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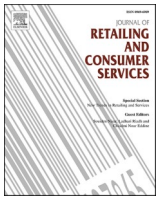

Bridging the intention-behavior-gap through digitalized information (?) - Two laboratory experiments in the textile industry

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ABSTRACT

Since literature revealed limited information among consumers as one of the main drivers for the intention-behavior-gap, this article focuses on how information can be communicated in a more effective manner. To overcome previous shortcomings (reliance on (online) surveys) for investigating this gap and increase closeness to reality (enabling touching textiles; try-ons), two laboratory experiments with between-subjects designs are conducted. It is examined if displaying textiles' sustainability information through (i) QR codes linking to videos (n = 114) and/or (ii) Augmented Reality (AR; n = 124) enables informing consumers better than through conventional, textual hangtags. While QR codes linking to video improve product evaluation ($p < 0.001$) compared to textual hangtags, this effect could not be proven for AR ($p = 0.058$). Purchase intention increased in both studies when using digitalized information. Additionally, the intention-behavior gap can be narrowed using AR, since consumers who will actually buy the exhibited textiles make higher bids regarding willingness-to-pay.

1. Introduction

The textile industry causes 10% of carbon emissions worldwide (more than flights and shipping combined) and is the third largest source of land use and water degradation (European Parliament, 2020). Besides environmental harm, the textile industry can be characterized by mostly manufacturing in lower-cost countries, often poor working conditions, and a fast-fashion business model with short product life cycles (Rausch and Kopplin, 2021). Hence, transforming the textile industry into a more sustainable one will provide large lever effects.

Nowadays, surveys oftentimes find that the majority of consumers reports to frequently buy sustainable textiles, but in fact, their actual behavior does not mirror these intentions (Nguyen et al., 2019). This intention-behavior-gap (IBG) remains one major issue when investigating sustainable consumption in the textile industry. Literature revealed that besides price, availability, and inertia, the main reason for the IBG is consumers' lack of information (Bray et al., 2011; Davies et al., 2012), especially for textile products (Harris et al., 2016; McNeill and Moore, 2015; Turunen and Halme, 2021; Wiederhold and Martinez, 2018). While most brick-and-mortar stores selling textiles offer an additional tag displaying some sustainability information (systematic field observations of largest fashion retailers in Europe), these information are printed in very small font size. Therefore, reading these information is rather uncomfortable and not reader-friendly. In contrast, online shops oftentimes apply richer, digital media, such as videos, to explain the sustainability or circularity of textiles. This raises the question if the IBG is truly caused by a lack of information or, instead, how this information is presented (Goodarzi et al., 2021).

Since more complex information should be communicated using media with higher richness (Lengel and Daft, 1988), textual labels at textiles may be insufficient in explaining sustainability information appropriately. As a result, sustainability as a complex phenomenon (with its ecological, social, and economic pillar), which has been divided into 17 intertwined sustainable development goals by the United Nations, might need to be explained with different media to effectively convey this information. While QR codes as one potential media channel have proven to increase the purchase intention of sustainable food items (using online surveys; Lee et al., 2020), literature on the textile industry revealed a paucity of investigations with higher closeness-to-reality (i.e., laboratory/field experiments) and employing more recent media, such as Augmented Reality (AR) (see section 2). In contrast, richer media may enable more transparency as well as traceability of sustainable products with (almost) unlimited space to present such information (Rotsios et al., 2022). As a result, the question appears if richer media, such as QR codes linking to sustainability information or AR, may improve consumers' product evaluation and, ultimately, purchase intention:

Research question (RQ) 1: To what extent do sustainability information provided by QR codes linking to a video improve the evaluation

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and/or sales of clothing compared with conventional information on the product label?

RQ2: To what extent do sustainability information provided by Augmented Reality (AR) improve the evaluation and/or sales of clothing compared with conventional information on the product label?

Apart from these content-related reflections on the IBG, there appears to be a methodological shortcoming in investigating sustainable consumption behavior. The vast majority of studies concerning the IBG in the textile industry makes use of (online) surveys (Busalim et al., 2022). As a result, respondents will not be able to actually buy the textiles presented in most cases, and, more importantly, they cannot touch or try on the textiles. However, especially for textiles, it is of utmost importance to actually feel the material and test the products' fit. To increase closeness-to-reality, some studies conducted laboratory experiments to enable these essential pre-purchase inspections. Moreover, using online surveys, respondents are forced to be exposed to textiles' sustainability information, whereas they may not take them into account in real-life shopping situations. Therefore, the research questions will be examined by conducting two laboratory experiments and including actual purchases.

Since a recent systematic literature review on sustainable textiles identified significantly fewer experimental studies and calls to explore the IBG in more depth (Busalim et al., 2022), several contributions are provided by this investigation. Besides addressing the before-mentioned calls for literature (Busalim et al., 2022), this article fills the literature gap by Hoffmann and Mai (2022) by investigating the effect of AR in an offline, brick-and-mortar context (while most studies focus on e−/m-commerce) and use the "informing" functionality (which has only been used in the entertainment and food context). Additionally, this article contributes to literature by addressing the recent calls (i) to go beyond online surveys to compare the effect of AR for communicating sustainability information and, (ii) for other product categories than food (Dekhili and Ertz, 2024), as well as the one calling for efficient digital tools to communicate sustainability information (Wiederhold and Martinez, 2018). Similarly, this article responds to the need for research at the interface between innovation and consumer literature to uncover solutions of how to efficiently communicate the sustainability of products using (innovative) labeling (Taufique et al., 2019). Moreover, this article provides empirical evidence for the media richness theory in the light of conveying sustainability information for clothing based on more realistic laboratory experiments (compared with conventional online surveys).

The remainder is structured as follows: first, the literature is reviewed with regard to previous research on conveying sustainability information using QR codes and AR (including systematic literature review). Subsequently, theoretical backgrounds (i.e., media richness theory; construal-level theory) for both studies and the related hypotheses are presented. Finally, the results and its discussion are outlined including theoretical contribution and practical implications.

2. Literature review

While QR codes have already been investigated in the field of purchasing sustainable products, especially when distrusting sustainability claims (Atkinson, 2013) and for groceries, literature reveals a paucity when it comes to the (i) textile industry or to the effect of (ii) AR on purchasing sustainable textiles. However, in contrast to groceries, textiles may be characterized as high-involvement products, which are bought less frequently and are more expensive (Brand et al., 2022a). Therefore, textiles come along with more extensive search costs before purchasing (compared to habitual purchases of groceries), which is why communicating textiles' sustainability information appears to be even more important and may work differently. For sustainable textiles in particular, label satisfaction (which may be optimized using QR codes) was identified as a substantial driver for buying sustainable textiles (Dhir et al., 2021).

Besides a conference contribution that conceptually develops a model summarizing the benefits of QR codes for sustainable textiles (Shukla and Gupta, 2019), an article with n = 65 students participating in an online survey on transparency perception with vs. without QR codes for sustainable textiles (Strähle and Girwert, 2016), and a study on the antecedents for using a QR code for sustainable products in general (Atkinson, 2013) not much attention has been put on the effect of QR codes on the purchase intentions of sustainable textiles.

Apart from the ability of QR codes to appropriately convey textiles' sustainability information, AR may be used to effectively communicate these information and, in turn, lower the IBG. For analyzing the literature on AR's effect on purchasing sustainable textiles, a systematic literature review was conducted. In contrast to QR codes, which are rather widely distributed nowadays, this systematic literature review about the more nascent technology of AR aimed at revealing which literature gaps and current limitations exist in the AR literature for examining actual consumer behavior for sustainable products. For this review, the focus was on laboratory and/or field experiments, since (i) the immersive effect of AR cannot be displayed in online surveys appropriately and, in order (ii) to overcome the methodological shortcomings of investigating sustainable consumption (i.e., capturing intentions, not behavior as well as self-report and social desirability bias).

The search string contained the two topics AR ("augmented reality OR extended reality OR mixed reality OR animated reality OR advanced reality OR twin transformation") and sustainability ("sustainable OR sustainability OR ecological OR eco OR ecofriendly OR environmentally OR environmental OR green") and was slightly adjusted dependent on the database used.

The search covered articles published between 2012 and 2024 and deployed EBSCO (n = 307), Science Direct (n = 105), Jstor (n = 46), and Web of Science (n = 126) resulting in a total amount of n = 584 hits (after eliminating duplicates). Focusing on those that are published in English and in academic journals, n = 381 remained. After screening titles and abstracts, n = 31 articles remained. Based on these, a subselection was made based on method (laboratory/field experiment), since (i) the immersive effect of AR will otherwise not uncover its effect entirely and, (ii) feeling/trying on textiles is essential for a realistic investigation. Including an additional three articles identified based on backward search, a total of n = 12 articles remained (see Table 1).

Even though the systematic literature search embraced a rather broad focus, only twelve studies conducted laboratory/field experiments that include AR applications in the field of sustainability. These studies mainly involve students (median number of respondents n = 99), whereas field experiments with actual customers are an exemption (n = 3 studies). Most studies report a beneficial influence of using AR on the investigated outcomes (except for one study). It becomes apparent that previous studies' focus is limited to four thematic contexts (i.e., consumer electronics, groceries, educational purposes, gaming). Hence, it appears that the potential of AR to better inform consumers about the sustainability of textiles has not been investigated yet. Given the tremendous environmental impact related to the textile industry, examining this potential seems to be a promising endeavor. Additionally, adequately transforming the results from other industries (e.g., groceries) to textiles is not possible, since textiles are classified as high-involvement products with higher search costs (and the necessity to actually try on these products).

Apart from that, investigating AR's ability to better inform consumers about the sustainability aspects of textiles also addresses the literature gap identified by Hoffmann and Mai (2022) to focus on offline/brick-and-mortar stores and investigating the "informing" functionality of AR. Similarly, investigating the effect of AR in a shopping context. This also counteracts the predominant focus of investigating AR in field like gaming, tourism, and marketing (Caboni et al., 2024) by analyzing an (offline) shopping context.

Table 1
Results from systematic literature review on AR and sustainability aspects.

Source	Empirical Study	Sample	Key Findings	Context
Bekaroo et al. (2018)	Pre-Test, Usage, Post-Test	n = 40 students	AR increases awareness for environmental impact of consumer electronics.	Consumer Electronics
Hormann et al. (2019)	Field experiment	n = 378, n = 155 customers	AR increases the awareness and purchasing behavior in favor for sustainable groceries.	Groceries
Jäger and Weber (2020)	Field experiment	n = 122 customers	AR cannot significantly increase the number of purchased sustainable groceries.	
Joerss et al. (2021)	Lab. experiment	n = 120 customers	AR usage increases probability for purchasing sustainable groceries.	
Huang et al. (2016)	Pre-Test, Usage, Post-Test	n = 21 pupils	AR improves pupils' learning results concerning the environment, creates positive emotions as well as a positive connection to nature.	Educational
Eames and Aguayo (2020)	Pre-Test, Usage, Post-Test	n = 20, n = 28 pupils	AR increased eco-literacy.	
Lee and Yoon (2020)	Pre-Test, Usage, Post-Test	n = 30 pupils	AR fosters a positive attitude towards the environment. AR optimizes learning towards environmental concerns. AR is more appealing to children than books.	
Safitri et al. (2022)	Lab. experiment	n = 286 pupils	AR-based labels increases environmental awareness.	
Garzón et al. (2022)	Pre-Test, Usage, Post-Test	n = 40 students	AR-based learning tools increase gaining and keeping knowledge about sustainable tourism.	
Wang et al. (2021)	Pre-Test, Usage, Post-Test	n = 37 students	AR gaming leads to a positive attitude towards sustainability and increased knowledge about sustainability.	Gaming
Dunn et al. (2021)	Lab. experiment	n = 182 gamers	AR gaming effectively inform about environment and its protection.	
Strada et al. (2023)	Lab. experiment	n = 99 students	AR gaming fosters sustainable behavior and increases sustainability awareness.	

3. Theoretical background

Given the lack of studies investigating the effect of QR codes and AR for better communicating sustainability information in the field of textiles, testing the hypotheses derived subsequently intends to enrich extant literature.

The foundation for the expected effect of a QR code linking to a video in contrast to textual information (independent variables) lies in the media richness theory (Daft and Lengel, 1986; see Fig. 1). Accordingly the more ambiguous, more unreliably transformable, and more complex the communication task to be transported, the higher the media richness needs to be. Given the complex phenomenon of "sustainability" with its three main pillars and its related 17 sustainable development goals, communicating sustainability information using text may result in an over-simplified and thus, ineffective communication of such information. In contrast, a video containing the exact same information may be more appropriate and also more effective in conveying sustainability information.

Moreover, previous studies showed that video format can increase information credibility (Brand and Reith, 2022). In the sustainability context, consumers were found to use QR codes to access (additional) information when in doubt concerning the sustainability of a product (Atkinson, 2013). Such increased credibility of sustainability information may improve consumers' evaluation of a product (due to positive reinforcement). Based on the media richness theory and previous studies on the effect of video versus textual information, it is hypothesized.

H1. Product evaluation for sustainable textiles is better if sustainability information are displayed using QR codes with video compared with textual information.

Product evaluation can (but does not have to) be an antecedent of purchase intention (Garrett et al., 2017). While some consumers may perceive a sustainable textile to be better when the sustainability information are communicated using a video compared to textual information (and thus, more effectively), some may consider the price to be too high and not buy the textile anyway. Although it is essential to differentiate between product evaluation and purchase intention as the two dependent variables, purchase intention as a proxy for sales stands out as the most important variable for many companies. Following the previous line of argumentation (for H1), the effect of a QR code linking to a video compared with textual information is the same for purchase intention as the successor of product evaluation.

H2. Purchase intention for sustainable textiles is higher if sustainability information are displayed using QR codes with video compared with textual information.

For the effect of AR, the different nature of AR in contrast to a video presentation of sustainability information (independent variable) is taken into account. More precisely, AR will display such information closer to consumers due to the immersive nature of AR (e.g., by using their mobile phone). Therefore, the construal level theory (Trope and Liberman, 2010) provides proper ground to develop the related hypotheses. Accordingly, this theory deals with the psychological distance for four different dimensions (i.e., social, temporal, hypothetical, spatial distance). Things that are closer to oneself (e.g., friends for the social distance) come along with a smaller psychological distance than things that are further apart (e.g., foreigners). The further things are apart, the more abstract one perceives such things (i.e., larger psychological distance). Since AR enables to display the sustainability information closer

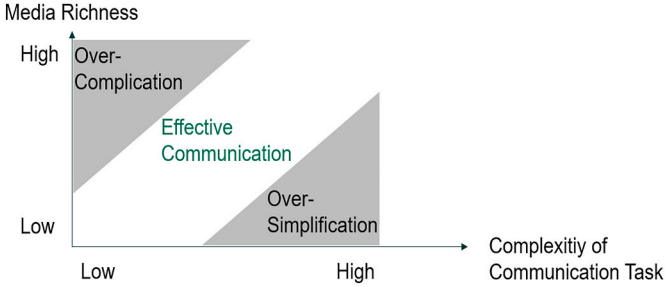

Fig. 1. Media Richness Theory based on Daft and Lengel (1986).

to consumers by its immersive nature (smaller spatial distance), it can be assumed that these information will be perceived as more concrete (smaller psychological distance; Trope and Liberman, 2010). Hence, this more concrete perception of sustainability information may result in impacting consumers' evaluation of sustainable textiles stronger compared with having a (spatially) more distant and more abstract perception of textual information on regular hangtags.

Moreover, Breves and Schramm (2021) proved that mixed reality can affect the spatial distance of environmental problems in line with the construal level theory. Additionally, previous studies showed that AR can increase the awareness in favor of sustainable groceries (Hormann et al., 2019), lead to a positive attitude towards sustainability in the context of gaming (Wang et al., 2021), or increase the credibility of sustainability information (Dekhili and Ertz, 2024). Furthermore, the qualitative study by Aslam and Davis (2024) indicates that consumers highly appreciate additional information about sustainable clothing through AR apps. Summarizing these insights, AR may lead to improved product evaluation (compared with pure textual information).

H3. Product evaluation for sustainable textiles is better if sustainability information are displayed using AR compared with textual information.

Similar to the development of H2, product evaluation is considered as an antecedent for purchase intentions (Garrett et al., 2017). Moreover, the usefulness of AR tools (which, in turn, affects behavior) is strongly influenced by how convenient AR is and the informational value provided (Schultz and Kumar, 2024). Accordingly, displaying the sustainability information in a more convenient way using AR may increase purchase behavior. Furthermore, previous studies indicated that AR can increase purchasing (more) sustainable groceries (Hormann et al., 2019; Joerss et al., 2021). Additionally, AR enables a more direct connection between products and information, which, in turn, affects consumer behavior and increases purchase intention (Hoffmann et al., 2022). Reducing the psychological distance with AR also increased purchase intention for sporting goods online (Uhm et al., 2022). Therefore, combining the assumptions of the construal level theory with lower spatial distance using AR together with the findings of previous studies from the food industry, it is hypothesized.

H4. Purchase intention for sustainable textiles is higher if sustainability information are displayed using AR compared with textual information.

However, the field study with n = 122 customers by Jäger and Weber (2020) evinced that AR did not increase the purchases of more sustainable milk. Given these ambiguous results for the effect of AR for sustainable groceries, an additional variable should capture the (actual) likelihood of purchasing sustainable textiles. To increase closeness to reality, a variation of the Becker-DeGroot-Marschak (BDM) mechanism (Becker et al., 1964) was employed. Instead of having another item battery with answers operationalized on a Likert scale, consumers will be asked about the highest price they would be willing to pay for a sustainable textile. Consumers will be made aware of the fact that the person with the highest bid will need to actually buy the exhibited textile. This way, Study 2 with the AR condition overcomes methodological shortcomings of (online) investigations on sustainable products, which ask for purchase "intentions" only. Given an increased social desirability bias in the realm of sustainability research and the existence of the IBG, Study 2 will contribute to extant literature by uncovering consumers' actual willingness to pay (WTP) for sustainable textiles. Following the previous line of argumentation, it is hypothesized.

H5. Willingness-to-pay (WTP) for sustainable textiles is higher if sustainability information are displayed using AR compared with textual information.

4. Method

4.1. Study 1: sustainability information with QR codes linking to video vs. textual hangtags

To increase closeness to reality and to overcome biases (especially in the sustainability realm) related to online studies, a laboratory experiment was conducted. This way, participants could actually feel the textiles' material and try on textiles to check their fit, which is essential in realistically imitating the shopping scenario for textiles. Moreover, this approach enables testing if consumers are actually using QR codes for additional information, whereas online surveys would need to "force" respondents to use the QR code. The experiment involved a between-subjects design consisting of a control (sustainability information on conventional hangtags) and an experimental group (same information obtained via QR code linking to video). The procedure was threefold: first, participants were exposed to a (i) scenario, then took part in the actual (ii) laboratory experiment, before a (iii) follow-up survey had to be filled in.

First, the (i) scenario asked participants to imagine that they currently are considering to potentially buy a white basic t-shirt once again. This generic textile was selected, since allows high generalizability (everyone can relate to and unisex product) and is less affected by personal design preferences (e.g., regarding colors). The scenario description explained that searching for this t-shirt, they are visiting their local favorite apparel store. Since favorite apparel stores will offer participants' favorite brands, it was decided to exclude brands. This way, potential biases related to specific brands can be prevented. However, the t-shirt's price was included to increase closeness to reality. The price was calculated based on the mean price of leading fashion retailers in Germany that are perceived to sell sustainable textiles (Splendid Research, 2016; i.e. Zara, H&M, C&A, Vero Moda, average price: 9.30 EUR, later on increased to 10.30 EUR based on pretest). The scenario asked participants to imagine that the room in front of them is a department in their favorite apparel store, in which the t-shirts are exhibited. Participants were asked to inform themselves about the exhibited t-shirts so that they could decide whether to purchase them. Since forcing participants to make use of the QR code would lead to unrealistic results, this scenario formulation was intended to counteract such potential bias. Participants were also informed about the possibility of making use of the changing room in the left corner (allowing to change without being monitored through the one-way mirror). Finally, participants were asked to leave the room after having made a decision.

Second, the (ii) laboratory experiment took place in two adjacent rooms, which are separated by a one-way mirror (see Fig. 2). In the first room, the fictitious textile store was constructed, whereas in the second one the researcher could observe how participants interacted with the t-shirts. In the store, six white organic cotton t-shirts were exhibited on hangers on a clothes rail. There were three t-shirts for females and three for males (with posters stating "females" and "males"), both with the sizes S, M, and L. On the left corner, a changing room was installed.

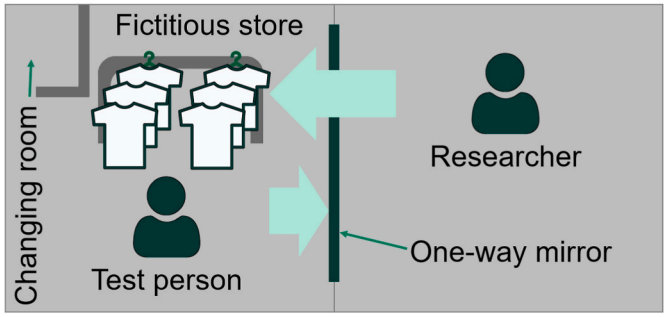

Fig. 2. Setting of the laboratory experiment.

On the t-shirts, all potentially misleading information was removed (e.g., manufacturer information; embroidering a square over the brand logo), leaving a plain t-shirt. Using a cord, a hangtag was attached with either the textual sustainability information or a QR code linking to the exact same information in a video format. Additionally to the sustainability information, the t-shirts' size, material, and price was displayed (see Fig. 3). The sustainability information were derived from the above-mentioned five leading fashion retailers. For the experimental condition with the QR code, a statement was added below that says "Scan me for more information!". The video linked to the QR code makes the sustainability information appear sequentially accompanied by a slightly dark, female voice, consumers prefer this type of voice the most, and is being used for almost any voice assistants (Cambre and Kulkarni, 2019).

Third, (iii) the follow-up survey consisted of established constructs from previous research and was conducted using Qualtrics. These encompass purchase intention (Rausch and Kopplin, 2021), product evaluation (Garrett et al., 2017; both as dependent variables), as well as perceived environmental knowledge (Rausch and Kopplin, 2021), green consumption values (Brand and Rausch, 2021), innovativeness (Giovanis et al., 2019; all as control variables) and socio-demographic information (age, gender, education, price perception, shopping frequency, spending for clothes, income). All construct and the related items were randomized in their order (except for the dependent variables) to prevent positioning biases. A 7-point Likert scale was used for all constructs (see Appendix A for all constructs used in Study 1 and Study 2).

Before the sampling, a pretest with n = 18 participants was conducted. As a result, the price was slightly increased (i.e., 10.30 EUR) since a majority of participants raised credibility concerns for a more sustainable t-shirt given the comparably low price. Similar to previous field/laboratory experiments (see Table 1), data acquisition included students. More precisely, they were acquired in the end of 2022 at a university from a mid-sized city in Germany (approximately 75,000 inhabitants in a rather rural area). The sample consists of 50% males, is 23 years old on average (SD = 3.08) with 57.9% having a high school degree followed by 29.8% holding a bachelor's degree. Out of n = 122 participants, eight participants from the experimental group did not scan the QR code (6.5%), which is why the final sample consists of n = 114 students (n = 53 experimental and n = 61 control group).

4.2. Study 2: sustainability information with AR vs. textual hangtags

The laboratory experiment for comparing textual sustainability information with displaying these information using AR, the same setting was employed to enable comparability of the results. The only differences are that the price was increased by 16% (to 11.95€) to update to the most recent prices, which were affected by inflation. While the scenario, the laboratory setting, the stimuli (except for price adjustment) were the same, the follow-up survey was extended by AR's Ease of Use (Pantano et al., 2017), credibility of sustainability information (Brand and Reith, 2022), greenwashing concerns (Rausch and Kopplin, 2021), an inquiry of WTP with BDM mechanism, and additional control variables. The reason for adding additional control variables on top to those already included in Study 1 is to eliminate potential alternative causes for variances between CG and EG.

Before the sampling, a pretest with eight participants was conducted. To yield a comparable sample as for Study 1 (QR code study), the same sampling approach was deployed in the same city in January 2024. Data acquisition resulted in a sample with 51.6% females, which is 23 years old on average (SD = 2.74) with 71% having a high school degree followed by 21% holding a bachelor's degree. After excluding two participants who were rushing through the survey and another three who did not use the AR filter, a total of n = 124 students (n = 60 in control and n = 64 in experimental group) remained.

5. Results

5.1. Study 1: QR code study

Participants spent approximately 1.4 min in the fictitious store. Out of n = 114 participants, most respondents haptically felt the t-shirts (control group (CG): 85%; experimental group (EG): 91%) and some even tried on the t-shirt (CG: 10%; EG: 9%). Both underline the importance of conducting laboratory/field experiments when examining consumers' decision-making for textiles.

To ensure that CG and EG are comparable with each other, structural equity was tested. There were no differences between CG and EG concerning gender ($\chi^2 = 2.39$; $df = 2$; $p = 0.302$), education ($\chi^2 = 6.08$; $df = 5$; $p = 0.298$), income ($\chi^2 = 3.91$; $df = 5$; $p = 0.563$), and age ($U = 1326$; $z = -1.67$; $p = 0.096$). Similarly, CG and EG did not differ concerning

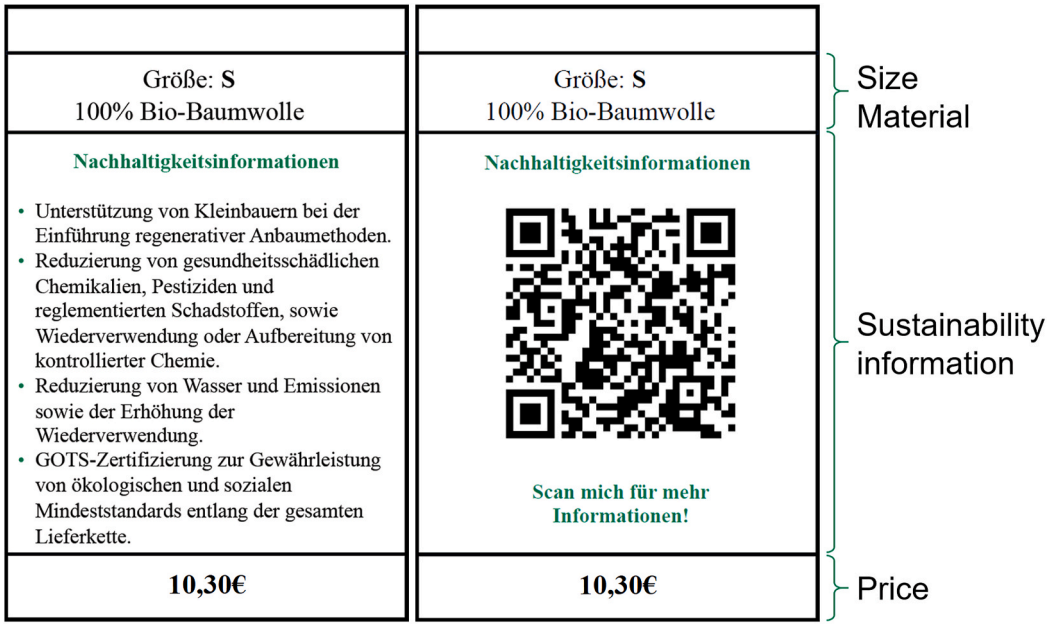

Fig. 3. Hangtags for control (left) and experimental group (right) for Study 1 (QR code).

innovativeness ($U = 1413$; $z = -1.16$; $p = 0.246$), green consumption values ($U = 1326$; $z = -1.66$; $p = 0.098$), or perceived environmental knowledge ($U = 1613$; $z = -0.02$; $p = 0.984$). Hence, CG and EG can be compared with each other.

Focusing on the dependent variables, both product evaluation and purchase intention were improved in the EG condition (see Fig. 4). Product evaluation in the EG with QR code ($m = 5.32$; distribution: 90.6% rated the product positive (more than the neutral "4" on the 7-point Likert scale)) improved significantly ($U = 920$; $z = -3.97$; $p < 0.001$) compared with the CG with textual hangtags ($m = 4.18$; distribution of positive rankings: 55.7%). Purchase intention was significantly higher in the EG ($m = 4.81$; $U = 1018$; $z = -3.41$; $p < 0.001$; distribution of positive ratings: 69.8%) compared with the CG ($m = 3.75$; distribution of positive ratings: 44.3%).

Controlling for innovativeness, perceived environmental knowledge, and green consumption values behavior values by means of an ANCOVA showed that the main effect between CG and EG still remains for purchase intention (F (1, 109) = 9.74, $p = 0.002$, $r = 0.29$), as well as for product evaluation (F (1, 109) = 18.17, $p < 0.001$, $r = 0.38$). For this ANCOVA all requirements (normality of error terms, homogeneity of regression slopes, homoscedasticity) are fulfilled except for the homogeneity of regression slopes for green consumption values. Since both product evaluation and purchase intention increased with and without green consumption values and, since there are no differences in the distribution of green consumption values between groups, this increase should still be considered valid.

5.2. Study 2: AR study

Participants spent 1.8 min in the fictitious store. While all participants haptically felt the t-shirts' material, only some participants tried on the t-shirt (CG: 5%; EG: 8%). Concerning structural equity between CG and EG, no differences were detected concerning gender ($\chi^2 = 2.16$; $df = 2$; $p = 0.340$), education ($\chi^2 = 8.22$; $df = 6$; $p = 0.223$), income ($\chi^2 = 2.56$; $df = 4$; $p = 0.635$), or age ($U = 1845$; $z = -0.383$; $p = 0.702$). Similarly, CG and EG did not differ concerning credibility of sustainability information ($U = 1692$; $z = -1.14$; $p = 0.252$), innovativeness ($U = 1724$; $z = -0.98$; $p = 0.325$), environmental knowledge ($U = 1748$; $z = -0.87$; $p = 0.382$), green consumption values ($U = 1878$; $z = -0.21$; $p = 0.833$), or greenwashing concerns ($U = 1779$; $z = -0.51$; $p = 0.702$). Hence, both groups can be compared with each other.

Focusing on the dependent variables, purchase intention exhibits a weak significant increase for the AR condition (EG) and an even clearer increase for the WTP, whereas the improvement of product evaluation shows not to be significantly different between groups (see Fig. 5). More precisely, product evaluation in the CG ($m = 4.51$; distribution of positive rankings: 63.3%) did not improve significantly over the evaluation of the EG ($m = 4.86$; $U = 1542$; $z = -1.90$; $p = 0.058$; distribution of positive rankings: 78.1%). In contrast, both WTP ($m_{CG} = 15.43$; $m_{EG} = 19.53$; $U = 926$; $z = -2.48$; $p = 0.013$) and purchase intention ($m_{CG} = 4.15$; $m_{EG} = 4.61$; $U = 1523$; $z = -1.99$; $p = 0.046$; distribution of positive rankings: CG = 51.7%; EG = 70.3%) increased significantly. Since participants should not be forced to buy the t-shirt (related to the WTP question based on the BDM mechanism), answering the WTP question was optional (resulting in $n_{CG} = 47$ and $n_{EG} = 55$).

When controlling for innovativeness, perceived environmental knowledge, green consumption values, greenwashing concerns, and credibility by means of an ANCOVA (all requirements (normality of error terms, homogeneity of regression slopes, homoscedasticity) for conducting an ANCOVA are fulfilled), the main effect between CG and EG for product evaluation turned significant (F (1, 117) = 7.35, $p = 0.008$, $r = 0.24$) and the previously detected effect for purchase intention intensified (F (1, 117) = 5.98, $p = 0.016$, $r = 0.22$). Even though structural equity is given for credibility of sustainability information between CG and EG, this control variable explains large shares of the variance for purchase intention (14.1%, $p < 0.001$, $\beta = 0.58$, $r = 0.38$) and product evaluation (21.2%, $p < 0.001$, $\beta = 0.58$, $r = 0.46$). When including this important control variable, much more variance of both dependent variables can be explained compared to the main effect of AR vs. textual labels (purchase intention: 4.9%; product evaluation: 5.9%). The average Ease of Use (only measured in the EG since the AR filter was not part of the CG condition) indicates that using the AR filter was perceived as relatively easy ($m_{EaseOfUse} = 6.03$ on 7-point Likert scale; SD = 0.96).

6. Discussion

6.1. General discussion

The findings indicate that using QR codes linking to a video appears to be very successful in communicating sustainability information compared to the currently deployed textual format. Concerning RQ1, it became evident that participants using the QR code showed improved product evaluation and increased purchase intention (with comparably strong effect sizes given the rather small sample size). These findings corroborate studies from other industries, such as the grocery sector (Lee et al., 2020). Moreover, it indirectly confirms insights from Strähle and Girwert (2016), who found consumers to give higher importance to sustainability characteristics of textiles when using QR codes compared to without. Such increased importance may positively affect product evaluation and, ultimately, purchase intention, as indicated in Study 1. While labels informing about clothing's sustainability can increase the purchases of such textiles (Rese and Baier, 2025), communicating these information via videos using QR codes appears to foster this effect.

Concerning RQ2, the second laboratory experiment (Study 2) showed that AR can help to narrow the IBG by communicating sustainability information more effectively (increase in actual purchase (WTP) for highest bids). However, while both purchase intention and WTP increased using AR, product evaluation did not (significantly) improve. Although all variables (purchase intention, WTP, product

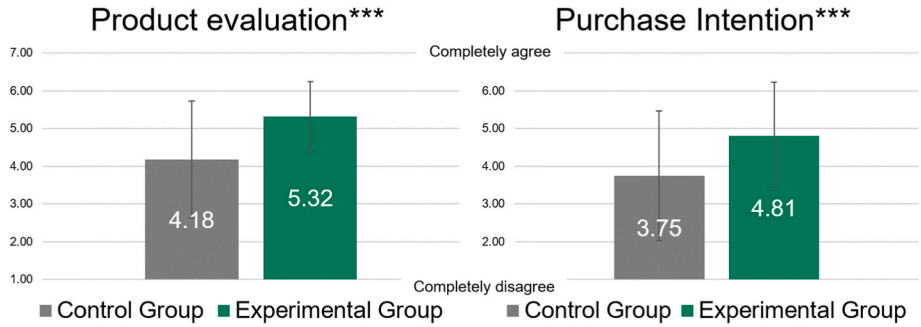

Fig. 4. Product evaluation (left) and purchase intention for Study 1 (QR code study).
Note: *** = p < 0.001.

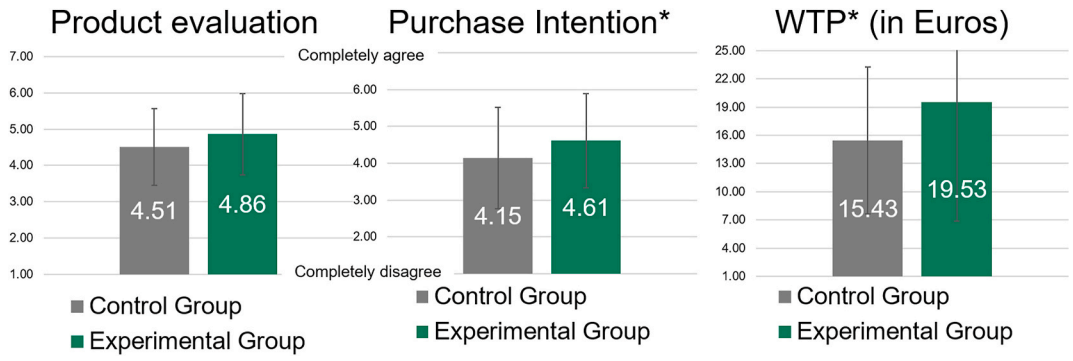

Fig. 5. Product evaluation (left), purchase intention (center), and WTP (right) for Study 2 (AR study).
Note: * = $p < 0.05$.

evaluation) showed to increase from a descriptive point of view, one reason why the improvement did not improve significantly ($p = 0.058$) may stem from the comparably small sample size within each condition ($n_{CG} = 60$; $n_{EG} = 64$). Another reason may be based on the free text information received from the follow-up survey. Since the AR filter was developed with freeware (Meta Spark Studio), the AR application opened using Instagram. Therefore, some participants mentioned potential negative spillover effects of the platform (Instagram) to the detriment of the sustainability information displayed (comparable to negative context effects of AR, see Pfaff and Spann, 2023). No significant improvement for product evaluation using AR aligns with previous research from the grocery context (Jäger and Weber, 2020). However, the increased purchase intention as a result of using AR corroborates previous literature in the context of groceries (Hormann et al., 2019; Joerss et al., 2021).

Potential spillover effects of the platform used for illustrating the AR application – in particular concerning the sustainability informations' credibility – may also explain the interesting finding from the ANCOVA: while purchase intention was significantly higher for those being exposed to AR illustration of sustainability information compared with textual ones, this was not the case for product evaluation. However, both dependent variables significantly increased between CG and EG when taking into account the control variable credibility of sustainability information. Even though structural equity was ensured between CG and EG concerning credibility of sustainability information, the control variable showed to significantly increase both product evaluation and purchase intention. Given that the sustainability information were perceived as marginally more credible for the textual condition ($m_{CG} = 5.23$) compared with the AR condition ($m_{EG} = 5.06$) from a descriptive point of view, opening the AR application via the platform (Instagram) might have diminished the effect of AR vs. textual information. Therefore, those participants with higher credibility indicated higher purchase intentions and higher product evaluations. This finding corroborates earlier studies on negative spillover effect of AR on purchase intention and (mediated by processing fluency) on product quality perception (Pfaff and Spann, 2023). Moreover, it underlines the important aspect of credibility when displaying (detailed) information via AR (Hoffmann et al., 2022).

Comparing the Study 1 (QR code) and Study 2 (AR study), the first solution seems to yield more promising results. This might be caused by the fact that participants in the QR code condition could passively perceive the sustainability information audibly, whereas they would still need to actively read it in the AR condition. While it is generally possible to use sound for AR as well, this study was limited to the technical possibilities of the low-cost AR solution (Meta Spark Studio). However, previous literature that also made use of the media richness theory showed that including voice versus without will not cause differences regarding functional and hedonic values of technology (Brengman et al., 2024). Another reason for the discrepancy between the effect of QR code with video and the AR study might lie in consumers' reduced levels of familiarity with the more recent technology. Additionally, reduced level of familiarity are more likely to be the cause for the differences between the QR code and the AR study, since technical hurdles can be ruled out for deploying the AR filter given the high Ease of Use ($m_{EaseOfUse} = 6.03$; SD = 0.96).

6.2. Theoretical contribution

This investigation with its two laboratory experiments provides several contributions to extant literature. First, it provides empirical evidence of the media richness theory in the context of sustainable textiles using two laboratory experiments. While extant literature identified a lack of information as one main strengthening the IBG, richer media (such as videos initiated by QR codes or AR) appears to lead to a better communication of sustainability information, which, in turn, increases purchase intention.

Second, this article addresses several calls for literature and closes literature gaps. In these investigations, the call for research at the intersection of consumer literature and innovations about how to efficiently communicate products' sustainability (Taufique et al., 2019) is served. Additionally, the literature gap identified by Hoffmann and Mai (2022) concerning AR investigations in offline store context and using the "informing" functionality of AR is addressed. This investigations also respond to the call for research on efficient digital tools to communicate sustainability information by Wiederhold and Martinez (2018).

Third, based on an own systematic literature review on AR and sustainability within this article, it becomes apparent that there are no laboratory/field experiments to investigate AR's effect concerning sustainability issues in the textile industry. Given the severe environmental impact of the textile industry (more carbon emissions than flights and shipping combined; European Parliament, 2020), examining this industry seems to be of particular importance. Since this article appears to be the first to shed light on the effect of AR on sustainability aspects in this industry using (more realistic) laboratory experiments, the insights gained are especially important.

Fourth, based on a systematic literature review on sustainable clothing, there is a paucity of laboratory/field experiments, whereas most studies deploy (online) surveys (Busalim et al., 2022). By conducting two laboratory experiments, this article takes into account the identified paucity and provides an investigation that is closer to reality. Moreover, this type of investigation appears to be of particular importance in the textile industry, since consumers need to touch and/or try on textiles first before purchasing. By doing so, this article also addresses the call to go beyond online surveys when investigating the communication of sustainability information (using AR), and to focus on other product categories besides groceries (Dekhili and Ertz, 2024).

Fifth, by implementing a WTP measurement using the BDM mechanism, the participants with the highest bids had to actually purchase

the t-shirt (for each of the three sizes and based on gender). As a result, this approach not only increases the study's closeness to reality but also narrows the IBG (with actual purchases for highest bidders). Since most studies investigate the intention to buy only (Busalim et al., 2022), questions about actual behavior remain unanswered. In contrast, this Study 2 reveals that AR can actually narrow the IBG by using the BDM mechanism for measuring the WTP. Accordingly, consumers are actually willing to pay more in case they receive textiles' sustainability information through AR.

6.3. Limitations

While (online) stores exist that sell sustainable textiles only (e.g., Avocadostore), informing consumers about textiles' sustainability (using QR codes with video or AR) still seems to be important, since this does not account for the mass market (e.g., H&M, C&A, Zara). These investigations did not include brands, which are oftentimes an important driver for buying textiles. However, the scenario asked respondents to imagine that the store would be their favorite store. Hence, the favorite store usually sells consumers' preferred brands. On the one hand, laboratory experiments may involve consumers with a generally higher involvement, which might bias the findings. On the other hand, this potential bias would affect both CG and EG and thus, seems to be absent.

Similarly, both samples involve German consumers only. Future studies should therefore verify the results for consumers from other countries, since Germans tend to be more reluctant to technological innovations (Shaw et al., 2022) and cultural differences exist concerning sustainable clothing consumption (Robichaud et al., 2024; Ulrich et al., 2024). Comparable to previous field/laboratory experiments (see Table 1), data acquisition included students, which is why future studies may incorporate other consumers as well to extend the findings' generalizability. As a result, participants' age impedes drawing conclusion for other consumer segments. Apart from that, the try-on rate in the experiments were comparably low. While most participant touched the t-shirts to feel its texture, one could assume that try-on rates in stores are actually higher. This might be caused by the different motivation in the laboratory setting (i.e., occasionally taking part into an experiment) compared a store visit, where consumers may have visited the store in the first place because they have clear purchase intentions.

While the Study 1 (using QR codes with a video) showed to be more promising, listening to a video in public might be perceived as awkward. However, the widely distributed in-ear headphones could represent a solution to this. Besides, not all consumers will (i) take into account textiles' sustainability or (ii) make use of a QR code (linking to video or activating AR applications) as of yet. Since younger generations tend to care more about sustainability (Brand et al., 2022b) and show higher affinity to technological innovations, consumers informing themselves about textiles' sustainability using technology can be assumed to increase in upcoming years. In contrast, older customers may be more likely not to scan a QR code/AR marker.

Similarly, the laboratory setting may have triggered participants more to scan the QR code/AR filter compared to settings in actual stores. Lastly, only those participants were taken into account for the analysis, who did actually scan the QR code/AR marker; however, this was necessary in order to compare the way participants were affected by the different format of sustainability information. Future studies may incorporate an additional variable that controls for the amount of time participants from the CG took to read the hangtag. This way, one may compare all participants from the EG (regardless of scanning the QR code) with all participants from the CG while controlling for the exposure time to the sustainability information. While all participants were aware that they might need to actually pay for the products, the t-shirt was finally bought only by those participants with the highest bid following the BDM mechanism.

The video in the QR code condition could be considered as rather simple in order to ensure comparability between the textual and the video condition. Therefore, making use of the advantages of the video format (e.g., music, additional pictures, video effects) could even strengthen the effects found. This also accounts for the AR condition, which could enable additional, individualized information, such as displaying savings when purchasing a product with a bonus card that the consumer may possess.

6.4. Practical implication

Based on the findings uncovered in the two laboratory experiments, retailers and manufacturers should be incentivized to implement QR codes linking to videos or AR in order to increase product evaluation (QR code) and purchase intention (QR code and AR). Given that participants were actually willing to pay more for sustainable textiles when being informed about textiles' sustainability via AR, this technology provides a promising path to compensate for the higher production costs of sustainability textiles while still matching consumers' WTP. Based on higher levels of familiarity with the QR codes (compared with AR), it seems reasonable to focus on this more established technology first. In upcoming years, AR experience in offline shopping might be more prevalent and the impact of AR (on product evaluation and purchase intentions) might increase even further.

Given that there were better product evaluations (QR code condition) and higher purchase intentions (QR code and AR condition) even though the experimental conditions merely put textual sustainability information into a different (richer) presentation format, practitioners can benefit even more from such digitalized formats when making use of the various possibilities related to these media. To ensure comparability between control and experimental group, the information in both groups had to be the same; however, future studies may also incorporate images, video effects, or individualized information, which do not fit onto textual hangtags (due to lack of space or technological barriers). For instance, the AR filter on consumers' smartphone may display discount that are enable based on (digital) bonus cards they possess in an app.

Based on the benefits related to the findings in Study 1 and Study 2, policy makers may facilitate (or incentives) adding QR codes to (sustainable) products to foster counteracting climate change. In the same vein, the European Union is currently discussing QR codes to enable consumers an easy access to products' information about their value-chain (also, to highlight their degree of sustainability).

Since these studies have been conducted with comparably young consumers (and might not necessarily be generalizable to older ones), retailers that target this specific group are recommended to make use of these technological advantages in selling sustainable textiles. Future studies may investigate if the observed effects also hold true for older consumers as well.

7. Conclusion

Based on a systematic literature review, it becomes evident that AR as a technological tool to bridge the intention-behavior gap has not yet been used in the context of textiles. Given the severe impact of this industry on the environment, discovering ways to transform consumer behavior in this industry into a more sustainable one provides large leverage effects. Therefore, this article overcomes previous shortcomings in examining the intention-behavior gap (i.e., reliance on (online) surveys) for sustainable textiles by conducting two laboratory experiments, which aim at analyzing participants' actual behavior (including actual purchases). By manipulating the way sustainability information are presented, it is shown that students have higher purchase intentions when illustrating these information via QR code linking to video or using AR compared to conventional textual information. Moreover, even actual purchase spendings increased when using AR. Concerning product evaluation, only the QR code condition lead to an optimized assessment compared to the textual condition. As indicated by these two

studies, combining the digital transformation with the sustainability transformation (i.e., twin transformation) provides a fruitful endeavor.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Constructs used

Construct	Items	Factor loadings	Cronbach's α Study 1/Study 2	Source
Purchase intention	PI1: I consider purchasing this t-shirt.	0.910/0.904	0.903/0.841	Rausch and Kopplin (2021)
	PI2: I intend to buy this t-shirt instead of conventional t-shirts in the future.	0.833/0.738		
	PI3: I might possibly buy this t-shirt in the future.	0.877/0.791		
	PI4: I would consider to buy this t-shirt if I happen to see it in a store.	0.907/0.871		
Product evaluation	PE1: This t-shirt has a high quality.	0.872/0.899	0.905/0.869	Garrett et al. (2017)
	PE2: This t-shirt is reliable.	0.899/0.807		
	PE3: This t-shirt is durable.	0.892/0.843		
	PE4: This t-shirt is well-made.	0.875/0.841		
Perceived environmental knowledge	PEK1: I know how to behave sustainably.	0.842/0.854	0.801/0.861	Rausch and Kopplin (2021)
	PEK2: I know how I could lower the ecological harm with my behavior.	0.890/0.913		
	PEK3: I understand how I could reduce the negative environmental consequences of my behavior.	0.811/0.896		
Green consumption values	GCV1: I consider the potential environmental impact of my actions when making many of my decisions.	0.738/0.760	0.769/0.796	Adapted from Brand and Rausch, 2021
	GCV2: I am willing to be inconvenienced in order to take actions that are more environmentally friendly.	0.836/0.760		
	GCV3: My purchase habits are affected by my concern for our environment.	0.700/0.795		
	GCV4: I support brands that support the environment.	0.800/0.835		
Innovativeness	IN1: If I heard about a new technology, I would look for ways to experiment with it.	0.891/0.910	0.848/0.856	Giovanis et al. (2019)
	IN2: Among my peers, I am usually the first to explore new technologies.	0.877/0.910		
	IN3: I like to experiment with new technologies.	0.861/0.910		
Ease of Use	EOU1: I found the AR filter to be very easy to use.	0.895	0.860	Pantano et al. (2017)
	EOU2: The AR filter was intuitive to use.	0.810		
	EOU3: It was easy to learn how to use the AR filter.	0.864		
	EOU4: Handling the AR filter was easy.	0.808		
Credibility	CR1: I think the sustainability information were believable.	0.802	0.813	Brand and Reith (2022)
	CR2: I think the sustainability information were factual.	0.619		
	CR3: I think the sustainability information were accurate.	0.892		
	CR4: I think the sustainability information were credible.	0.867		
Green-washing concerns	GWC1: I am concerned that this t-shirt is not produced of environmentally friendly materials.	0.898	0.884	Rausch and Kopplin (2021)
	GWC2: I am concerned that this t-shirt is not manufactured under sustainable conditions.	0.902		
	GWC3: I am concerned that the manufacturer of this t-shirt is only pretending its green image.	0.904		

Data availability

Data will be made available on request.

References

Aslam, U., Davis, L., 2024. Analyzing consumer expectations and experiences of Augmented Reality (AR) apps in the fashion retail sector. J. Retailing Consum. Serv. 76, 103577.
Atkinson, L., 2013. Smart shoppers? Using QR codes and 'green' smartphone apps to mobilize sustainable consumption in the retail environment. Int. J. Consum. Stud. 37 (4), 387–393.
Becker, G.M., DeGroot, M.H., Marschak, J., 1964. Measuring utility by a single-response sequential method. Behav. Sci. 9 (3), 226–232.
Bekaroo, G., Sungkur, R., Ramsamy, P., Okolo, A., Moedeen, W., 2018. Enhancing awareness on green consumption of electronic devices: the application of Augmented Reality. Sustain. Energy Technol. Assessments 30, 279–291.
Brand, B.M., Kopplin, C.S., Rausch, T.M., 2022a. Cultural differences in processing online customer reviews: holistic versus analytic thinkers. Electron. Mark. 32 (3), 1039–1060.
Brand, B.M., Rausch, T.M., 2021. Examining sustainability surcharges for outdoor apparel using Adaptive Choice-Based Conjoint analysis. J. Clean. Prod. 289, 125654.
Brand, B.M., Rausch, T.M., Brandel, J., 2022b. The importance of sustainability aspects when purchasing online: comparing generation X and generation Z. Sustainability 14 (9), 5689.
Brand, B.M., Reith, R., 2022. Cultural differences in the perception of credible online reviews – the influence of presentation format. Decis. Support Syst. 154, 113710.
Bray, J., Johns, N., Kilburn, D., 2011. An exploratory study into the factors impeding ethical consumption. J. Bus. Ethics 98, 597–608.
Brengman, M., Willems, K., Gauquier, L. de, Vanderborght, B., 2024. Media richness effectiveness: humanoid robots with or without voice, or just a tablet kiosk? Psychol. Market. 41 (4), 734–753.
Breves, P., Schramm, H., 2021. Bridging psychological distance: the impact of immersive media on distant and proximal environmental issues. Comput. Hum. Behav. 115, 106606.

Busalim, A., Fox, G., Lynn, T., 2022. Consumer behavior in sustainable fashion: a systematic literature review and future research agenda. Int. J. Consum. Stud. 46 (5), 1804–1828.
Caboni, F., Basile, V., Kumar, H., Agarwal, D., 2024. A holistic framework for consumer usage modes of augmented reality marketing in retailing. J. Retailing Consum. Serv. 80, 103924.
Cambre, J., Kulkarni, C., 2019. One voice fits all? Social implications and research challenges of designing voices for smart devices. In: Proceedings of the ACM on Human-Computer Interaction, vol. 3. CSCW, pp. 1–19.
Daft, R.L., Lengel, R.H., 1986. Organizational information requirements, media richness and structural design. Manag. Sci. 32 (5), 554–571.
Davies, I.A., Lee, Z., Ahonkhai, I., 2012. Do consumers care about ethical-luxury? J. Bus. Ethics 106 (1), 37–51.
Dekhili, S., Ertz, M., 2024. Reinventing ecolabels in the era of augmented reality: an experimental study on the case of fair-trade coffee. J. Clean. Prod. 434, 139987.
Dhir, A., Sadiq, M., Talwar, S., Sakashita, M., Kaur, P., 2021. Why do retail consumers buy green apparel? A knowledge-attitude-behaviour-context perspective. J. Retailing Consum. Serv. 59, 102398.
Dunn, M.E., Shah, G., Veríssimo, D., 2021. Stepping into the Wildeverse: evaluating the impact of augmented reality mobile gaming on pro-conservation behaviours. People. Nature. 3 (6), 1205–1217.
Eames, C., Aguayo, C., 2020. Designing mobile learning with education outside the classroom to enhance marine ecological literacy. Teaching & Learning Research Initiative, pp. 1–20.
European Parliament, 2020. The impact of textile production and waste on the environment (infographics). https://www.europarl.europa.eu/pdfs/news/expert/2020/12/story/20201208STO93327/20201208STO93327_en.pdf, 1-7.
Garrett, T.C., Lee, S., Chu, K., 2017. A store brand's country-of-origin or store image: what matters to consumers? Int. Market. Rev. 34 (2), 272–292.
Garzón, J., Acevedo, J., Pavón, J., Baldiris, S., 2022. Promoting eco-agritourism using an augmented reality-based educational resource: a case study of aquaponics. Interact. Learn. Environ. 30 (7), 1200–1214.
Giovanis, A., Assimakopoulos, C., Sarmaniotis, C., 2019. Adoption of mobile self-service retail banking technologies. Int. J. Retail Distrib. Manag. 47 (9), 894–914.
Goodarzi, S., Masini, A., Aflaki, S., Fahimnia, B., 2021. Right information at the right time: reevaluating the attitude–behavior gap in environmental technology adoption. Int. J. Prod. Econ. 242, 108278.
Harris, F., Roby, H., Dibb, S., 2016. Sustainable clothing: challenges, barriers and interventions for encouraging more sustainable consumer behaviour. Int. J. Consum. Stud. 40 (3), 309–318.
Hoffmann, S., Joerß, T., Mai, R., Akbar, P., 2022. Augmented reality-delivered product information at the point of sale: when information controllability backfires. J. Acad. Market. Sci. 50 (4), 743–776.
Hoffmann, S., Mai, R., 2022. Consumer behavior in augmented shopping reality. A review, synthesis, and research agenda. Frontiers. Virtual Reality. 3, 961236.
Hormann, L.B., Putz, V., Rudic, B., Kastl, C., Klinglmayr, J., Pournaras, E., 2019. Augmented shopping experience for sustainable consumption using the internet of thing. IEEE Inter.Things. Magazine. 2 (3), 46–51.
Huang, T.-C., Chen, C.-C., Chou, Y.-W., 2016. Animating eco-education: to see, feel, and discover in an augmented reality-based experiential learning environment. Comput. Educ. 96, 72–82.
Jäger, A.-K., Weber, A., 2020. Increasing sustainable consumption: message framing and in-store technology. Int. J. Retail Distrib. Manag. 48 (8), 803–824.
Joerss, T., Hoffmann, S., Mai, R., Akbar, P., 2021. Digitalization as solution to environmental problems? When users rely on augmented reality-recommendation agents. J. Bus. Res. 128, 510–523.
Lee, E.J., Bae, J., Kim, K.H., 2020. The effect of environmental cues on the purchase intention of sustainable products. J. Bus. Res. 120, 425–433.
Lee, S.-Y., Yoon, S.-Y., 2020. Exploring augmented reality for mobile learning: a case study with children's readings on environmental sustainability. Intern. J. Smart Technol. Learning. 2 (2–3), 151–165.
Lengel, R.H., Daft, R.L., 1988. The selection of communication media as an executive skill. Acad. Manag. Perspect. 2 (3), 225–232.
McNeill, L., Moore, R., 2015. Sustainable fashion consumption and the fast fashion conundrum: fashionable consumers and attitudes to sustainability in clothing choice. Int. J. Consum. Stud. 39 (3), 212–222.
Nguyen, H.V., Nguyen, C.H., Hoang, T.T.B., 2019. Green consumption: closing the intention-behavior gap. Sustain. Dev. 27 (1), 118–129.
Pantano, E., Rese, A., Baier, D., 2017. Enhancing the online decision-making process by using augmented reality: a two country comparison of youth markets. J. Retailing Consum. Serv. 38, 81–95.
Pfaff, A., Spann, M., 2023. When reality backfires: product evaluation context and the effectiveness of augmented reality in e-commerce. Psychol. Market. 40 (11), 2413–2427.
Rausch, T.M., Kopplin, C.S., 2021. Bridge the gap: consumers' purchase intention and behavior regarding sustainable clothing. J. Clean. Prod. 278, 123882.
Rese, A., Baier, D., 2025. Rental clothing box subscription: the importance of sustainable fashion labels. J. Retailing Consum. Serv. 83, 104153.
Robichaud, Z., Brand, B.M., Yu, H., 2024. Bridging the information asymmetry in e-commerce: an intercultural perspective on sustainable clothing. Int. J. Retail Distrib. Manag. https://doi.org/10.1108/IJRDM-12-2023-0708 ahead-of-print No. ahead-of-print.
Rotsios, K., Konstantoglou, A., Folinas, D., Fotiadis, T., Hatzithomas, L., Boutsouki, C., 2022. Evaluating the use of QR codes on food products. Sustainability 14 (8), 4437.
Safitri, D., Lestari, I., Maksum, A., Ibrahim, N., Marini, A., Sudrajat, A., Zahari, M., Iskandar, R., 2022. Ecolabel with augmented reality on the website to enhance student environmental awareness. Int. J. Ecol. 2022 (1), 8169849.
Schultz, C.D., Kumar, H., 2024. ARvolution: decoding consumer motivation and value dimensions in augmented reality. J. Retailing Consum. Serv. 78, 103701.
Shaw, N., Eschenbrenner, B., Brand, B.M., 2022. Towards a Mobile App Diffusion of Innovations model: a multinational study of mobile wallet adoption. J. Retailing Consum. Serv. 64, 102768.
Shukla, V.K., Gupta, R., 2019. Enhancing user experience for sustainable fashion through QR code and geo-fencing. In: 2019 International Conference on Automation, Computational and Technology Management (ICACTM). International Conference on Automation, Computational and Technology Management (ICACTM). IEEE, pp. 126–131.
Splendid Research, 2016. Welchen bekannten Modeherstellern würden Sie es am ehesten zutrauen, dass sie nachhaltig bewusste Mode herstellen? Slow Fashion Monitor. https://de.statista.com/statistik/daten/studie/724371/umfrage/wahrscheinliche-produktion-nachhaltiger-mode-fuehrender-hersteller-in-deutschland. (Accessed 15 June 2024).
Strada, F., Lopez, M.X., Fabricatore, C., dos Santos, A.D., Gyaurov, D., Battegazzorre, E., Bottino, A., 2023. Leveraging a collaborative augmented reality serious game to promote sustainability awareness, commitment and adaptive problem-management. Int. J. Hum. Comput. Stud. 172, 102984.
Strähle, J., Girwert, F., 2016. Impact of a fashion fTRACE app on the perception of sustainability. J. intern. business res.marketing. 1 (2), 7–18.
Taufique, K.M.R., Polonsky, M.J., Vocino, A., Siwar, C., 2019. Measuring consumer understanding and perception of eco-labelling: item selection and scale validation. Int. J. Consum. Stud. 43 (3), 298–314.
Trope, Y., Liberman, N., 2010. Construal-level theory of psychological distance. Psychol. Rev. 117 (2), 440.
Turunen, L.L.M., Halme, M., 2021. Communicating actionable sustainability information to consumers: the Shades of Green instrument for fashion. J. Clean. Prod. 297, 126605.
Uhm, J.-P., Kim, S., Do, C., Lee, H.-W., 2022. How augmented reality (AR) experience affects purchase intention in sport E-commerce: roles of perceived diagnosticity, psychological distance, and perceived risks. J. Retailing Consum. Serv. 67, 103027.
Ulrich, I., Cacho-Elizondo, S., Damay, C., Loussaïef, L., 2024. A practice theory perspective on apparel sharing consumption models exploring new paths of consumption in France and Mexico. J. Retailing Consum. Serv. 77, 103626.
Wang, K., Tekler, Z.D., Cheah, L., Herremans, D., Blessing, L., 2021. Evaluating the effectiveness of an augmented reality game promoting environmental action. Sustainability 13 (24), 13912.
Wiederhold, M., Martinez, L.F., 2018. Ethical consumer behaviour in Germany: the attitude-behaviour gap in the green apparel industry. Int. J. Consum. Stud. 42 (4), 419–429.