

An Avatar a Day Keeps the Stress Away: The Implementation of Avatars as Technostress Relievers on Online Shopping Websites

Jasmin Feste
University of Bamberg
jasmin.feste@uni-bamberg.de

Leonore Peters
University of Bamberg
leonore.peters@uni-bamberg.de

Michael Schirmer
University of Bamberg
michael.schirmer@uni-bamberg.de

Abstract

In contrast to stationary retail, online shopping websites are characterized by the fact that no human salesperson is available to buyers as a reference and supporting function for the purchase. With increasing technological penetration and thus online shoppers facing the challenges of technologically induced stress (technostress), it becomes crucial for e-commerce operators to reduce this impersonality of online stores to avoid negative consequences of technostress. Our study proposes the means of an avatar as a technostress reliever. We empirically assess the indirect effect of technostress on purchase intention mediated by online store quality and moderated by avatar presence on the online store website. Our 2x2-factorial between-subjects experimental study reveals a negative indirect effect of technostress on purchase intention of respondents. Further, our findings show that independently of perceived online store quality the total level of the purchase intention is higher for the presence of an avatar than for the absence of an avatar.

Keywords: online shopping, avatars, technostress, social presence, online store quality.

1. Introduction

“By 2022, brick and mortar retail spaces will be little more than showrooms” (Machaalani & Harper, 2021) - this quote from Bigcommerce’s CEOs Eddie Machaalani and Mitchell Harper does not yet reflect reality and may seem exaggerated. Nevertheless, it is symbolic of the focus on e-commerce platforms that has become increasingly pronounced in recent years. New technologies are opening up new decision-making opportunities for consumers, such as shopping online, anytime and anywhere (Ragu-Nathan et al., 2008). Instead of taking the often lengthy trip to a store, platforms like Amazon or eBay are just one click away. Unsurprisingly, the trend of shopping online has been

increasing, not just since the outbreak of Covid-19. It is not only the reduction in transaction costs, which makes e-commerce more and more attractive from the perspective of potential customers: on the one hand, the ever-advancing digitization with a multitude of possibilities also contributes to ordering that until a few years ago still had to be bought locally (Javadi et al., 2012). On the other hand, the population is increasing need for convenience is constantly making new demands. With the establishment of online commerce, it is essential to stand out from the competition with a sophisticated website design, but this also increases the likelihood of technical problems, such as an unintuitive operation of the website or longer loading periods of animations. These states are often reflected in so-called technostress, i.e. stress that arises in the context of dealing with technical systems (Ayyagari et al., 2011; Chen et al., 2019; Riedl et al., 2012; Tarafdar et al., 2019). At this point, a major problem of online platforms becomes obvious: there is no human person who is available to support inexperienced or stressed consumers (Barlow et al., 2004). One possible solution to this problem could be avatars. Avatars are humanized entities that are designed to be abstract representations of sales agents (Holzwarth et al., 2006; Liew et al., 2017). Thus, they act on e-commerce platforms as a substitute for the missed presence of sales persons and often exhibit human traits (Keeling et al., 2020). This humanization of technologies fulfills people’s intrinsic need for social presence (Gefen & Straub, 2004; Mennecke et al., 2010). This is in line with findings from social response theory (Huang & Lin, 2011). If technologies exhibit social traits, they are perceived as social actors by individuals and are evaluated on a more emotional than technological level as a result. Accordingly, avatars are intended to contain the danger posed by technostress on websites and thus to prevent undesirable negative actions on the part of consumers. It is notable that consumers are subject to a high degree of uncertainty when buying online, as they do not have the products in front of them and cannot judge them on

the basis of appearance or condition. Both the effects of physical absence of a sales person and the disappearance of a familiar environment differ depending on the sector analyzed. Here, manufacturers of products where the purchase decision is made on the basis of taste, appearance or texture face a particular challenge. In the food industry, for example, customers are very critical of buying from online stores (Weitzel & Ernst, 2019). These doubts can be dispelled by a high quality online store website, since consumers often link perceived website quality and image of a store to product quality (Everard & Galletta, 2005; Green & Pearson, 2011; Lin, 2007). In order to increase individuals' assessment of online stores, the usage of avatars is discussed as a promising option since avatars contribute significantly to consumers' perception of social presence which in turn contributes to a positive perception of the shop (Holzwarth et al., 2006; Keeling et al., 2020; Liew et al., 2017).

However, the congruence of the avatar with the products offered is crucial (Liew et al., 2017; Lin, 2007; Wöflfl et al., 2019). In this context, the term avatar fit, i.e. the congruence of the website's values and those conveyed by the avatar, is often used (Mull et al., 2015). There is evidence that congruent avatars have a more positive impact on consumers than non-congruent avatars (Wöflfl et al., 2019). While information systems and platforms have been extensively researched in a business context (La Torre et al., 2019; Tarafdar et al., 2019), there is relatively little research examining the impact of using information systems in a personal context. Therefore, we answer the call by Tarafdar et al. (2019) for an extension of the research on technostress in other areas, e.g. e-commerce. Our research questions are the following:

- 1) *How does technostress influence purchase intention mediated by online store quality?*
- 2) *How is this relationship affected by the presence of an avatar?*

With our research we aim to contribute to e-commerce and technostress literature with a focus on effects of perceived technostress in an online store context. Besides, we extend on the research of Peters et al. (2022) by responding to their call for research that suggests the implementation of avatars on online store websites to reduce the perception of technostress. We therefore analyze the effects of technostress on perceived online store quality and purchase intention in the presence vs. absence of an avatar in an experimental study and proceed as follows: first, we present a conceptualization of technostress, describe the phenomenon of avatars by drawing on social response theory, and their impact on online store quality and purchase intention. Based on this, we develop a research

model from which three hypotheses on relationships of the above constructs derive. Along with a description of our experimental study, we present, discuss and analyze the results. Recommendations for e-commerce practice, contributions to research and directions for future research conclude our paper in line with limitations of our research findings.

2. Theoretical foundations

2.1. Technostress in e-commerce

The basic understanding of technostress is based on the transactional stress model developed by Lazarus and Folkman. According to them, stress is not the direct consequence of individual environmental conditions or personalities but the consequence of an encounter between an acting person and the demands of the situation the person is exposed to (Lazarus, 1966; Lazarus & Folkman, 1984). This demand on individuals increases especially in rapidly changing environments (Tarafdar et al., 2010). In the course of progressive technological development and digital innovation, the original transactional model of stress was transferred to the technological context. It is through this transfer that Brod (1982) coined the term *technostress*.

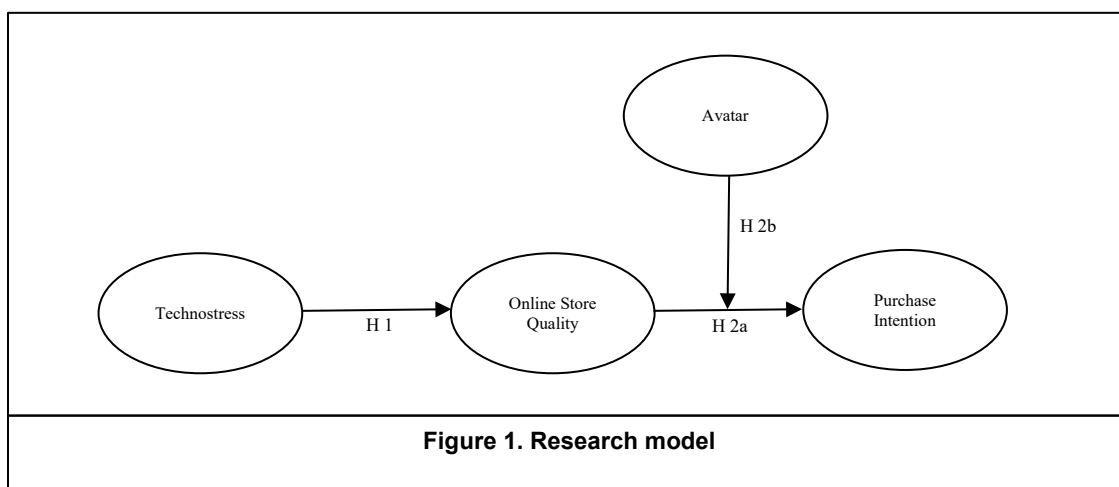
With ever-changing technological standards, individuals are constantly faced with new technological challenges both in the workplace and in their personal lives. This not only affects technostress perception but has additional impact on private consumer behavior (Tarafdar et al., 2019). New technologies are opening up new types of consumer behavior. In the private context (non-work context), the consumer focus is particularly on e-commerce, which is used as an alternative to stationary shopping (Riedl et al., 2012). Equivalent to the in-store shopping experience, the online shopping experience can also cause technostress, that is, stress resulting from the use of information and communication technologies (ICT). Tarafdar et al. (2007) identified five factors, likely to cause technostress in individuals: techno-overload, techno-invasion, techno-insecurity, techno-complexity, and techno-uncertainty. These *technostress triggers* are factors that generate feelings of technostress in an individual (Tarafdar et al., 2007). These correspond to the stressors in the stress model of Ragu-Nathan et al. (2008). Furthermore, technostress can occur in situations where interruptions and/or software problems cause unexpected errors on the users' side (Ayyagari et al., 2011). Stressors influence human physiology by activating cognitive and affective processes in the brain (Lazarus & Folkman, 1984). After perceiving a stressor, the human brain often subconsciously evaluates these environmental stimuli. This in turn can lead to

emotional reactions, such as dissatisfaction or negative evaluation of the situation/technology (Ragu-Nathan et al., 2008).

The majority of researchers examine technostress in an organizational and work-related context, where individuals are regularly exposed to innovations in technology and resulting technological challenges (La Torre et al., 2019; Bucher et al., 2013). However, several researchers highlight the necessity to extend the research focus to include the use of technology in the private lives of individuals (Tarafdar et al., 2007; Tarafdar et al., 2010; Qasem, 2019).

In the wake of this, e-commerce is unavoidable for most businesses as customers expect to be able to buy products online. As consumers become increasingly connected via social networks and digital consumption

intention since the potential customer draws from the online store quality to the quality of the products offered (Hsu et al., 2012; Kim & Lennon, 2013; Qalati et al., 2021; Wells et al., 2011). Consequently, in terms of stress resulting from using technologies in the online shopping context, a consumer's perceived technostress is expected to negatively affect his or her evaluation of the online store quality (Riedl et al., 2012), hence negatively impacting his or her intent to purchase from this website. If a customer perceives stress in a stationary retail environment, it may be possible to mitigate it with the assistance or help of a sales associate. However, such personal sales assistance does not exist in the online context, which under normal circumstances leads to consumers not experiencing any help in their stress situation.



continues to rise, e-commerce enables new communication opportunities to be opened up between suppliers and consumers (Hermes et al., 2022). Since e-commerce is also subject to constantly changing technologies, the use of an online store carries the risk of users experiencing technostress (Ayyagari et al., 2011; Tarafdar et al., 2019). Possible triggers for technostress include non-loading images, general website loading errors, or distracting graphics and advertisements (Chen et al., 2019; Moody & Galletta, 2015; Riedl et al., 2012). These stressors are the reason that the situation in an online store is deviating from the normal case. As a consequence, consumers come to the conclusion that the website does not appear as usual. Therefore, the potential customer evaluates the online store quality as low (Green & Pearson, 2011; Moody et al., 2014). Experiencing technostress in these situations leads to consumers evaluating online store quality significantly worse than when they are not influenced by stressors (Peters et al., 2022). This bears a high risk for e-commerce operators in the e-commerce context, as a reduced perceived online store quality subsequently also has a negative impact on consumers' purchase

2.2. Avatars as stress relievers?

Avatars can be understood as kind of a virtual representative of a person in a virtual space. Avatars are images that are designed and embodied by means of technology (Holzwarth et al., 2006; Liew et al., 2017). They can be assigned different characteristics depending on the purpose that the virtual figures are intended to fulfill. Commercial websites in particular use avatars to compensate for the absence of a sales representative in the digital context (Keeling et al., 2020). The avatar is supposed to give the same impression as an employee in a store who is on site to advise the customer. Thus, the presence of a virtual character is intended to positively influence the shopping experience on the website in a similar way to a clerk in a store (Holzwarth et al., 2006). Previous research has shown that the presence of non-interacting avatars ensures that consumers perceive a social presence. Social presence on a website is interrelated with evaluation of online store quality by consumers

(Seeger et al., 2021; Wöfl et al., 2019). If consumers rate the online store quality as high, then the probability that they will make a purchase or behave loyally towards the company or the online store in the long term also increases (Hsu et al., 2012; Kim & Lennon, 2013; Qalati et al., 2021; Wells et al., 2011).

This is in line with findings of social response theory. This theory states that people tend to perceive computers and technologies as social actors if they exhibit human characteristics and behaviors (Huang & Lin, 2011). Assigning human attributes and characteristics to non-human objects is understood as anthropomorphism. Studies on anthropomorphism prove that objects such as avatars that have human attributes increase the perceived quality of an online store (Wöfl et al., 2019). In terms of social response theory, the avatar in this case replaces the missing human-social presence. This leads to increased credibility of the online store, thus increasing its perceived quality and positively influencing consumers' purchase intention.

The encounter of consumers with an avatar lends credence to the website and convinces consumers of the online store's high quality (Holzwarth et al., 2006; Kang & Lee, 2018; Liew et al., 2017; Shim et al., 2012). This encourages consumers to pursue their goal - making a purchase decision. Further, it helps consumers establish a relationship with a company. Avatars are essential on e-commerce websites in order to ensure that consumers' need for social presence in a virtual context is satisfied (Gefen & Straub, 2004; Liew et al., 2017; Mennecke et al., 2010). If this is the case, consumers rate the website more positively overall and have a higher purchase intention than on websites that do not show a social presence. Avatars therefore fulfill a customer-specific need for social encounters in social networks and in e-commerce. This leads to an increased conviction of the customer to make a purchase. Thus, a positive correlation exists between the perception of social presence, positive evaluation in the website, and purchase intention. Avatars with a human appearance elicit the most positive responses from consumers, as they appear to be more attractive, credible, and trustworthy than nonhuman or abstract avatars. An emotional connection can nevertheless be established with non-human avatars. This is especially the case if the avatar has been anthropomorphized, i.e. has human attributes and is thus perceived as a social object (Liew et al., 2017; Mull et al., 2015; Wöfl et al., 2019). Additionally, the avatar fit is of central importance. Avatars whose characteristics are congruent with the characteristics of the website on which they appear have a significantly more positive effect on consumers' evaluation of the online store quality than non-congruent avatars. Avatar fit positively influences

customer perception in terms of website and avatar credibility and purchase intent. Contextual avatars further enhance the effect of online store quality on purchase intention on the part of customers (Wöfl et al., 2019).

2.3. Research model

Our research model is based on the findings of social presence theory in combination with findings from technostress research and the application of the transactional stress model in a technological context by Tarafdar et al. (2007). Our goal is to examine to what extent technostress triggered by stressors affects consumers in the e-commerce sector. Furthermore, we investigate the effects of online store quality on consumer buying behavior and the role of non-human avatars in this relationship. Based on the theoretical findings, we build a research model, which is graphically depicted in figure 1.

Previous research has shown that stress also has a negative impact on consumers in a digital context (Moody & Galletta, 2015; Moody et al., 2014; Riedl et al., 2012). Consumers react negatively to the stimuli emitted by technological stressors. This thus translates into a negative perception of the website or the store and further ensures that customers perceive the website or the store of low quality (Green & Pearson, 2011; Moody et al., 2014). Since the buying behavior of consumers depends significantly on the quality of the buying environment, we propose the following hypothesis:

***Hypothesis 1:** Technostress has a negative impact on the online store quality.*

The shopping environment and the general feeling when entering the store are significant factors that influence a customer's intention to buy. Previous research transferred this to the digital context. The design of the website and the overall perceived quality of the website represent crucial cues on which consumers base their evaluations (Hausman & Siekpe, 2009). According to previous research, the general perception of the shopping environment and the evaluation of online store quality has a significant impact on whether website visitors intend to make purchases and actually do so (e.g., Hausman & Siekpe, 2009; Liang & Lai, 2002; Ranganathan & Ganapathy, 2002; Vijayasathy, 2004). The quality of an online store is expressed above all in a certain clarity, ease of navigation and user-friendliness (Poddar et al., 2009; Ranganathan & Ganapathy, 2002). According to previous research (Everard & Galletta, 2005; Kim & Lennon, 2013; Poddar et al., 2009; Qalati et al., 2021; Wells et al., 2011) and the assumption that consumers

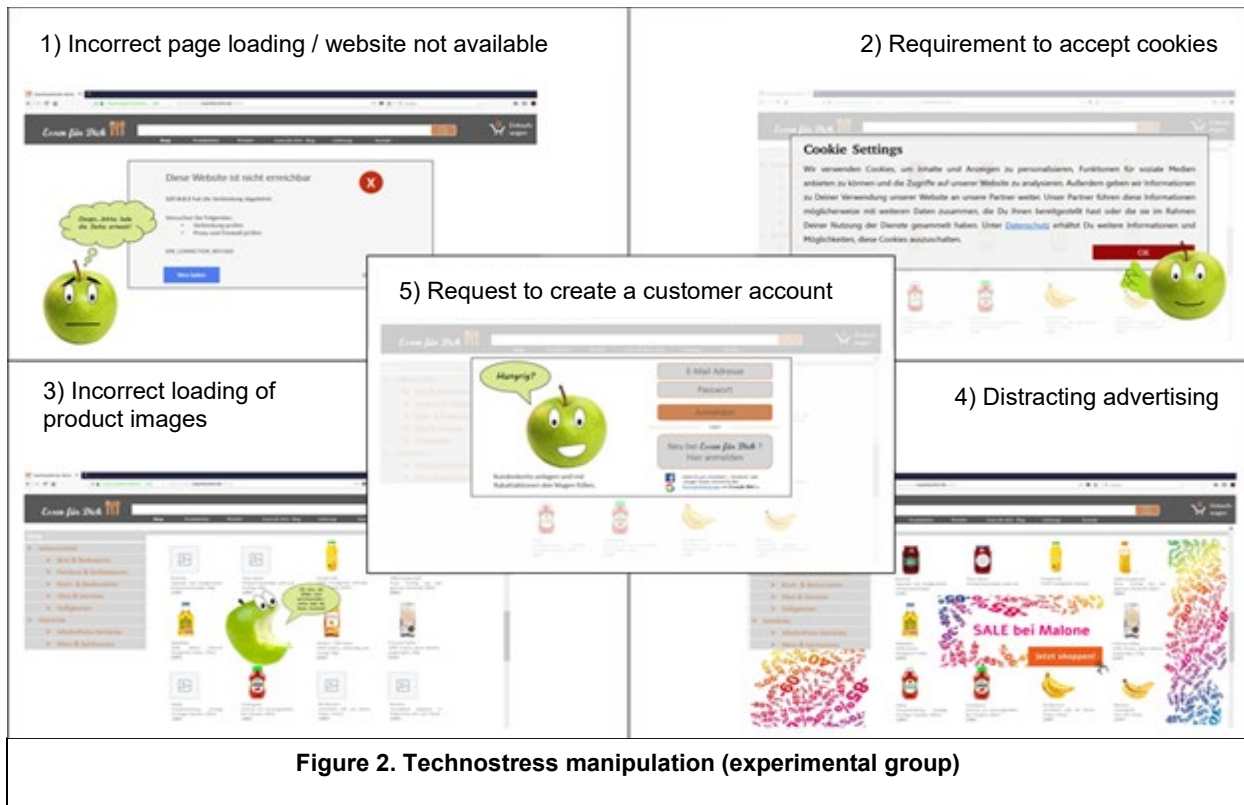


Figure 2. Technostress manipulation (experimental group)

will only consider to make a purchase decision if they if they have the impression that the website offers good quality, we assume the following:

Hypothesis 2a: *Online store quality has a positive effect on the intention to purchase from that online store.*

As described in the theoretical foundation, avatars are considered a digital substitute for social presence, such as that of a physically present sales consultant (Holzwarth et al., 2006). Previous research indicates that avatars are an important tool in e-commerce which can counteract negative attitudes or potential doubts from a consumers' perspective (Seeger et al., 2021; Wöfl et al., 2019). Avatars help to overcome negative attitudes (e.g., an online store quality perceived as low) toward an online store through their social presence-enhancing and support suggesting function (Holzwarth et al., 2006; Wöfl et al., 2019; Wöfl & Feste, 2018). Therefore, potential customers get stimulated by the avatar's social cues and thus compensate for a low online store quality compared to a situation without an avatar. As a consequence, consumers' perception towards the quality of an online story also differs with respect to the presence of an avatar. From this context, we assume the following:

Hypothesis 2b: *The effect of online store quality on the intention to purchase from that store is moderated by the presence vs. absence of an avatar such that this effect is stronger for the presence of an avatar.*

3. Empirical study

3.1 Design and participants

To examine the effect of technostress on intention to purchase from an online store, we set up a 2x2-factorial (technostress type: no technostress manipulation vs. technostress manipulation; avatar type: no avatar vs. avatar) between-subjects experimental study from Germany. In order to achieve an age structure that is as heterogeneous as possible, we acquired people via a snowball system, starting with the personal circle of general contacts, friends and family of bachelor's and master's students and asked participants to put themselves in the situation that they are about to buy food in an online store. 160 participants took part in the experiment. Approximately 65% of the sample is female. The mean age is 34.8 years (SD = 14.5). The online questionnaire exposed participants randomly to

one of the four website designs, so that age and gender are equally distributed across all four conditions.

3.2 Stimulus and procedure

To investigate our research hypotheses, we created two fictional German online stores providing ordinary food supplies. They discriminate on the basis of the manipulation vs. non-manipulation of technostress and of the presence or absence of an avatar. Their overall layout was oriented towards the regular style of online stores. In line with Tarafdar et al. (2019), causing technostress should be ensured by technical malfunctions, such as incorrect loading of the website or product images, by technical requirements, such as the need to accept cookies or create a customer account, and by advertising banners that strongly distract from the purchasing process (Tarafdar et al., 2020). The integration of an avatar was realized in the form of a humanized apple, which was thematically adapted to the product focus of the store (Wölfl et al., 2019), which supported people throughout the imaginary buying process in a non-interactive manner. We consciously decided for a non-interactive avatar to consider the consequences of presence vs. absence of the avatar in isolation.

Participants were randomly exposed to either a technostress manipulating or technostress absent scenario that included either an avatar or no avatar.

As an introduction, we created an imaginary frame for the participants who took part in the experiment. Subsequently, we guided them through the whole buying process and encouraged them to view the website pictures carefully and to put themselves in the situation that they are about to buy food in an online store. In the following, participants answered questions about their impressions of the online store and their intention to purchase.

Figure 2 shows the technostress manipulating an online store including the avatar presented to the participants of the experimental group.

3.3 Construct measures and manipulation checks

To measure the constructs of interest, we relied upon scales developed and validated in multiple previous studies. We used four items to capture respondents' ratings of online store quality (Everard & Galletta, 2005) and three items to measure respondents' intention to purchase from that online store (Everard & Galletta, 2005). We established the measurement model by using CFA and by assessing global fit indices and criteria for the internal structure of the model (Bagozzi & Yi, 1988; Schreiber et al., 2006). Results for the evaluation of the overall model fit using multiple indices show that all thresholds are met ($\chi^2/df = 1.79$; CFI = 0.99; TLI = 0.98; RMSEA = 0.07; SRMR = 0.02), which points to an acceptable overall model fit. Furthermore, local fit parameters show evidence of the validity and reliability of construct measures. Cronbach's alpha reaches values of 0.86 and 0.96, thus exceeding the commonly accepted threshold of 0.7 (Nunnally, 1978). Average variance extracted (AVE) shows values of 0.78 and 0.82, thus exceeding the threshold of 0.50.

Table 1. Information on construct measures	
Online Store Quality (AVE = 0.78; CR = 0.93; α = 0.92)	
7-point Likert-type agreement scale ranging from 1 "Don't agree at all" to 7 "Fully agree"	
<ul style="list-style-type: none"> - The website is of high quality. - Probably the quality of the website is very high. - The website must be of very good quality. - The website seems to be of poor quality (R). 	
Intention to Purchase from Online Store (AVE = 0.82; CR = 0.93; α = 0.93)	
7-point Likert-type agreement scale ranging from 1 "Don't agree at all" to 7 "Fully agree"	
If I were to want to buy the products shown in the near future, ...	
<ul style="list-style-type: none"> - ...I would consider buying from this site. - ...I would buy them on this site. - ...I could imagine buying on this site. 	
Notes: α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted	

Composite reliability (CR) shows values of 0.93 and 0.93, thus exceeding the threshold of 0.60 (Bagozzi & Yi, 1988). The squared correlation between the pair of constructs is 0.31, so that the AVE value for each construct is larger than the squared correlation between the pair of constructs, indicating discriminant validity (Fornell & Larcker, 1981). Table 1 provides information on the measurement instruments for each construct and on their reliability and validity criteria.

With respect to manipulation checks, we performed a check for the manipulation of technostress on the online store website by asking participants to indicate the degree to which they perceive technostress in the

respective website condition. Technostress perception of respondents was measured using three items, which were designed and pretested to achieve appropriate construct reliability and validity. The wording of the items was as follows: 1) “The scenario shown personally would put me under a lot of stress”, 2) “My stress level in such an online shopping situation would be very high”, 3) “I would perceive the online shopping situations shown as very stressful” (Peters et al., 2022; Schumacher et al., 2022). We used a seven-point Likert-type agreement scale ranging from 1 “Don’t agree at all” to 7 “Fully agree”. A two sample t-test indicated a significant difference ($t(158) = 9.22, p < 0.001; M_{technostress} = 4.54, M_{regular} = 2.39$), thus pointing to a successful manipulation of technostress.

3.4 Results

We analyzed the postulated research model with a conditional process analysis based on a regression approach. We tested whether a technostress manipulating website translates into decreased purchase intention from that website and whether this effect is mediated by the online store quality. Additionally, our analysis tested whether the association between online store quality and intention to purchase from that store is moderated by the presence of an avatar. All multi-item constructs were combined into average scores.

In order to examine the conditional process model, we conducted a moderated mediation analysis using the SPSS macro PROCESS v3.5.3 as proposed by Hayes (2018). We used Hayes’ (2018) model 14 and entered the experimental condition variable of triggered technostress (1 = technostress, 0 = no technostress) as the independent variable, intention to purchase from the online store as the dependent variable, and online store quality as mediator. We further entered avatar presence on the website as a binary moderator (1 = avatar is implemented on the website, 0 = no avatar is presented on website) affecting the relationship between online store quality and intention to purchase from the online store. To test the indirect mediated effect of technostress on intention to purchase from the online store, we used a bootstrapping approach (Preacher & Hayes, 2008).

Our first hypothesis predicts that technostress leads to a lower perception of online store quality. Results from the mediation analysis support this assumption, as we found a highly significant negative direct effect of technostress on online store quality ($b = -1.56, p < 0.001$) pointing to a reduction of online store quality in the experimental condition of technostress. Furthermore, hypothesis 2a assumes that online store quality has a positive effect on the intention to purchase from that online store. Analysis results reveal a highly significant positive direct effect of online store quality

on the intention to purchase from that store ($b = 0.63, p < 0.001$). Consequently, a higher online store quality strengthens the intention to purchase from that store. Therefore, hypothesis 2a is supported.

Concerning the moderated effect (hypothesis 2b) of online store quality on intention to purchase from that store which is moderated by the presence of an avatar on the website, moderation analysis shows a significant interaction effect between online store quality and presence of an avatar ($b = -0.30, p < 0.05$), thus pointing to support for the assumption that effects differ with regard to avatar presence on an online store website. Thus, these results confirm our hypothesis 2b.

Finally, we hypothesize that technostress influences purchase intention through online store quality and that this effect is dependent on the presence or the absence of an avatar on the online store website. Therefore, we probed the indirect effect of technostress condition on purchase intention mediated by online store quality for both online store types (including an avatar vs. not including an avatar), drawing on 5,000 bootstrapping samples (e.g., Hayes, 2015). The results point to a moderated mediation revealing a significant index of moderated mediation ($b = 0.48; CI [0.02; 0.9]$), such that the effect of technostress on intention to purchase via online store quality depends on the moderator of avatar presence on the website.

For an easier interpretation of the moderating effect of avatar presence vs. absence, we performed a visualization of this effect in figure 3. Consequently, it becomes visible that independently of online store quality the total level of the intention to purchase is higher for the presence of an avatar than for the absence of an avatar, since the straight line for avatar dummy = 1 (avatar presence) lies above the straight line for avatar dummy = 0 (avatar absence). Furthermore, the straight line for avatar absence (blue) is steeper than the straight line for avatar presence (red), suggesting that quality deficiencies of an online store website have a stronger negative impact on purchase intention if no avatar is implemented on the website. An avatar on a website, on the other hand, seems to compensate for website deficiencies in quality. Overall, these results confirm our research model to the full extent.

4. Discussion

The aim of our research was to investigate the effects of technostress on the perceived quality of online stores and resulting influences on consumer purchase intention. Furthermore, we tested whether the use of an avatar has a significant influence on the presumed relationship between online store quality and purchase intention. Our research model and the associated hypotheses were confirmed throughout. We achieved

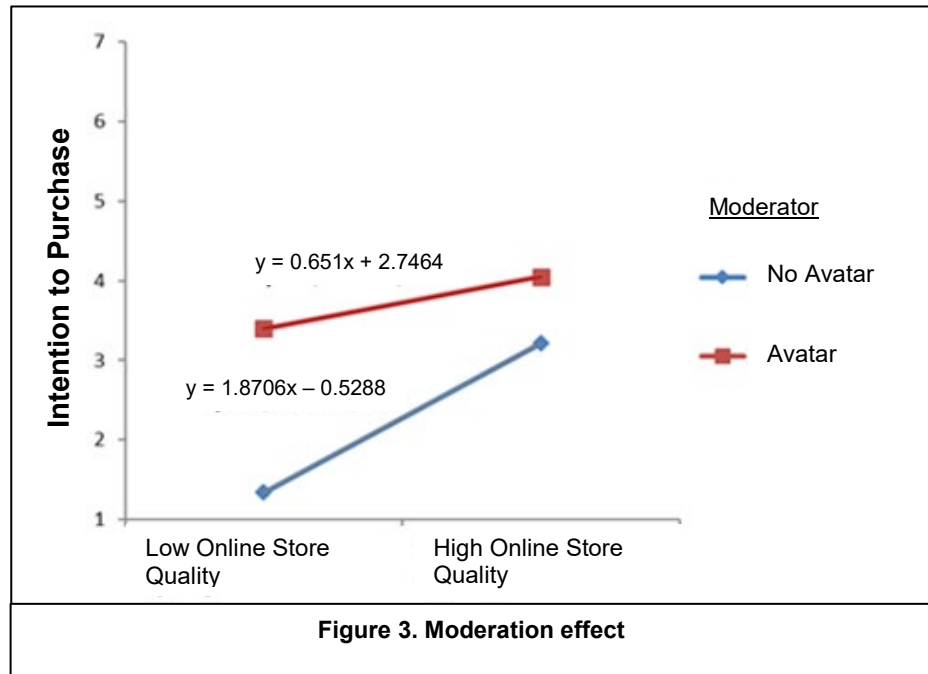
significant effects for all assumptions made, thus it can be concluded that the mediation effect of technostress on purchase intention through online store quality is moderated by the use of an avatar. Thus, some implications for research and management practice can be derived in the following.

Our results show that technostress crucially affects consumers' behavior in e-commerce. Just as in the business context, individuals are also subject to challenges and stressors in the private context, especially when buying online, which triggers certain behaviors.

We were able to show that the perception of technostress causes substantial behavioral changes. This is reflected, for instance, in a lower evaluation of online store quality, which in turn leads to a decreased purchase intention. This implies that research on stress triggered by ICTs should not only focus on the business but also on the private context. We thus add to this rather new topic in technostress research.

We also make a promising contribution to technostress research by providing a first link between technostress and the implementation of avatars as socializing components on a rather anonymous e-commerce setting. The significant moderating role of the avatar confirms the focus on the indispensability of a social component in the virtual shopping context. Our findings confirm literature that considers avatars to be a powerful tool for mediating social presence (Liew et al., 2017; Qiu & Benbasat, 2009; Wöfl et al., 2019; Wöfl & Feste, 2018). We extend the findings of this research stream by examining the effect of the avatar in a stressful situation. Our results show that avatars can significantly contribute to consumers' stress management. This is an important finding for making the e-commerce shopping experience more attractive and stress-free for consumers in the future and to avoid undesirable behavior of online shoppers, such as switching online stores.

For management practice, three recommendations for action can be derived from our findings. Stress has a strong influence on perceived store quality and purchase intention. The use of an avatar reduces this effect. First, this means that stress or technostress must be reduced as



much as possible. Operators of e-commerce websites should make sure that functionality and usability of the website is running smoothly without any problems. Faulty image files, disruptive display of advertising or damaged web pages and links trigger technostress in consumers and should be avoided at all costs. Second, we encourage online retailers to consider the use of avatars on websites. These fulfill the intrinsic need of customers for social presence and thus give customers a better feeling when shopping online. Furthermore, they are able to mitigate the impact of undesirable stressors in case of website errors. Third, we strongly recommend considering the fit when using avatars. Avatars that are congruent with the website characteristics are significantly more effective than avatars that do not fit the website (Wöfl et al., 2019).

Of course, there are also some limitations to consider when interpreting our research. First, we used a non-interactive avatar in our research model. Much research has examined the contexts and effects of interactive avatars, which demonstrate an even stronger social presence effect than non-interactive avatars. Second, our research model relies on research data from one-time purchases or one-time interactions with the shopping scenarios. As a result, our model does not allow us to draw conclusions about repeated purchases. Thus, our results do not allow us to make a statement about the behavior of loyal customers. However, customers tend to shop regularly where they are satisfied (Lu et al., 2012). Against this background, it would be exciting to see how customers deal with technostress in online stores in the long term. Would the impact be less if customers are used to the stressors?

Would the avatar have a stronger effect because customers are used to it and thus have a higher level of social comfort?

Furthermore, we did not test coping strategies of consumers when dealing with technostress in an e-commerce context. Avatars do not completely equalize the effects of technostress, they only have a mitigating effect. It would be exciting to investigate what coping mechanisms customers use to deal with technostress.

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