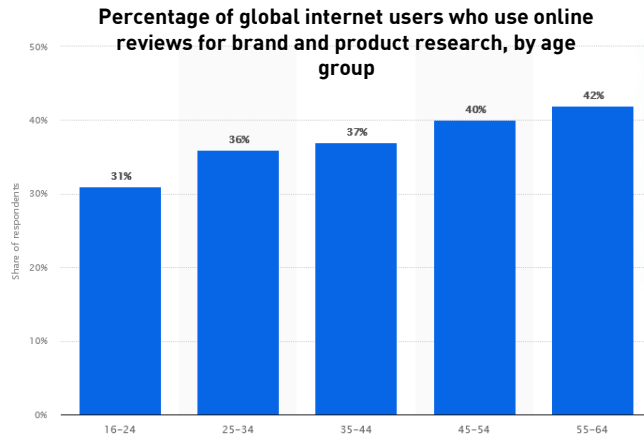


INTRODUCTION

IMPORTANCE OF CUSTOMER REVIEWS

Trust in customer reviews (Statista August 2023)

- Unconditional trust: a fifth of customers always trust online reviews as much as a personal recommendation.
- Overall positive view: 78% of customers trust online reviews under certain conditions; only 22% are sceptical or don't trust reviews at all
- Age groups: large shares of any age group use online reviews to research brands and products



Percentage of customers who trust online reviews as much as personal recommendations

Characteristic	2014	2015	2016	2017	2018
Yes, always	-	8%	18%	19%	19%
Yes, if I believe the reviews are authentic	22%	31%	27%	27%	19%
Yes, for some types of businesses, no for others	34%	22%	19%	20%	15%
Yes, if there are multiple customer reviews to read	26%	19%	20%	20%	25%
No, I am often skeptical about online reviews	-	-	12%	13%	16%
No, I don't trust reviews at all	17%	20%	4%	3%	6%

Value for business

(Baier et al. 2025a, Baier et al. 2025b, Karasenko 2025)

Businesses can extract value from customer reviews by analysing and summarizing key issues.

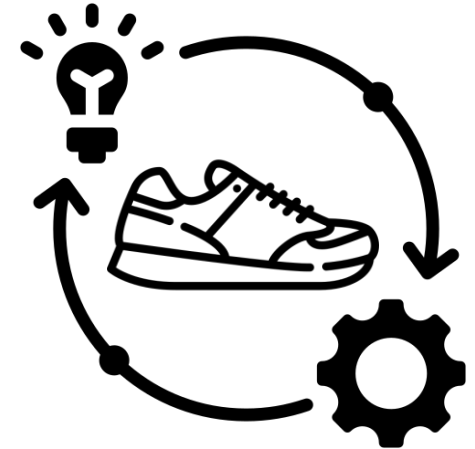
Key application areas:

- Product / Service management
- Product development / improvement
- Customer satisfaction prediction
- (Partially) substituting conventional surveys

Application area	Method	Results	Source
New product/ service developmt	ChatGPT-based summarization & ideation	Large Language Models (LLMs) like ChatGPT can help human innovation teams in their development process by synthesizing and discussing ideas from reviews.	Bouschery et al. (2023)
Customer/ market selection	Dictionaries	Using custom dictionaries to identify product features and sentiments allows the authors to measure the customer preferences at scale (without surveys). These are subsequently ordered by priority helping product and design teams.	Xiao et al. (2016)
Product/ service quality managemt	Dictionaires / transfer learning models	Using OCRs the authors trained a machine learning model to predict TAM construct scores. These can be predicted over time, allowing for a nuanced evaluation of (e.g.) perceived ease of use to identify key issues with products and services	Baier et al. (2025)
Product/ service improvement + competitor analysis	Aspect-based sentiment analysis & document summarization	See following slides	This study – First revision: International Journal of Market Research

2 GOAL

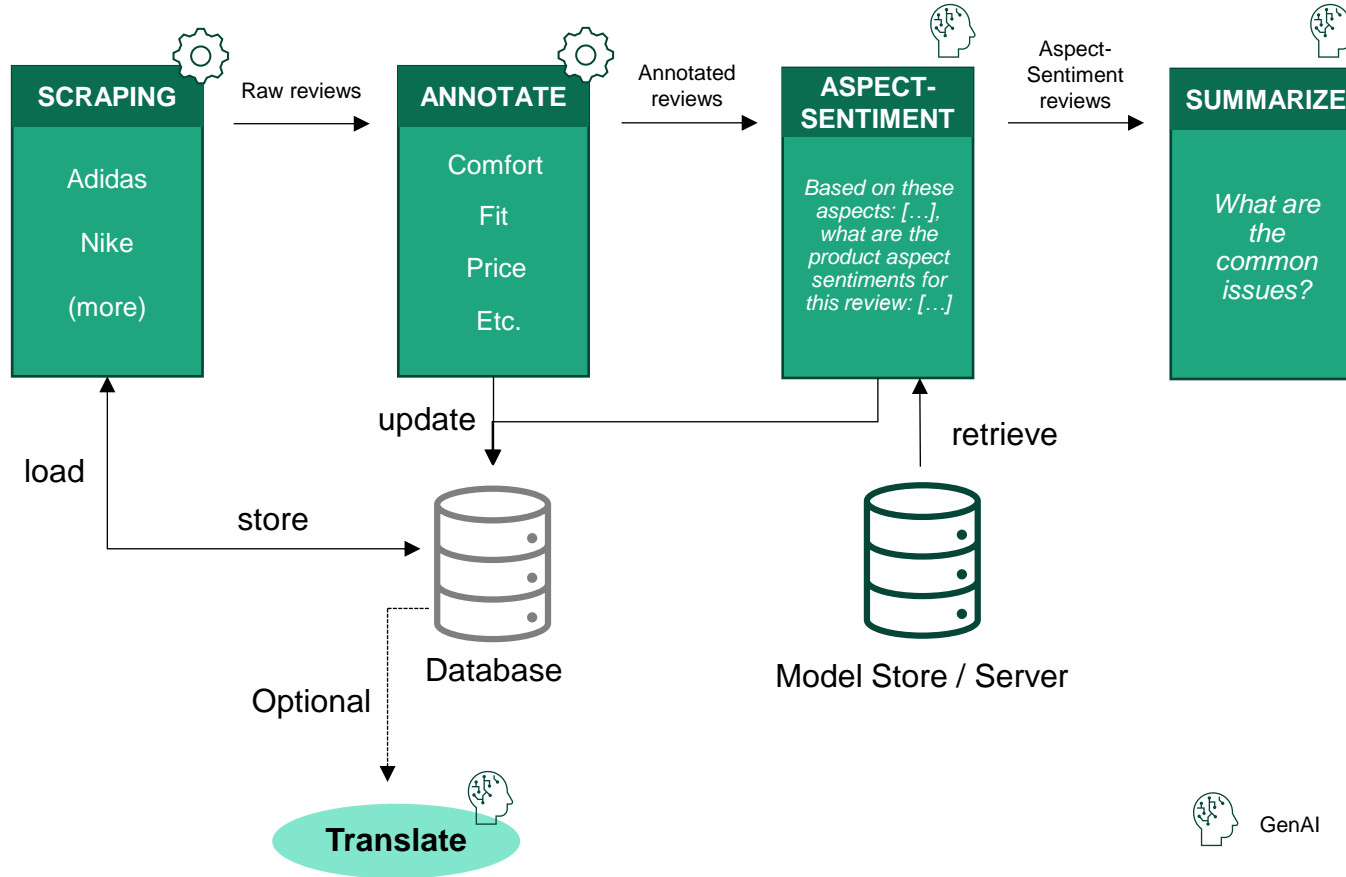
- **Identify opportunities for product improvement and provide insights into the following questions:**
 - How are sustainable products from Adidas perceived?
 - How do they compare to their conventional counterparts from Adidas?
 - How do sustainable products from Adidas compare to Nike?
- **How?**
 - Identify suitable product groups for analysis
 - Determine useful product aspects for evaluation
 - Classify aspect-based sentiments using large language models
- **Who benefits?**
 - Marketers:
can compare results from surveys to those from online customer reviews
can use competitor analysis to shape campaigns, pricing, positioning, etc.
 - Product innovation teams:
can identify strengths and weaknesses
can track perceptions over time



3 METHODOLOGY

METHODOLOGY PROCESS

BIOTEXFUTURE[™]



METHODOLOGY

1. SCRAPING & TRANSLATING

SCRAPING

Adidas

- **API-based scraper**
- Adidas uses an API to populate reviews on product pages
- → use API to get all reviews per product

3 sustainable products



Ultraboost 1



Stan Smith - primegreen



NMD R1

9 conventional products

(Ultraboost 20/22, Galaxy 6/7, ...)

Nike

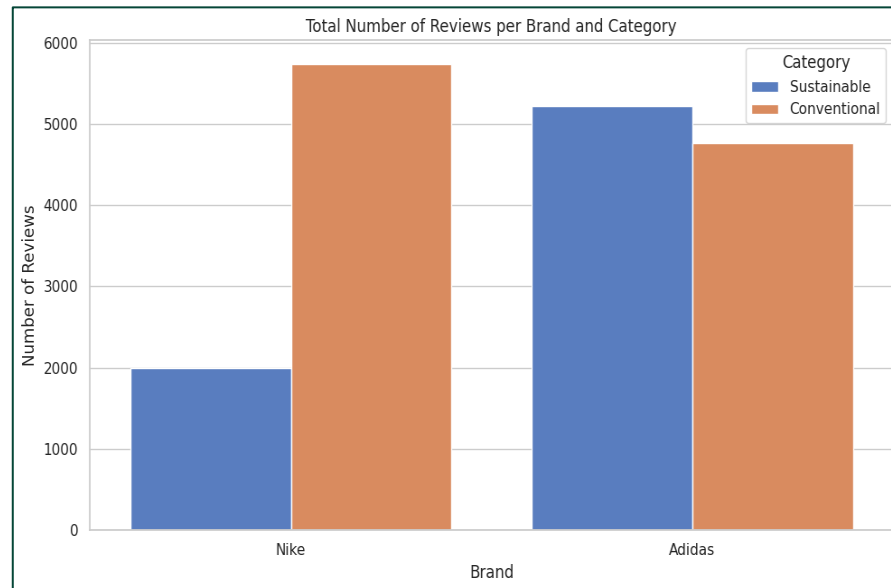
- Same as Adidas

5 sustainable products

3 conventional products

BAUR

- Scraper implemented but not used



Total: 17727 reviews

Translating

- **One store many languages**
- Translate using DeepL API & LLM

METHODOLOGY

1. SCRAPING & TRANSLATING

SCRAPING

Do customers talk about sustainability in their reviews?

- Pass the review to an LLM
- Classify the review as being about sustainable topics, or not:

'Super good shoe - top material & ecologically correct - highly recommended. You don't even notice that it's made from recycled material!'

'Good as always. Shoes meet expectations. Good fit. Quality is good. Buy Stan Smith for years. Super shoe and now also sustainably produced.'

Adidas sustainable
2.37% (124 out of 5217)

'Beautiful colours. Good workmanship! Packaging box sustainable! Laces good length'

'is okay. can be bought when on offer. It's okay, you can buy them when they're on sale. The quality is okay at first glance. A lot of plastic and synthetic material, of course, just like other shoes today, they are produced as cheaply as possible.'

Adidas conventional
0.58% (24 out of 4770)

'[...]. I love that they are made from recycled materials. [...]'

'[...]. The Nike Court Vision Low Next Nature offer an excellent combination of sustainability and functionality[...]'

Nike sustainable
2.80% (56 out of 1999)

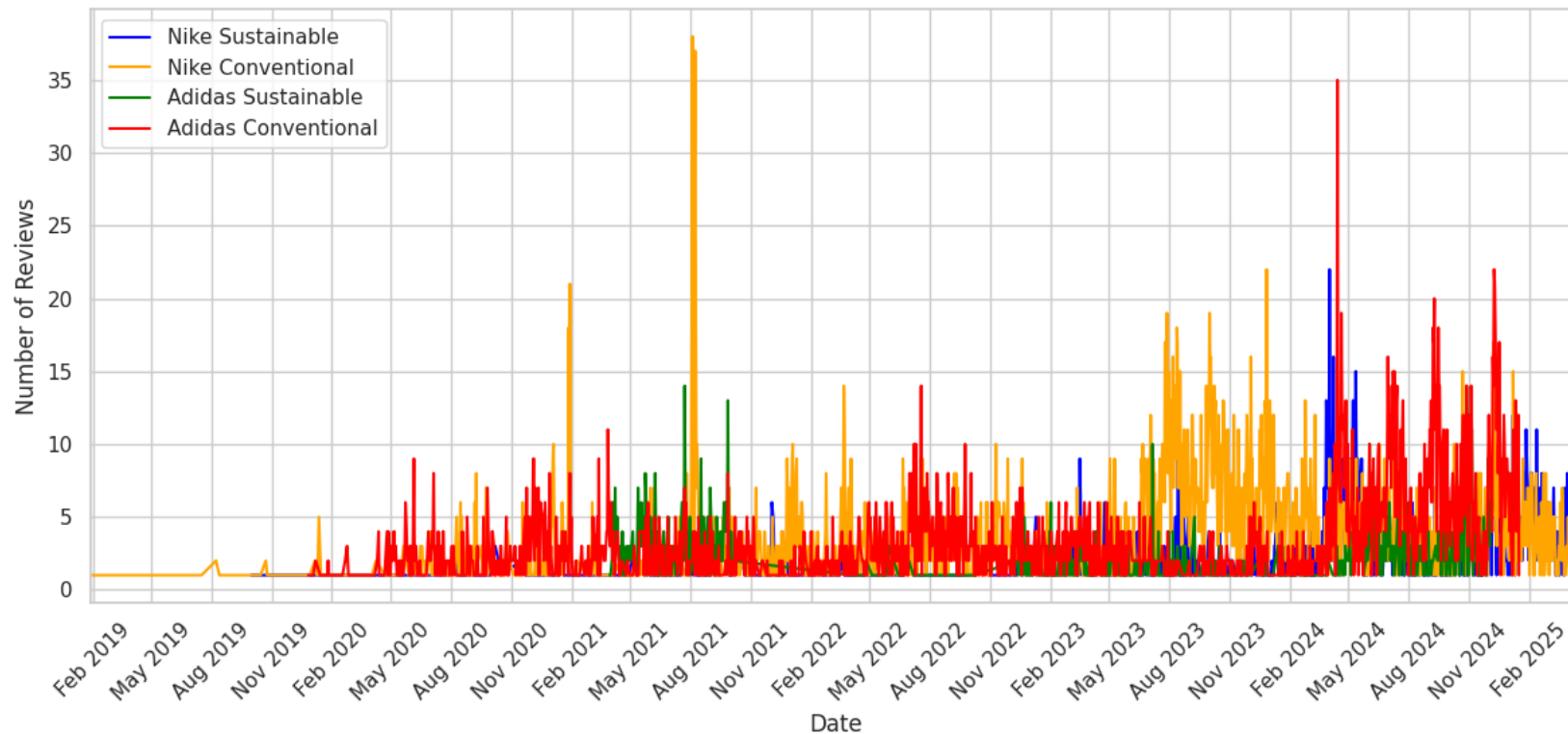
'[...]. After only a month and a half of regular use, I noticed a visible tear in the material of the shoe. [...]'

'[...]. They are difficult to obtain and wear out quite quickly, not a very durable product[...]'

Nike conventional
1.17% (67 out of 5741)

Customers generally address the topic of sustainability less in their reviews (even for sustainable products)
→ What other factors are in focus?

Review distribution over time

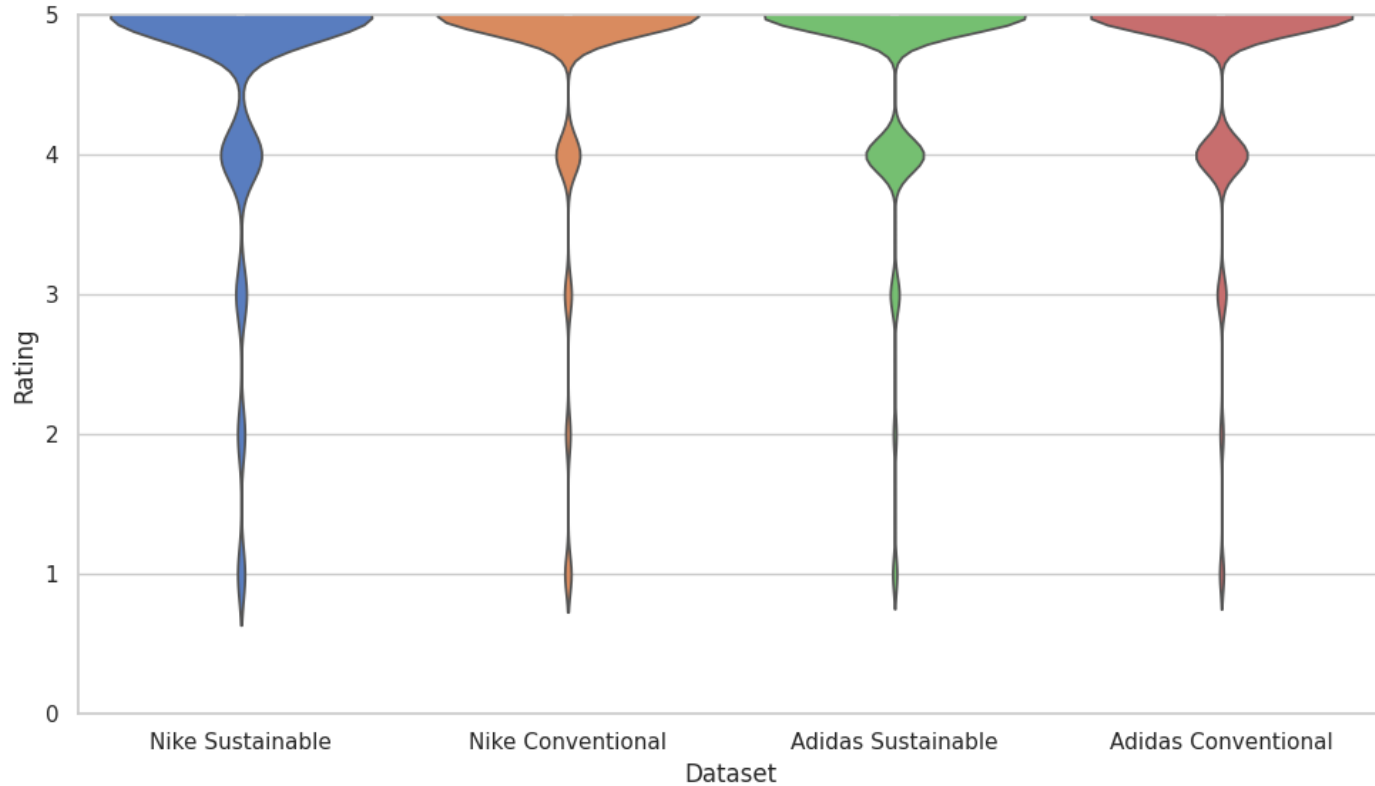


METHODOLOGY

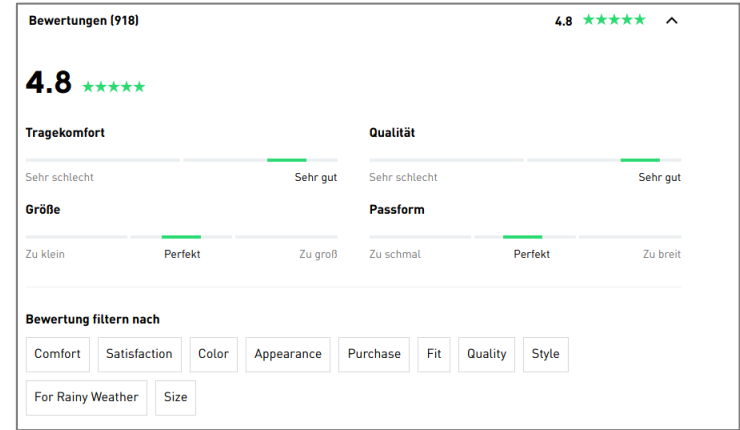
1. SCRAPING & TRANSLATING

SCRAPING

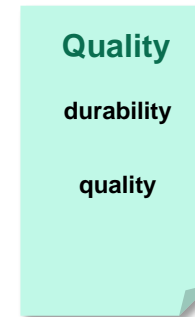
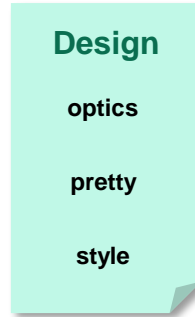
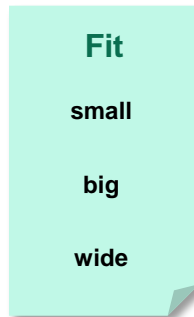
Rating distribution per dataset



- Adidas provides categories to filter product reviews (others do not)
- Categories depend on review content
- Select important categories as known from surveys
- Use word-clouds and manual inspection to identify keywords

Source: [Adidas](#)

- Map aspects to reviews according to keyword dictionary



METHODOLOGY

3. & 4. GENAI EVALUATION

ASPECT-
SENTIMENT

SUMMARIZE

Gemma2:9b

- A prior quantitative study on sentiment classification showed that Gemma2:9b was the best

Evaluation

- Pass both the review and the aspects to the LLM
- Classify each aspect-based sentiment
- Pass negative aspect to the LLM again
- Summarize common issues

4 RESULTS

RESULTS

ASPECT RATING DISTRIBUTION IN PERCENTAGES

Reviews can talk about multiple topics at the same time!
These can often have conflicting sentiments.

If a review is about one or more of the 5 aspects, is that specific part of the review negative, neutral, or positive?
(see right table for an overview)

'Super good shoe - top material & ecologically correct - highly recommended. You don't even notice that it's made from recycled material!'

Good as always. Shoes meet expectations. Good fit. Quality is good. Buy Stan Smith for years. Super shoe and now also sustainably produced.'

Conventional (Adidas)

rating	comfort	price	fit	design	quality
negative	2.16%	16.48%	11.75%	2.99%	7.3%
neutral	0.56%	19.98%	8.73%	7.41%	5.0%
positive	97.28%	63.54%	79.52%	89.60%	87.7%

id	review	aspects	rating	ratings
48 162372255	Gute Dämpfung. Gute Dämpfung und atmungsaktiv ...	Komfort	5	1
48 162372255	Gute Dämpfung. Gute Dämpfung und atmungsaktiv ...	Preis	5	-1

2844	Super guter Schuh - Top Material & ökologisch ...	Man merkt gar nicht das es sich um Recycling M...	5	...	aspects ratings	['Qualität']	[1]
1476	Wie immer gut. Schuhe entsprechen die Erwartung.	Passform gut. Qualität ist gut. \nKaufe seit J...	4	...	aspects ratings	['Passform', 'Design', 'Qualität']	[1, 1, 1]

Sustainable (Adidas)

rating	comfort	price	fit	design	quality
negative	2.75%	17.05%	10.76%	3.97%	8.89%
neutral	0.51%	40.09%	5.33%	5.88%	4.68%
positive	96.74%	42.86%	83.91%	90.15%	86.43%

'Is okay. can be bought when on offer. It's okay, you can buy them when they're on sale. The quality is okay at first glance. A lot of plastic and synthetic material, of course, just like other shoes today, they are produced as cheaply as possible.'

Good cushioning and breathable makes the shoe comfortable. Price is a little too high.'

'Beautiful colours. Good workmanship!
Packaging box sustainable! Laces good length'

RESULTS

ASPECT RATING DISTRIBUTION IN PERCENTAGES

Adidas

Sustainable

rating	comfort	price	fit	design	quality
negative	2.75%	17.05%	10.76%	3.97%	8.89%
neutral	0.51%	40.09%	5.33%	5.88%	4.68%
positive	96.74%	42.86%	83.91%	90.15%	86.43%

„Conflicting“: 219

Nike

rating	comfort	price	fit	design	quality
negative	12.98%	20.18%	20.81%	6.19%	14.68%
neutral	0.73%	52.91%	17.57%	11.85%	8.21%
positive	86.29%	26.91%	61.62%	81.96%	77.1%

„Conflicting“: 121

Conventional

rating	comfort	price	fit	design	quality
negative	2.16%	16.48%	11.75%	2.99%	7.3%
neutral	0.56%	19.98%	8.73%	7.41%	5.0%
positive	97.28%	63.54%	79.52%	89.60%	87.7%

„Conflicting“: 251

rating	comfort	price	fit	design	quality
negative	10.59%	27.69%	16.57%	6.10%	18.14%
neutral	0.90%	36.89%	10.91%	8.73%	6.49%
positive	88.51%	35.42%	72.52%	85.16%	75.36%

„Conflicting“: 136

RESULTS

DEEP DIVE – IMPROVEMENT AVENUES – ADIDAS

Category	Conventional	Sustainable
Comfort	<ul style="list-style-type: none"> The upper material (tongue, instep, threading) of some products is too thin and uncomfortable Some of the running shoes appear too instable for running 	<ul style="list-style-type: none"> Material is stiffer than alternatives Material is less breathable than alternatives
Price	<ul style="list-style-type: none"> Price is a bit too high and higher than expected, but often better than alternatives 	<ul style="list-style-type: none"> Price increase not warranted compared to alternative Customers often compare the price to leather alternatives („paying 150€ is too much, especially if you don't even get leather“)
Fit	<ul style="list-style-type: none"> Shoes are too slim (especially around the ankle) Shoes are smaller than similar collections 	<ul style="list-style-type: none"> Sizes are generally too small Proportions are wrong (entrance / front or back too small) Size changed over time (now smaller than expected)
Design	<ul style="list-style-type: none"> Customers some of the running shoes as more „massive“ than others (e.g. „too plastic“, „too blocky“) Some of the running shoes are not suitable for leisure time Prior generations had more visual appeal 	<ul style="list-style-type: none"> Colors are not declared properly Some colors exhibit an unexpected yellow tint (e.g. NMD) Visually less appealing than alternative („not elegant“, „boring“, ...) Customers wish for further customization options for the sustainable products
Quality	<ul style="list-style-type: none"> Quality decreased over the years Other brands are perceived to be of higher quality The sole of some shoes wears out too quickly 	<ul style="list-style-type: none"> Quality is low (especially vegan leather) Products age / break faster (e.g. after less than a year) The sole is not properly glued and starts slipping Personalization options break too fast Some customers do not perceive „plastic trash“ to be a sustainable alternative

RESULTS

DEEP DIVE – IMPROVEMENT AVENUES – NIKE

Category	Conventional	Sustainable
Comfort	<ul style="list-style-type: none"> Some products (e.g. Comfycush inlay) do not dampen impacts enough Other inlays are not secured properly The sole is often too hard 	<ul style="list-style-type: none"> The leather materials are usually too stiff The inner sole is too narrow The sole does not absorb shocks well enough Some customers find the material too thick and not breathable enough
Price	<ul style="list-style-type: none"> Customers find the price too high unless they were able to purchase them in a sale Customers frequently don't recommend the shoe because of quality but because they are cheap 	<ul style="list-style-type: none"> Customers find the shoes are too expensive given the material and quality Customers were happy, if they could get the shoes in a special sale (50% off) Customers complain about volatile pricing
Fit	<ul style="list-style-type: none"> Some shoes are often too big (especially Jordans), while others are too narrow (e.g. AF1) 	<ul style="list-style-type: none"> None of the standard sizes are wide enough The shoes overall offer too few sizes The sizes also differ between different models
Design	<ul style="list-style-type: none"> The shape sometimes varies between shoes Similar colors are too different to other models (e.g. Jordans) Some designs are too old-fashioned 	<ul style="list-style-type: none"> Customers find the design too boring (especially special editions for valentines day) Some of the designs are too bulky
Quality	<ul style="list-style-type: none"> Some of the materials (e.g. leather of Jordan 1 Low) feels cheap and more like plastic than leather Several customers complain about improper build quality The color of some products deteriorates quickly 	<ul style="list-style-type: none"> The recycled plastic materials oftentimes smell too strong The sole quickly wears and deteriorates visually („white spots“) Some customers notice creasing of the shoes after short periods Most products show clear wear and tear after only a few weeks

RESULTS COMPARISON

COMMON THEMES

Negative aspects often come as pairs

- Negative price perception is often accompanied by quality, longevity, fit, or design concerns
- Especially for sustainable products the negative price considerations are usually because of quality issues.

Similar negative aspects

- For both Adidas and Nike the most negative aspects are Price, Fit and Quality for both conventional and sustainable shoes

'Beautiful, but... The shoe is visually very nice, but full of flaws and imperfections and the material is inferior for the price.'

'The quality is not particularly good. I am not impressed with the materials of this shoe. The coloring is good, but the leather feels more like plastic/artificial leather and in my opinion is not worth the price. Also, glue was visible where the toe area meets the sole.'

DIFFERENCES

Adidas is perceived as overall more positive

- Both sustainable and conventional products score better across aspects than the Nike counterparts
- Negative **sustainable aspects** for Adidas are more centered around the quality and design of the products (e.g. color, feel) but distinct from the **conventional aspects**
- Negative **sustainable aspects** for Nike are in line with their negative **conventional aspects** (e.g. bulkiness)

However: Nike does not have „proper“ sustainable materials like Adidas, but rather focuses on recycled materials (e.g. shredded plastics).

5 IMPLICATIONS & SUMMARY

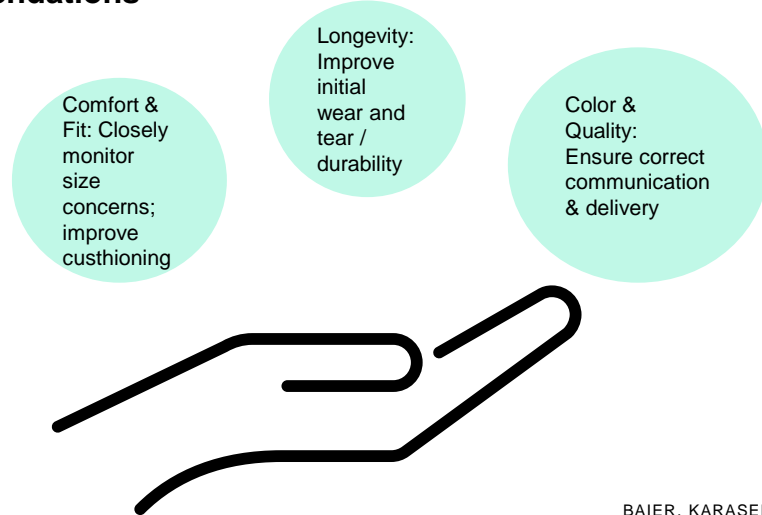
IMPLICATIONS & SUMMARY

RECOMMENDATIONS AND AVENUES FOR IMPROVEMENT

Large Language Models as innovation partners

- LLMs can:
 - Aid human innovation teams (see also Bouscher et al. 2023)
 - Automatically identify more nuanced issues with products
 - Summarize key issues
 - Automate some of the product improvement process
 - (Recommend avenues for improvement)

Recommendations



SUMMARY

- Sustainable shoes from Adidas perform worse than conventional products for some aspects (price, design, quality)
- This trend is also true for direct competitors (e.g. Nike)
- Adidas performs better than competitors for both sustainable and conventional products **across all aspects**
- Customers barely talk about sustainability in their reviews of sustainable products; Reviews of conventional products primarily deal with longevity concerns

LIMITATIONS

LIMITATIONS & POTENTIAL EXTENSIONS

Incentivized reviews

- Some reviews (e.g. from Nike) are incentivized. How do incentivized reviews differ from non-incentivized?

Attributes over time

- So far we only looked at the attribute ratings overall, but not over time.
- The current pipeline can be easily extended to allow for evaluations over time (see e.g. Baier et al. 2025)

Unknown and incomplete attributes

- Any attribute not currently matched is „unknown“.
- Many further common topics can be identified (e.g. delivery)
- Current dictionaries could be expanded upon.

THANK YOU FOR YOUR ATTENTION!

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