AI in e-commerce: The impact of an AI's alleged age on consumer perceptions of competence and trust

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Abstract

Artificial intelligence (AI) technology rapidly advanced in recent years, revolutionizing various domains, including marketing and online retail. As more and more online retail companies employ AI in technological solutions like website design, it is crucial to understand how consumers perceive and evaluate AI-driven technological solutions in this context. This study examined whether the year of development of an AI (2017 vs. 2023) that had allegedly created the website of an online retail company influences the perceived competence and trustworthiness of the AI as well as the perception of the websites' quality. Our online experiment ($N = 182$) revealed significantly higher competence ratings for the younger than for the older AI. Contrary to our hypotheses, we found no evidence that participants perceived the older AI as more trustworthy. Instead, participants indicated the younger AI to be slightly more trustworthy. These findings offer valuable insights into the consumer expectations and trust dynamics in AI-enhanced online retail environments. We discuss the results considering implications of recent advancements in AI for the retail sector and highlight how our findings can inform future research and companies on the strategic deployment of AI technologies in online retail.

Keywords: artificial intelligence, trust, competence, online retail

1 Introduction

Significant technological advancements in machine learning have led to the proliferation of artificial intelligence (AI)-powered technologies, profoundly impacting various parts of people's everyday lives: from how content is created to how they make purchases online. Underlying these new AI-driven technologies is the development of computer algorithms to perform tasks typically associated with human intelligence [1]. Marking one of the most impactful moments in AI history, the release of the text-based large language model (LLM)-powered conversational agent ChatGPT by OpenAI in 2022 sparked significant public attention. It showcased the immense potential of generative AI, a subset of AI comprising algorithms that are designed to generate new and diverse content, such as images and text [2]. However, AI's impact extends beyond generative AI, and even before ChatGPT, AI-based applications were already being used in various forms, such as voice assistants like Alexa and Siri, recommendation systems in platforms like Netflix and Amazon, and facial recognition technology in security systems.

1.1 Artificial intelligence applications

The ever-growing use of AI suggests that there is seemingly no limit to the areas in which AI-based applications are or can be employed. Apart from its application in fields such as healthcare [3], education [4], engineering [5], and finance [6], AI is also increasingly integrated into various aspects of business operations as the IBM Global AI Adoption Index 2023 shows: About 42% of companies (> 1.000 employees) reported active AI deployment in their business in November 2023 [7]. The potential use cases of AI in the business sector are manifold. A recent survey identified marketing and sales as business functions where generative AI is most often adopted by companies [8]. For example, in marketing, AI is used to analyze consumer behavior and preferences based on vast amounts of consumer data, enabling companies to make predictions, provide tailored recommendations, and create highly personalized marketing campaigns [9]. In turn, besides boosting a company's efficiency, this can bring significant benefits to the company in terms of business value, including increased revenue, improved decision-making, and reduced costs [10; 11]). The associated expected competitive advantage is a crucial driver for implementing AI in business: According to a recently published survey, 60% of advertising industry professionals from Europe reported competitive advantage as a primary factor for adopting generative AI within their business [12]. As a result, investments in AI are on a steep increase, with estimates suggesting that by 2032, the market size of generative AI in marketing will expand to 22 billion dollars, a substantial rise from 1.9 billion in 2022 [13]. Moreover,

this increased adoption of AI is not limited to marketing but also gaining popularity in the retail sector [14].

1.2 Artificial intelligence application in retail

In recent years, the retail industry has seen a significant shift in consumer behavior from traditional in-store shopping to online shopping, a trend accelerated by the COVID-19 pandemic [15]. By the end of May 2020, electronic commerce (e-commerce) transactions reached levels previously expected in four to six years [16]. In 2023, global e-commerce sales reached an estimated 5.8 trillion dollars, with projections indicating further growth of 39% over the coming years, expected to surpass 8 trillion dollars by 2027 [17]. As consumers increasingly transition to online shopping, businesses compete to deliver superior customer service and create a seamless, personalized shopping experience—and leveraging AI can help achieve these objectives [18].

AI has evolved as a transformative tool in the highly competitive and constantly evolving e-commerce sector, offering a range of benefits to both consumers and retailers. AI can be used by companies for content generation, for example, for product descriptions, for the design of customized website layouts, and in the form of AI algorithms to provide personalized content, including tailored product suggestions and dynamic content adaptation [19; 9]. The implementation of AI technology in the form of AI-powered virtual assistants and chatbots has become a significant trend in e-commerce [20]. Following other major retailers like Amazon, Zalando, one of the leading European online fashion platforms, recently released its AI-powered Zalando Assistant, which can provide customers with personalized advice and tailored product recommendations [21]. Chatbots, also known as conversational agents, are automated text-based dialogue systems with which users can interact through natural language [22]. More and more companies are now integrating chatbots into their websites as they offer convenience for customers by delivering real-time and immediate 24/7 customer assistance, while at the same time boosting a company's operational efficiency and reducing costs compared to human customer service agents [23]. The already widespread use of chatbots among companies is expected to increase even further, with chatbots expected to become the primary communication channel for a quarter of organizations by 2027, according to a recent survey [24]. As a result of this predicted increase in the implementation of AI technology in e-commerce, customers will be increasingly exposed to AI content when shopping online. It is therefore crucial to gain insights into how the integration of AI-driven solutions in the shopping activity is experienced and perceived by customers.

1.3 Perceptions of artificial intelligence in retail

There is an emerging body of research exploring how AI technology is perceived by users across various contexts of implementation. Much of this research builds on the Technology Acceptance Model (TAM [25; 26], a theoretical framework widely employed and studied to understand the acceptance and adoption of new technologies [27]. The original TAM proposed humans' perceived usefulness and perceived ease of use of a technology as primary factors influencing their attitudes and intentions to use it, ultimately driving their actual use of technology [26]. Subsequently, additional variables were incorporated into the TAM; for example, Wu et al. [28] identified a significant influence of trust on TAM constructs. The application of the TAM and the role of trust were also investigated with regard to the acceptance and use of AI technologies [29]. The results of a survey show a significant influence of trust on the intention to use AI, mediated by perceived usefulness and attitudes toward voice assistants [30]. Additionally, a recently published review of 60 studies on user acceptance of AI highlights several factors that determine the intention, willingness, and use behavior of AI across different industries: perceived usefulness, performance expectancy, attitudes, trust, and effort expectancy [31]. Trust has also been related to perceptions of warmth, which has, together with competence, been identified as a dimension of humanlike mind perception in non-human entities [32].

Despite the widespread implementation of AI in customer-company interactions, there is still a limited understanding of how AI technology is perceived and used by customers in online shopping. To

address this gap, some research is beginning to explore the TAM constructs and customers' trust in e-commerce. For instance, an online survey revealed trust and perceived usefulness as pivotal for customer acceptance of AI technology [33]. An increasing body of research on customer perceptions of AI in e-commerce focuses explicitly on customers' perceptions of chatbots. Research indicates that, in addition to perceived usefulness and ease of use, various other chatbot-related factors, including expertise, responsiveness, and anthropomorphism, as well as the company-related factor of brand trust, affect consumers' trust in chatbots [34]. Moreover, credibility and competence have been found to influence consumers' trust in chatbots and shape their purchase intentions [35]. Differentiating factors that influence the use of text-based compared to voice-based chatbots for shopping, Jan et al. [36] identified ease of use, usefulness, trendiness, and informativeness as reasons for the usage of text-based chatbots, whereas they found convenience, interactivity, and ubiquity as reasons for the usage of voice-based chatbots.

The rapid rate at which new AI technology and updates to existing models are released, such as the improvements seen with the recent GPT-4 update to GPT-4o, introduces enhanced capabilities and regular updates to functionalities, for example, to the spectrum of input and output modalities and response speed [37]. Accordingly, the AI landscape includes longer-established models and newly developed ones that differ in their programming year and period of use. This constant evolution of new AI versions raises the question of how these advancements impact users' perceptions. Are, on the one hand, "newer/younger" AIs perceived as more competent than "older" ones due to their broader capabilities? And are, on the other hand, "older" AIs perceived as more trustworthy than "newer/younger" AIs as they have been used successfully for many years? Despite the growing relevance of AI across industries, there is a scarcity of studies examining how the rapid advancements in AI technology affect the perceptions of users and customers. While there is some research showing a general preference in humans for the new, given that there is interest [38], to the best of our knowledge, there has yet to be a current investigation on the impact of year of development of an AI on users' perceived competence and trustworthiness of the AI. Concerning the growing application of AI technology in e-commerce, studying these potential differences may have practical implications for the design and implementation of efficient customer service chatbots by practitioners and companies. To fill this gap in existing research, this study aims to explore how the perceived age of AI influences consumer perceptions in the context of e-commerce.

We seek to answer this research question (RQ) and test the following hypotheses:

How does the "age" of an AI influence the rating of its competence and trustworthiness?

H1: People judge AIs as more competent when the AI is "younger" (2023) in comparison to the AI being "older" (2017).

H2: People judge AIs as more trustworthy when the AI is "older" (2017) in comparison to the AI being "younger" (2023).

Moreover, we aimed to explore if perceived competence and trustworthiness of AI influence the evaluation of the quality of a website the AI had allegedly designed.

2 Methods

This experiment was preregistered on AsPredicted before data collection began (https://aspredicted.org/WCN_FT3).

2.1 Participants and design

We recruited participants via university mailing lists and collected data of 425 participants for this online experiment. Participants were required to have an age of at least 18 years and have good knowledge of the German language. The participants were randomly assigned to one of two conditions. Depending on the condition, participants received different information on the AI that allegedly created the website of a fictional company. They either received the information that the AI was developed in 2017 and called "webwx2017" (*old AI condition*) or that the AI was developed in 2023 and called "webwx2023" (*young AI condition*). Following our preregistered exclusion criteria, participants were excluded if they indicated to be under the age of 18 years, did not have a good knowledge of the German language, did not agree to the usage of their anonymously saved data for research purposes, did not complete the experiment, or did not pass the attention check. Passing the attention check required the participants to pick the correct year of development of the AI that allegedly created the website (see procedure). We excluded $n = 2$ participants from the analysis due to indicating an age under 18 years and $n = 241$ participants due to a failed attention check. Thus, the eligible sample consisted of $N = 182$ participants (129 female, 49 male, 4 non-binary; aged: $M = 24.32$ years, $SD = 6.87$, 18-72 years). Regarding their occupation, 167 participants indicated that they were university students, 12 participants stated that they were employed, and three participants indicated their occupation as "other". In the old AI condition, the final sample consisted of $n = 122$ participants (89 female, 29 male, 4 non-binary; aged: $M = 23.95$ years, $SD = 6.35$, 18-59 years). In the young AI condition, the final sample consisted of $n = 60$ participants (40 female, 20 male; aged: $M = 25.08$ years, $SD = 7.81$, 18-72 years).

2.2 Procedure

The online experiment was introduced as a study on the topic of web design to prevent participants from recognizing our actual research intentions (see Online Appendix A for the recruiting email). The experiment was composed in German and ran on www.soscisurvey.de. The participants were randomly assigned to one of two conditions. In each condition, participants first filled in the informed consent form. Then they read a brief introductory text (see Online Appendix B) that asked them to help in improving an AI, which was in the *old AI* condition referred to as "Webwx2017" and in the *young AI* condition referred to as "Webwx2023" (manipulation of factor age of the AI). The respective name of the AI was repeated throughout the experiment and always written in bold letters. Depending on the condition, participants were further informed that the respective AI had either existed for 6 years or for 1 year. In both conditions, participants received the information that the AI creates websites specifically for products, that after its development the AI has received regular updates, and that in the study the AI was used to develop a prototype for an eyewear website for the company "Looxify". At the end of the introductory text, participants were asked to rate the website according to various criteria. Additionally, the participants were presented with the specifications under which the AI had allegedly designed the website (i.e., simple and user-friendly design, design and incorporate the company logo, images of happy people wearing glasses, linked social media).

Following the introductory text and independent of the experimental condition, participants were presented with two images that allegedly showed screenshots of the AI-created website. They were instructed to look at the images carefully. After a minimum of 40 seconds, they could continue the study and answered a questionnaire on the perceived competence of the AI, trust in the AI, and the perceived quality of the AI-created website. The order of the items was kept the same for all participants. Subsequently, participants rated the perceived age of the AI on a 7-point scale (1 = *young*, 7 = *old*) in a manipulation check question. Following the manipulation check question, participants had to indicate the year of development of the AI by selecting the correct year (i.e., either 2017 or 2023) from four options (2014, 2017, 2020, 2023). After this attention check question, participants were asked to report their age, gender, and occupation. At the end of the study, participants were debriefed (see Online Appendix B), given the option to withdraw their data, and

given the opportunity to sign up for a drawing of one of seven vouchers for an online store (two vouchers worth 50€ each and five vouchers worth 20€ each).

2.3 Material

The two images that allegedly showed screenshots of the online shopping website of the fictional eyewear company “Looxify” were created by the authors using the imaging editing software Adobe Photoshop. The images depicted, among other things, the fictional company logo and slogan, a selection of glasses, pictures of people wearing glasses, and linked social media (see Fig. 1).

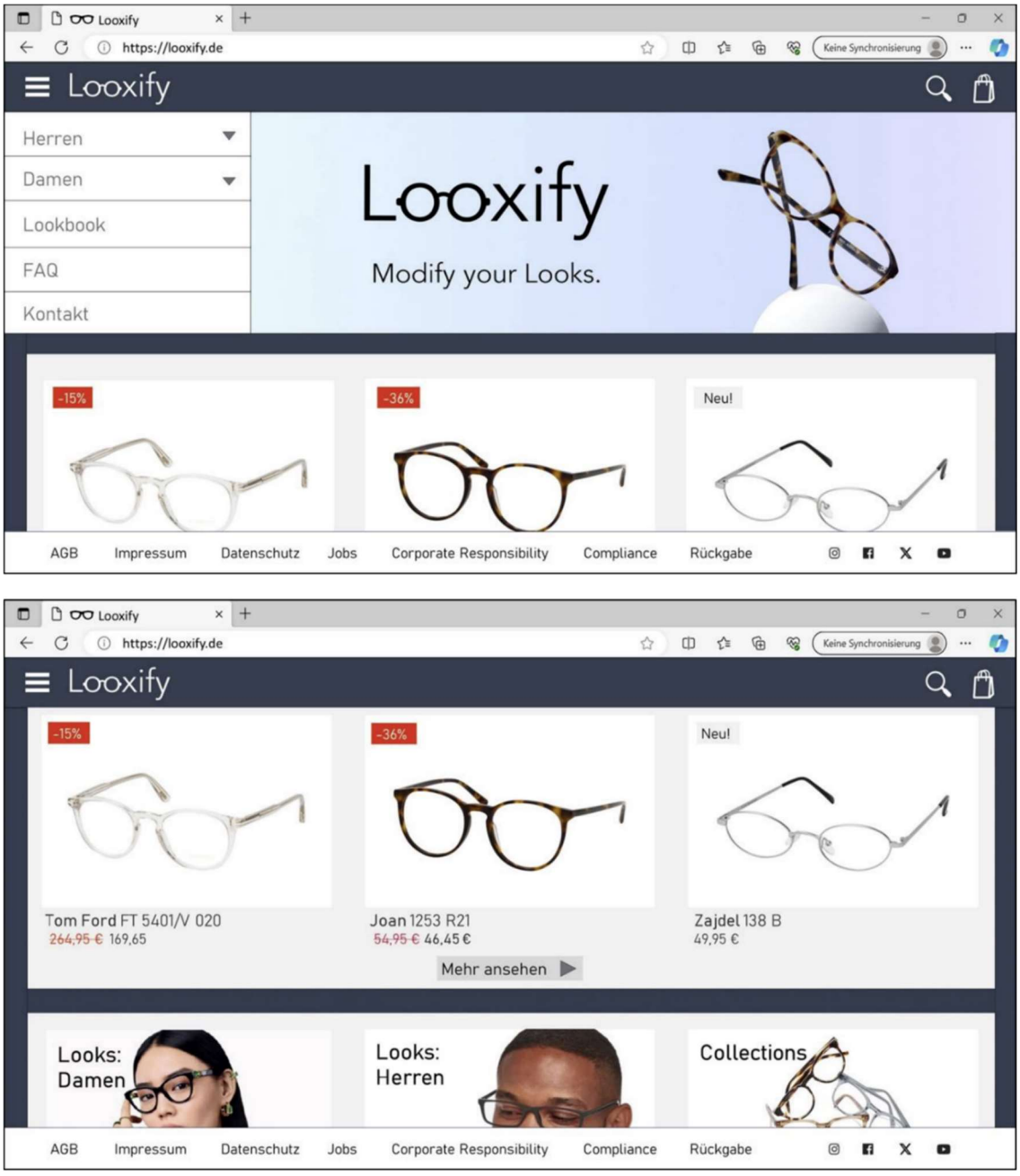

Fig. 1 Screenshots of the website

2.4 Measures

Based on similar measures applied in a study by Toader et al. [39], we implemented a questionnaire that comprised a total of 15 items, with five items for each of our three dependent variables perceived competence, trust in the AI, and perceived quality of the website. All items were measured on 7-point scales (1= *strongly disagree*, 7 = *strongly agree*).

We measured the *perceived competence* of the AI with the items: "The AI provided relevant and useful information on the website", "The AI knew exactly what to do", "The AI appears competent", "The AI appears to have a lot of practice", "The AI can understand complex problems and provide appropriate solutions" ($\alpha = .90$).

Trust in the AI was measured with the items: "I could trust the AI to make important decisions", "I would follow the AI's recommendations or advice", "Artificial intelligence is generally a reliable source of information and advice", "The AI is safe and uses my personal data securely", "I would let this AI help me with certain tasks (e.g., developing a new website)" ($\alpha = .72$).

The *perceived quality of the website* was measured with the items: "The website is designed to be user-friendly", "The website is clear and well structured", "The design of the website is appealing", "The website presents relevant and interesting information", "The website has met the requirements of the creators well" ($\alpha = .87$).

See Online Appendix C for the applied questions.

3 Results

A Welch t-test confirmed the manipulation of the age of the AI as successful. Participants in the old AI condition rated the AI as significantly older ($M = 4.20$, $SD = 1.26$) than did participants in the young AI condition ($M = 2.55$, $SD = 1.29$), $t(114.97) = 8.13$, $p < .001$, $d = 1.29$.

To test H1 and H2, we conducted Welch t-tests. There was a significant effect of age of the AI for perceived competence of the AI with higher competence ratings for the younger ($M = 5.47$, $SD = 1.13$) than for the older AI ($M = 4.97$, $SD = 1.22$), $t(126.24) = -2.74$, $p = .007$, $d = 0.43$, which supports H1. See Fig. 2 for a visualization. However, the older AI did not receive higher ratings of perceived trust ($M = 3.62$, $SD = 0.95$) than the younger AI ($M = 3.88$, $SD = 0.97$), $t(114.70) = -1.711$, $p = .090$, which contrasts with H2.

Concerning the exploratory research question if perceived competence of the AI and trust in the AI influence the evaluation of the quality of the website the AI had allegedly designed, correlation analyses showed both perceived competence of the AI ($r = .65$, $p < .001$) and trust in the AI ($r = .33$, $p < .001$) were positively related to the perceived quality of the website the AI had allegedly designed. However, no significant effect of age of the AI on the perceived quality of the website was found, $t(99.59) = -1.38$, $p = .171$ (older AI: $M = 5.30$, $SD = 0.98$; younger AI: $M = 5.50$, $SD = 1.19$). Thus, we refrained from conducting mediation analyses as initially outlined in our preregistration.

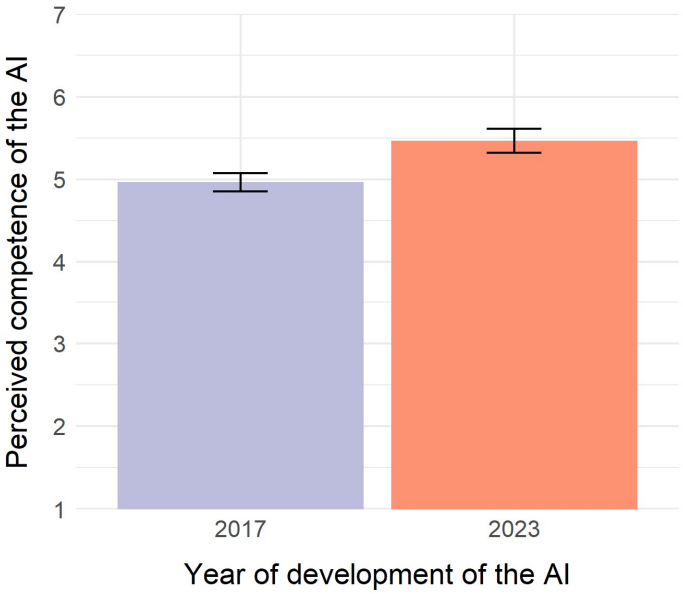

Fig. 2 Average indicated perceived competence of the AI as a function of year of development of the AI (2017 vs. 2023). The error bars represent the respective standard errors

4 Discussion

AI technologies are used across various industries, including the e-commerce sector. However, despite their wide applications, there is still a limited understanding of how AI technology is perceived by users, especially regarding the ongoing development in the field and the rapid release of new AI versions. To investigate the impact of the perceived age of an AI on perceptions of competence and trustworthiness, we conducted an online experiment where we presented participants with screenshots of a fictional website an AI (either introduced with year of development in 2017 or in 2023) had allegedly created. Consistent with our first hypothesis, we detected significantly higher competence ratings for the younger than for the older AI. This finding is revealing considering the mere manipulation of the AIs' age in our study, that is, neither was there an actual interaction of participants with the AI nor did they receive information on the process of how the AI allegedly created the website. The mere manipulation of the year of development of the AI across the two experimental conditions was sufficient for participants to ascribe a higher level of competence to the younger than to the older AI. The reasons for this could be manifold, and disentangling whether newer AIs, or even newer technologies in general, are attributed better capabilities and a higher level of competence, even without an evaluation of their actual performance, could be an objective of future research. Another avenue for future research could be to assess the impact of actual engagement with an AI for website creation on the evaluation of the AIs' competence. It is important to note that in both experimental conditions, the average competence ratings were in the upper range of the scale. These overall quite high average competence ratings might be due to the specific task of website design that the AI in our study had allegedly performed. Research has found that people subjectively overestimate the abilities of others who performed superior to them in a task [40]. We assume that most participants in our study would regard website design as rather complex and would most likely not consider themselves able to perform this task. Therefore, rather than perceiving the AI as exceptionally competent, the high competence ratings across our experimental conditions could be due to participants considering the task very difficult.

In contrast to our second hypothesis, there was no evidence of significantly higher trust perception of the older compared to the younger AI. Instead, our findings revealed a descriptively higher level of ascribed trust to the younger than to the older AI. Notably, compared to average competence ratings,

average levels of trust were found to be lower across both experimental conditions. Considering research on perceived trustworthiness among humans with findings of higher indicated trustworthiness toward older compared to younger people (e.g., ref. [41]), our findings suggest that this positive effect of age on perceived trustworthiness does not translate to AI. Previous research found an impact of perceived competence on trust [39; 35]; however, the higher average levels of indicated perceived competence compared to trustworthiness suggest that in our study competence alone was not enough to elicit trust toward the AI. Besides competence, research also points to transparency and understandability as important factors that contribute to establishing trust in an AI (e.g., ref. [42]). In our study, participants did not receive information on the process of how the AI allegedly created the website. Thus, future research could be directed at the question of how explanations of an AIs' functioning and its capabilities might shape the way trust is evoked toward newer compared to older AI technologies. Also, a general aversion toward algorithms in our sample could be the reason for our findings (see also ref. [43]). Jussupow et al. [44] found that people prefer to interact with humans even when algorithms outperform humans in various tasks. Taken together, further research into trust in AI technology is needed, especially considering the impact of trust on customer satisfaction and purchase intentions [39; 35].

Regarding our exploratory research question, our results revealed no significant impact of AI age on perceived quality of the website. In addition to the age of an AI other factors might influence whether the product of an AI is perceived and rated as high in quality. Considering that we found perceived competence and trust significantly positively related to quality judgements, it appears likely that these factors play a more important role in shaping peoples quality judgments than the perceived age of an AI.

Limitations of our study concern the high number of excluded datasets due to many participants who failed the attention check, which resulted in unbalanced experimental conditions, and the overrepresentation of university students and female participants in our sample. The fact that a large proportion of participants did not recall the year of publication correctly in the attention check raises the question of whether the manipulation of age was not presented obviously enough. Even though our manipulation check proved the manipulation of perceived age by programming year to be successful, future studies should present the year of publication of an AI more clearly.

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