

OVERCOMING THE NEGATIVE ROLE OF NOSTALGIA IN CONSUMER REACTIONS TO AUTOMATED PRODUCTS

Patrick Kremer

Doctoral Candidate
Faculty of Economics and Business
Department of Marketing
Goethe University Frankfurt
Germany

Sven Feurer (corresponding author)

Professor of Marketing
Business School
Institute Marketing & Global Management
Bern University of Applied Sciences
Bern
Switzerland

Ju-Young Kim

Professor of Marketing
Faculty of Economics and Business
Department of Marketing
Goethe University Frankfurt
Germany

Steve Hoeffler

Professor of Marketing
Owen Graduate School of Business
Vanderbilt University
USA

Correspondence

Sven Feurer, Business School, Institute Marketing & Global Management, Bern University of Applied Sciences, Brückenstrasse 73, CH-3005 Bern. Email: sven.feurer@bfh.ch

Acknowledgments: The authors sincerely thank the editorial team and reviewers at the Journal of Product Innovation Management for their guidance. The authors also thank the participants of the 2019 EMAC Conference as well as participants of the 2019 Theory+Practice in Marketing (TPM) Conference, especially C. Page Moreau and Markus Giesler, for their valuable comments. The first author acknowledges that he is professionally affiliated with Mercedes-Benz AG, Germany, but was not supported (financially or non-financially) or influenced by Mercedes-Benz AG in any way during this research project. The authors have no competing interests to disclose.

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process which may lead to differences between this version and the [Version of Record](#). Please cite this article as doi: [10.1111/jpim.12641](https://doi.org/10.1111/jpim.12641)

Funding information: The authors received no third-party funding for this research.

Ethical Review Approval: We followed the guidelines of the editorial review board.

Author Bios

Patrick Kremer, M.Sc. is a Doctorate Candidate at the Chair of Marketing Management at the Goethe University Frankfurt. His work on technology acceptance and consumer behavior has been published in *Energy Policy* as well as various academic conference proceedings.

Dr. Sven Feurer is Professor of Marketing at the Business School, Institute Marketing & Global Management, Bern University of Applied Sciences (Switzerland). His work focuses on technology acceptance, really new products, pricing, and sustainable/healthy consumption. His work has appeared in such journals as the *Journal of Consumer Research*, the *Journal of the Academy of Marketing Science*, the *Journal of Product Innovation Management*, and the *International Journal of Research in Marketing*.

Dr. Ju-Young Kim is Professor for Marketing Management at the Goethe University Frankfurt (Germany). Her research focuses on practical issues related to pricing, online marketing and innovation. Ju-Young's research has been published in such journals as *Journal of Marketing*, *Marketing Science*, *International Journal of Research in Marketing*, *Management Information Systems Quarterly* and *Marketing Letters*.

Steve Hoeffler, Ph.D. is Professor of Marketing at Vanderbilt University's Owen Graduate School of Management. As an expert in consumer products marketing, brand management and consumer behavior, he focuses on how radically new products are marketed. His work has appeared in such journals as the *Journal of Consumer Psychology*, the *Journal of Product Innovation Management*, and the *Journal of Marketing Research*.

Overcoming the negative role of nostalgia in consumer reactions to automated products

Abstract

Automated products that take over tasks that consumers used to carry out themselves are becoming increasingly sophisticated, but consumers continue to resist such innovations. Drawing on the status quo bias as a theoretical framework, this article investigates the role of nostalgia in consumer reactions to product automation in a series of six experiments with almost 1,500 participants. The first four experiments converge on a consistent finding: a high (vs. low) degree of automation reduces consumers' nostalgic feelings about past consumption episodes, which in turn decreases nostalgia-prone consumers' product evaluations. Against this backdrop, we conduct two additional experiments to determine how firms' communication tactics can overcome the negative role of nostalgia proneness in consumer reactions to automated products. We conclude that managers involved in the marketing of automated products should assess the level of nostalgia in their target groups, and align both their intended positioning for the automated product and the decision to automate critical tasks within the product design that may evoke nostalgic feelings in consumers. Furthermore, when consumers are nostalgia-prone, managers should craft their launch communication tactics such that the focus is diverted from the automated task itself.

Practitioner Points

- This research illuminates how nostalgia leads some consumers to resist automated products.
- It is important to understand that nostalgic memories that consumers have stored in their memories relate to carrying out even mundane tasks themselves.
- Automating functions that take over such tasks entirely disconnects consumers from such nostalgic memories, potentially leading to lower product evaluations from nostalgia-prone consumers.
- Managers can overcome this effect by shifting consumers's focus to non-task related aspects of the product.

Keywords: product automation, consumer, nostalgia, innovation resistance

*Well she got her daddy's car
And she cruised through the hamburger stand now
Seems she forgot all about the library
Like she told her old man now
And with the radio blasting
Goes cruising just as fast as she can now
And she'll have fun fun fun
'Til her daddy takes the T-bird away*

—“Fun Fun Fun” by The Beach Boys, 1964

1 INTRODUCTION

New technological developments have brought the world a variety of advanced automated products such as Keurig coffee makers, Instapot multifood cookers, e-bikes, and vacuum robots. Automated products include functions that take over tasks that consumers would otherwise need to carry out themselves (Leung et al., 2018). With recent technological advancements, increasingly complex tasks are being and will continue to be automated, even tasks as complex as mowing the lawn and driving a car (Marr, 2017; Porter & Heppelmann, 2014; Rijdsdijk & Hultink, 2003). For example, automated products such as lawn mower robots and self-driving cars promise a quantum leap in benefits generated by freeing up consumer resources such as time and effort (Leung et al., 2018).

Despite these substantial benefits and to the detriment of manufacturers, many consumers are reluctant to adopt new automated products. Removing consumer barriers to adoption is a key challenge for many firms introducing innovative products (Heidenreich & Handrich, 2015; Heidenreich & Kraemer, 2016; Ram, 1989; Ram & Sheth, 1989; Talke & Hultink, 2010) to avoid slow diffusion and outright failure (Castellion & Markham, 2012). Research on how to overcome this challenge is critical given that “the success of innovations depends ultimately on consumers accepting them” (Hauser et al., 2006, p. 688).

While well-understood barriers such as perceived risk and lack of perceived relative advantage may also apply (Ostlund, 1974; Rijdsdijk & Hultink, 2003), researchers have turned to unique factors shaping consumer reactions to automated products. For example, consumers may reject automated products because they perceive them as a threat to their self-identity (Leung et al., 2018) or lack trust in their functionality (Ha et al., 2020; Waytz et al., 2014). In this study, we propose a different mechanism based on consumer nostalgia, which refers to a sentimental longing for the past (Holbrook, 1993; X. Zhou et al., 2012). Furthermore, consumer nostalgia may be associated with negative feelings toward the future (Davis, 1979; Holbrook, 1993).

Consumer nostalgia is important to consider in the context of automated products for at least three reasons. First, carrying out a complex task can be a source of emotional experiences that consumers like to recall and relive. Anecdotal evidence in support of the experiential value comes from pop culture. For example, countless songs are devoted to the act of driving, suggesting that even such mundane tasks as driving on “Route 66” (Chuck Berry) or on “Country Roads” (John Denver) for hours represent emotional experiences for consumers, and according to a Hagerty study, 61% of respondents agree that this is the case for them (Edsall, 2018). Importantly, many people have unique driving episodes stored in their memories, such as the first time driving alone after getting their license, the first road trip taken with friends, or that one occasion of having “fun, fun, fun ’til daddy took the T-bird away.”ⁱ The idea of no longer being able to collect such driving experiences is why some consumers feel anxious about the encroaching of automation in cars (e.g., Hinsliff 2016). It is this initial evidence that leads us to the belief that evoked nostalgic feelings stemming from psychologically comforting experiences made or memories collected (Baldwin et al., 2015; Davis, 1979; Holbrook & Schindler, 2003) need to be considered in the context of product automation. Second, nostalgia is a relevant variable to consider in this context because it is common. For example, a majority of the

Accepted Article

European public shows nostalgic tendencies, with 67% of respondents believing that the world used to be a better place (de Vries & Hoffmann, 2018). Moreover, nostalgic emotions are frequent and are experienced by people of all ages (Juhl et al., 2020). Third, consumer nostalgia is important from a managerial perspective because managers often try to address consumers' affective longing for the past by using retro brands, vintage designs, and nostalgic advertising (Brown, 1999; Brown et al., 2003; Hartmann & Brunk, 2019; Muehling et al., 2014; X. Zhou et al., 2019). The question remains, however, whether product automation hinders the effectiveness of these efforts in attracting nostalgia-prone consumers.

Thus, understanding the role of nostalgia in the context of product automation is important for both consumers and firms; however, extant insights are inconclusive. For example, Zhou et al. (2021) find that nostalgia fosters social support, which in turn encourages consumers to adopt new products. Consumer nostalgia, triggered by threatening situations (e.g., COVID-19), can also bolster adoption intentions for new products through an increased search for meaning (Xia et al., 2021). Huang et al. (2021) demonstrate that the use of novel technologies can evoke nostalgic feelings and lead to a preference for nostalgic products. In our study, we adopt the opposite view—namely, that automation technologies evoke nostalgic feelings to a lesser extent—and base our theorizing on the status quo bias (Kahneman et al., 1991; Kuester et al., 2015; Samuelson & Zeckhauser, 1988; Yen & Chuang, 2008). Therefore, we differentiate between dispositional nostalgia proneness (a consumer trait) and nostalgic feelings evoked (a state variable) by products automated to a high or low degree. Importantly, if nostalgia turns out to play a negative role, as we propose, the next question to ask is what firms can do to overcome consumers' initial negative reactions to automated products.

The overarching goal of our research is to answer these questions. We do so by carrying out a series of six experiments conducted both online and in the lab with approximately 1,500

Accepted Article

participants. The purpose of the first set of experiments is to establish the interaction between product automation and nostalgia proneness (Studies 1a–1c). We then report an experiment that provides evidence of evoked nostalgic feelings as the underlying mechanism driving the previously established moderation (Study 2). Finally, we provide guidance on how to mitigate the negative effects of consumer nostalgia in response to product automation (Studies 3a and 3b).

Our research relates to several literature streams, including consumer reactions to product automation (Leung et al., 2018), innovation resistance and consumer preference for the status quo (Kuester et al., 2015; Samuelson & Zeckhauser, 1988), and marketing innovations (Feurer et al., 2021; Hultink et al., 2000; Schuhmacher et al., 2018). We contribute by identifying ways to mitigate the potential negative effects of the introduction of an innovation on relevant target groups. We also contribute to the literature in marketing and psychology on nostalgia (Loveland et al., 2010; Pascal et al., 2002; Wildschut et al., 2006; X. Zhou et al., 2008), especially in the new product context (Huang et al., 2021; Xia et al., 2021; K. Zhou et al., 2021), by examining the process by which consumer nostalgia interacts with technology to influence consumer reactions to automated products.

2 CONCEPTUAL BACKGROUND

2.1 A consumers' perspective on product automation

In this research, we adopt a consumer perspective on the concept of automation. This perspective is important to highlight for three reasons. First, a great deal of managerial interest in automation technology is concerned with both the manufacturing side of products (Aversa et al., 2021; Holmström et al., 2019; Rindfleisch et al., 2017) and the innovation process (Marion & Fixson, 2021; Verganti et al., 2020). By contrast, we focus exclusively on consumption-related aspects of automation (i.e., consumer reactions to automated products) (Leung et al., 2018).

Second, extant literature in related disciplines such as ergonomics reports that automation and autonomy (e.g., autonomous cars) are distinct concepts; automated systems are those “designed to accomplish a specific set of largely deterministic steps,” whereas autonomous systems “are generative and learn, evolve and permanently change their functional capacities as a result of the input of operational and contextual information” (Hancock, 2019, p. 481). For the purpose of our research, however, we argue that this distinction (e.g., between an advanced food processor and an autonomous car) is not necessary as long as consumers believe that the technology no longer requires (or allows) them to perform the core task themselves. Therefore, we use the term “automation” hereinafter to refer to the full spectrum of technology, from preprogrammed automated systems to autonomous systems (Schaefer et al., 2016).

Third, we posit that consumer perceptions of product automation are a matter of degree. Therefore, we conceptualize product automation as a continuum ranging from “not at all automated” to “fully automated” (rather than as an automated/not automated dichotomy), implying that all products available on the marketplace are automated to some extent. This conceptualization is important because complex tasks such as driving or mowing typically comprise a variety of subtasks or subroutines, some of which are already automated in “conventional” products. For example, a typical self-propelled lawn mower has automated cutting and propulsion functions that partially take over the pushing subtask, and even today’s conventional cars come with manual or automatic transmissions and have more or less advanced driver-assistance systems. Yet, in these cases, consumers likely still feel that they are carrying out the core tasks themselves (i.e., mowing the lawn and driving the car). What we focus on herein, however, is the degree of automation that is so high that consumers perceive themselves as no longer carrying out the core task, as is likely in the case of products such as lawn mower robots, vacuum robots, and self-driving cars. We posit that only products with a high (vs. low) degree of

automation fundamentally alter consumers' nostalgic perceptions of these products. Next, we elaborate on the concept of nostalgia to develop our conceptual framework and hypotheses.

2.2 Consumer nostalgia

As a "basic aspect of the human condition" (Holbrook, 1993, p. 245), the concept of nostalgia has received attention from researchers in various domains, including marketing and psychology.

Wildschut et al. (2006) provide a history of research on nostalgia. In brief, work on nostalgia dates back to the seventeenth century, when Johannes Hofer wrote a medical dissertation about homesickness of Swiss soldiers in 1688 (Anspach, 1934), treating nostalgia as a neurological disease. Nostalgia was later considered a form of depression, until it was shown to be a concept distinct from homesickness in the twentieth century (Davis, 1979). Since then, nostalgia has received some attention from marketing and innovation researchers as well as from scholars in psychology.

Research has conceptualized nostalgia in two important ways, which are both relevant for our research: a state or a trait variable. First, state nostalgia can be characterized as a bittersweet emotional experience felt at a specific time, such as when it is evoked by researchers or in response to marketing stimuli (Routledge et al., 2008). Being in a state of nostalgia entails mentally traveling back in time (Cheung et al., 2016). Thus, Pascal et al. (2002) assess state nostalgia in response to advertising on items such as "[this product] brings back memories of good times from the past." Research also suggests that nostalgic feelings can be evoked by autobiographically salient stimuli, such as music and scent (Barrett et al., 2010; Reid et al., 2015), and also by aversive stimuli (Routledge et al., 2008; Van Tilburg et al., 2013). For example, in the new product adoption context, Xia et al. (2021) assess the extent to which participants felt more nostalgic during the past month than usual in response to the COVID-19 pandemic. Being in a nostalgic state is then associated with negative feelings such as

homesickness, sadness, and anxiety (Hepper et al., 2014; Wildschut et al., 2006), but it predominantly involves positive feelings of social connectedness and self-esteem and can function to counteract aversive states (Pade & Feurer, 2022; Wildschut et al., 2006). As a consequence, prior research suggests a close connection among nostalgic feelings, feelings of social connectedness, and behavioral reactions. For example, evoked nostalgic feelings may also increase perceptions of social support when people feel lonely (X. Zhou et al., 2008) and can promote charitable behavior through feelings of empathy (X. Zhou et al., 2012). Notably, evoked nostalgic feelings can also foster optimism, suggesting that it is not a purely past-oriented emotion but has implications for future outcomes (Cheung et al., 2016).

Second, nostalgia proneness is a personality trait that reflects individuals' temporally stable and cross-situationally consistent sentimental longing for the past or the propensity to nostalgize (Juhl et al., 2020), stemming from psychologically comforting experiences made or memories collected (Baldwin et al., 2015; Davis, 1979; Holbrook & Schindler, 2003). Thus, while being in a state of nostalgia involves mentally traveling back in time, people high in nostalgia proneness tend to be more "frequent travelers" than those low in nostalgia proneness (Cheung, Sedikides, and Wildschut 2016). Overall, nostalgia proneness is less frequently examined in the literature, but has recently gained recognition by researchers attempting to illuminate how nostalgia-prone individuals tick (Juhl et al., 2020; Pade & Feurer, 2022). Importantly, research has shown that state and trait nostalgia interact such that evoked nostalgic feelings have an effect specifically when consumers are nostalgia prone (Cheung et al., 2016). Thus, we expect nostalgia proneness to moderate the effect of product automation on product evaluations and ultimately behavior, but we also expect the differential capacity of technologies, as the mechanism mediating this moderation, to evoke nostalgic feelings (Muller et al., 2005).

3 THEORETICAL FRAMEWORK AND HYPOTHESES

Research on the status quo bias (Samuelson & Zeckhauser, 1988) informs our theorizing on how consumers react to product automation, conditional on the extent to which they are nostalgia prone. While a person may stick with the status quo for rational reasons, this bias offers a psychological explanation for the notion “that individuals have a tendency to over-rate the status quo by displaying exaggerated preferences for the current state of affairs” and therefore reject innovations (Kuester et al., 2015, p. 523). A key explanation for this tendency is loss aversion (Kahneman et al., 1991), and we contend that evoked nostalgic feelings about task-related memories (about driving, cooking, mowing the lawn, and the like) are something that can be lost through automation. Indeed, prior research indicates that being in a positive emotional state is a driver of a preference for the status quo (Yen & Chuang, 2008). Studies on nostalgia also reinforce this notion, suggesting that task-related memories are associated with positive affect, feelings of belongingness, and optimism (Cheung et al., 2016; Loveland et al., 2010; X. Zhou et al., 2008) and thus may result in preferences for the product inducing the nostalgic response (Holak & Havlena, 1998). Similarly, research on autobiographical memories indicates that past memories help determine one’s self-identity, such that pleasant autobiographical memories boost people’s current affect and strengthen their feelings of self-worth (Wilson & Ross, 2003). Research further suggests that autobiographical memories influence behavior in the present, as consumers draw on them to develop opinions and attitudes (Bluck, 2003; Cohen, 1998). Thus, consumers treat such special memories of past experiences as assets to be protected (Zauberman et al., 2009), again highlighting the role of loss aversion.

Furthermore, the extent to which this process occurs likely depends on consumers’ level of nostalgia proneness. Longing for the past and feeling anxious about the future are distinctive of nostalgia (Holbrook, 1993; Juhl et al., 2010). Essentially, we propose that nostalgia-prone

Accepted Article

consumers will prefer the conventional to the automated product, to be able to indulge in the recollection of past task-related experiences, which makes them feel nostalgic by reliving these memories (Cheung et al., 2016). Conversely, consumers low in nostalgia proneness should be less averse to the loss of these nostalgic experiences and therefore display a lesser bias for the status quo (which implies a stronger preference for the automation technology). Thus, in line with prior research on the status quo bias, our main prediction is as follows:

Hypothesis 1 *Nostalgia proneness moderates the effect of product automation on product evaluations, such that consumers high (low) in nostalgia proneness show a stronger preference for the conventional (automated) product.*

The process described in hypothesis 1 implies a mediated moderation, such that nostalgic feelings evoked by the product technology is the key mediator driving the moderation. We can then formally state this mediated moderation as follows:

Hypothesis 2 *Evoked nostalgic feelings mediate the effect of product automation on product evaluation, such that the indirect effect is negative, but only for consumers high (vs. low) in nostalgia proneness.*

We also predict that actively shifting consumers' focus to non-task-related aspects of the product will help those who are nostalgia prone to better accept automated products. If, as we propose, the automated task is responsible for a reduction in evoked nostalgic feelings, having nostalgia-prone consumers think about other aspects that make driving (or cooking, fishing, and the like) an enjoyable experience should be enough to counteract this undesirable effect. That is, encouraging consumers to mentally unpack the experience into its different components in such a way (Vilches-Montero, 2016) should prevent them from having decreased nostalgic feelings in the first place, so that important aspects of the experience will not be lost (Kahneman et al.,

1991). Ultimately, highly nostalgia-prone consumers should then react no differently to high-degree automation than they do to low-degree automation. Thus:

Hypothesis 3 *Shifting the focus of the automated product away from the automated features mitigates the negative moderating effect of nostalgia proneness.*

4 OVERVIEW OF STUDIES

Three studies (1a–1c) establish and validate the focal interaction between product automation and nostalgia proneness (H1). Study 1a provides initial evidence for the focal interaction and shows that higher product evaluations are associated with higher adoption intentions and also behavioral reactions (in terms of the time voluntarily spent watching a video with information on the product). While we used a product with a retro design as the stimulus in Study 1a and measured nostalgia proneness, we experimentally primed nostalgia in Study 1b to assess whether inducing a nostalgic mindset coupled with a contemporary design has the same (causal) effect. Study 1c offers further evidence of the focal interaction from different product categories (i.e., food processor, fishing rod, and bike). We also illuminate the process by which this interaction occurs. A detailed description of all conditions can be retrieved from Web Appendix 1 (sample stimuli are provided in Table 1). Specifically, Study 2 shows that an autonomous (vs. conventional) car decreases consumers' evoked nostalgic feelings; this, in turn, leads to lower product evaluations of consumers that are nostalgia-prone (H2). Studies 3a and 3b test an intervention designed to decrease the negative moderating role of nostalgia proneness in the automation–product evaluation relationship (H3). Study 3a indicates that having people think about what constitutes a memorable driving experience apart from the driving task per se (either in the past or in the future) reduces the negative impact of nostalgia proneness. Drawing on this finding, we show

how managers can explicitly address nostalgic consumers in Study 3b. Figure 1 depicts our framework of the relationships examined and the sequence with which they appear in this article.

Moreover, we note three additional studies conducted. Study WA-1 in Web Appendix 2 validates Study 1 with an online experiment and using a nonstudent sample. Study WA-2 in Web Appendix 3 rules out a potential alternative explanation for the focal interaction, demonstrating that the same effect does not occur when the task is simply outsourced to a third person under conditions of low product automation. Finally, Study WA-3 in Web Appendix 4 provides a mini meta-analysis (Goh et al., 2016) of our main moderating effect across all experimental studies reported herein. We further note that we collected all data before the COVID-19 pandemic.

[Figure 1 about here.]

[Table 1 about here.]

5 ESTABLISHING THE MODERATING EFFECT OF NOSTALGIA PRONENESS ON THE AUTOMATION–PRODUCT EVALUATION RELATIONSHIP

5.1 Study 1a: Examining the product automation × nostalgia proneness interaction

5.1.1 Method

We recruited 252 students at a large German university to take part in a laboratory experiment, using a one-factorial (degree of automation: high vs. low) between-subjects design. Two participants were removed for obvious speeding, and the final sample was thus $N = 250$ (44.4% female, median age 23 years). Before being exposed to the experimental stimuli, participants responded to six items on a seven-point scale (see Appendix) capturing nostalgia proneness (with 7 indicating high levels, $M = 3.00$; $SD = 1.19$) in between other unrelated questions about personal attitudes. We dropped three items because of low factor loadings; the remaining three items showed acceptable internal consistency ($\alpha = .71$). Participants then saw a mock

advertisement for the new Volkswagen (VW) ID.Buzz and a description of its functions (see Web Appendix 1). The high degree of automation condition presented the ID.Buzz as fully self-driving (no steering wheel or pedals), and the low degree of automation condition presented it without the autonomous driving function.

After reading the scenario, participants responded to a short questionnaire that assessed product evaluations on a seven-point three-item scale (with 7 indicating a positive evaluation, $\alpha = .86$). We also assessed adoption intention on a seven-point three-item scale ($\alpha = .81$). Moreover, to validate the self-reported adoption intentions with a proxy for actual behavior (Morales et al., 2017), we included a video at the end of the survey that provided more information on the car presented. Participants were told that the study was now finished but that they could watch the video for as long as they wanted. We then assessed behavioral reactions in terms of the time spent (in seconds) watching the video, which we log-transformed to normalize the distribution.

5.1.2 Results and discussion

The manipulation check for automation (“This car was ...” 1 = “definitely not automated,” 7 = “definitely fully automated”; $M_{\text{high degree}} = 5.90$, $M_{\text{low degree}} = 3.87$; $F(1, 248) = 115.477$, $p < .001$) indicates that the manipulation was successful. To assess the predicted interaction, we performed a regression-based moderation analysis using Hayes’s (2019) procedure (Model 1), with automation (dummy-coded 1 = high degree, 0 = low degree) as the independent variable, product evaluation as the dependent variable, and nostalgia as the moderator ($F(3, 246) = 9.952$, $p < .001$, $R^2 = .108$). We found a significant, positive main effect of degree of automation ($b = 1.086$, $t = 2.591$, $p = .010$) for the regression model, with product evaluation as the outcome. The direct effect of nostalgia proneness on product evaluation was negative but not significant ($b = -.151$, $t = -1.572$, $p = .117$). In line with our expectations in H1, we also found a significant and negative

degree of automation \times nostalgia proneness interaction ($b = -.322, t = -2.421, p = .016$).

Specifically, the presence of two Johnson–Neyman points (2.274 and 6.249) indicates that for low values of nostalgia proneness, consumers prefer the autonomous car to the conventional car, while for high values of nostalgia proneness, consumers prefer the conventional car to the autonomous one (see Figure 2, Panel A).ⁱⁱ

[Figure 2 about here]

We then expanded our model to include adoption intentions in response to consumers' product evaluations. Specifically, we performed a regression-based conditional process analysis using Hayes's (2019) PROCESS macro for SPSS (Model 7; 5,000 bootstrap resamples), with product evaluation as the mediator, adoption intentions as the dependent variable, and nostalgia proneness moderating the effect of automation on the mediator. This analysis reveals a positive association between product evaluations and adoption intentions ($b = .800, t = 15.831, p < .001$). The direct effect of automation on adoption intentions is .215 but not significant ($t = 1.619, p = .107$). Together with the moderating effect described previously, this effect implies a moderated mediation, such that the scope of the indirect effect of degree of automation on adoption intentions through product evaluations is conditional on the level of nostalgia proneness. At the mean of nostalgia proneness, the indirect effect is .116 and not significant (95% confidence interval [CI] $[-.134, .366]$). For low nostalgia proneness (1 SD below the mean), the indirect effect is positive (.423) and significant (95% CI $[.059, .797]$). For high levels of nostalgia proneness (1 SD above the mean), the indirect effect is negative ($-.190$) and not significant (95% CI $[-.594, .198]$). The index of moderated mediation is $-.257$ (95% CI $[-.506, -.025]$). As such, automation increases adoption intentions only for consumers low in nostalgia proneness. Last, we replaced our adoption intentions dependent variable with the log-transformed time watching the information video. In this case, the effect of the mediator (product evaluation) on the behavioral

outcome is .140 ($t = 2.667, p = .008$), and the direct effect of automation is .0507 ($t = .368, p = .713$). The index of moderated mediation is $-.045$ (95% CI $[-.120, -.001]$), and thus we essentially find the same results as when adoption intention is the dependent variable.

5.2 Study 1b: Combining a nostalgia prime with a contemporary product design

In this study, we aimed to experimentally prime nostalgia to support our contention that the degree of automation \times nostalgia interaction we observed in Study 1a can be interpreted as a causal effect. Furthermore, our predictions were based on the notion that some products evoke nostalgia, thus reducing product evaluations among consumers high (but not low) in nostalgia proneness. Our product stimulus, the retro-designed ID.Buzz, might have facilitated this process. Thus, in Study 1b, we explicitly examine whether the same effect can be achieved using a product with a contemporary design in combination with primed nostalgia. We predict that high (vs. low) levels of automation will also decrease product evaluations for primed nostalgia, but not in the control prime condition.

5.2.1 Method

We used a European consumer panel (Clickworker) to recruit 220 individuals to participate in our study. Twenty-two individuals failed an attention check and were excluded from further analysis. Three participants were removed for obvious speeding such that the final sample size was $N = 198$ participants (52% female, median age 32 years). The experiment used a 2 (degree of automation: high vs. low) \times 2 (prime: nostalgia vs. neutral) between-subjects design. As a contemporary-design car, we used the VW Budd-e, which we adapted to “Buddy” as the “-e” highlights an electric motor, which is not the focus of our study (see Web Appendix 1).

In the nostalgia prime condition, we asked participants to think about an occasion when they felt nostalgic, to write down four keywords about this occasion, and then to describe the

occasion in three to five sentences (Baldwin et al., 2015; Cheung et al., 2016). In the neutral prime condition, we asked participants to think about, to state keywords, and to write about an ordinary occasion they remembered happening last week. The experimental conditions with regard to the degree of automation were similar to those in Study 1a. Again, product evaluation was the dependent variable ($\alpha = .93$).

5.2.2 Results and discussion

The manipulation check for automation of the driving function (“the driving task ...” 1 = “is definitely performed by a human,” 7 = “is definitely performed by artificial intelligence”) indicates that the manipulation was successful ($M_{\text{high degree}} = 6.08$, $M_{\text{low degree}} = 3.10$; $F(1, 196) = 153.74$, $p < .001$). The priming task was also successful, as participants in the nostalgia prime condition reported having more nostalgic feelings than those in the no prime condition (“Right now, I feel ...” 1 = “not at all nostalgic,” 7 = “very nostalgic”; $M_{\text{nostalgia prime}} = 6.21$, $M_{\text{neutral prime}} = 3.24$; $F(1, 196) = 185.27$, $p < .001$). Last, we checked that participants did not perceive the car design itself as a retro design ($M = 5.19$, on a scale from 1 = “very retro” to 7 = “very futuristic”).

Regarding our focal effects, a 2×2 analysis of variance revealed a nonsignificant main effect of automation ($F = .169$, $p = .681$) that was qualified by a significant interaction ($F = 3.876$, $p = .05$, partial $\eta^2 = .02$). As Figure 2 (Panel B) shows, in the case of primed nostalgia, the effect of automation on evaluation is negative, in support of H1. In the control prime condition, we do not find a negative effect of automation.

5.3 Study 1c: Additional evidence from different product categories

5.3.1 Method

To further validate our finding that the degree of automation and nostalgia proneness interact, we recruited 509 people (46% female, median age 33 years) to participate in our online

(Clickworker) study, which used a 2 (degree of automation: high vs. low) \times 3 (product category: food processor vs. fishing rod vs. bike) \times nostalgia proneness (measured) design. The product stimuli we used are currently all available in the market and are presented in Web Appendix 1. We again assessed nostalgia proneness on the same six-item scale as before ($M = 3.53$, $SD = 1.34$, $\alpha = .77$ after three items were dropped due to low factor loadings) and product evaluation ($\alpha = .86$).

5.3.2 Results

The manipulation checks (“This product ...” 1 = “can definitely not cook/fish/accelerate automatically,” 7 = “can definitely cook/fish/accelerate automatically”) were successful for each product (food processor: $M_{\text{high degree}} = 5.23$; $M_{\text{low degree}} = 4.73$ [$p = .05$]; fishing rod: $M_{\text{high degree}} = 5.11$; $M_{\text{low degree}} = 3.06$ [$p < .001$]; bike: $M_{\text{high degree}} = 4.25$; $M_{\text{low degree}} = 2.10$ [$p < .001$]). We analyzed the regression models for each product separately. Product evaluation was the dependent variable, the dummy-coded automation variable was the independent variable (1 = high-degree automation, 0 = low-degree automation), and nostalgia was the continuous moderator. Across all products, neither the direct effect of automation nor the direct effect of nostalgia proneness was significant. We found no interaction in the food processor category, but we did find a trend in the data towards a negative automation \times nostalgia proneness interaction in the fishing rod category, and a significant interaction in the bike category (interaction coefficients: $b_{\text{foodprocessor}} = -.062$, $t = -.425$, $p = .664$; $b_{\text{fishingrod}} = -.295$, $t = -1.779$, $p < .077$; $b_{\text{bike}} = -.319$, $t = -2.052$, $p = .042$) in support of H1. In the fishing rod and bike cases, we found only one Johnson–Neyman point (2.426 and 2.298, respectively), indicating no significant effect of automation for nostalgia values lower than these points; however, for high nostalgia, automation had a strong negative effect.ⁱⁱⁱ

6 STUDY 2: EVIDENCE OF PROCESS

We now turn to understanding the underlying mechanism driving the effects established in the Studies 1a–1c. Specifically, we expect evoked nostalgic feelings to be the key mediator driving the proposed relationships.

6.1 Method

We used a European consumer panel (Clickworker) to recruit a sample of 193 people. Twenty-eight individuals failed an attention check and were automatically excluded. An additional 15 participants were removed for obvious speeding, and the final sample thus was $N = 150$ (35% female, median age 36 years). The experiment was a 2 (degree of automation: high vs. low) \times nostalgia proneness (measured) design. The experimental procedure was similar to the prior experiments. We again used a mock advertisement (see Web Appendix 1), and participants answered a questionnaire, which included our six-item scale to capture nostalgia proneness ($M = 3.20$, $SD = 1.26$; $\alpha = .78$ after three items were dropped due to low factor loading), a four-item scale capturing the extent to which the product evokes nostalgic feelings ($\alpha = .90$), and product evaluations as before ($\alpha = .88$). We also accounted for the possibility that a reduction in evoked nostalgic feelings in response to product automation would simply be due to participants thinking about whether the novel technology (which to date does not exist) would really work. To account for this potential alternative explanation and to increase the precision of our hypothesis tests, as this variable likely captures a large share of variance in the dependent variable, we captured the product's perceived ability to free up personal resources as a control variable (Klarman & Feurer, 2018).

6.2 Results and discussion

A manipulation check indicated that participants in the high degree of automation condition perceived the driving tasks as being carried out by technology rather than by humans ($M_{\text{high degree}} = 5.53$, $M_{\text{low degree}} = 3.28$; $F(1, 149) = 60.716$, $p < .001$). Thus, the manipulation was effective.

In a first step, we analyzed the product automation \times nostalgia proneness interaction on product evaluation, as before. Again, we observe a (nonsignificant) positive effect of automation ($b = .816$, $t = 1.350$, $p = .178$) qualified by a negative and significant interaction ($b = -.367$, $t = -2.084$, $p = .039$), indicating that people high in nostalgia respond negatively to product automation while those low in nostalgia do not. In a second step, to test our prediction, we used Hayes's (2019) PROCESS macro to estimate a mediated moderation model (Model 14, 5,000 bootstrap resamples), with degree of automation (coded 1 = high degree, 0 = low degree) as the independent variable, product evaluation as the dependent variable, evoked nostalgic feelings as the mediator, and nostalgia proneness as the moderator. We mean-centered the continuous variables defining the interaction before analysis. The product's ability to free up resources served as the control variable.

Figure 3 depicts the results. Specifically, a high degree of automation decreases evoked nostalgic feelings ($b = -.848$, $t = -2.847$, $p = .002$). Evoked nostalgic feelings are also positively related to product evaluation ($b = .343$, $t = 5.426$, $p < .001$); however, as expected, this effect is qualified by a positive and highly significant interaction with nostalgia proneness ($b = .138$, $t = 3.046$, $p = .003$), indicating that the effect of evoked nostalgic feelings is enhanced (reduced) for people high (low) in nostalgia proneness. Furthermore, the direct effect of automation on product evaluation is negative and significant ($b = -.592$, $t = -5.125$, $p = .005$), indicating partial mediation. Together, these results imply a mediated moderation, such that the indirect effect of degree of automation on product evaluations through evoked nostalgic feelings is indeed

conditional on nostalgia proneness, such that the indirect effect is stronger for high (vs. low) levels of nostalgia proneness (index = $-.117$, 95% CI [$-.242$, $-.035$]). These results support H2.

[Figure 3 about here]

Three additional findings are also noteworthy. First, if we omit the control variable, the interaction remains highly significant ($p = .004$), but the direct effect of automation on evoked nostalgic feelings is somewhat weaker, though the tendency for this effect is still observable ($p = .07$). Second, the estimation of an alternative mediation model (Hayes 2018, Model 72), in which we allowed the front-end of the model to also be moderated by nostalgia proneness, yielded only a direct negative effect of automation on evoked nostalgic feelings and no significant interaction, suggesting that automation evokes lesser nostalgic feelings independent of nostalgia proneness. Third, the correlation between nostalgia proneness and evoked nostalgic feelings is close to zero ($r = .025$, n.s.), implying that these two constructs are not only conceptually but also empirically distinct (Fornell & Larcker, 1981).

7 MITIGATING THE NEGATIVE ROLE OF NOSTALGIA

7.1 Study 3a: Testing a strategy to mitigate the negative role of nostalgia proneness

So far, we have shown evidence of the complex but largely negative role of nostalgia proneness in consumer responses to autonomous products. Now, we turn to the managerially relevant question of how managers can mitigate the potentially negative effect of task-related memories on the evaluation of automated products. Thus, the goal of Study 3a is to test an intervention to alleviate the negative degree of the automation \times nostalgia proneness interaction by directing consumers' thoughts away from the automated task. As such, in the case of autonomous cars, we prime consumers by activating nondriving-related cognitions. We also test whether having consumers think about actual memories of past events or about a possible future event is more

effective. Thus, thinking about a future experience may generate the same connection with a stored memory as recalling a past experience in the same context.

7.1.1 Method

We recruited a sample of 179 participants (36% female, median age 22 years) for a laboratory experiment using a 2 (degree of automation: high vs. low) \times 3 (task-unrelated cognition prime: no prime, past occasion prime, future occasion prime) unbalanced between-subjects design, which resulted in four experimental conditions (low level of automation, high level of automation + no prime, high level of automation + past occasion prime, and high level of automation + future occasion prime). We again used the car scenario in this study. Participants were students at a large German university who took part in the study in exchange for a monetary incentive.

Before being exposed to the experimental stimuli, participants responded to our six-item nostalgia proneness scale ($M = 2.96$, $SD = .97$; $\alpha = .69$ after one item was dropped due to low factor loading). In the past prime condition, we asked participants to think about one occasion in which they were taking the car and, specifically, three things that made traveling by car pleasurable *except for the driving task*. In the future prime condition, we asked participants to think about a future occasion traveling by car and, specifically, three things that would make traveling by car pleasurable *except for the driving task*. Participants were asked to write down and think about these words for a couple of minutes. Examples of words written down are “beautiful landscape” and “conversations with fellow passengers.” The no prime condition had no such task. Participants then saw a mock advertisement for the new VW ID.Buzz and a description of its functions (see Web Appendix 1). The high degree of automation condition presented the minivan as fully autonomous (no steering wheel or pedals), and the low degree of automation condition presented it without the automated driving function. After reading the

scenario, participants responded to a short questionnaire that assessed product evaluations as before ($\alpha = .82$).

7.1.2 Results and discussion

We performed a linear regression analysis in which we regressed product evaluation on nostalgia proneness, the four experimental conditions (three dummy-coded variables with “high degree of automation + no prime” as the reference condition), and the respective dummy \times nostalgia proneness interaction terms ($F(7, 171) = 4.146, p < .001, R^2 = .145$). Figure 4 (Panel A) illustrates the results. The slope of nostalgia proneness for the “high degree of automation + no prime” reference condition is negative ($-.813$) and significant ($t = -4.655, p < .001$). The difference in slopes between this reference condition and the low degree of automation condition is significant ($b = .712, t = 2.916, p = .004$), as is the slope difference between the reference condition and the “high degree of automation + past prime” condition ($b = .712, t = 3.322, p = .001$). The slope difference between the reference condition and the “degree of automation + future prime” condition is also marginally significantly different ($b = .576, t = 1.921, p = .056$). As such, the slope of nostalgia in the “high degree of automation + no prime” condition is significantly more negative than it is in all the other conditions. A floodlight analysis also indicates that the Johnson–Neyman point is 3.33, indicating that for all nostalgia proneness values larger than 3.33, having no prime for the autonomous car leads to significantly lower product evaluations than in all other conditions. This implies that the prime (both past and future) diminishes the negative effect of nostalgia proneness to such an extent that it is as low as in the low degree of automation condition. This is important because it gives managers a tool to mitigate the negative focal interaction. We expand on this notion in Study 3b.

[Figure 4 about here]

7.2 Study 3b: Using the mitigation strategy in an advertisement setting

The results of Study 3a suggest that the negative role of nostalgia proneness can be alleviated by shifting consumers' focus from the automated activity to other aspects of the experience that are not taken over by automation itself. Study 3b now aims to translate this finding into a more practically relevant setting to equip managers with a strategy to help them position automated products to nostalgia-prone consumers. To do so, we set up a mock advertisement that navigates consumers' focus by shifting salience either to the automated task itself or to other activities unrelated to the automated task that are important to nostalgia-prone individuals.

7.2.1 Method

We recruited 202 individuals (37.1% female, median age 31 years) to participate in an online experiment (Clickworker), which used a one-factorial (advertisement focus: automated task focus vs. nonautomated task focus) between-subjects design. Participants responded to the same seven-point multi-item scale capturing nostalgia proneness as in the previous studies ($M = 3.00$, $SD = 1.00$; $\alpha = .75$ after two items were dropped due to low factor loading). Afterward, participants saw one of two advertisements of the VW ID.Buzz (see Web Appendix 1). In both conditions, the ID.Buzz was described as being fully self-driving. In the first condition, the ad claims that the driver can enjoy the ride without the need to focus on the driving task, making the automated activity salient. In the second condition, the ad claims that the driver can enjoy the ride while enjoying conversations with friends and listening to music. Thus, in the second condition, other aspects of the driving experience are more salient, analogous to our pilot study findings in which participants highlighted these aspects as being valuable elements of the experience. Product evaluation again served as the dependent variable ($\alpha = .89$).

7.2.2 Results and discussion

We performed a regression-based moderation analysis using Hayes's (2019) PROCESS macro (Model 1), with ad focus as the dummy-coded independent variable (1 = automated task focus, 0 = nonautomated task focus), product evaluation as the dependent variable, and nostalgia proneness as the moderator ($F(3, 198) = 4.676, p < .01, R^2 = .066$). We found a moderately significant direct effect of advertisement focus ($b = .972, t = 1.778, p = .077$) and a nonsignificant, negative main effect of nostalgia ($b = -.080, t = -.669, p = .504$). In line with our expectations (H3), we also found a significant and negative ad focus \times nostalgia proneness interaction ($b = -.358, t = 2.108, p = .036$). Specifically, the presence of a Johnson–Neyman point (3.99) indicates that for low values of nostalgia proneness, ad focus does not influence the evaluation of the autonomous car, while for higher values of nostalgia proneness, consumers evaluate the autonomous car significantly better when the ad focuses on other parts of the experience than the driving activity itself. We show the interaction in Figure 4 (Panel B). The results imply that shifting the focus away from the automated activity may help increase evaluations when promoting automated products to nostalgia-prone consumers.

8 GENERAL DISCUSSION

Recent technological advances (e.g., artificial intelligence, robotics) have enabled firms to develop automated products that carry out sophisticated tasks such as mowing the lawn, vacuuming, and, soon, driving. These products promise high utility because they free up resources that consumers can use to complete other tasks; still, many consumers reject such automated products (Leung et al., 2018). Against the backdrop of high failure rates of innovative products (Castellion & Markham, 2012), in this research, we set out to better understand consumers' reactions to automated products. Prior research suggests several reasons for these negative reactions, including consumers' self-identity (Leung et al., 2018), lack of trust (Waytz et

al., 2014), and desire for control (Faraji-Rad et al., 2017). To add to this body of knowledge, we examine the role of consumer nostalgia in adopting automated products. Concurrent to recent research (Xia et al., 2021), we posit that nostalgic feelings can hinder rather than foster the adoption of such products. As such, we aimed to illuminate the effect of nostalgia on consumers' perceptions of automated products and to discover how to mitigate its potential negative impact.

Our results lend support to our predictions. Specifically, the degree of product automation interacts with nostalgia such that highly nostalgic people react more negatively to automation than do their low-nostalgia counterparts. In some cases, we even find a pronounced interaction such that consumers high (low) in nostalgia prefer conventional (automated) products. We observe a negative interaction across various product categories (car, fishing rod, and bike). This effect does not simply occur because nostalgic consumers like to carry out tasks themselves (see Study WA-2 in Web Appendix 3); rather, it is the automation technology that triggers task-related memories of past consumption episodes to a lesser extent, which leads to less favorable reactions for consumers high in nostalgia. The good news for managers is that they can overcome the negative moderating effect of nostalgia by having people think about what constitutes a memorable experience apart from the (driving) task. Table 2 provides an overview of our results.

[Table 2 about here]

8.1 Research contributions

Our research makes several notable contributions to the literature. We contribute to the growing literature in the various domains (e.g., marketing innovations, innovation resistance and consumer preference for status quo, social psychology) attempting to understand consumers' reactions to automated products and the effect of basic human traits (e.g., consumer nostalgia) in this context. Depending on the domain, research has considered different applications of automation, from chatbots and humanoid service robots in service contexts to autonomous cars.

Accepted Article

First, we add to the literature by focusing on the aspect of automation that frees consumers from having to carry out a focal task themselves. Our results provide compelling evidence that in many cases, consumers enjoy carrying out even mundane tasks to such an extent that they store task-related experiences in their memories, which, when recalled, evoke nostalgic feelings. In a similar vein, Leung et al. (2018) examine the automation of tangible consumer products (e.g., Thermomix, e-bikes) and observe negative consumer responses if the use of the automated product undermines consumers' self-identity. The finding that our empirical results indicate a partial mediation complements their work by identifying evoked nostalgia as another mechanism driving consumer reactions. Specifically, our research suggests a contradiction between the macro trend of automation in many industries and individuals' need to nostalgize about past consumption experiences related to the task.

Second, we add to literature on innovation resistance, the status quo bias, and loss aversion (Kahneman et al., 1991; Kuester et al., 2015; Samuelson & Zeckhauser, 1988). We broaden the extant knowledge base by examining the specific case of product automation and a bias for a specific technology, which has the capacity to create such valuable experiences that some consumers are in fear of losing their nostalgic memories in a world in which automated products replace conventional ones. By showing a path to attenuate the role of consumer nostalgia, our research also informs the literature on go-to-market strategies for innovations (e.g., Kuester et al., 2018; Schuhmacher et al., 2018).

Third, our findings also inform research in related product domains, such as smart products (Mani & Chouk, 2018; Rijdsdijk & Hultink, 2003, 2009) and really new products (Feurer et al., 2021; e.g., Hoeffler, 2003). For example, really new products represent major departures from existing categories, are often based on new technologies, and also often induce some kind of behavior change for consumers (Feurer et al., 2021). As such, there is a certain overlap of these

Accepted Article

concepts, and having to alter a task that stimulates nostalgic task-related feelings might have the same effect as taking it over entirely. Moreover, our study contributes to research on marketing innovations. Especially for really new products, consumers may have difficulty understanding the novel functions and thus difficulties imagining how to use the innovation, which is detrimental to the innovation's perceived utility. Thus, the innovation literature suggests techniques to enhance this understanding by essentially shifting attention to these functions, for instance, visualization or mental simulation (Zhao et al., 2009, 2011). Our results suggest a boundary condition for the effectiveness of such techniques, given that we find that nostalgia-prone individuals respond more favorably when the attention is drawn *away* from the novel (automated) function.

Finally, our research also adds to the nostalgia literature in general and to a new product context in particular. To date, only limited research has examined nostalgia proneness as a consumer trait, and the present research adds to the understanding of “what it means to be a nostalgia-prone person” (Juhl et al., 2020, p. 486). Furthermore, we identify product automation as a factor that is capable of evoking (less) nostalgic feelings, and we thus add to prior research examining different triggers such as scent (Reid et al., 2015), music (Barrett et al., 2010), and threatening situations (Routledge et al., 2008; Xia et al., 2021). When nostalgic feelings are evoked or no longer evoked, we demonstrate that product evaluations are affected, but not in all cases. In line with prior research on the interplay of state and trait nostalgia (Cheung et al., 2016), we find that product evaluations are impaired only when consumers are nostalgia-prone because they fear losing nostalgic feelings. We also note that our results seem to depart from the recent finding that nostalgia can boost adoption intentions for new products (Xia et al., 2021; K. Zhou et al., 2021) through nostalgia's role as a restorative function. Our results also differ from those of Huang et al. (2021), who demonstrate that the use of novel technologies can evoke nostalgic

feelings and lead to a preference for nostalgic products. In our focal case, the old technology evokes nostalgic feelings, suggesting that it is the type of novel technology that matters.

8.2 Managerial implications

The information garnered about consumer nostalgia should inform the decision in early-stage new product development of whether the main task the product carries out (e.g., driving, cooking) should be automated to a high degree or not. Especially if the target group is high in nostalgia proneness, automating the main task will likely lead to decreased evaluations and ultimately lower consumer adoption. In this case, managers should either reconsider the strategic decisions about the target group, positioning, and technology or take appropriate measures in their communication efforts to counteract the negative role of consumer nostalgia. For example, the VW ID.Buzz uses a retro design to appeal to nostalgia-prone consumers, which seems to call for not automating the driving function or at least allowing consumers to switch to a conventional driving mode if they wish to do so.

A prerequisite to make such product positioning decisions is to identify the level of nostalgia of the target audience through market research. Using recent technology, firms might also engage in automated market research activities. For example, they could employ machine learning algorithms to draw conclusions about consumers' nostalgia proneness based on prior purchases, social media activity, or online search behaviors (Matz et al., 2017; Pade & Feurer, 2022).

Our results also suggest that managers should communicate the benefits of their (automated) products in a way that is tailored to the respective customer segments when launching an automated product. As a general rule, inducing nostalgia by means of communication (e.g., placing the product in a context that might trigger nostalgia) should be

avoided when products are automated. Moreover, for the nostalgia-prone consumer segment, our results reveal the seemingly counterintuitive implication to focus communication not on the product's key innovative feature—the automated function—and its ability to free up resources but on aspects related to nostalgic experiences that are unrelated to the actual automated task. For example, managers communicating their new autonomous car should appeal to nostalgic consumers by highlighting the car's ability to still produce memorable experiences (e.g., by highlighting social connections). By assisting potential nostalgic buyers in decomposing the aspects of the focal product (e.g., an autonomous car and the travel experience), managers can shift salience from the automated function itself to the holistic experience, leading nostalgic consumers to accept automated product versions as well. Conversely, nonnostalgic segments can be addressed by highlighting the benefits of a technology that frees them from performing the driving task.

8.3 Limitations and further research

While the study results converge to support our framework and predictions, we acknowledge that our work also has limitations. First, we assessed the generalizability of our results by demonstrating the role of nostalgia using a car, fishing rod, and bike as stimuli, but we were unable to obtain the same results in the case of a food processor. Future research could thus examine product category as a boundary condition. For example, the food processor might be considered relatively utilitarian, whereas the other categories might be viewed as relatively hedonic in nature, and future research should examine this issue in greater detail by means of experimental manipulation to draw generalizable conclusions. Specifically, research could assess whether our findings generalize to service industries (e.g., service robots; Mende et al. 2019).

Furthermore, we focus on key factors that affect consumer responses to automated products, but other potential relevant behavioral factors exist (e.g., learning, experimentation, cultural aspects).

Second, although we controlled for the VW brand to rule out potential brand bias effects in our car studies, a replication of the given studies with other brands might help generalize our findings. Third, the assessment of product evaluations sheds light on the role of nostalgia proneness for automated products, but the inclusion of further downstream, actual behavioral responses (e.g., willingness to pay for an automated car) would increase the external validity of our findings.

Finally, we ran the studies that used autonomous vehicles as stimuli in what are arguably “car cultures” (i.e., United States and Germany). In other countries, cars may not evoke such levels of nostalgia in consumers. As such, we might not have observed the same mechanism with consumers in other countries or cultures, and thus research could examine such cultural differences.

REFERENCES

- Anspach, Carolyn K. 1934. "Medical Dissertation on Nostalgia by Johannes Hofer, 1688." *Bulletin of the Institute of the History of Medicine* 2(6): 367–391.
<https://www.jstor.org/stable/44437799>
- Aversa, Paolo, Marco Formentini, Daniela Iubatti, and Gianni Lorenzoni. 2021. "Digital Machines, Space, and Time: Towards a Behavioral Perspective of Flexible Manufacturing." *Journal of Product Innovation Management* 38(1): 114–41.
<https://doi.org/10.1111/jpim.12542>
- Baldwin, Matthew, Monica Biernat, and Mark J. Landau. 2015. "Remembering the Real Me: Nostalgia Offers a Window to the Intrinsic Self." *Journal of Personality and Social Psychology* 108(1): 128–47. <https://doi.org/10.1037/a0038033>
- Barrett, Frederick S., Kevin J. Grimm, Richard W. Robins, Tim Wildschut, Constantine Sedikides, and Petr Janata. 2010. "Music-Evoked Nostalgia: Affect, Memory, and Personality." *Emotion* 10(3): 390–403. <https://doi.org/10.1037/a0019006>
- Bluck, Susan. 2003. "Autobiographical Memory: Exploring Its Functions in Everyday Life." *Memory* 11(2): 113–23. <https://doi.org/10.1080/741938206>
- Brown, Stephen. 1999. "Retro-Marketing: Yesterday's Tomorrows, Today!" *Marketing Intelligence & Planning* 17(7): 363–76. <https://doi.org/10.1108/02634509910301098>
- Brown, Stephen, Robert V. Kozinets, and John F. Sherry. 2003. "Teaching Old Brands New Tricks: Retro Branding and the Revival of Brand Meaning." *Journal of Marketing* 67(3): 19–33. <https://doi.org/10.1509/jmkg.67.3.19.18657>
- Castaño, Raquel, Mita Suján, Manish Kacker, and Harish Suján. 2008. "Managing Uncertainty in the Adoption of New Products: Temporal Distance and Mental Simulation." *Journal of Marketing Research* 45(3): 320–36. <https://doi.org/10.1509/jmkr.45.3.320>
- Castellion, George, and Stephen K. Markham. 2012. "Perspective: New Product Failure Rates: Influence of Argumentum Ad Populum and Self-Interest." *Journal of Product Innovation Management* 30(5): 976–79. <https://doi.org/10.1111/j.1540-5885.2012.01009.x>
- Cheung, Wing Yee, Constantine Sedikides, and Tim Wildschut. 2016. "Induced Nostalgia Increases Optimism (via Social-Connectedness and Self-Esteem) among Individuals High, but Not Low, in Trait Nostalgia." *Personality and Individual Differences* 90: 283–88.
<http://dx.doi.org/10.1016/j.paid.2015.11.028>.

- Cohen, G. 1998. "The Effects of Aging on Autobiographical Memory." in *Autobiographical Memory: Theoretical and Applied Perspectives*, edited by C. P. Thompson, D. J. Hermann, D. Bruce, J. D. Read, D. G. Payne, and M. P. Toglia. Mahwah, NJ: Erlbaum, 105–23.
- Davis, Fred. 1979. *Yearning for Yesterday: A Sociology of Nostalgia*. New York: Free Press.
- Edsall, Larry. 2018. "It's True: Hagerty Survey Finds Millennials Like to Drive."
<https://journal.classiccars.com/2018/06/27/its-true-hagerty-survey-finds-millennials-like-to-drive/>.
- Faraji-Rad, Ali, Shiri Melumad, and Gita Venkataramani Johar. 2017. "Consumer Desire for Control as a Barrier to New Product Adoption." *Journal of Consumer Psychology* 27(3): 347–54. <https://doi.org/10.1016/j.jcps.2016.08.002>
- Feurer, Sven, Steve Hoeffler, Min Zhao, and Michal Herzenstein. 2021. "Consumers' Response to Really New Products: A Cohesive Synthesis of Current Research and Future Research Directions." *International Journal of Innovation Management* 25(8): 2150092.
<https://doi.org/10.1142/S1363919621500924>
- Fornell, Claes, and David F. Larcker. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error." *Journal of Marketing Research* 18(1): 39–50. <https://doi.org/10.1177/002224378101800104>
- Goh, Jin X., Judith A. Hall, and Robert Rosenthal. 2016. "Mini Meta-Analysis of Your Own Studies: Some Arguments on Why and a Primer on How." *Social and Personality Psychology Compass* 10(10): 535–49. <https://doi.org/10.1111/spc3.12267>
- Ha, Taehyun, Sangyeon Kim, Donghak Seo, and Sangwon Lee. 2020. "Effects of Explanation Types and Perceived Risk on Trust in Autonomous Vehicles." *Transportation Research Part F: Traffic Psychology and Behaviour* 73: 271–80. <https://doi.org/10.1016/j.trf.2020.06.021>.
- Hancock, P. A. 2019. "Some Pitfalls in the Promises of Automated and Autonomous Vehicles." *Ergonomics* 62(4): 479–95. <https://doi.org/10.1080/00140139.2018.1498136>.
- Hartmann, Benjamin J., and Katja H. Brunk. 2019. "Nostalgia Marketing and (Re-) Enchantment." *International Journal of Research in Marketing* 36(4): 669–86.
<https://doi.org/10.1016/j.ijresmar.2019.05.002>.
- Hauser, John, Gerard J. Tellis, and Abbie Griffin. 2006. "Research on Innovation: A Review and Agenda for Marketing Science." *Marketing Science* 25(6): 687–717.
<https://doi.org/10.1287/mksc.1050.0144>

- Hayes, Andrew F. 2019. *Introduction to Mediation, Moderation, and Conditional Process Analysis*. 2nd ed. New York: The Guilford Press.
- Heidenreich, Sven, and Matthias Handrich. 2015. "What about Passive Innovation Resistance? Investigating Adoption-Related Behavior from a Resistance Perspective." *Journal of Product Innovation Management* 32(6): 878–903. <https://doi.org/10.1111/jpim.12161>
- Heidenreich, Sven, and Tobias Kraemer. 2016. "Innovations-Doomed to Fail? Investigating Strategies to Overcome Passive Innovation Resistance." *Journal of Product Innovation Management* 33(3): 277–97. <https://doi.org/10.1111/jpim.12273>
- Hepper, Erica G., Tim Wildschut, Constantine Sedikides, Timothy D. Ritchie, Yiu Fai Yung, Nina Hansen, Georgios Abakoumkin, Gizem Arıkan, Sylwia Z. Cisek, Didier B. Demassosso, Jochen E. Gebauer, J. P. Gerber, Roberto González, Takashi Kusumi, Girishwar Misra, Mihaela Rusu, Oisín Ryan, Elena Stephan, Ad J. J. Vingerhoets, and Xinyue Zhou. 2014. "Pancultural Nostalgia: Prototypical Conceptions across Cultures." *Emotion* 14(4): 733–47. <https://doi.org/10.1037/a0036790>
- Hinsliff, Gaby. 2016. "Driverless Cars: The Slow, Sad Death of Joyous Motoring, One Satnav at a Time." <https://www.theguardian.com/commentisfree/2016/may/20/driverless-cars-sad-death-joyous-driving-petrolhead-motoring-pleasure>.
- Hoeffler, Steve. 2003. "Measuring Preferences for Really New Products." *Journal of Marketing Research* 40(4): 406–21. <https://doi.org/10.1509/jmkr.40.4.406.19394>
- Holak, Susan L., and William J. Havlena. 1998. "Feelings, Fantasies, and Memories: An Examination of the Emotional Components of Nostalgia." *Journal of Business Research* 42(3): 217–26. [https://doi.org/10.1016/S0148-2963\(97\)00119-7](https://doi.org/10.1016/S0148-2963(97)00119-7)
- Holbrook, Morris B. 1993. "Nostalgia and Consumption Preferences: Some Emerging Patterns of Consumer Tastes." *Journal of Consumer Research* 20(2): 245–56. <https://doi.org/10.1086/209346>
- Holbrook, Morris B, and Robert M. Schindler. 2003. "Nostalgic Bonding: Exploring the Role of Nostalgia in the Consumption Experience." *Journal of Consumer Behaviour* 3(2): 107–27. <https://doi.org/10.1002/cb.127>
- Holmström, Jan, Matthias Holweg, Benn Lawson, Frits K. Pil, and Stephan M. Wagner. 2019. "The Digitalization of Operations and Supply Chain Management: Theoretical and Methodological Implications." *Journal of Operations Management* 65(8): 728–34.

<https://doi.org/10.1002/joom.1073>

Huang, Niwen, Shijiang Zuo, Fang Wang, Yawen Li, Pan Cai, and Shun Wang. 2021. "New Technology Evokes Old Memories: Frequent Smartphone Use Increases Feeling of Nostalgia." *Personality and Social Psychology Bulletin* 1–14.

<https://doi.org/10.1177/01461672211061935>

Hultink, Erik Jan, Susan Hart, Henry S. J. Robben, and Abbie Griffin. 2000. "Launch Decisions and New Product Success: An Empirical Comparison of Consumer and Industrial Products." *Journal of Product Innovation Management* 17(1): 5–23. <https://doi.org/10.1111/1540-5885.1710005>

Juhl, Jacob, Clay Routledge, Jamie Arndt, Constantine Sedikides, and Tim Wildschut. 2010. "Fighting the Future with the Past: Nostalgia Buffers Existential Threat." *Journal of Research in Personality* 44(3): 309–14. <https://doi.org/10.1016/j.jrp.2010.02.006>

Juhl, Jacob, Tim Wildschut, Constantine Sedikides, Tara Diebel, Wing Yee Cheung, and Ad J.J.M. Vingerhoets. 2020. "Nostalgia Proneness and Empathy: Generality, Underlying Mechanism, and Implications for Prosocial Behavior." *Journal of Personality* 88(3): 485–500.

Kahneman, Daniel, Jack L. Knetsch, and Richard H. Thaler. 1991. "The Endowment Effect, Loss Aversion, and Status Quo Bias." *Journal of Economic Perspectives* 5(1): 193–206.

Klarmann, Martin, and Sven Feurer. 2018. "Control Variables in Marketing Research." *Marketing ZFP - Journal of Research and Management* 40(2): 26–40.

Kuester, Sabine, Silke C. Hess, and Andreas Herrmann. 2015. "The Role of Defaults in Preventing Innovation Rejection." *International Journal of Innovation Management* 19(2): 1550023. <http://www.worldscientific.com/doi/10.1142/S1363919615500231>.

Kuester, Sabine, Elisa Konya-Baumbach, and Monika C. Schuhmacher. 2018. "Get the Show on the Road: Go-to-Market Strategies for e-Innovations of Start-Ups." *Journal of Business Research*, 83(February): 65–81. <https://doi.org/10.1016/j.jbusres.2017.09.037>.

Leung, Eugina, Gabriele Paolacci, and Stefano Puntoni. 2018. "Man Versus Machine: Resisting Automation in Identity-Based Consumer Behavior." *Journal of Marketing Research* 55(6): 818–31.

Loveland, Katherine E., Dirk Smeesters, and Naomi Mandel. 2010. "Still Preoccupied with 1995: The Need to Belong and Preference for Nostalgic Products." *Journal of Consumer Research* 37(3): 393–408. <https://academic.oup.com/jcr/article-lookup/doi/10.1086/653043>.

- Mani, Zied, and Inès Chouk. 2018. "Consumer Resistance to Innovation in Services: Challenges and Barriers in the Internet of Things Era." *Journal of Product Innovation Management* 35(5): 780–807. <https://doi.org/10.1111/jpim.12463>
- Marion, Tucker J., and Sebastian K. Fixson. 2021. "The Transformation of the Innovation Process: How Digital Tools Are Changing Work, Collaboration, and Organizations in New Product Development." *Journal of Product Innovation Management* 38(1): 192–215. <https://doi.org/10.1111/jpim.12547>
- Marr, Bernard. 2017. "The Amazing Ways The Ford Motor Company Uses Artificial Intelligence And Machine Learning." Forbes. <https://www.forbes.com/sites/bernardmarr/2019/05/17/the-amazing-ways-the-ford-motor-company-uses-artificial-intelligence-and-machine-learning/?sh=7fd0ebe5e49a>.
- Matz, S. C., M. Kosinski, G. Nave, and D. J. Stillwell. 2017. "Psychological Targeting as an Effective Approach to Digital Mass Persuasion." *Proceedings of the National Academy of Sciences of the United States of America* 114(48): 12714–19. <https://doi.org/10.1073/pnas.1710966114>
- Mende, Martin, Maura L. Scott, Jenny van Doorn, Dhruv Grewal, and Ilana Shanks. 2019. "Service Robots Rising: How Humanoid Robots Influence Service Experiences and Elicit Compensatory Consumer Responses." *Journal of Marketing Research* 56(4): 535–56. <http://journals.sagepub.com/doi/10.1177/0022243718822827>.
- Morales, Andrea C., On Amir, and Leonard Lee. 2017. "Keeping It Real in Experimental Research-Understanding When, Where, and How to Enhance Realism and Measure Consumer Behavior." *Journal of Consumer Research* 44(2): 465–76. <https://doi.org/10.1093/jcr/ucx048>
- Muehling, Darrel D., David E. Sprott, and Abdullah J. Sultan. 2014. "Exploring the Boundaries of Nostalgic Advertising Effects: A Consideration of Childhood Brand Exposure and Attachment on Consumers Responses to Nostalgia-Themed Advertisements." *Journal of Advertising* 43(1): 73–84. <https://doi.org/10.1080/00913367.2013.815110>
- Muller, Dominique, Charles M Judd, and Vincent Y Yzerbyt. 2005. "When Moderation Is Mediated and Mediation Is Moderated." *Journal of Personality and Social Psychology* 89(6): 852–63. <https://doi.org/10.1037/0022-3514.89.6.852>
- Ostlund, Lyman E. 1974. "Perceived Innovation Attributes as Predictors of Innovativeness." *Journal of Consumer Research* 1(2): 23–29. <https://doi.org/10.1086/208587>

- Pade, Robin, and Sven Feurer. 2022. "The Mitigating Role of Nostalgia for Consumer Price Unfairness Perceptions in Response to Disadvantageous Personalized Pricing." *Journal of Business Research* 145: 277–87. <https://doi.org/10.1016/j.jbusres.2022.02.057>
- Pascal, Vincent J., David E. Sprott, and Darrel D. Muehling. 2002. "The Influence of Evoked Nostalgia on Consumers' Resonances to Advertising: An Exploratory Study." *Journal of Current Issues and Research in Advertising* 24(1): 39–49. <https://doi.org/10.1080/10641734.2002.10505126>
- Porter, Michael E., and James E. Heppelmann. 2014. "How Smart, Connected Product Are Transforming Competition." *Harvard Business Review* 29(10): 64–88.
- Ram, S., and Jagdish N. Sheth. 1989. "Consumer Resistance to Innovations: The Marketing Problem and Its Solutions." *Journal of Consumer Marketing* 6(2): 5–14. <https://doi.org/10.1108/EUM0000000002542>
- Ram, S. 1989. "Successful Innovation Using Strategies to Reduce Consumer Resistance." *Journal of Product Innovation Management* 6(1): 20–34. <https://doi.org/10.1111/1540-5885.610020>
- Reid, Chelsea A., Jeffrey D. Green, Tim Wildschut, and Constantine Sedikides. 2015. "Scent-Evoked Nostalgia." *Memory* 23(2): 157–66. <https://doi.org/10.1080/09658211.2013.876048>
- Rijsdijk, Serge A., and Erik Jan Hultink. 2003. "'Honey, Have You Seen Our Hamster?'" Consumer Evaluations of Autonomous Domestic Products." *Journal of Product Innovation Management* 20(3): 204–16. <http://doi.wiley.com/10.1111/1540-5885.2003003>.
- Rijsdijk, Serge A., and Erik Jan Hultink. 2009. "How Today's Consumers Perceive Tomorrow's Smart Products." *Journal of Product Innovation Management* 26(1): 24–42. <https://doi.org/10.1111/j.1540-5885.2009.00332.x>
- Rindfleisch, Aric, Matthew O'Hern, and Vishal Sachdev. 2017. "The Digital Revolution, 3D Printing, and Innovation as Data." *Journal of Product Innovation Management* 34(5): 681–90. <https://doi.org/10.1111/jpim.12402>
- Routledge, Clay, Jamie Arndt, Constantine Sedikides, and Tim Wildschut. 2008. "A Blast from the Past: The Terror Management Function of Nostalgia." *Journal of Experimental Social Psychology* 44(1): 132–40. <https://doi.org/10.1016/j.jesp.2006.11.001>
- Samuelson, William, and Richard Zeckhauser. 1988. "Status Quo Bias in Decision Making." *Journal of Risk and Uncertainty* 1(1): 7–59. <https://doi.org/10.1007/BF00055564>

- Schaefer, Kristin E., Jessie Y.C. Chen, James L. Szalma, and P. A. Hancock. 2016. "A Meta-Analysis of Factors Influencing the Development of Trust in Automation: Implications for Understanding Autonomy in Future Systems." *Human Factors* 58(3): 377–400.
<https://doi.org/10.1177/0018720816634228>
- Schuhmacher, Monika C., Sabine Kuester, and Erik Jan Hultink. 2018. "Appetizer or Main Course: Early Market vs. Majority Market Go-to-Market Strategies for Radical Innovations." *Journal of Product Innovation Management* 35(1): 106–24.
<https://doi.org/10.1111/jpim.12379>
- Talke, Katrin, and Erik Jan Hultink. 2010. "Managing Diffusion Barriers When Launching New Products." *Journal of Product Innovation Management* 27(4): 537–53.
<http://doi.wiley.com/10.1111/j.1540-5885.2010.00734.x>
- Van Tilburg, Wijnand A.P., Eric R. Igou, and Constantine Sedikides. 2013. "In Search of Meaningfulness: Nostalgia as an Antidote to Boredom." *Emotion* 13(3): 450–61.
- Verganti, Roberto, Luca Vendraminelli, and Marco Iansiti. 2020. "Innovation and Design in the Age of Artificial Intelligence." *Journal of Product Innovation Management* 37(3): 212–27.
<https://doi.org/10.1111/jpim.12523>
- Vilches-Montero, Sonia. 2016. "Altering the Past to Influence the Future: The Effect of Mental Unpacking on Past Evaluations and Future Preferences." *Marketing Letters* 27(3): 499–510.
<http://dx.doi.org/10.1007/s11002-015-9367-9>
- de Vries, Catherine E., and Isabell Hoffmann. 2018. The Power of the Past: How Nostalgia Shapes European Public Opinion. <https://eupinions.eu/de/text/the-power-of-the-past/>.
- Waytz, Adam, Joy Heafner, and Nicholas Epley. 2014. "The Mind in the Machine: Anthropomorphism Increases Trust in an Autonomous Vehicle." *Journal of Experimental Social Psychology* 52(May): 113–17. <http://dx.doi.org/10.1016/j.jesp.2014.01.005>.
- White, Katherine, Lily Lin, Darren W. Dahl, and Robin J. B. Ritchie. 2015. "When Do Consumers Avoid Imperfections? Superficial Packaging Damage as a Contamination Cue." *Journal of Marketing Research* 53(1): 110–23. <https://doi.org/10.1509/jmr.12.0388>
- Wildschut, Tim, Constantine Sedikides, Jamie Arndt, and Clay Routledge. 2006. "Nostalgia: Content, Triggers, Functions." *Journal of Personality and Social Psychology* 91(5): 975–93.
<https://doi.org/10.1037/0022-3514.91.5.975>
- Wilson, Anne E. and Michael Ross. 2003. "The Identity Function of Autobiographical Memory:

Time Is on Our Side.” *Memory* 11(2): 137–49. <https://doi.org/10.1080/741938210>

Xia, Lan, Joyce Feng, and Shelle Santana. 2021. “Nostalgia: Triggers and Its Role on New Product Purchase Intentions.” *Journal of Business Research* 135: 183–94. <https://doi.org/10.1016/j.jbusres.2021.06.034>.

Yen, Hsiuju Rebecca, and Shih Chieh Chuang. 2008. “The Effect of Incidental Affect on Preference for the Status Quo.” *Journal of the Academy of Marketing Science* 36(4): 522–37. <https://doi.org/10.1007/s11747-008-0084-2>

Zauberman, Gal, Rebecca K. Ratner, and B. Kyu Kim. 2009. “Memories as Assets: Strategic Memory Protection in Choice over Time.” *Journal of Consumer Research* 35(5): 715–28. <https://doi.org/10.1086/592943>

Zhao, Min, Steve Hoeffler, and Darren Dahl. 2009. “The Role of Imagination-Focused Visualization on New Product Evaluation.” *Journal of Marketing Research* 46(1): 46–55.

Zhao, Min, Steve Hoeffler, and Gal Zauberman. 2011. “Mental Simulation and Product Evaluation: The Affective and Cognitive Dimensions of Process versus Outcome Simulation.” *Journal of Marketing Research* 48(5): 827–39. <https://doi.org/10.1509/jmkr.46.1.46>

Zhou, Kun, Xiaoyin Ye, and Jun Ye. 2021. “Longing for the Past and Embracing the New: Does Nostalgia Increase New Product Adoption?” *Marketing Letters* 32(4): 477–98. <https://doi.org/10.1007/s11002-021-09574-8>

Zhou, Xinyue, Constantine Sedikides, Tim Wildschut, and Ding-Guo Gao. 2008. “Counteracting Loneliness: On the Restorative Function of Nostalgia.” *Psychological Science* 19(10): 1023–29. <https://doi.org/10.1111/j.1467-9280.2008.02194.x>

Zhou, Xinyue, Wijnand A.P. van Tilburg, Dongmei Mei, Tim Wildschut, and Constantine Sedikides. 2019. “Hungering for the Past: Nostalgic Food Labels Increase Purchase Intentions and Actual Consumption.” *Appetite* 140: 151–58. <https://doi.org/10.1016/j.appet.2019.05.007>.

Zhou, Xinyue, Tim Wildschut, Constantine Sedikides, Kan Shi, and Cong Feng. 2012. “Nostalgia: The Gift That Keeps on Giving.” *Journal of Consumer Research* 39(1): 39–50. <https://doi.org/10.1086/662199>

TABLE 1 Sample experimental conditions

Stimulus (Study)	Descriptions
VW ID.Buzz (Study 2; variations and adaptations used in Studies 1a, 1b, 3a, and 3b)	<p><i>[Low degree of automation]:</i> With the ID.Buzz, VW puts the Californian lifestyle on the road in series production. With its retro design, the ID.Buzz is only visually reminiscent of the legendary “Bulli” of the 1950s. Inside, it is packed with the latest driving technology, which, however, only plays a supporting role. The very direct steering gives the driver the opportunity to design the driving experience according to his own personal ideas. This is the best way to enjoy a drive along Highway 1 to the beach of Santa Monica.</p> <p><i>[High degree of automation]:</i> With the ID.Buzz, VW puts the Californian lifestyle on the road in series production. With its retro design, the ID.Buzz is only visually reminiscent of the legendary “Bulli” of the 1950s. Inside, it is packed with the latest driving technology. Specifically, the Buzz will drive completely autonomously and without steering wheel or pedals. So, you don’t have to waste a single thought on driving and traffic. This is the best way to enjoy a drive along Highway 1 to the beach of Santa Monica.</p>
Contemporary design VW (Study 1b)	<p><i>[Nostalgia prime]:</i> Please think back to an event from the past that causes nostalgic feelings in you. Nostalgia is often defined as a sentimental longing for a time in the past that you like to remember. So try to think of the time that is most likely to make you nostalgic.</p> <p><i>[Neutral prime]:</i> Please think back to any ordinary event that happened last week and consider how you felt about it.</p>
Food processor (Study 1c)	<p><i>[Low degree of automation]:</i> The new Chef1000 elevates the cooking experience to a new level. With its design it is a real eye-catcher. Beyond that, the new Chef1000 convinces with its ease of handling that enables every chef to bring his or her individual cooking style on the plates. Doing so, every cook can personalize and enjoy the cooking experience.</p> <p><i>[High degree of automation]:</i> The new Chef1000 elevates the cooking experience to a new level. With its design it is a real eye-catcher. Beyond, the new Chef1000 convinces with its high automation: no more cutting, chopping or stirring. Without the need to participate in the cooking process, every cook can concentrate on the meal instead of the cooking experience.</p>

TABLE 2 Summary of main studies

Study	Goal/Purpose	Participants	Key Variables	Results
<i>Establishing the moderating effect of nostalgia on the automation-product evaluation relationship</i>				
1a	Establishing focal interaction effect	N = 250 Students Germany Lab	<ul style="list-style-type: none"> • IV: automation (high vs. low degree) • Moderator: nostalgia proneness • DVs: product evaluation, adoption intention, behavioral reactions 	Consumers low (high) in nostalgia proneness prefer autonomous (conventional) cars with downstream effects on adoption intention and reactions.
1b	Primed nostalgia, contemporary design	N = 198 Germany Online	<ul style="list-style-type: none"> • IV: automation (vs. not) • Moderator: primed nostalgia (vs. not) • DV: product evaluation 	Priming nostalgia (vs. measuring nostalgia proneness) largely replicates the focal interaction.
1c	Evidence from additional product categories	N = 509 Germany Online	<ul style="list-style-type: none"> • IV: automation (high degree vs. low degree); product category (food processor vs. fishing rod vs. bike) • Moderator: nostalgia proneness • DV: product evaluation 	The focal interaction effect occurs for fishing rod and bike but not for food processor.
<i>Why the moderating effect occurs</i>				
2	Evidence of process	N = 150 Germany Online	<ul style="list-style-type: none"> • IV: automation (vs. not) • Moderator: nostalgia proneness • Mediator: evoked nostalgic feelings • DV: product evaluation 	Automation evokes nostalgic feelings to a lesser extent, which in turn decreases product evaluations for people high (but not low) in nostalgia proneness.
<i>How to overcome the moderating effect.</i>				
3a	Intervention to alleviate negative interaction	N = 179 Students Germany Lab	<ul style="list-style-type: none"> • IV: automation (vs. not) • Moderator: nostalgia proneness • Moderator: nondriving-related cognition prime (past occasion vs. future occasion vs. none) • DV: product evaluation 	Having people think about what constitutes a memorable driving experience apart from the driving task (either in the past or in the future) mitigates the negative effect of nostalgia proneness.
3b	Ad focus for an autonomous car to alleviate negative interaction	N = 202 Germany Online	<ul style="list-style-type: none"> • IV: automation focus (vs. nonautomation focus) • Moderator: nostalgia proneness • DV: product evaluation 	For nostalgia-prone people, an ad for an autonomous car that focuses on the automated driving task leads to more negative responses than an ad focusing on other aspects of the ride.

Note: Two additional experiments and a meta-analysis appear in Web Appendices 2–4. IV = independent variable; DV = dependent variable.

FIGURE 1 Conceptual framework

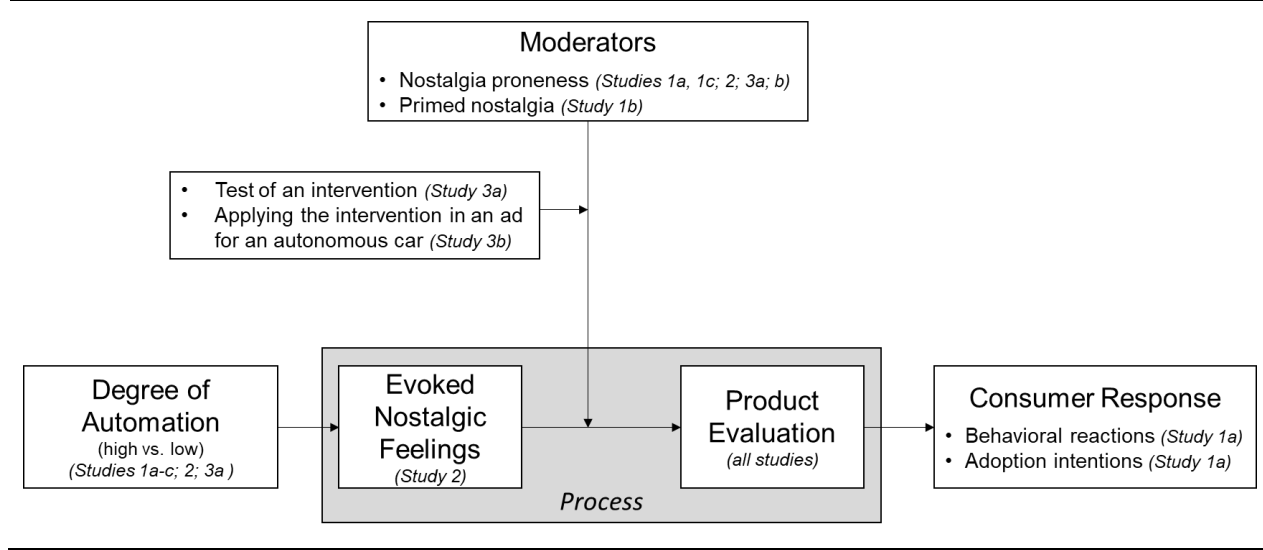
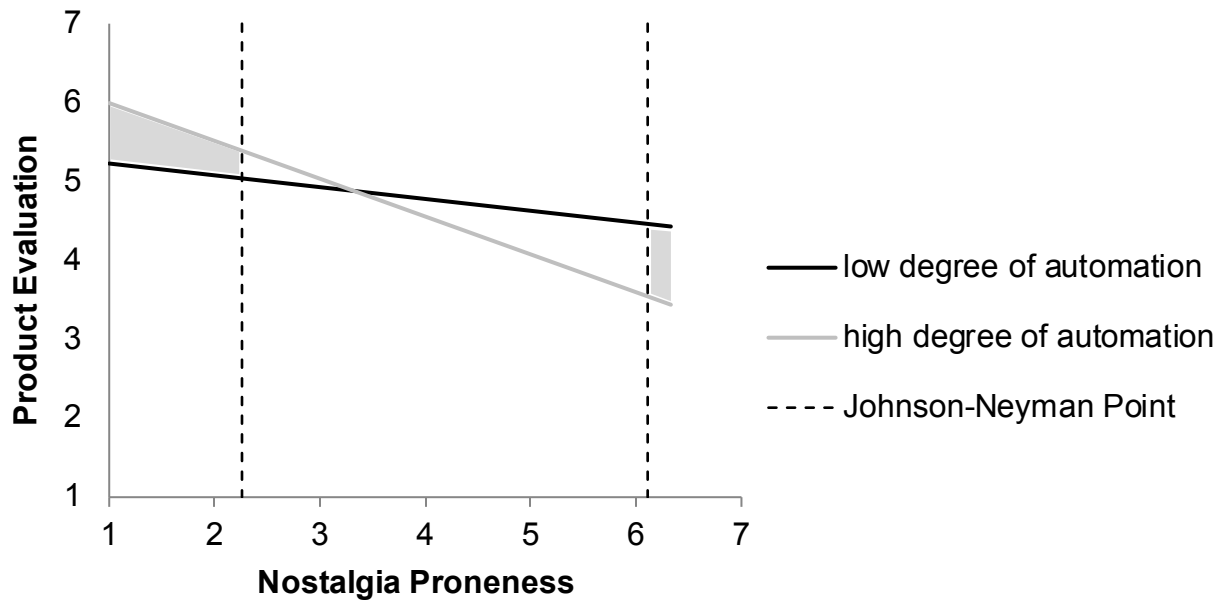


FIGURE 2 Degree of automation × nostalgia interaction

A: Study 1a



B: Study 1b

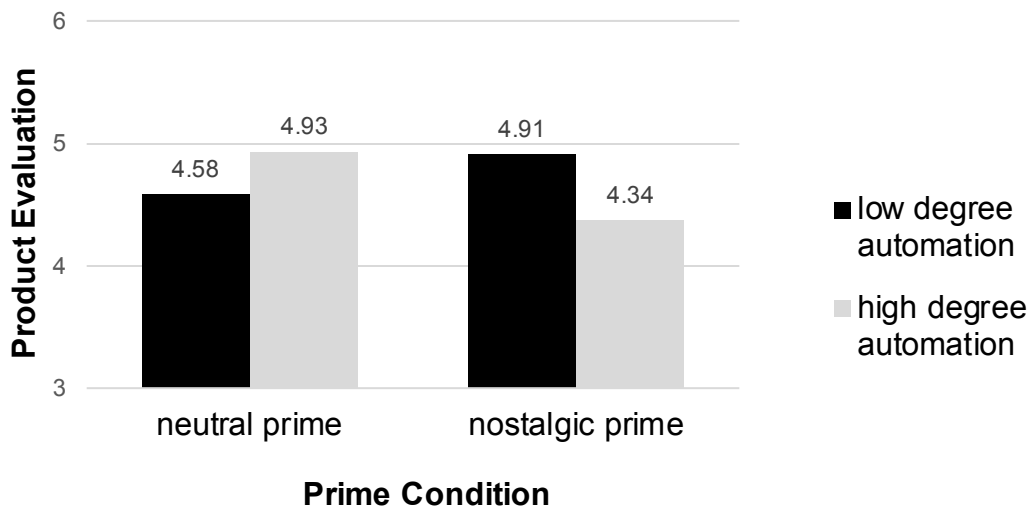


FIGURE 3 Process evidence (Study 2)

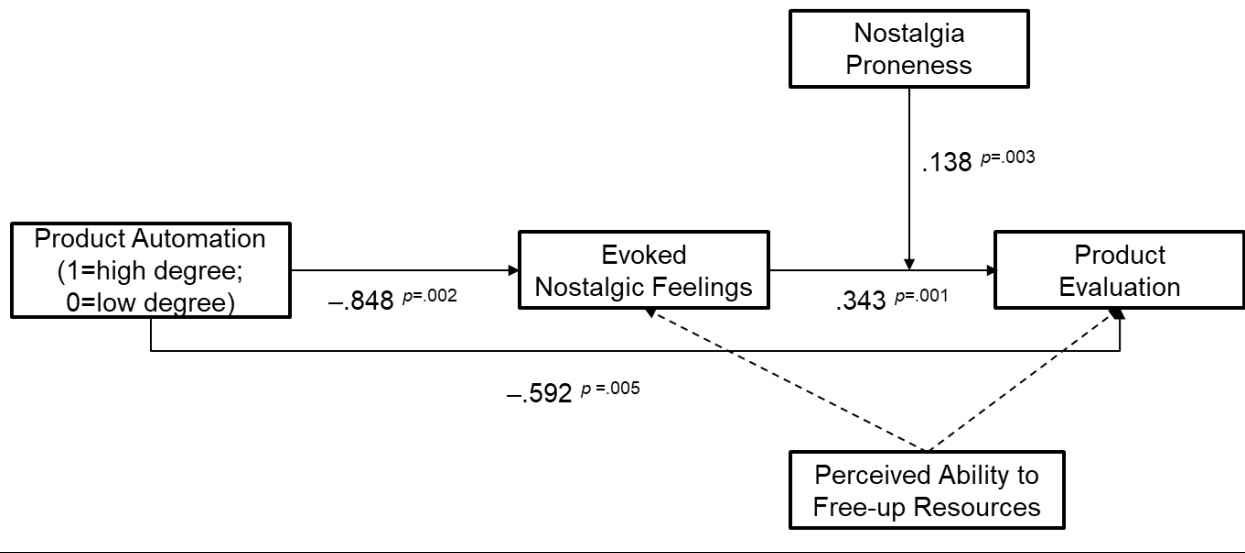
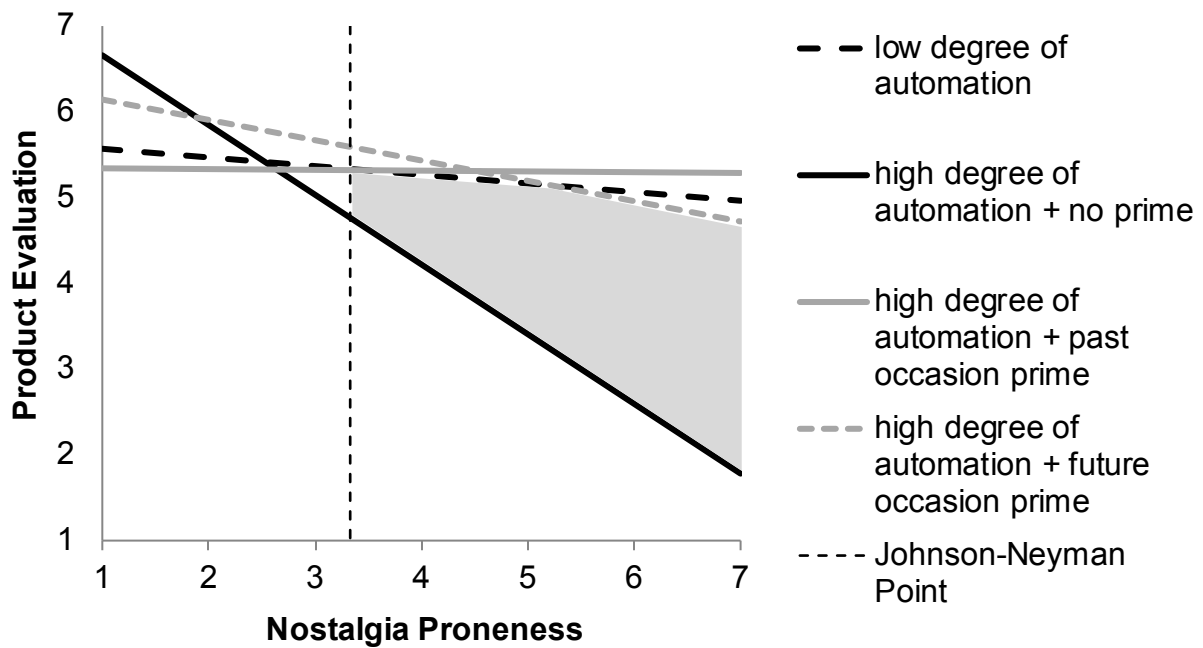
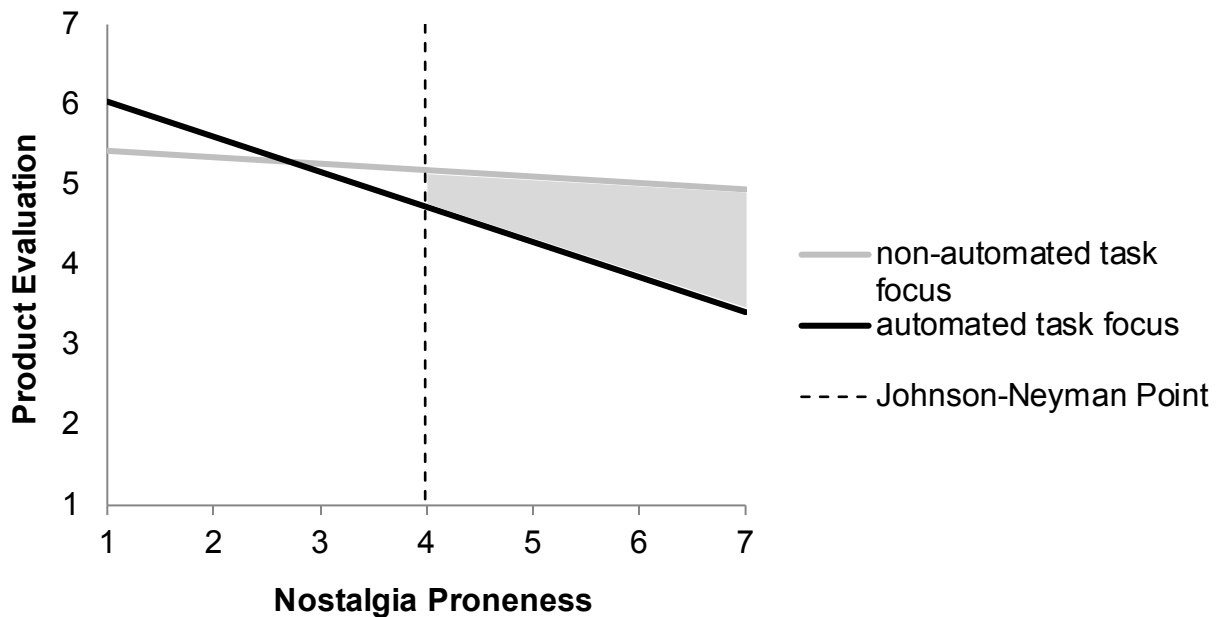


FIGURE 4 Mitigating the moderating role of nostalgia proneness (Studies 3a and 3b)

A: Nostalgia proneness \times degree of automation/prime interaction (Study 3a)



B: Nostalgia proneness \times focus of autonomous car advertisement interaction (Study 3b)



APPENDIX Measurements

<i>Latent Construct</i>	<i>Study</i>							
	<i>1a</i>	<i>1b</i>	<i>1c</i>	<i>2</i>	<i>3a</i>	<i>3b</i>	<i>WA1</i>	<i>WA2</i>
<i>Nostalgia Proneness (adapted from Holbrook 1993)</i>								
New is almost always better. (r)	-- ^a		-- ^a	-- ^a	✓	✓	✓	-- ^a
Things used to be better in the good old days.	-- ^a		-- ^a	-- ^a	✓	-- ^a	-- ^a	✓
I believe in the constant march of progress. (r)	✓		✓	✓	✓	✓	✓	-- ^a
Compared to our parents, we've got it good. (r)	✓		✓	✓	✓	✓	✓	✓
Technological change will ensure a brighter future. (r)	✓		✓	✓	✓	✓	✓	✓
When I was younger, I was happier than I am today.	-- ^a		-- ^a	-- ^a	-- ^a	-- ^a	-- ^a	✓
<i>Evoked Nostalgic Feelings (adapted from Pascal, Sprott, and Muehling 2002)</i>								
The presented product ...								
... helps me recall pleasant products, persons, or places from the past.				✓				
... reminds me of the good-old days.				✓				
... makes me feel comfortably transported back into the past.				✓				
... brings back memories of good times from the past.				✓				
<i>Product Evaluation (adapted from White et al. 2015)</i>								
The advertised [product] is ...								
Bad/good	✓	✓	✓	✓	✓	✓	✓	✓
Undesirable/desirable	✓	✓	✓	✓	✓	✓	✓	✓
Unfavorable/favorable	✓	✓	✓	✓	✓	✓	✓	✓
<i>Behavioral Intention (adapted from Castaño et al. 2008)</i>								
I like to test-drive the ID.Buzz.	✓						✓	
I would be interested to buy the ID.Buzz.	✓						✓	
I would actively seek information about the ID.Buzz.	✓						✓	

Notes: All constructs were measured on seven-point scales. r = reverse coded.

^aDropped due to low factor loading.

ⁱ A pilot study we conducted with 300 US participants (46% female, median age 34 years) recruited from Amazon Mechanical Turk provides further support for this notion: On a scale from 1 (strongly disagree) to 7 (fully agree), the levels of agreement to the statements “I have good memories that involve me driving somewhere” and “Without driving I would feel like I am losing a part of my past” were 5.02 (SD = 1.54) and 4.41 (SD = 1.94), respectively, and above the scale midpoints. In open questions, respondents described driving episodes they liked to recall, often involving close others and momentous events (e.g., road trips), which are typical for personal experiences that evoke nostalgic feelings (Wildschut et al., 2006).

ⁱⁱ We conducted an additional experiment (N = 196) using an identical design that validates our results online with a nonstudent sample. We report this experiment in detail in Web Appendix 2. Furthermore, a potential alternative explanation for this result is that it is not the product automation that has such an effect, but rather that any situation in which a consumer is not allowed to drive him- or herself would lead to the same result. We provide evidence that counters this explanation in an additional experiment (N = 166) reported in Web Appendix 3. The focal interaction occurs in the case of a high degree of product automation but not in the case of a low degree of product automation in which a third person is carrying out the task (i.e., a third person driving while the focal individual is sitting in the passengers’ seat).

ⁱⁱⁱ We also conducted a mini meta-analysis across all studies presented to summarize our findings on the focal interaction effect of degree of automation and nostalgia on consumers’ product evaluations by following the recommendations of Goh et al. (2016). We describe the method in detail in Web Appendix 4. The final analysis is based on six data collections with a total sample size of 938. The results show a positive direct effect of automation on product evaluation (weighted $r = .204$, 95% CI [.047; .318]), which is negatively moderated by nostalgia (weighted $r = -.299$, 95% CI [-.421; -.149]). Thus, this mini meta-analysis across the focal moderation model confirms the robustness of our central prediction.