

**Digitized Physical Products –  
Exploring Consumers' Responses  
Toward Digital Feature Upgrades for Physical Products**

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The President:

Prof. Dr. Bernhard Ehrenzeller

## **Vorwort**

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## Summary

New technologies enable firms to connect physical products to the internet and to adapt them remotely. This offers firms the opportunity to expand the products' functionalities digitally, and to sell these additional functionalities through a digital upgrade process—a practice the author terms *digital feature upgrades*. Despite its growing prevalence and relevance for marketing managers, knowledge about this novel phenomenon remains limited. While scholarly research is still lacking, practitioner reports focus predominantly on technological and legal requirements. Consumer acceptance—crucial for innovation success—has received even less attention. The three articles of this cumulative dissertation aim to narrow this research gap.

**Article 1** explores how and under which conditions digital feature upgrades impact consumers' firm evaluations. One pre-study (based on a sentiment analysis of actual Tesla Tweets following Hurricane Irma), one lab experiment (conducted using a Virtual Reality simulation) and six online experiments provide evidence that digital feature upgrades can adversely affect consumers' firm evaluations. This effect is driven by consumers' feelings of entitlement that arise from owning a physical product: because consumers feel entitled to the full capabilities of products that they own, they infer manipulative intent from firms who offer digital feature upgrades for an additional charge. Consequently, consumers evaluate the firm less favorably.

**Article 2** focuses on the upgrade process and explores how the digital upgrade format influences consumers' value perceptions. Five online experiments reveal that features are less likely to be purchased when they are offered through a digital upgrade process than through a physical upgrade process—despite the first being more convenient while essentially providing access to the same final feature. Because a digital upgrade process grants immediate access to features at the simple touch of a button, consumers associate the features with lower value and are therefore less willing to buy them.

**Article 3** synthesizes the empirical findings to offer managers insights into the potential negative implications of enabling feature upgrades through a digital upgrade process. Furthermore, drawing on agency theory, this article examines two mechanisms that firms could use to mitigate the negative effect of a digital upgrade process: consumer agency and transparency about the firm's value creation processes. The results show that if firms grant consumers a sense of agency, or make their processes transparent, consumers appreciate the value of the feature and become more willing to buy the upgrade.

## Zusammenfassung

Digitale Technologien ermöglichen Herstellern, physische Produkte aus der Ferne zu adaptieren. Unternehmen eröffnen sich dadurch zusätzlich Ertragsquellen über das Grundprodukt hinaus: Sie können Zusatzfunktionen digital freischalten und als *digitale Funktionsupgrades* über den gesamten Produktlebenszyklus anbieten. Obwohl digitale Funktionsupgrades zunehmend an Bedeutung gewinnen und Branchenexperten diesem Phänomen grosses wirtschaftliches Potenzial zuschreiben, existieren bislang nur Forschungserkenntnis zu technologischen und rechtlichen Anforderungen. Die Konsumentenakzeptanz—ein entscheidender Faktor für den Erfolg einer Innovation—bleibt bisher jedoch sowohl in der Forschung, als auch in der Praxis unberücksichtigt. Die vorliegende kumulative Dissertation adressiert diese Forschungslücke.

**Artikel 1** untersucht die Forschungsfrage, wie und unter welchen Bedingungen digitale Funktionsupgrades die Unternehmenswahrnehmung der Konsumenten beeinflussen. Eine Pre-Studie (Sentiments Analyse von Tesla-Tweets), ein Laborexperiment (Virtual-Reality Simulation) und sechs Online-Experimente zeigen systematisch auf, dass digitale Funktionsupgrades (im Vergleich zu physischen Upgrades) die Einstellung der Konsumenten gegenüber dem Unternehmen verschlechtern. Konsumenten assoziieren physische Produkte traditionell mit vollumfänglichem Besitzanspruch. Entsprechend empfinden sie Anspruch auf die als Upgrade erhältlichen, vorverbauten Zusatzfunktionen und fühlen sich durch das Unternehmen manipuliert. Folglich bewerten Konsumenten das Unternehmen negativer.

**Artikel 2** beleuchtet den Kaufprozess und geht dabei der Frage nach, welchen Einfluss das digitale Format des Upgrade Prozesses auf die Kaufabsicht der Konsumenten ausübt. Die Ergebnisse von fünf Experimenten belegen, dass das digitale Upgrade Format im Vergleich zum physischen Upgrade Format die Kaufwahrscheinlichkeit senkt—obwohl es für Konsumenten als digitale Aktivierung die schnellere und komfortablere Methode darstellt. Erhalten Konsumenten per Knopfdruck unmittelbaren Zugang zu Funktionen, empfinden sie diese als weniger wertvoll und sind folglich weniger bereit, die Funktion zu kaufen.

**Artikel 3** zeigt die Bedeutung der negativen Wertwahrnehmung des digitalen Upgrade Prozesses für die Marketingpraxis auf und untersucht Ansätze, wie sich diese Wertminderung stabilisieren lässt. Ausgehend von der Agency-Theorie zeigt der Artikel auf, dass Handlungsfähigkeit der Kunden sowie Transparenz über die Wertschöpfung als mögliche Gegenmassnahmen die Wertwahrnehmung und Kaufbereitschaft steigern können.

# Introduction

## Digital Feature Upgrades for Physical Products

Physical products are no longer static objects. New technologies have morphed them into connected products that can be changed and adapted in their functionality from remote (Ng and Wakenshaw 2017). Firms are thus able to apply digital business practices to physical products and to position such products with entirely new value propositions (Fleisch, Weinberger, and Wortmann 2015). This dissertation examines *digital feature upgrades*—a novel practice that allows consumers to upgrade their physical products by acquiring additional product features through a digital upgrade process. For example, car owners can add extra battery capacity to their car at any time and with the simple push of an upgrade button. The upgrade activates pre-installed hardware features or installs software-based features remotely through over-the-air software updates (Wucher and Kayser 2019). The physical product thus improves almost instantly—without requiring a service visit or further physical installments (Tesla 2020).

The business potential of digital feature upgrades seems promising (Handelsblatt 2020). Experts predict an annual sales potential of 10 billion euros in the German automotive market (euroforum 2019). This figure is not surprising, given that digital feature upgrades could generate new revenue streams over the product's entire life cycle. At the same time, digital feature upgrades allow firms to save costs from streamlined productions (i.e., firms can reduce the product range to fewer versions). Yet, as with any innovative practice, it is uncertain whether and, if so, how quickly firms will be able to reap the full business potential of digital feature upgrades. One determining factor for the market success of an innovation is consumers' resistance toward it (Ram and Sheth 1989).

This raises a crucial question: *Will consumers accept digital feature upgrades for physical products?* On the one hand, studies from the digital product context indicate that consumers should be willing to purchase additional product features through digital upgrades. For example, in-app purchases (i.e., feature upgrades inside a mobile application) generated around 1.2 billion euros in sales in Germany in 2019 (Statista

2020). On the other hand, some initial evidence suggests that consumers respond less positively to the idea of digitally acquiring features for physical products. Car manufacturer Tesla caused an uproar when it remotely provided a temporary range upgrade for some of its models to help customers escape a hurricane in fall 2017. Across social and traditional media, critics raised concerns about the newly revealed business practice. While some praised Tesla for the benevolent act and the innovative practice, others voiced concerns about Tesla's "corporate greed," given that "the company was kneecapping vehicle range under normal circumstances in pursuit of profit" (The New York Times 2017). Adding to this initial evidence, a recent study suggests that only 39% of participants would be willing to pay for digital feature upgrades (Norstat 2019).

According to prior research, consumers may resist an innovation if it conflicts with their established beliefs, norms, or traditions (Garcia, Bardhi, and Friedrich 2007). Digital feature upgrades undoubtedly introduce a completely novel business practice and upgrade experience, one that consumers still need to learn (Rumpelt 2017). First, consumers are used to static physical products that they own in their entirety—without the option of extending features digitally at a later point in time. By making additional (pre-installed) product features subject to an upgrade at extra charge, digital upgrades significantly conflict with consumers' traditionally learned experience of owning physical products in their entirety. Secondly, consumers are accustomed to obtaining adjustments to their physical products manually and on-site, instead of digitally and remotely. Given that digital feature upgrades change the traditional ownership and purchase experience associated with physical products and their features significantly, it seems reasonable to assume that consumers may respond with some form of resistance to this practice.

## **Research Gap**

To date, research on how consumers respond to the novel phenomenon of digital feature upgrades—the combination of a physical product and a digital upgrade process—is still lacking. Prior research on consumer responses to the digitization of goods has contrasted digital and physical products to explain why consumers prefer the latter format even when the products themselves are identical (e.g., books, photographs, movies; Atasoy

and Morewedge 2018; Giles, Pietrzykowski and Clark, 2007; Petrelli and Whittaker 2010). By focusing on the contrast between these distinctive formats, such research has not yet examined the combination of a physical product with digital product elements.

Research has also examined consumers' acceptance of digital self-service processes (e.g., using self-scanning terminals in stores, ATMs at banks). Self-serving technologies are related to digital feature upgrades in that both phenomena enable consumers to perform previously manual (and employee-based) service processes now digitally and by themselves. Prior research in this area has examined why consumers might adopt some of these digital self-serving processes while neglecting others, but has focused exclusively on transaction-based services (e.g., banking; travel bookings; Dabholkar 1996; Dabholkar and Bagozzi 2002; Meuter, Ostrom Roundtree, and Bitner 2000). To date, however, no research has explored consumers' acceptance of digital upgrade processes that enable the acquisition of additional product features for physical products.

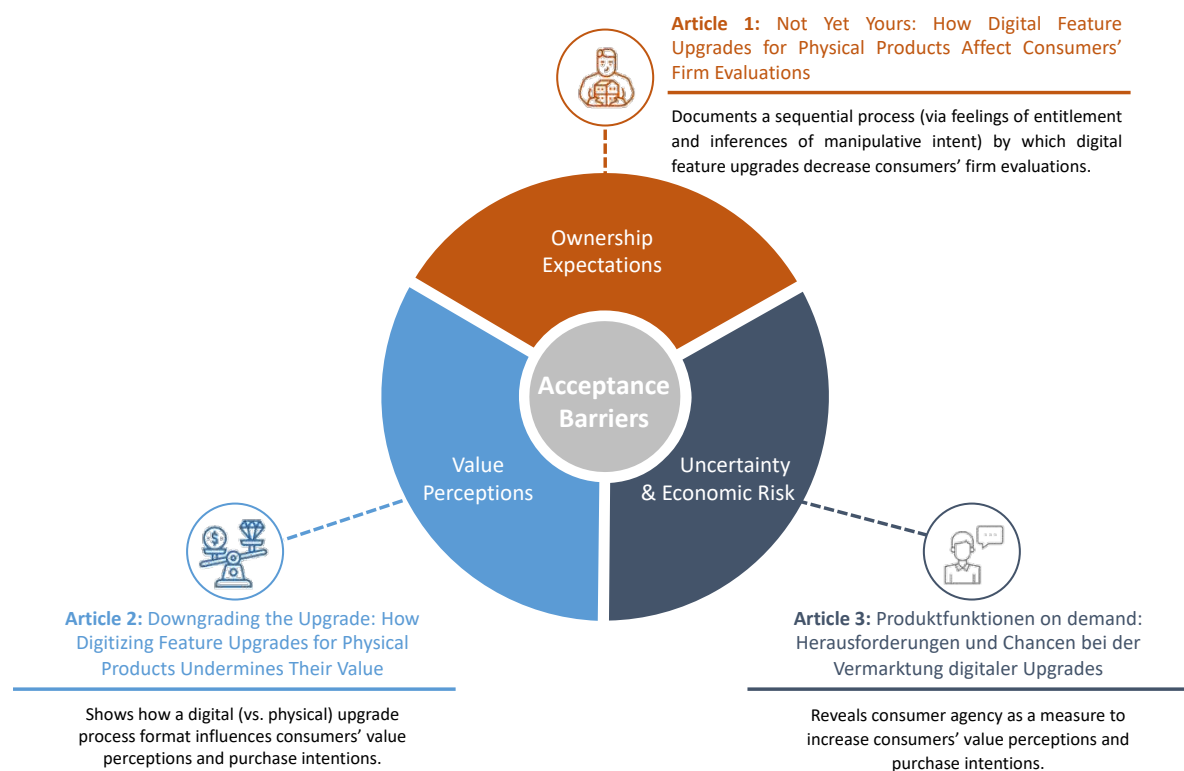
Finally, a third research stream has investigated how consumers perceive price discrimination practices that provide differently tiered products to cater to consumers' heterogeneous price and quality sensitivities (Bertini, Ofek, and Ariely 2009; Gershoff, Kivetz, and Keinan 2012; Heath, DelVecchio, and McCarthy 2011). This prior research has considered how consumers respond when firms produce multiple product versions, for instance, by degrading features of physical products (Gershoff, Kivetz, and Keinan 2012) or by providing ancillary physical add-ons (e.g., extra zoom through add-on lenses; Bertini, Ofek, and Ariely 2009). However, none of these studies has focused on the novel opportunity of providing physical product tiers through digital upgrades. In sum, while all three research streams have examined relevant phenomena, none has studied the unique combination of a physical base product and a digital upgrade process.

### **Three Articles on Consumers' Acceptance of Digital Feature Upgrades**

Prior research has identified several barriers to consumers' acceptance of innovations. For example, consumers may not accept an innovation if it conflicts with established norms or expectations, if consumers do not perceive its value, or if the innovation involves uncertainty or some economic risk (Ram and Sheth 1989). The three empirical

articles presented here examine consumers' acceptance of digital feature upgrades in terms of these barriers (see Figure 1).

**Figure 1.** Examining Consumer Acceptance of Digital Feature Upgrades



**Article 1** is inspired by the outrage at Tesla's battery upgrade during Hurricane Irma. It explores how and under which conditions digital feature upgrades impact consumers' company evaluations. One pre-study (based on a sentiment analysis of actual Tesla Tweets following Hurricane Irma), one lab experiment (conducted using a Virtual Reality simulation), and six online experiments provide evidence that digital feature upgrades can adversely affect consumers' firm evaluations. This effect is driven by consumers' feelings of entitlement that arise from traditional ownership expectations associated with owning a physical product: consumers feel entitled to the product's entirety that they own. As the firm charges consumers for acquiring these features through a digital process, feelings of entitlement translate into inferences that the firm must have manipulative intent. Consequently, consumers evaluate the firm less favorably. The findings reveal that digital feature upgrades conflict with established

norms and ownership beliefs to own physical products in their entirety. To overcome this potential acceptance barrier, managers responsible for launching digital feature upgrades could consider acquainting consumers with digital feature upgrades in a context where feelings of entitlement are less likely to occur (e.g., rental context without actual ownership).

**Article 2** examines how the digital (vs. physical) upgrade format influences consumers' value perceptions of the received feature and their willingness to purchase the upgrade. Five experiments in the automotive and home appliance context reveal that consumers perceive the value of the digitally received feature to be significantly lower than the value of the physically received feature. This effect is explained by the lack of physical quality cues during the digital upgrade process that could help consumers intuit the value of the received feature. As a result, consumers perceive the value of the digitally received feature to be lower, and are consequently less willing to buy the upgrade. This value-decreasing potential of the digital upgrade format is a critical acceptance barrier and underscores the importance of a careful design of the upgrade process. Notably, the findings show that insights into the firm's operations (i.e., feature development and production), or the steps underlying the installation of the upgrade (i.e., components being installed), can increase consumers' value perceptions of the digitally received feature and, therefore, their intention to buy the upgrade. Managers may thus evaluate whether their operational processes are suitable and interesting to provide consumers with more transparency.

**Article 3** provides a practitioner audience with insights into the potential negative impact of a digital upgrade process as well as into consumer agency as an additional mechanism for overcoming potential uncertainty and risk barriers. Given their novelty, digital feature upgrades involve more uncertainty and some economic risk about a feature's actual value and quality. As the value of digital feature upgrades is more difficult to evaluate for consumers (than for firms), they may fear that the firm could use this information asymmetry to their disadvantage (e.g., by charging consumers unreasonable prices). Firms can reduce consumers' information asymmetry by giving them a stronger sense of agency. More precisely, this article shows empirically that if firms provide consumers with a sense of agency (e.g., being able to express preferences, or feeling that one has a voice in the feature development), consumers become more

willing to buy the upgrade. The ability to express their preferences (e.g., about digital upgrades) helps consumers to develop trust, and to better couple the upgrade's necessary payment with its benefits. These recognized benefits reassure consumers of the upgrade's utility and thus heighten their value perceptions and willingness to buy the upgrade. The article concludes by discussing the concrete implications of employing these mechanisms in practice.

## **Theoretical Implications**

The key contribution of this research is to advance our currently limited understanding of consumers' perceptions of a novel and increasingly prevalent practice. It is the first research to theorize and document how digital feature upgrades for physical products adversely affect consumers' firm evaluations, value perceptions, and purchase intentions compared to a physical upgrade mechanism providing access to the same feature.

**Article 1** identifies a novel, sequential process driving the negative effect of digital feature upgrades on consumers' firm evaluations: heightened feelings of entitlement and subsequent inferences of manipulative intent. It thus advances current knowledge about both constructs: First, it reveals informal rules and ownership traditions as a new source of entitlement beliefs. Second, while prior research has focused on advertising tactics as a source of consumers' inferences about the firm's manipulative intent, this research is the first to identify product-inherent mechanisms as such a source. The findings also extend current research on novel consumption models with blurred property lines evolving in the digital context (Watkins, Denegri-Knott, and Molesworth 2016). They show that these consumption models require a refined understanding of consumers' normative beliefs and expectations about physical products.

This dissertation also contributes to a growing body of research on consumer responses to digital products (Atasoy and Morewedge 2018; Giles, Pietrzykowski, and Clark 2007; Petrelli and Whittaker 2010). Prior work has focused exclusively on contrasting the physical and the digital product format. By contrast, this dissertation examines a practice that combines a physical product with a digital upgrade process. While Article 1 finds that consumers associate this combination with bad intentions by

the firm, Article 2 reveals that a digital upgrade process undermines the perceived value even of physical features. These novel findings add to prior findings about the value-decreasing potential of digitization.

**Article 2** suggests a mechanism that explains why a digital upgrade process undermines the value of the underlying feature: the speed and simplicity of a digital process. This finding advances prior work on the trade-off between service quality and service duration. Contrary to previous findings that fast and convenient services provide greater consumer welfare (Li 1992; Li and Lee 1994), this dissertation shows that fast and convenient upgrade processes can backfire by undermining the underlying feature's perceived value. Furthermore, Article 2 examines production and delivery transparency as a means of mitigating the value-decreasing potential of a digital upgrade process and thus adds to prior findings on operational transparency (Buell and Norton 2011; Mohan, John, and Buell 2020) and process transparency (Buell, Kim, and Tsay 2017). It thus provides firms with important insights into how to increase consumers' value perceptions.

Finally, **Article 3** reveals that granting consumers a sense of agency (i.e., enabling consumer input) can increase purchase intentions of digital feature upgrades. This finding advances our understanding of the effect of consumer agency in a novel consumer context and thus adds to prior research examining consumer agency in charitable giving or tax-paying compliance (Lamberton et al. 2014; Singh and Sirdeshmukh 2000).

## **Practical Implications**

This dissertation offers various concrete insights for managers. It shows consumers responses to digital feature upgrades, reveals the underlying processes driving these responses, and discloses means to mitigate them.

**Article 1** illumines a potential negative effect of digital feature upgrades on consumers' firm evaluations and reveals that this effect is driven by consumers' feelings of entitlement and subsequent inferences about the firm's manipulative intent. These findings allow for several actionable recommendations about how to avoid these potential effects when implementing digital feature upgrades. They suggest that some

consumption contexts (e.g., non-ownership consumption models) or base product categories (e.g., products with a higher degree of digitization) might be less likely to provoke feelings of entitlement and thus less likely to lead to inferences of manipulative intent. The findings also indicate additional ways how firms can mitigate inferences of manipulative intent. For example, firms can use their communications to make a benevolent firm motive (e.g., to benefit consumers) more salient to consumers. Furthermore, the point in time when consumers learn about the upgrade opportunity will influence how they perceive the firm's information policy (i.e., how manipulative it is).

**Article 2** demonstrates that providing product features through a digital upgrade process can undermine their perceived value, and hence acts as a potential barrier to consumer acceptance. The digital upgrade process lacks physical elements and tangible cues about the firm's efforts and the quality of a feature. Consumers might find assessing the value of a feature provided through a digital upgrade process more difficult and thus rely on heuristics (e.g., the duration, perceived effort, or salient costs of the upgrade process). Managers should be aware about the influence of these heuristics on consumers' value perceptions. For example, firms that seek to speed up feature access and maximize upgrade simplicity might—unintentionally—increase the chance of consumers perceiving the upgrade as less valuable, and thus being less willing to buy it. Managers can mitigate this adverse effect by making their production efforts more accessible (e.g., through transparency about the production of the feature) and their digital processes more tangible (e.g., by illustrating installation steps during the upgrade). Such transparency will help consumers intuit the work underlying the digital feature upgrade and thus help them to appreciate the value being created.

**Article 3** extrapolates the previous empirical findings to provide managers with actionable insights into how to mitigate negative responses toward digital feature upgrades. Furthermore, it reveals an additional approach for proactively heightening purchase intentions of digital feature upgrades: increasing consumers' perceptions of agency. By granting consumers a greater sense of agency, firms can increase the perceived utility of features and thus lower the perceived economic risk typically associated with innovations. For example, firms can involve consumers more actively and facilitate the feeling that they have a voice by asking them to express their preferences about future features. Interestingly, even non-binding forms of consumer

agency can increase consumer acceptance, which should facilitate the implementability of such measures.

## **Conclusion**

Digital feature upgrades for physical products significantly change consumers' purchase experiences and consumer-product relationships, necessitating a rethinking of current purchase- and ownership habits associated with physical products. This dissertation has shed light on these important aspects as they might impede consumers' acceptance of digital feature upgrades. The three empirical articles gathered in this dissertation have revealed that this novel way of digitally acquiring additional features for physical products not only leads to negative inferences about the firm's intentions because of conflicting ownership expectations, it can also undermine the feature's value. These are important insights about potential acceptance barriers of digital feature upgrades, with clear relevance for firms. That is, firms that neglect these potential negative effects of digital upgrades may face consumer resistance and delayed returns on their investments.

Importantly, this dissertation has provided actionable recommendations for managers on how best to mitigate the potential negative effect of digital feature upgrades. More broadly, the findings further our theoretical understanding of consumer responses to technological advancements emerging in the marketplace and of the unique psychological consequences of digital (vs. physical) product elements. Finally, this dissertation has examined a very recent phenomenon that has only just begun evolving in the market. The novelty of the phenomenon means that opportunities for researching this phenomenon in the field are still limited (e.g., lack of actual stimulus). This dissertation has applied novel research methods (e.g., a virtual reality simulation, sentiment and text analysis of internet-based consumer-generated content) to overcome these limitations and to examine consumer responses in a highly realistic setting. Future research might examine consumers responses to digital feature upgrades in the field as the phenomenon becomes more widely evident.

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## Appendix - Overview of Articles

### Article 1

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#### **Not Yet Yours: How Digital Feature Upgrades for Physical Products Affect Consumers' Firm Evaluations**

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|         |                                                   |
|---------|---------------------------------------------------|
| Authors | Wiebke Lüders, Tobias Schlager, Alixandra Barasch |
|---------|---------------------------------------------------|

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Abstract | Recent technological advancements allow consumers to remotely update their physical products by acquiring pre-installed features through a digital process—a practice the authors term <i>digital feature upgrades</i> . To date, it is unclear how consumers will respond to this business practice—will they appreciate the company for offering a practice that provides greater convenience and flexibility, or will they feel tempted by the firm to purchase the upgrade? The authors examine how digital feature upgrades affect consumers' firm evaluations, compared to related price discrimination practices. Seven studies—one using a virtual reality simulation—show that digital feature upgrades can adversely affect consumers' firm evaluations. This effect is driven by consumers' feelings of entitlement that arise from owning a physical product: because consumers feel entitled to the full capabilities of products that they own, they infer manipulative intent from firms that offer digital feature upgrades for an additional charge, and as a result, they evaluate those firms less favorably. The authors also examine four moderators and boundary conditions: ownership of the physical base product, salience of a benevolent firm motive, the firm's monetization of access to features, and the physical (vs. digital) nature of the base product. The paper concludes by presenting theoretical and practical implications. |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|          |                                                                                                                                     |
|----------|-------------------------------------------------------------------------------------------------------------------------------------|
| Keywords | Digital feature upgrades, physical products, feelings of entitlement, inferences of manipulative intent, virtual reality simulation |
|----------|-------------------------------------------------------------------------------------------------------------------------------------|

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|--------|----------------------------------------------|
| Outlet | Journal of Marketing (2 <sup>nd</sup> Round) |
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### **Downgrading the Upgrade: How Digitizing Feature Upgrades for Physical Products Undermines Their Value**

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|         |               |
|---------|---------------|
| Authors | Wiebke Lüders |
|---------|---------------|

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Abstract | <p>Digital upgrades for physical products promise greater consumer benefit because they provide immediate access to additional product features—at the simple push of a button. Supposedly, this novel and simple way to add features should add value for consumers. But as physical products become increasingly digitized, manual installation processes and craftsmanship are being replaced by over-the-air updates and thus become less tangible and salient for consumers. To date, little is known about how consumers perceive such upgrades, and whether they would be willing to buy features for physical products via a digital process.</p> |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

To advance the currently limited knowledge of consumers' responses to the innovative practice, this article examines consumers' value perceptions and acceptance of features provided through a digital (vs. physical) upgrade process. The lack of physical quality cues during the digital upgrade process prompts consumers to perceive the value of digitally-received features to be lower than the value of physically-received features. As a result, they are less willing to buy the upgrade. Five studies in the automotive and home appliance contexts provide evidence for this theorizing. Study 1 shows the proposed negative main effect of the digital upgrade process on consumers' willingness to buy, while study 2 provides evidence for the theorized mediating role of perceived value. Furthermore, studies 3 – 5 examine two theory-driven moderators: transparency of the firm's production efforts and transparency of the installation process steps. The findings provide important actionable insights for firms on how to mitigate the negative effect of digital feature upgrades. The research concludes with theoretical and managerial implications.

|                                                                      |
|----------------------------------------------------------------------|
| Digital feature upgrades, perceived value, transparency, tangibility |
|----------------------------------------------------------------------|

|        |                                                                               |
|--------|-------------------------------------------------------------------------------|
| Outlet | Journal of the Association for Consumer Research (preparation for submission) |
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### Article 3

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#### **Produktfunktionen on demand: Herausforderungen und Chancen bei der Vermarktung digitaler Upgrades.**

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|         |               |
|---------|---------------|
| Authors | Wiebke Lüders |
|---------|---------------|

|          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Abstract | Digitale Funktionsupgrades ermöglichen Zusatzkäufe per Knopfdruck für traditionell analoge Produkte. Zwei Studien zeigen, dass die schnelle Verfügbarkeit und einfache Kaufabwicklung digitaler Upgrades jedoch den wahrgenommenen Wert zugrunde liegender Produktfunktionen untergraben können. Zudem untersuchen zwei weitere Studien Ansätze, wie Unternehmen diesem Wertempfinden begegnen können. Diese belegen, dass ein stärkeres Gefühl von Handlungsfähigkeit der Kunden sowie Transparenz in Bezug auf die Wertschöpfung die Wertschätzung und Kaufbereitschaft für digitale Upgrades steigern. |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|          |                                                                                                     |
|----------|-----------------------------------------------------------------------------------------------------|
| Keywords | Digitale Funktionsupgrades, Wertempfinden, Handlungsfähigkeit der Kunden, Wertschöpfungstransparenz |
|----------|-----------------------------------------------------------------------------------------------------|

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| Outlet | Marketing Review St. Gallen (submitted) |
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## Article I

# **Not Yet Yours: How Digital Feature Upgrades for Physical Products Affect Consumers' Firm Evaluations**

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## Abstract

Recent technological advancements allow consumers to update their physical products remotely by acquiring pre-installed features through a digital process—a practice the authors term *digital feature upgrades*. To date, it is unclear how consumers will respond to this business practice—will they appreciate the company for offering a practice that provides greater customizability and convenience, or will they feel tempted by the firm to purchase the upgrade? The authors examine how digital feature upgrades affect consumers' firm evaluations compared to related price discrimination practices. Seven studies—one using a virtual reality simulation—show that digital feature upgrades can adversely affect consumers' firm evaluations. This effect is driven by consumers' feelings of entitlement that arise from owning a physical product: because consumers feel entitled to the full capabilities of products that they own, they infer manipulative intent from firms that offer digital feature upgrades for an additional charge, and as a result, they evaluate those firms less favorably. The authors also examine four moderators and boundary conditions: ownership of the physical base product, salience of a benevolent firm motive, the firm's monetization of access to features, and the physical (vs. digital) nature of the base product. The paper concludes by presenting theoretical and practical implications.

**Keywords:** Digital feature upgrades, physical products, feelings of entitlement, inferences of manipulative intent, virtual reality simulation

### Web Appendix:

[https://www.dropbox.com/s/in6nzy6qv1x828g/1501\\_FINAL%20Web%20Appendix\\_Digital%20Feature%20Upgrades.pdf?dl=0](https://www.dropbox.com/s/in6nzy6qv1x828g/1501_FINAL%20Web%20Appendix_Digital%20Feature%20Upgrades.pdf?dl=0)

## Introduction

In September 2017, Florida’s governor declared a state of emergency as Hurricane Irma—purportedly the most powerful Atlantic storm in a decade—was expected to hit the southern US coast. As people were preparing to evacuate, the car manufacturer Tesla remotely extended the battery range of some of its vehicles by 40 miles for ten days, free of charge. Tesla had limited the battery’s initial capacity through software, enabling the firm to sell an entry model with a battery that could be digitally upgraded. The broader public, unaware of this possibility, was surprised to witness how a traditionally physical product could be digitally enhanced.

The case of Tesla illustrates how recent technological advancements enable novel practices: firms can now access and modify physical products remotely, and thus apply digital business practices to traditionally physical products (Kannan and Li 2017; Ng and Wakenshaw 2017; Yoo et al. 2012). For consumers, this means that they can upgrade their physical products by *digitally acquiring pre-installed features*. The current research examines this emerging and rapidly growing practice—which we term *digital feature upgrades*—and its impact on consumers’ firm evaluations.

Theoretically, digital feature upgrades have the potential to benefit firms and consumers significantly. Firms can price discriminate more efficiently, while consumers enjoy greater customizability (i.e., they can adapt their products according to changing preferences). Interestingly, consumers can improve their product instantly and over the product’s entire life cycle, without having to install additional physical elements. Thus, digital feature upgrades essentially make physical products more durable and their value more stable. At the same time, digital feature upgrades significantly alter the nature of physical products. If a physical product contains pre-installed features that can be digitally acquired at a later point of time, physical products morph into something that is a “functionally-incomplete offering upon purchase ” (Ng and Wakenshaw 2017; p. 9). To date, it is unclear how consumers respond to this technology-driven advancement. Will this novel purchase flexibility enhance their perceptions of firms, or will the practice spur negative reactions in some way? Furthermore, as firms want to materialize the benefits of digital feature upgrades, it is important to understand the conditions under which negative consumer responses evolve.

To gain initial insight into the effects of digital feature upgrades, we conducted an exploratory text analysis of actual consumer tweets related to Tesla's upgrade during Hurricane Irma. The temporary upgrade during Hurricane Irma was an important and highly relevant event for our research question, because digital feature upgrades became broadly known and were discussed by the general public. Thus, this pre-study's primary goal was to gain initial insights into how consumers talked about Tesla and this practice and to determine whether their tweets indicated inferences of manipulative intent. We compiled three datasets: one dataset related to Tesla and Hurricane Irma (digital feature upgrades), one dataset related to Tesla (control Tesla), and one dataset related to Hurricane Irma (control Irma; see Web Appendix A for a detailed description of the procedure and results). A sentiment analysis not only showed that consumers responded significantly more negatively to the Tesla and Hurricane Irma data than to that of Tesla itself, but revealed that consumers also articulated significantly more thoughts related to money and manipulative intent. The results indicate that despite Tesla's intended goodwill in granting free access to help customers escape a natural disaster, negative responses about the practice of digital feature upgrades prevailed.

The key argument of our research is that digital feature upgrades evoke feelings of entitlement that arise from owning a physical product with additional upgradeable features pre-installed. As the firm charges consumers for acquiring these pre-installed features through a digital process, feelings of entitlement translate into inferences that the firm must have manipulative intent. As a result, consumers evaluate the firm less favorably than firms that offer the same additional features through a different upgrade mechanism. Seven experiments across multiple product categories, including a driving simulation using virtual reality, provide evidence for these hypotheses. The insights make several contributions to theory and practice.

First and foremost, this research advances our understanding of consumer responses to the novel phenomenon of digital feature upgrades. To the best of our knowledge, this work is the first to empirically examine a practice that involves remotely reconfiguring a physical product through a digital upgrade process. Thereby, we contribute to recent conceptual work that has explored how new technologies enable physical products to become dynamically adaptable (Kannan and Li 2017; Ng and Wakenshaw 2017), and to empirical work examining consumer responses toward digital products (Atasoy and Morewedge 2018; Giles, Pietrzykowski, and Clark 2007; Petrelli and Whittaker 2010;

Siddiqui and Turley 2006). We investigate a practice that blurs traditional boundaries between physical and digital products (i.e., owning a physical product but being able to upgrade it digitally), and reveal that this unique combination can negatively affect consumers' firm evaluations. We also contribute to the literature on price discrimination practices that involve providing products at different tiers (Bertini, Ofek, and Ariely 2009; Gershoff, Kivetz, and Keinan 2012; Heath, DelVecchio, and McCarthy 2011) by showing that providing these tiers through a digital upgrade process has adverse effects. Our findings also have clear practical relevance for companies. First, we demonstrate the negative implications of digital feature upgrades for consumers' firm evaluations. Second, we identify circumstances in which digital feature upgrades are less likely to provoke negative effects, allowing us to provide actionable recommendations on how firms can implement this practice successfully.

## **Background**

For decades, firms have been engaging in various practices that cater to consumers' heterogeneous price and quality sensitivities. Typically, firms do this by creating multiple versions of their products at different “tiers,” so that each tier matches the preferences of a different target segment (Moorthy 1984). That is, firms provide more basic versions of a product for customers who have a lower willingness to pay, and more premium versions with higher-quality attributes for customers who are willing to pay more. At their core, these practices enable firms to maximize their profits—they can secure higher margins from less price-sensitive customers, while still being able to sell their products to more price-sensitive customers. Price discrimination practices achieve these tiers either statically (i.e., by offering distinct, nonadjustable product versions) or dynamically (i.e., by allowing adjustments to a base product through feature upgrades).

More specifically, firms commonly achieve distinct product tiers by vertically expanding their product offering to different capabilities and price levels (Heath, DelVecchio, and McCarthy 2011). One way to achieve these tiers is through the production practice called versioning (Deneckere and McAfee 1996; Shapiro and Varian 1998). In the practice of versioning, firms produce the most premium version of a product first, and subsequently disable different features to create limited-capability,

lower-priced versions. Thereby, firms streamline their production processes and serve price-sensitive customers more cost-efficiently (Deneckere and McAfee 1996; Shapiro and Varian 1998).

Another way of dynamically creating different product tiers is to enable additional feature upgrades. For example, firms may offer ancillary add-ons (e.g., zoom lenses that increase a camera's zoom ratio; Bertini, Ofek, and Ariely 2009) to enhance physical products at an additional charge (Gabai and Laibson 2006; Guiltinan 1987). Among such feature upgrades, the freemium business model represents a particular case. In the case of freemium, firms offer an entry version of a product with base functionality for free, and then charge consumers a fee to upgrade to the premium version (Gu, Kannan, and Ma 2018). This business model is particularly prevalent for digital products (e.g., mobile apps), because firms can easily adjust the software of digital products to quickly produce different product tiers, and to do so at virtually zero cost (Shapiro and Varian 1998).

Prior work suggests that these price discrimination practices may result in different consumer responses. On the one hand, consumers may appreciate the greater variety, which allows them to find products (and price points) that match their needs and preferences (e.g., Moorthy 1984). As such, greater variety through additional premium product tiers can increase consumers' brand evaluations (Heath, DelVecchio, and McCarthy 2011). On the other hand, these practices may result in unintended negative consequences. For example, consumers may perceive versioning as unfair (Gershoff, Kivetz, and Keinan 2012), while providing add-on features can make the base product appear less favorable in comparison (Bertini, Ofek, and Ariely 2009).

In sum, prior work on price discrimination strategies has examined how consumers respond to firms that provide distinct tiers of physical products, or firms that provide ancillary add-ons. However, while these prior findings are informative, they do not provide specific conclusions about consumer responses to the practice of digital feature upgrades, given its distinct characteristics (see Table 1). That is, while versioning involves irreversibly degrading product features to create distinct product tiers, digital feature upgrades utilize temporarily disabled features to enable upgrades. Moreover, while freemium typically involves digital goods that are free at entry level, digital feature upgrades involve charging for a base product of physical format (i.e., freemium

typically concerns digital goods). Finally, while both digital feature upgrades and physical add-ons allow consumers to acquire premium capabilities after a purchase, and thus are most closely related, only digital feature upgrades involve physically pre-installed features.

**Table 1:** Comparison of Price Discrimination Practices

|                                              | <b>Vertical<br/>Differentiation</b> | <b>Versioning</b> | <b>Physical Add-<br/>on</b> | <b>Freemium</b> | <b>Digital<br/>Feature<br/>Upgrades</b> |
|----------------------------------------------|-------------------------------------|-------------------|-----------------------------|-----------------|-----------------------------------------|
| <b>Nature of the<br/>Base Product</b>        | Physical                            | Physical          | Physical                    | Digital         | Physical                                |
| <b>Charges for<br/>the Base<br/>Product</b>  | Yes                                 | Yes               | Yes                         | No              | Yes                                     |
| <b>Product Tiers</b>                         | Static                              | Static            | Dynamic                     | Dynamic         | Dynamic                                 |
| <b>Pre-<br/>installment of<br/>Features</b>  | N/A                                 | Yes               | No                          | Yes             | Yes                                     |
| <b>Disablement<br/>of Features</b>           | No                                  | Permanent         | No                          | Temporary       | Temporary                               |
| <b>Nature of the<br/>Upgrade<br/>Process</b> | N/A                                 | N/A               | Physical                    | Digital         | Digital                                 |

Thus, we identify three specific characteristics of digital feature upgrades that are not accounted for in previous findings: (1) product features that are pre-installed but temporally disabled, (2) charging consumers to digitally access the product features, and (3) upgrading a physical base product that consumers pay to acquire. We propose that these characteristics ignite a unique psychological process that will harm evaluations of the firm. More precisely, we expect that consumers will feel entitled to the full capacity of the physical product that they own. As a result, when a firm offers additional features via a digital upgrade process for an extra charge, consumers infer that the firm must have manipulative intent, and evaluate the firm more negatively.

## **The Effect of Digital Feature Upgrades on Consumers' Firm Evaluations**

Digital feature upgrades describe the opportunity to acquire pre-installed product features for physical products through a digital upgrade process for an additional charge. Imagine the following example: A consumer has bought a car for which the manufacturer offers digital feature upgrades (e.g., seat warmers or advanced lights; motor1 2019; NGIN Mobility 2017). If the consumer has initially purchased the car without seat heating, digital feature upgrades provide the ability to instantly "unlock" the feature through a digital acquisition process. Because the seat heating's physical components are already pre-installed and the acquisition process is entirely digital, no visits to customer service or ordering of components are required. In the following, we conceptualize the consequences of this practice for consumers' responses to firms.

### **Feelings of Entitlement and Inferences of Manipulative Intent**

Traditionally, acquiring a physical product grants the owner exclusive property rights, with full access to the product and the entirety of its features (Snare 1972). By contrast, digital feature upgrades introduce a fragmented form of ownership for physical products. That is, consumers own the physical base product, but not the upgrade features—despite the features having been physically integrated into the product's base. We propose that this physical integration of the features through pre-installation, combined with consumers' traditional understanding of acquiring the product in its entirety, causes consumers to feel entitled to these features.

Consider the previous example: The car owner, accustomed to using all of a car's features, should feel entitled to access the seat heating when he or she learns that the feature has already been physically pre-installed. Indeed, entitlement beliefs, or expectations of what consumers should or ought to obtain (Singer 1981), are not limited to formal ownership; they also derive from norms, informal rules, and traditions (Lerner 1987; Major 1994). Thus, given that the acquisition of a physical product traditionally meant acquiring the entirety of the features of that product, we expect that consumers

will feel that they should be able to access those additional pre-installed product features.

The digital upgrade process through which consumers acquire the features should further intensify these entitlement feelings. Specifically, physical and temporal proximity to objects leads consumers to think that they possess that object (Hoch and Loewenstein 1991). The digitally-available features are both physically close (i.e., they are already pre-installed) and temporally close (i.e., consumers can acquire them digitally and thus immediately). Accordingly, we expect that consumers will feel more entitled to them because the features are “only a click away.” Following our previous example about the car owner, the ability for instant acquisition through the digital upgrade process should make him or her feel even more entitled to access the seat heating.

Whenever consumers feel entitled to something, they also feel deprived and inappropriately treated when that entitlement is violated (Xia, Kukar-Kinney, and Monroe 2010). In general, consumers acknowledge that a firm needs to achieve a certain level of profit (by charging consumers for products or services). However, consumers judge practices that seem to achieve profit arbitrarily and at their expense as inappropriate and unfair (Kahneman, Knetsch, and Thaler 1986). As digital feature upgrades require only digital activation (i.e., the features are already pre-installed), granting consumers access does not involve additional costs for the firm. Therefore, consumers may perceive that the firm charges them arbitrarily, and thus infer that the firm is achieving greater profit at consumers' expense.

When consumers infer a self-interested motive to increase profits, they may perceive the firm as being manipulative (Campbell 1995; Clee and Wicklund 1980; Kirmani and Campbell 2008; Vonk 1998). This is consistent with prior work, suggesting that consumers make negative inferences about firms that appear to use tactics to influence consumers that are at the consumers' expense (e.g., Boush, Friestad, and Rose 1994; Campbell and Kirmani 2000; Friestad and Wright 1994; Shiv, Edell, and Payne 1997). Following our previous example, the car owner who is continually reminded that he or she could immediately acquire and access the seat heating, but only for a fee, may infer that the firm intends to manipulate him or her to perform the upgrade.

In sum, we expect that the unique combination of digital feature upgrades—consumers owning a physical product and being able to digitally acquire physically pre-installed features—makes them feel entitled to these features. Because the firm charges for the digital activation of those features, consumers will infer that the firm has manipulative intent. Moreover, we expect that inferences of manipulative intent will lead to lower evaluations of the firm (Campbell 1995; Cotte, Coulter, and Moore 2005; Lunardo and Mbengue 2013).

H1: Relative to other price discrimination practices that involve feature upgrades (i.e., physical upgrades), digital feature upgrades will lead to lower consumers' evaluations of the firms that utilize them.

H2: The negative effect of digital feature upgrades (vs. other price discrimination practices that involve feature upgrades) on consumers' firm evaluations will be mediated by feelings of entitlement and inferences of manipulative intent.

## **Boundary Conditions**

Based on our theoretical framework of digital feature upgrades, we can make several additional predictions about the conditions under which this negative effect of digital feature upgrades should emerge. First, to the extent that feelings of entitlement drive the effect of digital feature upgrades, then any factor that reduces consumers' feelings of entitlement should attenuate the negative effect. As discussed earlier, consumers may feel a sense of entitlement when they own a physical product because, traditionally, ownership gave them access to a product in its entirety (Snare 1972). However, there are many current consumption models in which consumers acquire temporary access rights but no actual ownership (e.g., leasing, sharing, or renting a product; Bagga, Bendle, and Cotte 2018; Morewedge et al. 2020). In these situations, consumers should not feel entitled to the upgrade features because, without ownership, there should be no expectation of complete access. Thus, we predict that when consumers do not own the

base product, they will not feel as entitled to the upgrade features, and will consequently evaluate firms that offer them less negatively.

H3: Lack of ownership (vs. ownership) of the base product will attenuate the effect of digital feature upgrades on feelings of entitlement, and thus, the negative effect of digital feature upgrades on firm evaluations.

Second, if the negative effect of digital feature upgrades is driven by inferences about the firm's manipulative intent, then any evidence that the firm is not motivated by self-interest should mitigate the effect. When consumers evaluate a firm's practices, they make inferences about the firm's motives, and judge those motives' appropriateness (Campbell 1999). In a sales context, a firm's motive to influence consumers' purchase intentions is likely to be more accessible than alternative motives (Campbell and Kirmani 2000). Because digital feature upgrades allow consumers to acquire additional features in a particularly easy and immediate way, a firm's profit-driven motive—and thus manipulative intent—to influence consumers' upgrade intentions may come more readily to mind than alternative firm motives. However, making an alternative firm motive more salient should reduce the likelihood that consumers make such inferences. Prior research shows that consumers perceive a firm's profit-driven tactics as less unfair when the firm's actions seem to be driven by a benevolent motive rather than a greedy motive (Campbell 1999). Consequently, we predict that salience of a benevolent motive for offering digital feature upgrades (e.g., reducing buyers' remorse through greater purchase flexibility) will attenuate consumers' inferences of manipulative intent, and as a result, consumers will not evaluate the firm as negatively.

H4: Salience (vs. non-salience) of a benevolent firm motive will attenuate the effect of feelings of entitlement on inferences of manipulative intent, and thus, the negative effect of digital feature upgrades on firm evaluations.

Similarly, our theorizing assumes that consumers should infer manipulative intent from digital feature upgrades when they believe that the firm is trying to achieve additional profit—by charging consumers for accessing features that they feel entitled to receive. Thus, we predict that digital feature upgrades will not evoke inferences of manipulative intent when the company does not charge for accessing the features. Accordingly,

consumers should evaluate the firm less negatively when those upgrades are provided for free compared to when they require payment.

H5: The negative effect of digital feature upgrades on firm evaluations will be attenuated when no payment (vs. when payment) is required for the upgrade.

Finally, we have argued that the negative effect of digital feature upgrades is driven by entitlement beliefs resulting from traditionally exclusive ownership rights associated with a physical base product. However, a digital base product typically involves more limited ownership rights and greater access restrictions than physical products (e.g., firms restrict access of software licenses to a finite number of devices; Akins 2010; Singh et al. 2006; Stefik 1997; Helm et al. 2018). Moreover, consumers assume less psychological ownership for digital (vs. physical) products (Atasoy and Morewedge 2018), and are more accustomed to upgrading digital products like mobile applications (i.e., through in-app purchases). We predict that consumers will respond with less negative inferences about the firm when digital feature upgrades are offered for digital (vs. physical) base products.

H6: The negative effect of digital feature upgrades on firm evaluations will be attenuated when the base product is digital (vs. physical).

In sum, we propose that digital feature upgrades will decrease consumers' firm evaluations relative to other price discrimination practices that involve feature upgrades. This effect is driven by feelings of entitlement and inferences of manipulative intent, and is moderated by ownership of the physical product, salience of a benevolent motive, monetization of feature access, and the physical nature of the base product.

## **Overview of Studies**

We report seven studies that provide evidence for our theorizing. Study 1 demonstrates that digital feature upgrades lead to more negative evaluations of the firm and greater manipulative intent than other price discrimination practices. Study 2 uses a virtual

reality simulation to show the negative effect of digital feature upgrades on consumers' firm evaluations in a highly realistic setting. Further, a text analysis of consumers' open responses provides initial insights into the underlying process, showing that participants spontaneously mention words related to manipulative intent significantly more often, while ruling out privacy concerns and waste as alternative explanations. Study 3 directly assesses the process underlying digital feature upgrades by testing whether the negative effect of digital feature upgrades on consumers' firm evaluations is mediated by feelings of entitlement and subsequent inferences of manipulative intent. Study 4 reveals a theory-driven moderator by showing that a lack of ownership of the base product reduces feelings of entitlement. In Studies 5 and 6, we test our inferences of manipulative intent account by examining whether salience of a benevolent motive (Study 5) and free feature access (Study 6) moderate the effect of feelings of entitlement on inferences of manipulative intent. Finally, Study 7 shows that digital feature upgrades lower firm evaluations more for physical base products, but less for digital base products, thereby providing insights into the product categories where the harmful implications of digital feature upgrades are most likely to emerge.

### **Study 1: Consumers' Responses to Digital Feature Upgrades vs. Related Price Discrimination Practices**

The objective of Study 1 was to demonstrate the unique consequences of digital feature upgrades. More specifically, we contrast digital feature upgrades with other price discrimination practices (i.e., physical add-ons, freemium, versioning, and vertical differentiation), allowing us to evaluate its effect on consumers' firm evaluations relative to different baselines.

We predict that digital feature upgrades decrease firm evaluations compared to practices that offer upgrades without having features pre-installed (i.e., physical add-ons, H1), or to practices that offer digital upgrades but without charges for the base product (i.e., freemium). However, for practices that do not offer upgrades and that involve irreversibly disabled features (i.e., versioning), we predict digital feature upgrades to be perceived more favorably. This is because versioning does not allow consumers the flexibility to acquire the disabled features through upgrades—an

opportunity unique to digital feature upgrades—and which should result in less positive responses to versioning.

## Method

The study used 251 Amazon Mechanical Turk (MTurk) workers ( $M_{\text{Age}} = 38.33$ ,  $SD = 12.65$ , 58% females) who completed a 6-minute study for a compensation of 55 cents. We used a within-subject design and a coffee machine as the physical base product for this preregistered study ([http://aspredicted.org/login.php?x=vrAitAoN2AfAWK12mrK0osn\\_ANXClQUEncF](http://aspredicted.org/login.php?x=vrAitAoN2AfAWK12mrK0osn_ANXClQUEncF)).

Participants read five consecutive scenarios in randomized order, each describing one of the focal price discrimination practices. Each scenario showed a different fictitious firm name in counterbalanced order to avoid the firm names creating differences in consumers' responses. The *digital feature upgrades* scenario described a firm offering a coffee machine with premium features that consumers could obtain through a digital upgrade process. Furthermore, it stated that the firm had pre-installed the premium features to enable the digital upgrade process. The information in the *freemium* scenario differed from the digital feature upgrades condition in that the firm offered the coffee machine free of charge. In the *physical add-on* scenario, the premium features could be obtained through physical plug-ins. That is, the plug-ins could be ordered and installed by the customer, without requiring a service visit. In the *versioning* scenario, the firm offered two versions of a coffee machine: a standard and a superior version. Participants read that the firm produced the superior model first, and subsequently disabled the premium features to arrive at the standard model. The *vertical differentiation* scenario differed from the versioning scenario in that the firm produced the standard version first, and then installed premium features to arrive at the superior version (for stimuli, see Appendix A).

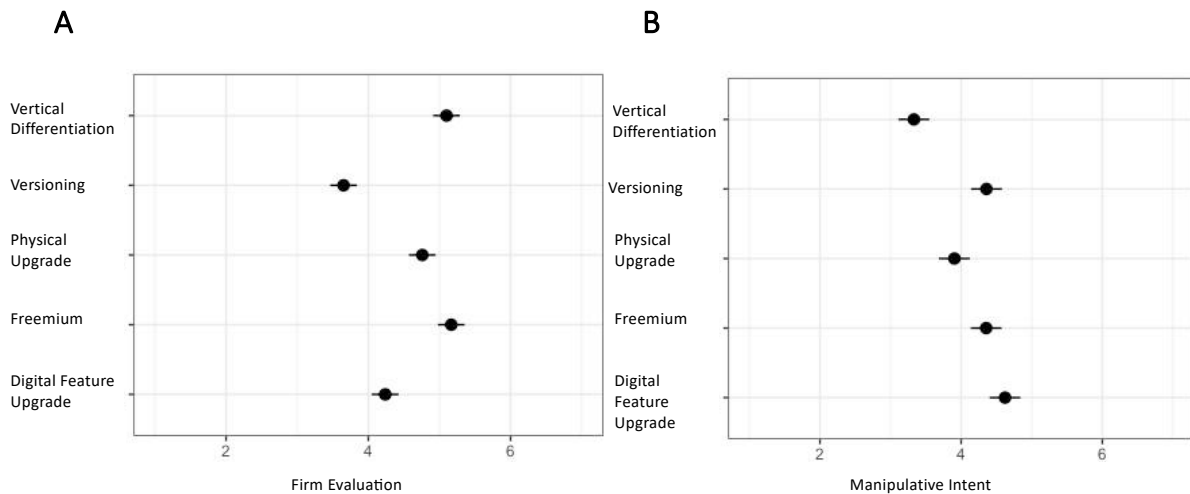
After each scenario, participants evaluated each of the firms on three bipolar measures on 7-point Likert scales (1 = “disliked” to 7 = “liked”, 1 = “bad” to 7 = “good”, 1 = “negative” to 7 = “positive”; Whan Park et al. 2010;  $\alpha = .98$ ). This served as our primary dependent measure across all studies. Participants then rated the firm's manipulative intent on a single item adapted from Campbell (1995): “The manufacturer seemed to be trying to manipulate the customer to make an upgrade” (7-point Likert

scale: 1 = “strongly disagree” to 7 = “strongly agree”). Finally, participants reported their age and gender.

## Results

*Firm evaluation.* We used a linear mixed model with firm evaluation as the dependent variable, price discrimination condition as the independent variable, and a random intercept for participant ID to account for the within-subjects design. Digital feature upgrades had a significant negative effect on firm evaluations compared to physical upgrades ( $b = -.52$ ,  $SE = .116$ ,  $t = -4.51$ ,  $p < .001$ ,  $\delta_{\text{RandomIntercept}} = .63$ ), freemium ( $b = -.93$ ,  $SE = .116$ ,  $t = -8.04$ ,  $p < .001$ ), and the vertically differentiated offer ( $b = -.86$ ,  $SE = .116$ ,  $t = -7.46$ ,  $p < .001$ ). Only versioning resulted in more negative firm evaluations than digital feature upgrades ( $b = .59$ ,  $SE = .116$ ,  $t = 5.07$ ,  $p < .001$ ). Thus, digital feature upgrades lowered firm evaluations, as compared to all price discrimination practices except versioning (see Figure 1.).

**Figure 1.** The Effect of Digital Feature Upgrades (vs. Related Price Discrimination Practices) on (A) Firm Evaluation and (B) Manipulative Intent



*Manipulative intent.* Next, we used a linear mixed model with inferences of manipulative intent as the dependent variable. The results showed that participants inferred marginally greater manipulative intent from digital feature upgrades than from freemium ( $b = .27$ ,  $SE = .140$ ,  $t = 1.91$ ,  $p = .06$ ) and versioning ( $b = .26$ ,  $SE = .140$ ,  $t = 1.9$ ,  $p = .06$ ), and significantly greater manipulative intent from digital feature upgrades

than from physical add-ons ( $b = .72$ ,  $SE = .140$ ,  $t = 5.13$ ,  $p < .001$ ) and vertical differentiation ( $b = 1.29$ ,  $SE = .140$ ,  $t = 9.23$ ,  $p < .001$ ). Thus, digital feature upgrades led to greater inferences of manipulative intent compared to all price discrimination practices. As a robustness check, we repeated the analyses while controlling for firm name, and found the same results (as reported in Web Appendix B).

## Discussion

This study shows the unique consequences of digital feature upgrades on consumers' firm evaluations relative to other price discrimination practices. Digital feature upgrades significantly decreased firm evaluations compared to practices that offered upgrades without having features pre-installed (i.e., physical upgrades; H1), or to practices that allowed for digital upgrades but without charges for the base product (i.e., freemium). However, the effect of digital feature upgrades on consumers' firm evaluations was more positive relative to versioning, likely because versioning does not allow consumers the flexibility to acquire the disabled features. Interestingly, digital feature upgrades evoked more inferences of manipulative intent relative to versioning, suggesting that the overall more negative consumer response to versioning may be ignited by a different psychological process.

In this study, we compared digital feature upgrades to a broader range of price discrimination practices that achieve product tiers statically (i.e., vertical differentiation and versioning) or dynamically through upgrades (i.e., physical add-ons and freemium). By doing so, we are able to compare the effect of digital feature upgrades to different baselines, and to show that consumers evaluate dynamic practices (i.e., involving upgrades) generally positively, but digital feature upgrades specifically negatively.

In the following studies, we isolate differences in the *upgrade mechanism* specifically, while keeping the available features identical, by comparing digital feature upgrades to physical feature upgrades—the only other way to actually upgrade physical products.

## **Study 2: The Impact of Digital Feature Upgrades on Consumers' Firm Evaluations in Virtual Reality**

The purpose of this study was to test the main effect of digital feature upgrades on consumers' firm evaluations (H1) in a highly realistic, yet controlled, setting. To do so, we collaborated with a large German car manufacturer that was planning to launch digital feature upgrades and wanted to test its impact on how consumers would evaluate their brand.

We used a 360-degree virtual reality (VR) simulation to mimic a real driving and ownership experience. VR simulations not only afford a high level of control, but they also provide conditions that resemble a field setting (Bainbridge 2007; Burgess et al. 2006; Gneezy 2017). Given that the study was conducted before the market introduction of digital feature upgrades, a VR simulation provided a more realistic setting than its alternative of hypothetical scenarios. An agency specialized in programming VR driving simulations (including a project for Swiss governmental agencies to replace driving schools) developed the stimuli.

### **Method**

We recruited 185 participants ( $M_{\text{Age}} = 22.8$ ,  $SD = 3.29$ , 28% female) on a Swiss university campus to participate in a 20-minute study in exchange for a standard compensation of CHF 12.50 (approx. \$12.50). We conducted the study during a three-week period, with participants going through the simulation one at a time.

A research assistant, who was blind to the hypothesis, supervised the experiment, and proceeded as follows. First, the assistant instructed participants that they would be going for a drive in their recently purchased car in a simulated VR environment. Participants sat in front of a physical steering wheel with their feet placed on a device that looked exactly like the acceleration and brake pedals from a real car (see Appendix B). Next, the research assistant installed a VR headset (model: HTC Vive) on the participants' heads and informed them that they could stop the experiment at any time. The assistant then launched the simulation. The simulation included a high level of detail (e.g., the car's interior resembled a real car's interior, including elements such as a modern steering wheel, a dashboard, a center console; see Appendix B). In addition,

the car responded realistically to input from participants (e.g., steering, accelerating, sound adjusted to acceleration, a haptic response from the driving wheel).

First, participants were given two minutes to familiarize themselves with the car and with driving in the VR environment (through a course that included both a city and landscapes). Participants were then randomly assigned to one of the two experimental conditions (upgrade mechanism: *digital feature upgrades* vs. *control*) of the between-subjects design. All participants read that the firm offers delayed feature upgrades to consumers. In the *digital feature upgrades* condition, installing a feature upgrade could be done remotely. That is, participants were told that they could simply unlock the pre-installed feature through a digital process. In the *control* condition, installing a feature upgrade would involve driving to the dealership and having the feature installed manually. However, to hold the effort equal across both conditions, participants did not actually have to drive to the dealership. They could only reveal their intention to do so and were asked whether they would like to schedule an appointment at the dealership. We did not tell participants about any particular upgrade options at this point, but told them to keep this possibility in mind while driving.

Participants then began the main driving simulation for the study. This contained three different driving courses in counterbalanced order: a landscape course at night, a landscape course in the daytime (with the potential of crossing animals), and a city course in the daytime. During each course, participants were offered a different feature upgrade that would help them drive in that particular setting (an advanced light in the night setting, braking assistance in the landscape setting, parking assistance in the city setting). These features resembled actual features considered for digital feature upgrades by the collaborating manufacturer.

Each course followed the same procedure. After participants had driven for 30 seconds, a pop-up notification appeared above the dashboard's right-hand side. This notification offered participants the feature associated with that course and included a description of the feature as well as the feature's price (i.e., 1,060 CHF (approx. 1,067 USD) for the advanced light; 1,050 CHF (approx. 1,057 USD) for the parking assistance, and 500 CHF (approx. 503 USD) for the braking assistance). These prices were actual prices provided by the collaborating manufacturer. The notification also reinforced the manipulation by either stating that the feature was available digitally or

physically (see Appendix B). Participants could dismiss the notification by pressing one of two buttons on the steering wheel.

After completing all three courses, participants indicated how they felt about the scenario in an open-ended text box. They then evaluated the car manufacturer on the same three bipolar measures as in Study 1 ( $\alpha = .99$ ). Finally, they reported their age and gender.

## Results

*Firm evaluation.* A t-test showed that participants in the digital feature upgrades condition evaluated the firm significantly more negatively ( $M_{\text{Digital feature upgrades}} = 4.15$ ,  $SD = 1.33$ ) than did those in the control condition ( $M_{\text{Control}} = 4.83$ ,  $SD = 1.43$ ;  $t(183) = 3.35$ ,  $p < .001$ , Cohen's  $d = -.49$ ).

*Open text analyses.* We conducted an exploratory text analysis of consumers' spontaneous responses, with the objective of further testing our mechanism via manipulative intent and of ruling out potential alternative accounts, such as concerns related to privacy or waste. We used the same custom dictionary applied in the pre-study for coding participants' open-text answers (i.e., to code manipulative intent and privacy concerns). Again, they were coded as "1" in cases where participants articulated a concern, and "0" otherwise. For instance, one participant's open text was "*The only goal is to make money and trick customers into buying features that they did not want to buy in the first place,*" which was coded as "1".

Logistic regressions revealed that participants in the digital feature upgrades condition were more likely to mention manipulative content ( $P_{\text{Digital feature upgrades}} = 33.3\%$ ) than were participants in the control condition ( $P_{\text{Control}} = 14.1\%$ ;  $b = 1.111$ ,  $z = 2.992$ ;  $p = .003$ ). We did not find significant differences between conditions for concerns about privacy ( $P_{\text{Digital feature upgrades}} = 6.5\%$ ,  $P_{\text{Control}} = 3.3\%$ ;  $b = .716$ ,  $z = .990$ ;  $p = .322$ ) or waste ( $P_{\text{Digital feature upgrades}} = 9.6\%$ ,  $P_{\text{Control}} = 4.3\%$ ;  $b = .858$ ,  $z = 1.383$ ;  $p = .167$ ). This text analysis was conducted across all remaining studies, with very similar results. For brevity, we will not report the full set of text results in the further studies, but include a summary of the means and test statistics for all of these analyses in Table 2.

**Table 2:** Means and Standard Deviations for Dependent and Mediating Variables Across Studies

| Means and Standard Deviations Study 2 to 6 |             |                          |             |                          |             |                          | Means and Logistic Regressions Across Studies 2 to 6 |            |                    |            |                    |          |          |
|--------------------------------------------|-------------|--------------------------|-------------|--------------------------|-------------|--------------------------|------------------------------------------------------|------------|--------------------|------------|--------------------|----------|----------|
| Firm<br>evaluation                         |             | Feelings of entitlement  |             | Manipulative<br>intent   |             | Manipulative intent      |                                                      | Privacy    |                    | Waste      |                    |          |          |
| M (SD)                                     |             | M (SD)                   |             | M (SD)                   |             | Percentage               | Log.<br>regression                                   | Percentage | Log.<br>regression | Percentage | Log.<br>regression |          |          |
| <b>Study 2</b> (n = 185)                   |             |                          |             |                          |             |                          |                                                      |            |                    |            |                    |          |          |
| <i>Digital upgrades</i>                    |             | 4.15 (1.33)              |             |                          |             | 33.3 %                   | b = 1.111                                            | 6.5%       | b = .716           | 9.6 %      | b = .858           |          |          |
| <i>Control</i>                             |             | 4.83 (1.43)              |             |                          |             | 14.1 %                   | z = 2.992                                            | 3.3%       | z = .990           | 4.3 %      | z = 1.383          |          |          |
|                                            |             |                          |             |                          |             |                          |                                                      | p = .003   |                    | p = .322   |                    | p = .167 |          |
| <b>Study 3</b> (n = 201)                   |             |                          |             |                          |             |                          |                                                      |            |                    |            |                    |          |          |
| <i>Digital upgrades</i>                    |             | 3.98 (2.25)              |             | 5.01 (1.61)              |             | 4.50 (1.91)              | 19.6 %                                               | b = 1.523  | 0.0%               | na         | 2.9 %              | b = .385 |          |
| <i>Control</i>                             |             | 5.81 (1.29)              |             | 4.08 (1.51)              |             | 3.08 (1.54)              | 5.0 %                                                | z = 2.916  | 0.0%               |            | 2.0 %              | z = .417 |          |
|                                            |             |                          |             |                          |             |                          |                                                      | p = .004   |                    |            |                    | p = .677 |          |
| <b>Study 4</b> (n = 286)                   |             | <i>Ownership</i>         |             | <i>Ownership</i>         |             | <i>Ownership</i>         |                                                      |            |                    |            |                    |          |          |
|                                            | yes         | no                       | yes         | no                       | yes         | no                       |                                                      |            |                    |            |                    |          |          |
| <i>Digital upgrades</i>                    |             | 4.54 (2.22)              | 4.67 (1.83) | 4.83 (1.57)              | 4.45 (1.57) | 4.39 (2.08)              | 4.01 (1.85)                                          | 29.2 %     | b = 0.710          | 0.0 %      | na                 | 8.3 %    | b = .493 |
| <i>Control</i>                             |             | 5.50 (1.55)              |             | 3.75 (1.59)              |             | 2.83 (1.63)              |                                                      | 16.8 %     | z = 2.392          | 0.0 %      |                    | 5.3 %    | z = 1.00 |
|                                            |             |                          |             |                          |             |                          |                                                      | p = .02    |                    |            |                    |          | p = .317 |
| <b>Study 5</b> (n = 487)                   |             | <i>Benevolent Motive</i> |             | <i>Benevolent Motive</i> |             | <i>Benevolent Motive</i> |                                                      |            |                    |            |                    |          |          |
|                                            | Not salient | Salient                  | Not salient | Salient                  | Not salient | Salient                  |                                                      | b = .80    |                    | b = -.036  |                    | b = .716 |          |
| <i>Digital upgrades</i>                    |             | 3.86 (2.05)              | 4.88 (1.92) | 4.53 (1.75)              | 4.26 (1.57) | 4.20 (1.88)              | 3.24 (1.77)                                          | 19.2 %     | z = .288           | 3.2 %      | z = -.062          | 8.0 %    | z = .990 |
| <i>Control</i>                             |             | 5.13 (1.33)              | 5.48 (1.39) | 4.11 (1.45)              | 3.96 (1.42) | 2.87 (1.42)              | 2.63 (1.47)                                          | 9.7 %      | p = .006           | 3.3 %      | p = .950           | 2.2 %    | p = .322 |
| <b>Study 6</b> (n = 500)                   |             | <i>Monetization</i>      |             | <i>Monetization</i>      |             | <i>Monetization</i>      |                                                      |            |                    |            |                    |          |          |
|                                            | Monetized   | Free                     | Monetized   | Free                     | Monetized   | Free                     |                                                      |            |                    |            |                    |          |          |
| <i>Digital upgrades</i>                    |             | 3.34 (2.20)              | 5.52 (1.76) | 5.21 (1.34)              | 5.27 (1.55) | 4.81 (2.08)              | 3.30 (2.06)                                          | 41.3 %     | b = 1.369          | 1.7 %      | b = -1.161         | 9.1 %    | b = .056 |
| <i>Control</i>                             |             | 4.36 (2.20)              | 5.85 (1.57) | 4.79 (1.41)              | 4.42 (1.60) | 3.79 (2.02)              | 2.98 (1.79)                                          | 15.2 %     | z = 5.872          | 0.5 %      | z = 1.155          | 8.6 %    | z = .153 |
|                                            |             |                          |             |                          |             |                          |                                                      | p < .001   |                    | p = .248   |                    | p = .878 |          |

## Discussion

Study 2 examines the main effect of digital feature upgrades on consumers' firm evaluations in a highly realistic setting—an actual usage simulation that employed virtual reality. Despite offering identical features, digital feature upgrades led to significantly lower firm evaluations than the control condition, supporting H1. The test in this study is particularly conservative, given that the upgrade mechanism in the control condition is less convenient (i.e., driving to the dealership) and requires additional costs (i.e., the fuel costs for driving to the dealership). The text analysis also provides initial insights into the underlying mechanism. Participants were more likely to mention that the firm had manipulative intent when the firm offered digital feature upgrades, compared to physical upgrades (control condition). In the next study, we build on these process results by more directly measuring inferences of manipulative intent, as well as feelings of entitlement.

## Study 3: The Role of Feelings of Entitlement and Inferences of Manipulative Intent

Study 3 had the objective of testing the underlying psychological mechanism by which we hypothesized digital feature upgrades to influence consumers' firm evaluations (i.e., via feelings of entitlement and inferences of manipulative intent). In addition, we extend the scope of our inquiry by examining digital feature upgrades within a different product domain: home appliances.

## Method

Two hundred and one MTurkers ( $M_{\text{Age}} = 37.89$ ,  $SD = 12.22$ , 49 % females) completed this 6-minute survey for a compensation of 55 cents. We used a combination washer-dryer appliance as the physical base product, and an intelligent drying feature as the focal upgrade feature.

First, we told participants to imagine that they had purchased a new combination washer-dryer and that the manufacturer was offering feature upgrades for this appliance. Participants were then randomly assigned to one of two experimental conditions (upgrade mechanism: *digital feature upgrades* vs. *control*) in a single-factor between-

subjects design. In the *digital feature upgrades* condition, participants read that these features could be upgraded through a digital process. That is, participants were told that they could simply unlock the feature. In the *control* condition, participants read that a service assistant could install these features with a quick visit to their home. Then they read about one available feature, the AutoDry feature (e.g., providing fabric-specific treatment, lower risk of shrinking clothes), that was available to them either as a digital or physical upgrade (control) at an extra charge (for stimuli, see Web Appendix C).

On the subsequent page, we asked participants to write how they felt about the upgrade scenario in an open-ended text box, and on the page that followed, they completed the same firm evaluation measure as in Studies 1 and 2 ( $\alpha = .98$ ). In addition, we measured inferences of the firm's manipulative intent, using two items (the extent to which the firm was trying to manipulate the customer, the extent to which the firm was trying to inappropriately manage or control the customer; adapted from Campbell 1995;  $r = .87, p < .001$ ). We also assessed participants' feelings of entitlement with two items (the extent to which they felt entitled to receive this feature, and the extent to which they expected the company to give them this feature; adapted from Xia, Kukar-Kinney, and Monroe 2010; and Feather 2008;  $r = .71, p < .001$ ). All measures were presented in counterbalanced order and used Likert scales ranging from 1 = "strongly disagree" to 7 = "strongly agree." Finally, participants reported their age and gender.

## Results

*Firm evaluation.* As in Study 2, participants in the digital feature upgrades condition evaluated the firm significantly more negatively ( $M_{\text{Digital feature upgrades}} = 3.98, SD = 2.25$ ) than did those in the control condition ( $M_{\text{Control}} = 5.81, SD = 1.29; t(199) = -7.03, p < .001$ , Cohen's  $d = -1.1$ ).

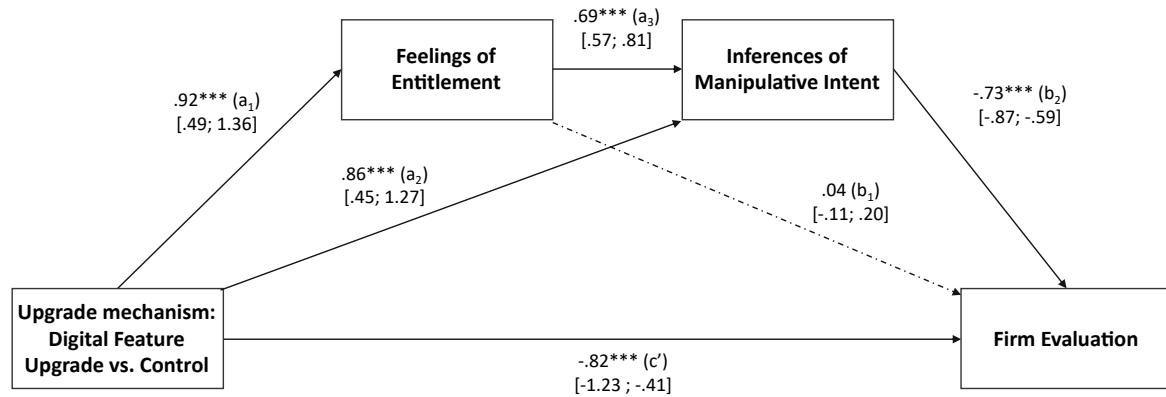
*Feelings of Entitlement.* Participants in the digital feature upgrades condition also reported significantly greater feelings of entitlement ( $M_{\text{Digital feature upgrades}} = 5.01, SD = 1.61$ ) than did those in the control condition ( $M_{\text{Control}} = 4.08, SD = 1.51; t(199) = 4.19, p < .001$ , Cohen's  $d = .59$ ).

*Manipulative Intent.* Participants in the digital feature upgrades condition also perceived the firm as significantly more manipulative ( $M_{\text{Digital feature upgrades}} = 4.50, SD =$

1.91) than did those in the control condition ( $M_{\text{Control}} = 3.08$ ,  $SD = 1.54$ ,  $t(199) = 5.82$   $p < .001$ , Cohen's  $d = .88$ ).

*Mediation analysis.* We conducted a serial mediation analysis (Preacher, Rucker and Hayes 2007; Process Macro Model 6,  $N_{\text{bootstrap}} = 10,000$ ) with upgrade mechanism (digital feature upgrades coded as “1”, control coded as “0”) as the independent variable, feelings of entitlement as proximal mediator, inferences of manipulative intent as distal mediator, and firm evaluations as the dependent variable. The mediation model was significant ( $b_{\text{indirect}} = -.46$ ,  $CI\ 95\% [-.758, -.227]$ ; see Figure 2).

**Figure 2.** Serial Mediation Effect of Digital Feature Upgrades on Consumers' Firm Evaluations via Feelings of Entitlement and Inferences of Manipulative Intent



Note: \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$

Relative to the control condition, digital feature upgrades significantly increased feelings of entitlement ( $a_1 = .92$ ,  $t = 4.19$ ,  $p < .001$ ), and as feelings of entitlement increased, inferences of manipulative intent increased ( $a_3 = .69$ ,  $t = 11.18$ ,  $p < .001$ ). Then, increased inferences of manipulative intent decreased firm evaluations ( $b_2 = -.73$ ,  $t = -10.20$ ,  $p < .001$ ). This shows that feelings of entitlement and inferences of manipulative intent serially mediate the effect of digital feature upgrades (vs. control) on firm evaluations.

## Discussion

The key objective of Study 3 was to test the full psychological process that underlies the negative effect of digital feature upgrades on consumers' firm evaluations. Specifically, digital feature upgrades increased consumers' feelings of entitlement, and these increased feelings of entitlement led to higher inferences of manipulative intent, and subsequently, lower evaluations of the firm. The findings also rule out alternative explanations as heightened privacy concerns (see Table 2), while replicating the previous study's effect in a new product domain. The next studies test our proposed mechanism further by examining theory-driven moderators and boundary conditions.

## Study 4: Moderation by Ownership

Study 4 had the objective of testing a theory-driven moderator, and thus strengthening our evidence of feelings of entitlement as mediator. We manipulated ownership of the physical base product to show that digital feature upgrades cause higher feelings of entitlement when consumers own (vs. rent) the base product, because, traditionally, ownership gave them full property rights (Snare 1972).

Examining ownership as a moderator is also managerially relevant because many current business models do not mandate legal ownership to consumers (e.g., renting, or sharing products; Bardhi and Eckhardt 2012). If digital feature upgrades had a less negative effect (or even no effect) on consumers' firm evaluations when consumers do not own the base product, digital feature upgrades would be more attractive for these evolving non-ownership business models.

## Method

Two hundred eighty-six MTurkers ( $M_{\text{Age}} = 38.03$ ,  $SD = 12.72$ , 54% females) completed this 6-minute survey for a compensation of 55 cents. We used a car as the physical base product and a massage feature as the focal upgrade feature.

The experiment proceeded as follows. Participants were randomly assigned to one of the three conditions (*digital feature upgrades owned* vs. *digital feature upgrades shared* vs. *control owned*) of a between-subjects design. We manipulated non-ownership through car-sharing. Car-sharing is a common consumption model for cars

without actual ownership, typically allowing the use of any available vehicle from a car-sharing provider for short periods, in exchange for a periodic subscription fee. Thus, users purchase the ride, but not the car (Morewedge et al. 2020).

The experiment proceeded as follows. First, participants in the *digital feature upgrades owned* condition and the *control owned* condition imagined they had bought a car. In contrast, participants in the *digital feature upgrades shared* condition imagined that they had rented a car-sharing vehicle. Then all participants read that the manufacturer offers to upgrade to additional features. Participants in the digital feature upgrades conditions read that they could acquire additional features through a digital process, while those in the control condition read that they could acquire features by having them physically installed at the dealership. We did not test for shared products in the control condition, because having features physically installed for products without ownership and for short-term use is unrealistic.

Next, participants saw a description of the available massage feature (providing five different massaging styles), which reinforced the manipulation by either stating that the feature was available to them digitally or physically (see Web Appendix D).

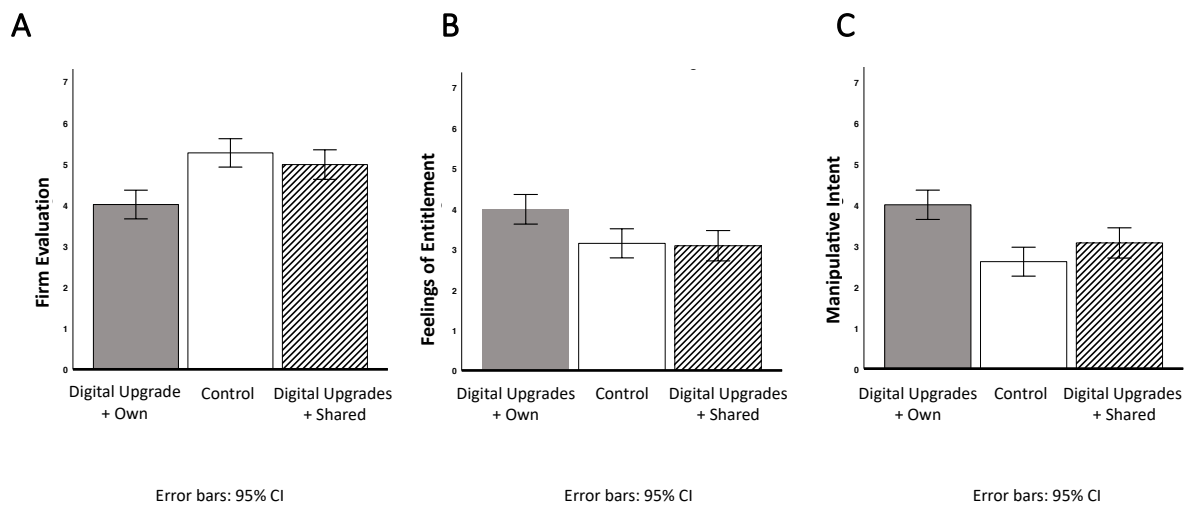
As in the previous studies, participants first recorded in an open-ended text box how the scenario made them feel. They then responded to the same scales for firm evaluation ( $\alpha = .98$ ), inferences of manipulative intent ( $r = .91, p < .001$ ), and feelings of entitlement ( $r = .75, p < .001$ ). Finally, we used two items to assess the effectiveness of our ownership manipulation (e.g., “I feel like I own the car”; ranging from 1 = “strongly disagree” to 7 = “strongly agree”;  $r = .95, p < .001$ ; adapted from Peck and Shu 2009). We also measured participants’ age and gender.

## Results

*Manipulation check.* A one-way ANOVA reveals a significant effect between the conditions ( $F(2, 283) = 36.89, p < .001$ ). Participants in the digital feature upgrades owned condition felt significantly more ownership of the product ( $M_{\text{Digital feature upgrades\_Owned}} = 4.08, SD = 2.0$ ) than did those in the digital feature upgrades shared condition ( $M_{\text{Digital feature upgrades\_Shared}} = 2.19, SD = 1.39; t(185) = 7.73, p < .001$ ), but not more than those in the control owned condition ( $M_{\text{Control\_Owned}} = 4.2, SD = 1.90; t(188) = .48, p = .63$ ). Thus, the manipulation of ownership worked as intended.

*Firm evaluation.* A one-way ANOVA reveals a significant effect between the conditions ( $F(2,283) = 13.84, p < .001$ ). Participants in the digital feature upgrades owned condition evaluated the firm significantly more negatively ( $M_{\text{Digital feature upgrades\_Owned}} = 4.01, SD = 1.95$ ) than did participants in the control owned condition ( $M_{\text{Control\_Owned}} = 5.26, SD = 1.49; t(193) = 5.04, p < .001$ ), or than did participants in the digital feature upgrades shared condition ( $M_{\text{Digital feature upgrades\_Shared}} = 4.98, SD = 1.73; t(185) = 3.82, p < .001$ ). Importantly, there were no significant differences in consumers' firm evaluations between the digital feature upgrades shared and the control owned condition ( $t(188) = 1.13, p = .26$ ). Therefore, the lack of ownership attenuated the negative effect of digital feature upgrades on consumers' firm evaluations.

**Figure 3.** The Effect of Digital Feature Upgrades (vs. Control) on (A) Firm Evaluation (B) Feelings of Entitlement and (C) Manipulative Intent Depends on Ownership of the Base Product



*Feelings of entitlement.* A one-way ANOVA also reveals a significant effect between the conditions for feelings of entitlement ( $F(2,283) = 7.34, p = .001$ ). Participants in the digital feature upgrades owned condition felt significantly more entitled ( $M_{\text{Digital feature upgrades\_Owned}} = 3.99, SD = 1.95$ ) than did participants in the control owned condition ( $M_{\text{Control\_Owned}} = 3.14, SD = 1.77; t(193) = -3.23, p = .001$ ) or than participants in the digital feature upgrades shared condition ( $M_{\text{Digital feature upgrades\_Shared}} = 3.08, SD = 1.71; t(185) = -3.39, p < .001$ ). Furthermore, feelings of entitlement did not differ between participants in the digital feature upgrades shared and control owned conditions ( $t(188)$

= .22,  $p = .82$ ). Thus, and as expected, the lack of ownership mitigated the effect of digital feature upgrades on feelings of entitlement.

*Manipulative intent.* Again, a one-way ANOVA reveals a significant effect between the conditions ( $F(2,283) = 13.55, p < .001$ ). Participants in the digital feature upgrades owned condition inferred significantly greater manipulative intent ( $M_{\text{Digital feature upgrades\_Owned}} = 4.01, SD = 2.09$ ) than did participants in the control owned condition ( $M_{\text{Control\_Owned}} = 2.66, SD = 1.63; t(193) = -5.12, p < .001$ ) or participants in the digital feature upgrades shared condition ( $M_{\text{Digital feature upgrades\_Shared}} = 3.10, SD = 1.77, t(185) = -3.35, p < .001$ ). There were no significant differences in consumers' inferences of manipulative intent between the digital feature upgrades shared and the control owned conditions ( $t(188) = -1.68, p = .10$ ).

*Moderated mediation.* We conducted a serial mediation analysis (Preacher, Rucker and Hayes 2007; Process Macro Model 6,  $N_{\text{bootstrap\_simulations}} = 10,000$ ), with condition (digital feature upgrades owned coded as “1”, digital feature upgrades shared coded as “2”, and control owned coded as “0”) as the independent variable, feelings of entitlement as the proximal mediator, inferences of manipulative intent as the distal mediator, and firm evaluation as the dependent variable. The mediation model was significant for the digital feature upgrades owned condition, ( $b_{\text{Indirect\_own}} = -.21, CI\ 95\% [-.39, -.07]$ ), such that relative to the control owned condition, digital feature upgrades significantly increased feelings of entitlement ( $a_1 = .84, t = 3.23, p < .001$ ), and as feelings of entitlement increased, inferences of manipulative intent increased ( $a_3 = .37, t = 6.57, p < .001$ ). Then, increased inferences of manipulative intent decreased firm evaluation ( $b_2 = -.67, t = -14.94, p < .001$ ). The same mediation model was non-significant for the digital feature upgrades shared condition ( $b_{\text{Indirect\_shared}} = .01, CI\ 95\% [-.11, .14]$ ). This shows that lack of ownership of the base product mitigates the negative effect of digital feature upgrades on firm evaluations.

## Discussion

In this study, we document an important theory-driven moderator for the effect of digital feature upgrades on feelings of entitlement, and thus on consumers' firm evaluations. Digital feature upgrades significantly decreased consumers' firm evaluations when consumers owned the base product, but not when they rented a shared-product. Renting lowered consumers' feelings of entitlement, which ignited the underlying psychological

process of the negative effect of digital feature upgrades on firm evaluations. This suggests non-ownership consumption models as contexts in which firms should be less concerned about launching digital feature upgrades, which is a particularly interesting finding for the automotive industry, where sharing and access-based business models are becoming increasingly prevalent. In the next study, we further test our proposed mechanism by examining a moderator that should influence the extent to which consumers will infer manipulative intent: salience of a benevolent motive.

### **Study 5: Moderation by Salience of a Benevolent Motive**

The objective of Study 5 was to test whether a benevolent firm motive (e.g., to benefit consumers) attenuates the negative effect of digital feature upgrades on consumers' firm evaluations. This is an important test of our theorizing, which postulates that digital feature upgrades lead to inferences of manipulative intent because consumers attribute a profit-driven motive to digital feature upgrades. Thus, providing evidence that the firm is not motivated by its own interests, but rather by consumer interest, should mitigate the effect and could be a practical way for firms to manage consumers' inferences (e.g., by emphasizing such motives through their communications).

#### **Method**

Four-hundred eighty-seven MTurkers ( $M_{\text{Age}} = 39.1$ ,  $SD = 14.9$ , 57% females) completed this 7-minute study, for a compensation of 60 cents. Again, we used a car as the physical base product, and a Matrix LED light feature as the focal upgrade feature.

Participants were randomly assigned to one of the four conditions in a 2 (upgrade mechanism: *digital feature upgrades* vs. *control*)  $\times$  2 (benevolent motive: *salient* vs. *non-salient*) between-subjects design. Salience of a benevolent motive was manipulated through a fictitious newspaper article. In the *salient benevolent motive* condition, participants read an article that explained that the manufacturer developed digital feature upgrades in order to reduce buyers' remorse by enabling consumers' greater purchase flexibility. In the *non-salient benevolent motive* condition, participants read an unrelated article about a nutritional grain, with no reference to digital feature upgrades. After reading the newspaper article, participants were given an open-ended question that asked them to reflect on the article's content. Subsequently, participants

were introduced to the upgrade scenario. Participants read that the manufacturer offers additional feature upgrades. In the *digital feature upgrades* condition, participants read that the Matrix LED light (i.e., an advanced light system) had been pre-installed and could thus be obtained through a digital process. In the *control* condition, participants read that they were currently at the dealership for a service visit and that the manufacturer could physically install the Matrix LED light. Next, participants read a description of the Matrix feature (for stimuli, see Appendix C).

As in the previous studies, participants described how they would feel about the firm. They then responded to our measures for firm evaluation ( $\alpha = .98$ ), feelings of entitlement ( $r = .65, p < .001$ ), and inferences of manipulative intent ( $r = .85, p < .001$ ). A one-item bipolar measure assessed the effectiveness of our benevolent motive manipulation (“The manufacturer seemed to have...; with 1 = “a customer-centric motive”, and 7 = “a profit motive”). Finally, we measured participants’ age and gender.

## Results

*Manipulation check.* Participants in the salient benevolent motive condition rated benevolence significantly higher ( $M = 4.50, SD = 1.80$ ) than did those in the non-salient benevolent motive condition ( $M = 4.97, SD = 1.65; F(1,483) = 9.19, p < .01$ ). Thus, the manipulation of benevolent motive worked as intended. Next, we used two-way ANOVAs to test the effect of upgrade mechanism and salience of a benevolent motive on our primary dependent measures.

*Firm evaluation.* Upgrade mechanism ( $F(1, 483) = 36.7, p < .001, \eta_p^2 = .07$ ), benevolent motive ( $F(1,483) = 19.7, p < .001, \eta_p^2 = .04$ ), and the interaction between both factors ( $F(1,483) = 4.69, p = .03, \eta_p^2 = .01$ ) had a significant effect on firm evaluations. In the absence of a benevolent motive, participants in the digital feature upgrades condition evaluated the firm significantly more negatively ( $M_{\text{Digital feature upgrades\_Benevolent non-salient}} = 3.86, SD = 2.05$ ) than in the control condition ( $M_{\text{Control\_Benevolent non-salient}} = 5.13, SD = 1.33; t(239) = 33.50, p < .001$ ). This effect was attenuated when the article made a benevolent motive salient ( $M_{\text{Digital feature upgrades\_Benevolent salient}} = 4.88, SD = 1.92; M_{\text{Control\_Benevolent salient}} = 5.48, SD = 1.39; t(244) = 7.67, p = .04$ ). Thus, providing a benevolent motive reduced, but did not nullify the negative implications of digital feature upgrades.

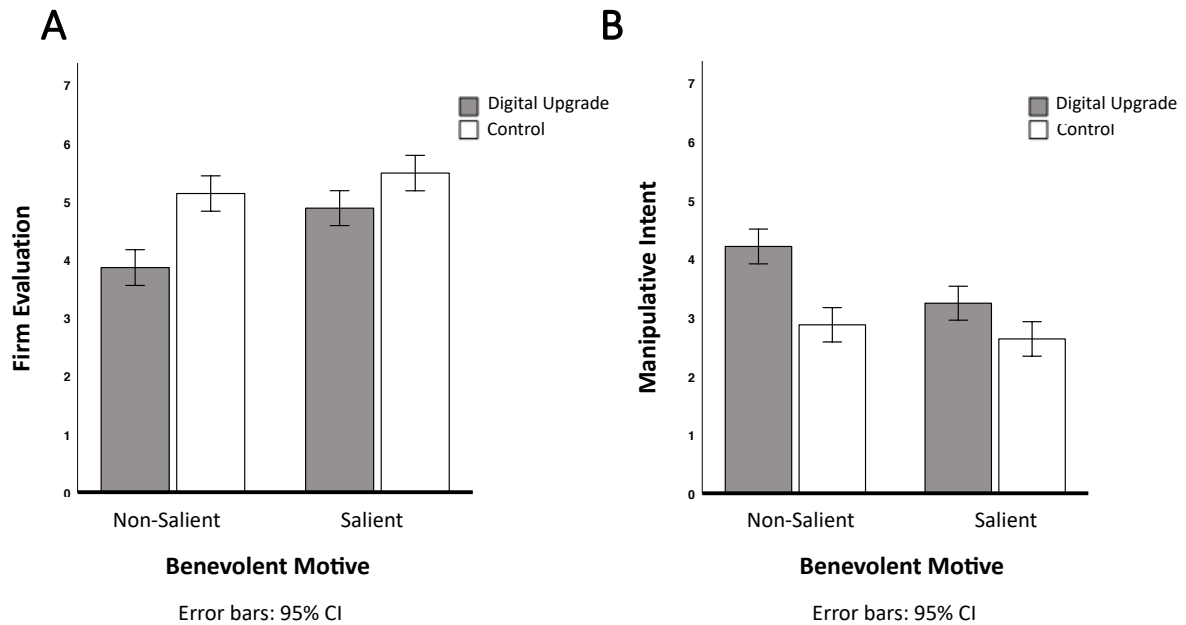
*Feelings of entitlement.* Next, we tested the effect of salience of a benevolent motive on feelings of entitlement. Only the main effect of upgrade mechanism ( $F(1,483) = 6.45, p < .01, \eta_p^2 = .013$ ) had a significant effect on feelings of entitlement. Neither benevolent motive ( $M_{\text{Digital feature upgrades\_Benevolent salient}} = 4.26, SD = 1.57, M_{\text{Digital feature upgrades\_Benevolent non-salient}} = 4.52, SD = 1.75, M_{\text{control\_Benevolent salient}} = 3.95, SD = 1.42, M_{\text{control\_Benevolent non-salient}} = 4.11, SD = 1.45; F(1,483) = 2.19, p = .14, \eta_p^2 < .01$ ) nor the interaction between both factors ( $F(1,483) = .16, p = .69, \eta_p^2 < .001$ ) had a significant effect on feelings of entitlement. Therefore, independent of the benevolent motive, digital feature upgrades led to significantly greater feelings of entitlement.

*Manipulative intent.* Upgrade mechanism ( $F(1,483) = 42.47, p < .001, \eta_p^2 = .08$ ), benevolent motive ( $F(1,483) = 16.39, p < .001, \eta_p^2 = .03$ ), and their interaction ( $F(1,483) = 5.92, p < .01, \eta_p^2 = .01$ ) had a significant effect on inferences of manipulative intent. In the absence of a benevolent motive, participants in the digital feature upgrades condition ( $M_{\text{Digital feature upgrades\_Benevolent non-salient}} = 4.20, SD = 1.88$ ) inferred significantly greater manipulative intent than in the control condition ( $M_{\text{Control\_Benevolent non-salient}} = 2.87, SD = 1.42; t(239) = 6.30, p < .001$ ). The same effect was attenuated, but remained significant when the benevolent motive was salient ( $M_{\text{Digital feature upgrades\_Benevolent salient}} = 3.24, SD = 1.77; M_{\text{Control\_Benevolent salient}} = 2.63, SD = 1.47; t(244) = 2.90, p < .01$ ). Thus, salience of a benevolent motive could attenuate, but could not reverse or fully eliminate, the effect of digital feature upgrades on inferences of manipulative intent.

*Moderated mediation.* Next, we tested whether salience of a benevolent motive also mitigated the serial mediation via feelings of entitlement and manipulative intent. We conducted a moderated serial mediation analysis (Process Macro Model 91,  $N_{\text{bootstraps}} = 10,000$ ). We inserted upgrade mechanism as independent variable (digital feature upgrades coded as "1", control coded as "0"), feelings of entitlement as proximal mediator, inferences of manipulative intent as distal mediator, and firm evaluation as dependent variable. Furthermore, we inserted benevolent motive as a moderator of the path between feelings of entitlement and inferences of manipulative intent. The index of moderated mediation was significant ( $B = .06, CI\ 95\% [.006, .145]$ ). Digital feature upgrades had a significant negative indirect effect on firm evaluations in the benevolent motive non-salient conditions ( $b_{\text{Indirect\_benevolent non-salient}} = -.15, CI\ 95\% [-.285, -.034]$ ), such that digital feature upgrades led to stronger feelings of entitlement, which translated into greater inferences of manipulative intent and thus lower firm evaluations.

This indirect effect was less significant in the benevolent motive salient conditions ( $b_{\text{Indirect\_benevolent salient}} = -.09$ , CI 95% [-.186, -.018]).

**Figure 4.** The Effect of Digital Feature Upgrades (vs. Control) on (A) Firm Evaluation and (B) Manipulative Intent Depends on Salience of A Benevolent Firm Motive



## Discussion

The results from this study provide an additional test of our manipulative intent account. They show that the extent to which consumers infer manipulative intent from digital feature upgrades is driven by the firm motive that consumers attribute to the practice. Precisely, when participants received no further information about the firm's motive, digital feature upgrades led to significantly lower firm evaluations than physical upgrades. In contrast, when an article made a benevolent firm motive salient, this effect was mitigated. This suggests that in the absence of any information about the firm's motive, consumers attribute a profit-driven motive to the firm, which causes them to infer manipulative intent and eventually evaluate the firm less favorably. Notably, the findings also indicate that increasing the salience of a benevolent firm motive (e.g., through communications) could be a practical way for firms to reduce, though not completely nullify, the negative implications of digital feature upgrades.

## Study 6: Moderation by Access Monetization

Study 5 tests the role of access monetization on the effect of digital feature upgrades on consumers' firm evaluations. Our theorizing suggests that it is not the digital upgrade opportunity per se that leads to inferences of manipulative intent, but the fact that consumers may perceive that the firm charges them arbitrarily to make money on features that they feel entitled to receive. As such, we expected that providing free access to the features would attenuate the effect of feelings of entitlement on inferences of manipulative intent. Notably, this is a boundary condition, as digital feature upgrades are per definition for-charge, and thus has less practical relevance than the previous studies.

### Method

Five hundred MTurkers ( $M_{\text{Age}} = 37.8$ ,  $SD = 12.2$ , 49% females) completed this 6-minute study, for a compensation of 55 cents. We used a coffee machine as the physical base product and a barista feature as the focal upgrade feature.

Participants were randomly assigned to one of the four conditions in a 2 (upgrade mechanism: *digital feature upgrades* vs. *control*)  $\times$  2 (access monetization: *monetized* vs. *free*) between-subjects design. First, participants imagined that they had purchased a digital coffee machine. As in the previous studies, we informed all participants that the manufacturer offered additional feature upgrades. In the *digital feature upgrades* condition, participants read that these features could be upgraded through a digital process. In the *control* condition, participants read that these features could be ordered as a plug-in (i.e., a physical element that can be attached easily to the product). Next, participants read about the new barista feature (e.g., customized brewing settings, programmable timer, and profiles), and that this feature was available to them as an upgrade, either digitally or as a plug-in, depending on the experimental condition. We also manipulated whether the feature upgrade was free (*free* condition) or subject to a charge of 60 USD (*monetized* condition; for stimuli, see Appendix D).

Participants again wrote how they would feel about the scenario. Subsequently, participants responded to the same measures as in the previous studies for firm evaluation ( $\alpha = .98$ ), feelings of entitlement ( $r = .60$ ,  $p < .001$ ), and inferences of manipulative intent ( $r = .92$ ,  $p < .001$ ). Finally, they reported their age and gender.

## Results

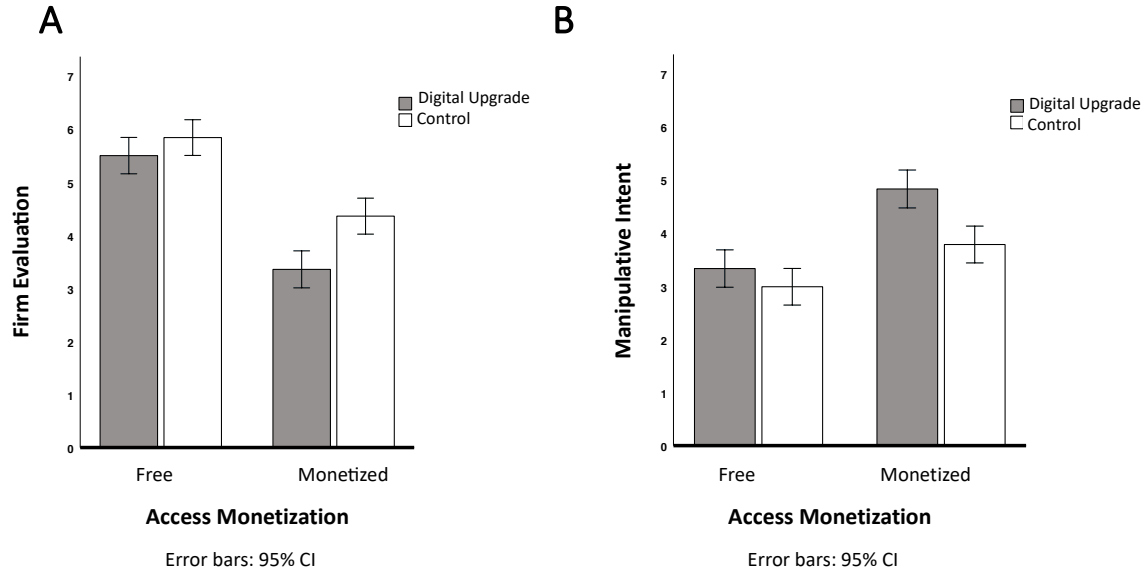
*Firm evaluation.* Upgrade mechanism ( $F(1,496) = 14.99, p < .001, \eta_p = .03$ ), access monetization ( $F(1,496) = 110.43, p < .001, \eta_p = .18$ ), and the interaction between both factors ( $F(1,496) = 3.73, p = .05, \eta_p = .01$ ) had a significant effect on firm evaluations. When payment was required, participants evaluated the firm significantly more negatively in the digital feature upgrades condition ( $M_{\text{Digital feature upgrades\_Monetized}} = 3.34, SD = 2.20$ ), than in the control condition ( $M_{\text{Control\_Monetized}} = 4.36, SD = 2.2; t(245) = 4.09, p < .001$ ). When access was free, this difference in consumers' firm evaluations was non-significant ( $M_{\text{Digital feature upgrades\_Free}} = 5.52, SD = 1.77; M_{\text{Control\_Free}} = 5.85, SD = 1.57; t(251) = 1.39, p = .16$ ). Thus, free access attenuated the negative effect of digital feature upgrades on consumers' firm evaluations.

*Feelings of entitlement.* Next, we tested the effect of access monetization on feelings of entitlement. As predicted, only the main effect of upgrade mechanism ( $F(1,496) = 23.29, p < .001, \eta_p = .04$ ) was significant, such that participants had significantly higher feelings of entitlement in the digital feature upgrades conditions ( $M_{\text{Digital feature upgrades}} = 5.24, SD = 1.44$ ) versus the control conditions ( $M_{\text{Control}} = 4.61, SD = 1.51$ ). Neither the effect of access monetization ( $F(1, 496) = 1.4, p = .24, \eta_p < .01$ ), nor the interaction ( $F(1,496) = 2.70, p = .10, \eta_p < .01$ ) was significant. The contrast between digital feature upgrades and control was significant in both the monetized ( $M_{\text{Digital feature upgrades\_Monetized}} = 5.21, SD = 1.34, M_{\text{Control\_Monetized}} = 4.79, SD = 1.41; t(245) = 4.55, p < .001$ ) and the free conditions ( $M_{\text{Digital feature upgrades\_Free}} = 5.27, SD = 1.55, M_{\text{Control\_Free}} = 4.42, SD = 2.02; t(251) = 2.26, p = .02$ ). Therefore, independently of access monetization, digital feature upgrades led to significantly greater feelings of entitlement.

*Manipulative intent.* Finally, we tested the effect of the manipulations on inferences of manipulative intent. Upgrade mechanism ( $F(1, 496) = 14.05, p < .001, \eta_p = .03$ ), access monetization ( $F(1, 496) = 41.55, p < .001, \eta_p = .08$ ) and the interaction of these factors were significant ( $F(1, 496) = 3.81, p = .05, \eta_p = .01$ ). In the monetized conditions, digital feature upgrades ( $M_{\text{Digital feature upgrades\_Monetized}} = 4.81, SD = 2.08$ ) led to significantly higher inferences of manipulative intent than in the control condition ( $M_{\text{Control\_Monetized}} = 3.79, SD = 2.02; t(245) = 4.01, p < .001$ ). The same effect was not significant in the free conditions ( $M_{\text{Digital feature upgrades\_Free}} = 3.30, SD = 2.06; M_{\text{Control\_Free}} = 2.98, SD = 1.79;$

$t(251) = 1.27$   $p = .21$ ). Free access thus mitigated the effect of digital feature upgrades on consumers' inferences of manipulative intent.

**Figure 5.** The Effect of Digital Feature Upgrades (vs. Control) on (A) Firm Evaluation and (B) Manipulative Intent Depends on Access Monetization



*Moderated mediation.* Next, we tested whether access monetization also mitigated the serial mediation via feelings of entitlement and manipulative intent. We conducted a moderated serial mediation analysis (Process Macro Model 91,  $N_{\text{bootstrap\_simulations}} = 10,000$ ). We inserted upgrade mechanism as the independent variable, feelings of entitlement as proximal mediator, inferences of manipulative intent as distal mediator, and firm evaluation as the dependent variable. Furthermore, we inserted access monetization as a moderator of the path between feelings of entitlement and inferences of manipulative intent. The index of moderated mediation was significant ( $B = -.18$ , CI 95%  $[-.344, -.056]$ ). Digital feature upgrades had a significant negative indirect effect on firm evaluation in the monetized conditions ( $b_{\text{Indirect\_Monetized}} = -.30$ , CI 95%  $[-.472, -.160]$ ), such that digital feature upgrades led to stronger feelings of entitlement, which translated into higher inferences of manipulative intent and thus lower firm evaluations. This indirect effect was less significant in the free conditions ( $b_{\text{Indirect\_Free}} = -.12$ , CI 95%  $[-.235, -.022]$ ).

## Discussion

This study documents a key boundary condition of the effect of digital feature upgrades on firm evaluations. We reveal that digital feature upgrades have negative implications when the firm charges consumers for accessing the feature, but not when consumers can access it free of charge. The final study examines consumers' acceptance of digital feature upgrades across different product categories to further understand the impact of the physical (vs. digital) nature of the base product.

## Study 7: Acceptance of Digital Feature Upgrades Across Product Categories

The purpose of Study 7 was to explore the role of the physical (vs. digital) nature of the base product on the effect of digital feature upgrades on consumers' firm evaluations (H6). Examining this effect is relevant, both theoretically and practically. Our theory assumes that consumers should have more (vs. less) exclusive ownership expectations toward physical (vs. digital) products based on consumers' learned experiences with both product formats. As a result, they should not evaluate the firm as negatively when digital feature upgrades are offered for digital (vs. physical) based products. Practically, firms gain insights into the type of base products for which digital feature upgrades should be more likely to evoke negative consumer responses.

## Method

One hundred and nine MTurkers ( $M_{\text{Age}} = 36.17$ ,  $SD = 9.56$ , 55% female) participated in this 5-minute within-subjects study, for a compensation of 50 cents. Participants read 13 consecutive product examples of digital versus physical base products (e.g., mobile applications, software, wearable, kitchen and home appliances, cars; see Web Appendix E) displayed in randomized order. We selected product examples with different degrees of digitization to account for a wide range of products. Each participant was randomly assigned to read half of the examples in the digital feature upgrades condition and the remaining half of the examples in a control condition. The *digital feature upgrades* condition stated that the product comes with an upgrade option; consumers can unlock enhanced features through a digital process (e.g., an intelligent dosage feature for a laundry machine), as the required physical components have already been pre-installed.

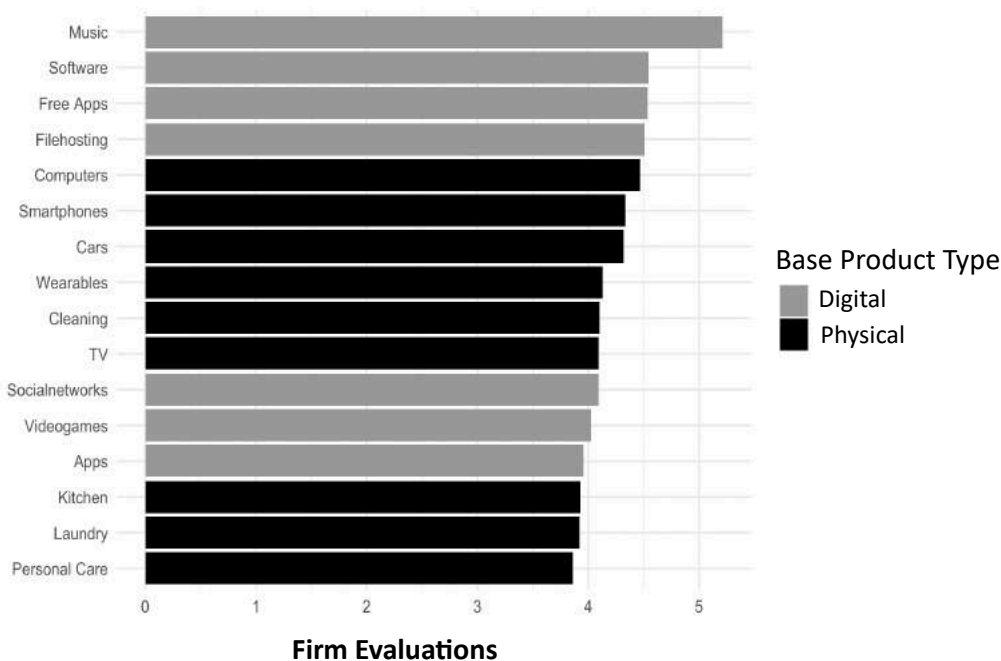
The *control* condition stated that the product comes directly with the enhanced feature (e.g., the intelligent dosage feature for the laundry machine). To avoid fatigue from the repeated measures design, participants evaluated each of the firms using a single item (“How do you feel about the firm described in this scenario?”; 1 = “dislike” to 7 = “like it”; Park et al. 2010).

## Results

*Firm evaluation.* We used a linear mixed model with firm evaluation as the dependent variable, digital feature upgrades (vs. control) as the independent variable, and the digital (vs. physical) base product as the moderator. Results reveal a significant interaction of digital feature upgrades and the physical base product ( $b_{\text{Digital feature upgrade} \times \text{Physical product}} = -.441$ ,  $SE = .155$ ,  $t = -2.85$ ,  $p = .004$ ;  $b_{\text{Digital feature upgrades}} = -.188$ ,  $SE = .115$ ,  $t = 1.632$ ,  $p = .10$ ;  $b_{\text{Physical product}} = -.06$ ,  $SE = .108$ ,  $t = -.579$ ,  $p = .563$ ,  $\delta_{\text{RandomIntercept}} = .812$ ). When the base product was physical, digital feature upgrades significantly decreased firm evaluations compared to the control condition ( $b = -.63$ ,  $SE = .102$ ,  $p < .001$ ). When the base product was digital, this effect was non-significant ( $b = -.19$ ,  $SE = .115$ ,  $p = .36$ ).

This corroborated our predictions that consumers evaluate firms offering digital feature upgrades for physical base products more negatively than they evaluate firms offering digital feature upgrades for digital base products. As a robustness check, we repeated the analyses while controlling for freemium products. This is an important step, because freemium was only prevalent among the digital product examples and could thus have confounded the effects (e.g., freemium should lead to more positive effects because of the free base product). Consistent with the previous results, we find a significant interaction of digital feature upgrades and the physical base product ( $b_{\text{Digital feature upgrades} \times \text{Physical product}} = -.441$ ,  $SE = .154$ ,  $t = -2.86$ ,  $p = .004$ ;  $b_{\text{Digital feature upgrades}} = -.188$ ,  $SE = .115$ ,  $t = -1.64$ ,  $p = .10$ ;  $b_{\text{Physical product}} = -.23$ ,  $SE = .118$ ,  $t = -1.952$ ,  $p = .05$ ;  $b_{\text{Freemium}} = .392$ ,  $SE = .113$ ,  $t = 3.46$ ,  $p < .001$ ,  $\delta_{\text{RandomIntercept}} = .812$ ). Thus, digital feature upgrades evoke less negative responses for digital base products, and more negative responses for physical base products (see Figure 5).

**Figure 5.** The Effect of Digital Feature Upgrades (vs. Control) on Firm Evaluation Depends on the Physical (vs. Digital) Nature of the Base Product



## Discussion

This study's findings provide insights into consumers' responses toward digital feature upgrades across various physical vs. digital base products. As expected, the results reveal a less negative effect of digital feature upgrades on consumers' firm evaluations when the base product is digital (vs. physical), supporting (H6). Conceptually, this supports our theory about consumers' entitlement expectations toward physical base (vs. digital base) products, and whose infringement eventually degrades firm evaluations. The findings provide an important indication for managers that product categories that are mostly physical in nature may be more prone to evoke negative consumer responses toward digital feature upgrades.

## General Discussion

While digital feature upgrades for digital products have been possible for years, recent technological advancements have allowed even physical products to become digitally augmented, and have thus stimulated novel and disrupting business practices. To our knowledge, the current research is the first to provide insights into consumers' responses toward the emerging practice of digital feature upgrades.

Across seven studies using multiple methodologies and product categories, we find that consumers evaluate a firm more negatively when it offers digital feature upgrades, relative to other price discrimination practices that equally enable upgrades. In Study 1, we show the specific effects of digital feature upgrades compared to a variety of price discrimination practices, and in Study 2 provide quasi-field evidence of a negative effect of digital feature upgrades on consumers' firm evaluations using a VR simulation. Furthermore, our research reveals that this negative effect on consumers' firm evaluations is driven by heightened feelings of entitlement and subsequent inferences of manipulative intent by the firm from monetizing feature access. We demonstrate this both via mediation analysis (Study 3) and through moderation analyses (Studies 4 to 6). Finally, Study 7 shows that digital feature upgrades adversely affect firm evaluations particularly for physical base products, but less for digital base products. Through multiple studies, we rule out privacy concerns and waste concerns as salient alternative explanations. To examine this, we use a more open-ended method of consumers' spontaneous responses, as well as text analysis, to obtain further evidence that consumers do indeed articulate more concerns about being manipulated through digital feature upgrades than about other alternative factors. Together, the studies corroborate our theorizing and provide insights for practitioners into when the harmful implications of digital feature upgrades unfold, by showing the effects of digital feature upgrades on consumers' firm evaluations, by articulating digital feature upgrades' underlying process, and by identifying several theory-driven moderators.

## Theoretical Implications

The current research offers several theoretical contributions to consumer research. Recent conceptual work has shed initial light on the consequences of new technologies that make physical products more dynamic (Kannan and Li 2017; Ng and Wakenshaw 2017; Yoo et al. 2012). However, research examining marketing practices that take advantage of this opportunity remains scarce. This work is the first to examine a practice that involves digitally adjusting physical products in the form of digital feature upgrades. We theorize and document how this emerging practice can adversely impact consumers' firm evaluations.

We also identify the underlying process driving this effect: digital feature upgrades evoke feelings of entitlement, which subsequently increase inferences of manipulative intent. Thus, we advance current knowledge about both of these constructs. First, we add to the scarce work on feelings of entitlement in the consumer behavior literature. While prior work has revealed how consumers' exerted effort (e.g., to obtain a promotion) can serve as a source of entitlement (Xia, Kukar-Kinney, and Monroe 2010), we investigate another specific source—traditional rights associated with owning a physical product—and show how consumers can also derive their entitlement beliefs from informal rules or traditions (Lerner 1987; Major 1994). Second, prior work has focused on how inferences of manipulative intent may result from promotional tactics (such as advertising and store ambiance) employed by a firm (Campbell 1995; Cotte, Coulter, and Moore 2005; Lunardo and Mbengue 2013). We build on this past work by highlighting a unique product-related practice as a factor that can trigger such inferences.

Our findings also contribute to a growing body of research examining consumer responses toward digital goods. Prior work in this field has predominantly focused on contrasting digital and physical products, and examining why consumers place more value on the latter even when the products are identical (e.g., books, photographs; Atasoy and Morewedge 2018; Giles, Pietrzykowski, and Clark, 2007; Petrelli and Whittaker 2010). Our work complements this area by examining a practice involving a hybrid product that blurs traditional product boundaries—that is, a combination of a physical base product and a digital upgrade process. We examine why this hybrid combination of digitally enabling feature upgrades for a physical product leads to more

negative firm evaluations than a traditional, purely physical upgrade process—given that both upgrade mechanisms essentially provide the same final feature. We find that this is because consumers associate the digital upgrade process with manipulative intentions by the firm. This adds to the prior findings by showing how the value-decreasing potential of digitization can go beyond a lower willingness to pay, and also have detrimental effects on how the firm is perceived.

Our findings also advance an emerging stream of research on evolving types of consumption models—beyond ownership—resulting from technological developments (e.g., access-based consumption models; Bardhi and Eckhardt 2012, 2017; Belk 2013; Rifkin 2000; Chen, 2009). Prior work has conceptualized how the digital context gives rise to consumption models with "fragmented ownership" that blur property lines between ownership and possession (Watkins, Denegri-Knott, and Molesworth 2016, p.45). Our work reveals that such consumption models require a refined understanding of consumers' (expected) relationships with physical products. While consumers' rights toward digital feature upgrades may be legally clear (i.e., the firm owns the feature until the consumer pays for the upgrade), consumers may expect differently, given their existing understanding and the psychology of owning physical products. Thus, it may backfire when a firm regards digital feature upgrades as optional features that they can charge money for, while consumers regard them as part of their entitlement.

Finally, and more broadly, we advance the literature examining consumer responses to price discrimination practices (Gershoff, Kivetz, and Keinan 2012; Moorthy 1984; Heath, DelVecchio, and McCarthy 2011). Prior research has examined how additional tiers impact brand evaluation (Heath, DelVecchio, and McCarthy 2011) and how the type of add-on feature influences product valuation (Bertini, Ofek, and Ariely 2013). Other work has investigated the effects of certain practices (e.g., versioning) on consumer preferences (Gershoff, Kivetz, and Keinan 2012). We add to this literature by focusing on a novel way through which firms provide tiers for physical products—by enhancing their capabilities through a digital upgrade process. We show how this new practice can violate consumers' expectations and lead to unintended negative consequences for firms.

## Managerial Implications

Digital feature upgrades are becoming increasingly prevalent. Current estimates from industry experts predict a market size development of USD 75.8 billion by 2030 from connected services, including digital feature upgrades (McKinsey&Company 2016). Moreover, digital feature upgrades promise to be mutually beneficial for both firms and consumers. They allow firms to achieve scale efficiency by streamlining productions (i.e., they can build fewer versions of the physical base product), while maximizing profit due to novel upselling opportunities and an extended revenue stream over the product's lifetime. Consumers can benefit from greater customizability (i.e., they can adapt their products flexibly over the entire life cycle of the product) and from the convenience of a constantly accessible digital upgrade process. However, despite these advantages, our findings suggest lower firm evaluations as a potential downside that firms should consider when implementing this practice. Importantly, our findings provide actionable recommendations for how to avoid this downside when implementing digital feature upgrades.

*What is a suitable context for digital feature upgrades?* Our results show that lack of ownership of the physical base product (i.e., renting a shared vehicle) mitigates the effect of feelings of entitlement that digital feature upgrades evoke. Consumption models in which consumers do not assume ownership over physical products are becoming increasingly prevalent (e.g., renting home appliances, car- or bike-sharing programs such as Zipcar or Hubway, and leasing cars or laptops; Bardhi and Eckhardt 2012; Bagga, Bendle, and Cotte 2017). These contexts could be more suitable for digital feature upgrades, given that feelings of entitlement might be less likely to evolve, so that consumers' firm evaluations eventually become less likely to decrease. Second, digital feature upgrades make physical products more flexible, which is particularly relevant when users change frequently (i.e., for products that are often rented), given that products should cater to consumers' heterogeneous needs in such contexts. Thus, firms may primarily consider consumption contexts that do not entail ownership of a product, at least to acquaint consumers with digital feature upgrades.

*What type of base product is appropriate for digital feature upgrades?* Throughout our studies, we find that the negative effect of digital feature upgrades is robust across multiple product categories. However, Study 7 demonstrates that the degree of

digitization of the base product could be a key factor for determining consumers' responses. Consumers responded most negatively to digital feature upgrades for predominantly physical base products (e.g., household and personal care appliances), less negatively to base products that were already more digital in nature (e.g., smartphones, wearables), and most positively to purely digital base products (e.g., apps, software). This finding indicates that products that are still mostly physical in nature are more likely to provoke negative responses. Manufacturers of these products need to carefully consider how to introduce consumers to digital feature upgrades.

*Which features are appropriate for digital feature upgrades?* This research shows that feelings of entitlement drive consumers' negative responses toward digital feature upgrades. Building on these findings, we conclude that some features might be more or less likely to provoke stronger feelings of entitlement and to thus lead to inferences of manipulative intent. That is, firms should not provide digital feature upgrades for features that consumers perceive to be more integral to the base product, such as those extending a product's (core) capabilities (e.g., battery extension, extra motor horsepower, additional memory) or those that are highly visible (i.e., better lighting). The characteristic of the degree of visibility, particularly, may lead to even stronger inferences of manipulative intent, given that greater visibility could be interpreted as an attempt to encourage making an upgrade, which would promote manipulative intent. Future work could test this prediction and, more generally, could investigate whether some features do indeed intensify the negative effect of digital feature upgrades on consumers' firm evaluations.

*How can firms use communication to mitigate the potential negative effect of digital feature upgrades?* The findings of this research indicate two ways in which firms can mitigate inferences of manipulative intent. First, Study 5 shows that firms can prevent inferences of a profit-driven motive (and thus inferences of manipulative intent) by making an alternative, benevolent motive more salient (i.e., through the firms' communications). Secondly, firms may inhibit skepticism toward their motives by being forthright about their practices (Forehand and Grier 2003). Some initial evidence demonstrates that informing consumers about digital feature upgrades before their purchase of the physical product, rather than after, mitigates inferences of manipulative intent (see study in Web Appendix F). Thus, firms can attenuate consumers' negative

responses by making alternative motives more salient, and by informing consumers early to inhibit further skepticism.

## **Future Research**

Given that digital feature upgrades are still very novel, there is considerable scope for future research. We suggest at least five interesting directions for how research can accompany practice and examine potential future variations of digital feature upgrades. First, in the current research, we focus on the duration of a lifetime activation of the feature upgrade (i.e., infinite activation of the upgrade), as this has been the prevalent practice in the market (i.e., by Telsa). More recently, the car manufacturer Audi has introduced digital feature upgrades with different durations, such as yearly or monthly upgrades (Audi 2020). Technically, firms could offer digital feature upgrades on even a single per-user basis. Future research might thus examine the effect of the upgrade duration (i.e., how long the feature is accessible) on consumers' responses toward digital feature upgrades. On the one hand, consumers could feel more entitled and more manipulated once the expiration of a period forces them to re-activate the upgrade. On the other hand, consumers could learn to appreciate the greater flexibility and lower commitment that these shorter upgrade periods involve. Furthermore, repeated exposure to the upgrade (through potentially recurring activations) could increase consumers' level of comfort with it, and thereby perhaps result in less negative perceptions. Insights into consumer responses to these durations would yield particularly valuable insights for practitioners who are deciding which durations to offer.

Relatedly, future research could examine consumers' responses to digital feature upgrades under different pricing strategies. For example, prior research has shown that temporally reframing a product's price (i.e., a considerable one-time expense) into a series of smaller amounts can increase consumers' transaction compliance (also referred to as the "*pennies-a-day*" strategy; Gourville 1998). This might be an interesting strategy for digital feature upgrades to mitigate negative consumer responses, as a series of small, on-going expenses (vs. a large one-time expense) for a feature upgrade could decrease its perceived monetary magnitude. If consumers perceive the monetary magnitude of digital feature upgrades to be lower, they may not feel as violated and

may potentially infer less manipulative intent by the firm. On the other hand, on-going payments (vs. a one-time expense) could increase consumers' pain of paying and thus trigger inferences that the firm is taking advantage of them.

Finally, future research could examine the role of different product lifecycle stages in consumers' responses toward digital feature upgrades. For example, consumers might view digital feature upgrades more negatively during the initial usage phase (when they have just paid for the new product), but come to appreciate the benefits of digital feature upgrades at a later stage, as their needs change, or as they might want to re-sell the product (a fully equipped product will not lose value as quickly and could thus be sold at a higher price). Thus, the lifecycle stage could moderate the effect of digital feature upgrades on consumers' inferences of manipulative intent and their subsequent evaluations of the firm. Interestingly, we propose that the aftermarket lifecycle stage cannot only mitigate, but also reverse the effect. If digital feature upgrades allow consumers to realize a financial benefit, they may evaluate the firm more positively than other upgrade practices that do not affect the product's value. Examining the lifecycle stage's role would also provide interesting insights for companies as to how to communicate to consumers in the respective phase. In sum, more research into these potential moderators could refine the applicability of our conceptual model and provide new insights for theory and practice alike.

## **Conclusion**

The current research reveals the potential downsides (i.e., lower firm evaluations) of the novel and technology-based practice of digital feature upgrades. The insights of our work provide important guidance on how to mitigate this potential negative effect. As this phenomenon relies on the latest technological developments, practitioners have only recently begun to implement digital feature upgrades, which makes a better understanding of consumer responses to this practice a valuable component of the emerging field.

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# Appendix

## SECTION A: STUDY 1 – DIGITAL FEATURE UPGRADES VS. RELATED PHENOMENA

### Scenario Introductions

I Digital Feature Upgrades

**Coffee Machine with Digital Upgrades**

The manufacturer offers a coffee machine for \$100. This machine can still be upgraded easily after its purchase. The manufacturer offers to digitally activate a number of pre-installed premium features instantly and at an extra charge. Customers can improve their machine with the simple touch of a button.

**Process description**

- To be able to offer these premium features digitally and with the simple touch of a button, the manufacturer had to physically pre-install the premium features and lock them through software.
- Access to a premium feature is only enabled with the purchase of a digital upgrade.
- The upgrade does not require a service visit and can simply be purchased with a payment method on file.
- After payment, the feature will be instantly activated through digital code for the quickest update experience.



II Physical Upgrade

**Coffee Machine with Physical Upgrades**

The manufacturer offers a coffee machine for \$100. This machine can still be upgraded after its purchase. Consumers can order a number of physical plug-ins with premium features at an extra charge.

**Process description**

- The premium features are available through physical plug-ins that can be ordered online.
- After payment, the plug-in will be shipped to the customer.
- The plug-in can be attached to the machine by the consumer him-/herself and thus does not require a service visit.



III Freemium Upgrade

**Coffee Machine (free of charge) with Digital Upgrades**

The manufacturer offers a coffee machine (worth \$100) for free. This machine can still be upgraded easily after its purchase. Customers can digitally activate a number of pre-installed premium features instantly and at an extra charge. Your machine improves with the simple touch of a button.

**Process description**

- The coffee machine is available for free.
- To be able to offer these premium features digitally and with the simple touch of a button, the manufacturer had to physically pre-install the premium features and lock them through software.
- Access to a premium feature is only enabled with the purchase of a digital upgrade.
- The upgrade does not require a service visit and can simply be purchased with a payment method on file.
- After payment, the feature will be instantly activated through digital code for the quickest update experience.



IV Versioning

**Standard Coffee Machine with Disabled Premium Features**

The manufacturer offers two coffee machines: a standard version for \$100 and a superior version with premium features for \$175.

**Process description**

- The manufacturer produces the superior version (\$175) with the premium features first. Then, the manufacturer disables these premium features to produce the standard version (\$100).
- The standard version is thus equipped with disabled premium features.
- The manufacturer is not selling upgrades. Customers can choose between the two machines based on their preferences and willingness to pay.
- Customers owning the standard version cannot access or purchase these premium features after production is finished as they are irreversibly disabled.



V Vertical Differentiation

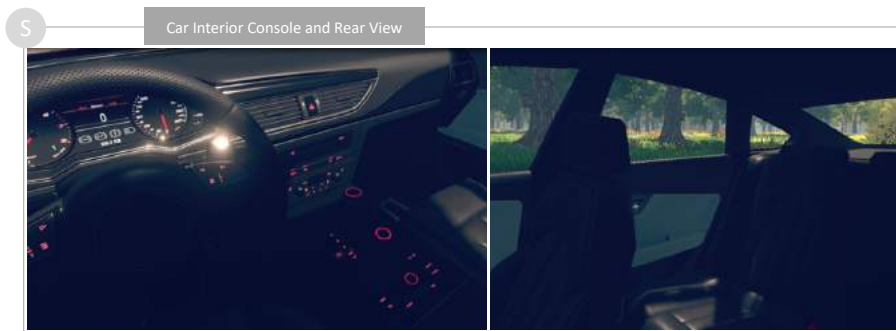
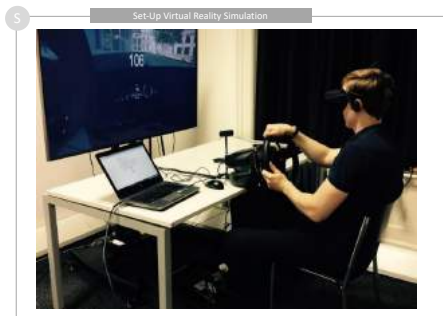
**Coffee Machine as Standard and Premium Model**

The manufacturer offers two coffee machines: a standard version for \$100 and a superior version with premium features for \$175.

- The manufacturer builds the standard machine for 100% first.
- Then, he additionally installs the premium features to produce the superior version (\$175).
- Therefore, only the superior version is equipped with these premium features.
- The manufacturer is not selling upgrades. Customers can choose between the two machines based on their preferences and willingness to pay.



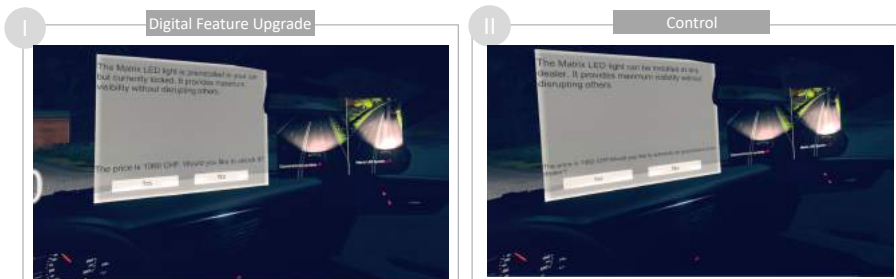
## SECTION B: STIMULI STUDY 2- CONSUMERS' RESPONSES TO DIGITAL FEATURE UPGRADES IN VIRTUAL REALITY



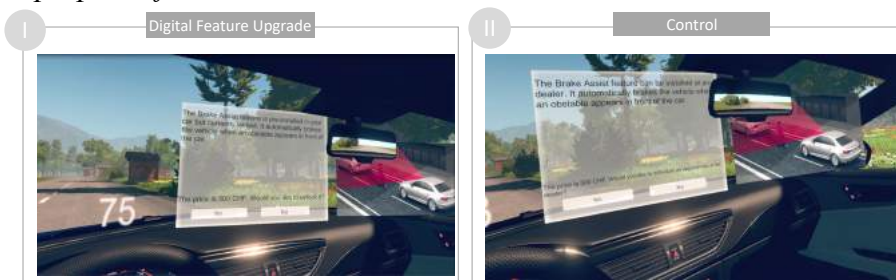
### Pop-up Notification Park Assist Feature



### Pop-up Notification Night Vision Feature



### Pop-up Notification Break Assist Feature



## SECTION C: STIMULI STUDY 5 – MODERATION BY BENEVOLENT MOTIVE

### Manipulation Saliency of Benevolent Motive

**I Benevolent Motive Article**

Please read

### Trending News

30 NOV 2020

#### Car Manufacturers Seek to Ease Buyers' Remorse

By ANDREW JAMES

Sometimes you might strongly regret your purchase decision. Suppose, you have bought a new car, and because it was already expensive, re-examined on the extra charge for the seats with massage function. Each lengthy ride raising your back to hurt reminds you of the forgone function. Oh, imagine you bought an expensive driving assistance feature that you thought would come in handy, but you actually never use it and now regret the expense.

Precisely for such cases, car manufacturers have developed a flexible solution that allows customers to avoid regretful purchase decisions. "We listened to our customers and learned that deciding about all the features when buying a car can be overwhelming," said an engineer of a well-known car manufacturer.

"Our objective was clear: we wanted customers to be able to purchase extra features after the purchase, once they are certain. Imagine we take the risk and provide every car with a fully equipped seat (e.g., including heating, massage etc.) that can be upgraded on the go. Our customers would not need to decide on individual features when buying the car, they could simply activate individual features and pay for them as needed." By delaying the purchase decision for the customer, the manufacturer can significantly ease buyer's remorse and give customers peace of mind when buying a car.

"Customers don't always know whether they need a certain feature right away. It is relevant for them to know that these features are built-in and available as an upgrade once they need it."

**II Neutral Article**

Please read

### Trending News

30 NOV 2020

#### The New Super Grain

By ANDREW JAMES

When Laura L., an avid runner from Boston, found out after a routine blood test that she was iron-deficient, she turned to the kitchen instead of the medicine cabinet. She started eating left.

A grain the size of a penny seed that hails from Ethiopia, left is naturally high in minerals and protein. Laura L. started baking with it, cooking with it, and using it to make left cereal with coconut oil. Now she keeps it so much that she doesn't run a race without it. "Left is like a runner's super food," she said. "It's great as a pre-run meal. It's high in iron and it's a whole grain so it provides a slow release of energy, which is exactly what I need."

Left has long been a dietary staple for Ethiopia's legendary distance runners, like the Olympic gold medalist and world record holder Haile Gebrselassie, who called left a secret to the success of Ethiopian runners. But now left is becoming a go-to grain for a growing number of Americans.

Endurance athletes like the grain because it's naturally high in iron. People who use it tolerate gluten as well as an alternative to wheat.

Scientists have been intrigued by left for a while. It has more calcium and vitamin C than almost any other grain. It is high in protein and iron, and much of the fiber is a type known as resistant starch, which has been linked in studies to health benefits such as improved blood sugar.

## Scenario and Feature Descriptions

**I Digital Feature Upgrade**

**Scenario Intro**

Please take a moment to imagine the following situation:

You have purchased a new car.

This vehicle offers you a novel way to buy additional features, namely, to upgrade features whenever needed, over the car's entire lifetime. All features have been preinstalled and can be unlocked at any point of time.

Your car is equipped with a conventional light system, yet, you can unlock a more advanced light system, the Matrix LED light. The Matrix lights are already installed in your car; you only have to activate it by paying.

Please note: The manufacturer's additional investment to pre-install these features has not been charged to your vehicle's initial purchase price.

On the next page, you will see a description of the Matrix LED system.

Please click **continue** to proceed.

**II Control**

**Scenario Intro**

Please take a moment to imagine the following situation:

You have purchased a new car.

Your car is equipped with a conventional light system, yet, a more advanced light system, the Matrix LED light, exists. You are currently at the service appointment. If you wish to, you can have the Matrix LED light installed by the service team.

On the next page, you will see a description of the Matrix LED system.

Please click **continue** to proceed.

**I Digital Feature Upgrade**

**Scenario**

The following Matrix LED feature is preinstalled in your car so that you can activate it as an upgrade when you are certain you need it.

The Matrix LED front lights support you on your daily drive on poorly-lit and foggy highways. It is capable of establishing and tracking multiple road users and illuminating the appropriate corridors of light either side of them to maintain maximum visibility of the road and surrounding environment without causing disruption to others. Whilst high beam is in use, and oncoming traffic is detected, the Matrix LED dips or fully extinguishes individual lighting diodes.



Purchase to unlock.

**II Control**

**scenario**

The following Matrix LED feature is available and can be installed by the service team during the service appointment if you are certain you need it.

The Matrix LED front lights support you on your daily drive on poorly-lit and foggy highways. It is capable of establishing and tracking multiple road users and illuminating the appropriate corridors of light either side of them to maintain maximum visibility of the road and surrounding environment without causing disruption to others. Whilst high beam is in use, and oncoming traffic is detected, the Matrix LED dips or fully extinguishes individual lighting diodes.



Available to built-in

## SECTION D: STIMULI STUDY 6 – MODERATION BY ACCESS MONETIZATION

### Scenario and Feature Descriptions

I

Digital Upgrade x Monetized

**Scenario Intro**

Please take a moment to imagine the following situation:

You have purchased a new coffee machine some time ago for USD 950. This coffee machine is a smart machine. It is Wi-Fi connected, can be accessed via a smartphone app and has a digital display.



This coffee machine offers you a novel way to upgrade to additional features. Specifically, the manufacturer has physically pre-installed additional features that you can unlock (in exchange for monetary payment) and that you can do so when you feel like you need it.

For example, you can unlock the barista feature.

You can digitally activate the pre-installed barista feature by paying the price of USD 60.

II

Physical Upgrade x Monetized

**Scenario Intro**

Please take a moment to imagine the following situation:

You have purchased a new coffee machine some time ago for USD 950. This coffee machine is a smart machine. It is Wi-Fi connected, can be accessed via a smartphone app and has a digital display.



The manufacturer of your coffee machine offers you a novel way to upgrade to additional features by adding feature plug-ins (in exchange for monetary payment). You can order these plug-ins for a charge through the manufacturer's webshop and plug in the feature easily yourself.

For example, you can order the barista feature plug-in for USD 60.

On the next page, you will see a description of the barista feature plug-in.

Please click **continue** to proceed.

Digital Upgrade x Free

**Scenario Intro**

Please take a moment to imagine the following situation:

You have purchased a new coffee machine some time ago for USD 950. This coffee machine is a smart machine. It is Wi-Fi connected, can be accessed via a smartphone app and has a digital display.



This coffee machine offers you a novel way to upgrade to additional features. Specifically, the manufacturer has physically pre-installed additional features that you can unlock for free and that you can do so when you feel like you need it.

You can digitally activate the pre-installed barista feature without being charged, thus for free.

The barista feature has a retail value of USD 60.

On the next page, you will see a description of the barista feature.

Physical Upgrade x Free

**Scenario Intro**

Please take a moment to imagine the following situation:

You have purchased a new coffee machine some time ago for USD 950. This coffee machine is a smart machine. It is Wi-Fi connected, can be accessed via a smartphone app and has a digital display.



The manufacturer of your coffee machine offers you a novel way to upgrade to additional features through adding feature plug-ins (for free). You can order these plug-ins free of charge through the manufacturer's webshop and plug in the feature easily yourself.

For example, you can order the barista feature plug-in without being charged, thus for free.

The barista feature has a retail value of USD 60.

On the next page, you will see a description of the barista feature plug-in.

Digital Upgrade x Monetized

**Barista Feature**

The following Barista feature is pre-installed in your coffee machine and allows you to upgrade your machine by digitally unlocking it (in exchange for paying the price of USD 60).

The Barista feature:

- allows you to control and customize the coffee brewing settings including the altitude, pre-soak time and temperature
- saves your favorites under your personal profile (up to 5 profiles can be programmed)
- has a programmable timer so you can have your coffee and the number of cups ready anytime you want



Physical Upgrade x Monetized

**Barista Feature**

The following Barista feature plug-in can be ordered through the webshop of the manufacturer for paying the price of USD 60. It allows you to upgrade your machine.

The Barista feature:

- allows you to control and customize the coffee brewing settings including the altitude, pre-soak time and temperature
- saves your favorites under your personal profile (up to 5 profiles can be programmed)
- has a programmable timer so you can have your coffee and the number of cups ready anytime you want



Digital Upgrade x Free

**Barista Feature**

The following Barista feature is pre-installed in your coffee machine and allows you to upgrade your machine by digitally unlocking it (free of charge).

The Barista feature:

- allows you to control and customize the coffee brewing settings including the altitude, pre-soak time and temperature
- saves your favorites under your personal profile (up to 5 profiles can be programmed)
- has a programmable timer so you can have your coffee and the number of cups ready anytime you want



Physical Upgrade x Free

**Barista Feature**

The following Barista feature plug-in can be ordered through the webshop of the manufacturer free of charge. It allows you to upgrade your machine.

The Barista feature:

- allows you to control and customize the coffee brewing settings including the altitude, pre-soak time and temperature
- saves your favorites under your personal profile (up to 5 profiles can be programmed)
- has a programmable timer so you can have your coffee and the number of cups ready anytime you want



## **Article II**

# **Downgrading the Upgrade: How Digitizing Feature Upgrades for Physical Products Undermines Their Value.**

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## Abstract

Digital feature upgrades for physical products promise greater consumer benefit because they digitally provide immediate access to additional product features—at the simple push of a button. It is logical to assume that this novel and simple way to add features for physical products should provide value for consumers. But as physical products become increasingly digitized, manual installation processes and craftsmanship are being replaced by over-the-air updates and thus become less tangible and salient for consumers. To date, little is known about how consumers perceive such upgrades, and whether they would be willing to buy features for physical products through a digital process. To advance the currently limited knowledge of consumers' responses to the innovative practice, this article examines consumers' value perceptions and acceptance of features provided through a digital (vs. physical) upgrade process.

This research proposes that consumers are less willing to buy digital feature upgrades, as compared to physical feature upgrades, because of their intangible format. The lack of physical quality cues of the digital upgrade process prompts consumers to perceive the value of digitally-received features to be lower than the value of physically-received features. As a result, they are less willing to buy the upgrade. Five studies in the automotive and home appliance contexts provide evidence for this theorizing. Study 1 shows the proposed negative main effect of the digital upgrade process on consumers' willingness to buy, while study 2 provides evidence for the theorized mediating role of perceived value. Furthermore, studies 3 – 5 examine two theory-driven moderators: transparency of the firm's production efforts and transparency of the installation process. The findings provide important actionable insights for firms on how to mitigate the negative effect of digital feature upgrades. The research concludes with theoretical and managerial implications.

*Keywords:* Digital feature upgrades, digital upgrade process, perceived value, transparency, tangibility

## Introduction

New technologies and consumer expectations are fueling on-demand business models in diverse industries (Dahlström and Edelman 2013). Whether it is shopping on Amazon or renting a movie from iTunes, consumers are accustomed to receiving products or services at the push of a button—at almost any time and from almost anywhere (Fromm 2019). Only recently, new technologies have enabled digital on-demand services for physical products. Firms can connect their physical products to the internet and access and adapt them remotely (Ng and Wakenshaw 2017; Yoo, Bolland, Lyytinen, and Majchrzak 2012). This offers firms the opportunity to expand the products' functionalities digitally, and to sell these additional functionalities through a digital process as digital feature upgrades. For example, car owners can purchase features (e.g., additional battery capacity, driving assistance systems) directly through their cars, at any time, and for the lifetime of the car. The digital upgrade is enabled through over-the-air (OTA) software updates, which activate pre-installed hardware features or install software-based features remotely (Wucher and Kayser 2019).

Digital feature upgrades are a very recent practice, and are just beginning to evolve in the market (Stüber 2017). While practitioner research provides insights into the technological and legal requirements necessary for their successful launch (Wucher and Kayser 2019; Plaß et al. 2020), there is limited knowledge and research about consumers' responses that could inform firms' sales forecasts and implementation strategies. Importantly, firms need to consider that digital feature upgrades introduce a novel purchase experience that many consumers have yet to learn (Rumpelt 2017). By replacing previously manual processes with technology, digital feature upgrades significantly change the purchase and after-sales experience of physical products. This raises a crucial question: What is the impact on consumers' value perceptions when product upgrades previously performed manually by firms are now quickly and simply delivered “over the air”?

Research suggests that the digital upgrade experience (i.e., the upgrade process) may significantly impact consumers value perceptions of the feature—given that consumers value the purchase experience as much as they value the final product (Parasuraman et al. 1985). Particularly in on-demand interactions, the consumer experience plays a significant role and drives two-thirds of the purchase decision (Dahlström and Edelman

2013). Therefore, it is imperative for managers to understand the psychological implications of digitizing an upgrade process. Doing so will allow firms to anticipate consumers' value perceptions of digital feature upgrades, and the consequences of these perceptions on purchase intentions, in order to design their upgrade process accordingly.

This research addresses the current lack of knowledge about consumer responses to this novel phenomenon. It examines how the digital upgrade process impacts consumers value perceptions compared to the more traditional process of providing features physically. The findings show that consumers associate digitally-received features with lower value than physically-received features and are thus less willing to buy them. Five experiments demonstrate this value-decreasing effect across two different product categories—automotive and home appliances. Notably, this research also examines two theory-driven moderators: production transparency and delivery transparency. The insights about these moderators suggest mechanisms by which firms can mitigate the potential value-decreasing effect of the digital upgrade process. That is, consumers will be better able to intuit the feature's value and be more willing to purchase the upgrade if firms make their production efforts more accessible (i.e., through production transparency) and their upgrade process more tangible (i.e., through delivery transparency).

This research contributes to the literature on digital products (Atasoy and Morewedge 2018; Giles, Pietrzykowski, and Clark 2007; Petrelli and Whittaker 2010) and technology-intermediated services (Buell and Norton 2011; Dabholkar and Bagozzi 2002; Meuter, Ostrom, Roundtree, and Bitner 2000). While these research streams have examined related and relevant phenomena (i.e., digital vs. physical products, and digital vs. manual services), none of these prior studies has focused on the unique combination of a physical base product and a digital upgrade process.

## **Theoretical Background**

Over the last decade, technology has enabled companies to increasingly digitize their products and services. Physical products are now widely available in digital format (e.g., e-Books, digital photographs, movies, music; Atasoy and Morewedge 2017), while physical services are often complemented through digital counterparts. That is, firms

offer physical services through direct employee contact, as well as digital services through self-service technologies (Meuter et al. 2000). For example, consumers can take advantage of a wide range of digital services online (or through apps), such as banking, travel bookings, brokerage services, or parcel tracking. In the offline context, firms provide digital services through self-scanning terminals in supermarkets, information kiosks at airports or train stations, self-checkout counters at hotels, and automated teller machines (ATMs) for banking (Curran and Meuter 2005; Dabholkar and Bagozzi 2002).

Given their unique nature, products or services in digital format would be expected to significantly enhance consumer welfare. For example, digital products can be used immediately, stored easily, and (given that they are stored in a device) accessed anytime or anywhere. Digital processes can deliver services more quickly, conveniently, and time independently than services that require physical interaction with firm employees (Meuter et al. 2000; Dabholkar and Bagozzi 2002).

Despite these advantages, prior research has found that consumers seem to prefer physical goods to digital goods. Atasoy and Morewedge (2018) demonstrate that consumers are less willing to pay for digital products than for their physical counterparts. This preference is driven by the materiality of physical products and by the reality that consumers cannot exert as much control over digital products (e.g., e-books) as they can over physical products (e.g., hardcover books). Consequently, they develop less psychological ownership and thus value digital products less. Other research has shown that consumers prefer physical products because they perceive digital products to be less stable, less durable (Petrelli and Whittaker 2010), and less tangible (Belk 2013; Siddiqui, May, and Monga 2016). On the other hand, research also argues that consumers can form attachments to digital products similar to the attachments they form to physical products (Lehdonvirta 2012). Even more, consumers who seek flexibility or detachment from products may actually prefer digital over physical products (Bardhi, Eckhardt, and Arnould 2012).

In terms of digital services, research on self-service technologies (e.g., ATMs, self-scanning terminals, travel booking platforms) has revealed that technology can promote consumer acceptance, but also undermine the value of the services provided. That is, services that arrive too fast or too easily can be perceived as being less valuable (Buell and Norton 2011). Consumers may also value personal service encounters more than

technology-intermediated services, because consumers prefer the social experience and interacting with employees than with technology (Zeithaml and Gilly 1987; Dabholkar and Bagozzi 2002). On the other hand, studies find that consumers may favor technology-based services over employee-based services because technology is easier to use and can be used independently (Dabholkar 1996; Meuter, Ostrom Roundtree, and Bitner 2000; Dabholkar and Bagozzi 2002). Moreover, technology-based services save time (Meuter and Bitner 1998) and can be located more conveniently (Kauffman and Lally 1994). Finally, consumers may be fascinated by the technology itself and thus enjoy using it (Meuter et al. 2000).

In sum, prior work has examined how consumers value and show a preference for a physical (vs. digital) product format, and has investigated consumers' preferences for technology- vs. employee-intermediated transactional services. However, no research has yet examined how consumers value a digital upgrade process for physical products, and thus a combination of digital and physical product and service elements. This is a particularly interesting combination for a number of reasons. First, it introduces a new value proposition for physical products. Previously, physical products were static and could only be adjusted manually—if at all. Secondly, this combination introduces a contrast, or incongruence, of digitally extending a physical product. Consumers are accustomed to upgrading physical products physically (e.g., through the manual installation of components) and to upgrading digital products digitally (e.g., through paid apps or in-app purchases). Upgrading physical products digitally introduces a novel incongruence between products and upgrade formats that consumers have yet to come to terms with.

## **How a Digital Upgrade Process Affects Consumers' Purchase Willingness**

The current research focuses on how a digital (vs. physical) upgrade process impacts consumers' perceived value and purchase intentions. Digital feature upgrades seek to provide added value to consumers by ensuring a fast, efficient, and readily accessible upgrade process. Yet, this research proposes that this upgrade format undermines

consumers' perceived value of the received feature, and thus decreases consumers' willingness to purchase the upgrade.

## **Perceived Value of Digital Products and Processes**

Perceived value is an important factor determining consumers' purchase intentions and is defined as consumers' assessment of the value received in an exchange (Zeithaml 1988). Notably, consumers may have difficulties correctly assessing the value of a product or service. They may not always intuit the underlying firm efforts necessary to produce a product or service (Parasuraman, Zeithaml, and Berry 1985). The difficulty to assess a product's value is particularly relevant in situations where a firm's efforts are less tangible for consumers because they cannot observe them (e.g., when services or products are digital).

When evaluating the value of a product or service, consumers may be subject to cognitive biases and include irrelevant information in their assessments (Chinander and Schweitzer 2003). They may rely on heuristics such as the effort of the manufacturer (*effort heuristic*, Kruger et al. 2004), the cost of the production (Chinander and Schweitzer 2003), or the duration of the production process (*duration heuristic*, Yeung and Soman 2011). For example, Kruger et al. (2004) find that consumers perceived objects as more valuable and of higher quality when their production required more time and effort. Moreover, participants relied on this heuristic more often when the study setting made assessing the object's value more difficult. Relatedly, Chinander and Schweitzer (2003) demonstrate that participants evaluated a product's quality higher when it was more expensive to produce, while Yeung and Soman (2011) reveal that consumers evaluated long-duration (vs. short-duration) services as more valuable. While consumers may be aware that the duration itself cannot account for the value being created, they may still belief in a positive relation between a product's value and the necessary effort or duration to produce it (Chinander and Schweitzer 2003). This misuse of effort or duration as a proxy for value may lead to distorted value judgements.

One specificity of digital products is that their development and distribution efforts are substantially different. That is, digital products (e.g., software) are often complex, lengthy, and expensive to produce, but can be replicated and distributed (e.g.,

downloaded) quickly, effortlessly and at low cost (Shapiro and Varian 1998). Moreover, the digital distribution lacks physical elements or tangible quality cues that could help consumers intuit the firm's underlying efforts (Hoffmann and Bateson 2001). Decades of research on knowledge activation have shown that consumers automatically attend to the most salient information, and pay less attention to alternative, less accessible information (Bargh 1997; Higgins 1996; Wyer 2004, 2008). Thus, consumers are often influenced by ostensibly trivial, but highly salient information (Taylor and Fiske 1978; Higgins 1996). When consumers judge the value of a digital product or service, they may attend more to the accessible distribution efforts, and less to the complex and expensive development efforts upfront. They may underestimate the firm's overall efforts and, as a result, perceive the product's value to be lower (Cheng and Qiu 2018).

Building on this body of research, the current research proposes that consumers may find it more difficult to assess the value of features received through a digital upgrade process than assessing the value of features received through a physical process. First, while the physical upgrade process involves the installation of features during the upgrade, the digital upgrade process involves pre-installation of features during manufacturing, and thus prior and unrelated to the upgrade. The firm's physical efforts (i.e., pre-installing features) to facilitate the digital upgrade process are thus less accessible for consumers. Secondly, the purchase interaction with the manufacturer becomes entirely digital. This digital process may prevent consumers from considering the firm's initial efforts, because there are no physical elements or tangible cues that could make these efforts accessible. Instead, digitally activating the feature or installing the feature's software becomes the more prominent firm effort observable to consumers. When assessing the upgrade feature's value, consumers may rely on heuristics such as duration (Yeung and Soman 2011), perceived effort (Kruger et al. 2004), or activation costs (Chinander and Schweitzer 2003). The digital upgrade process, which provides features rapidly and with minimal effort, could thus unintentionally undermine the feature's value (Buell and Norton 2011).

In sum, the current research assumes that consumers associate the digital upgrade process with lower effort than the physical upgrade process, even though both upgrade processes involve physical installation at some point. As a result, they associate the

digitally-received feature with lower value and should be less willing to buy the upgrade (Zeithaml 1988). Formally stated:

**H1:** A digital (vs. physical) upgrade process will reduce consumers' willingness to buy the upgrade.

**H2:** The negative effect of a digital (vs. physical) upgrade process on consumers' willingness to buy will be mediated by perceived value of the feature.

## **Boundary Conditions**

The proposed framework allows for additional predictions about the conditions under which the negative effect of the digital upgrade process on consumers' willingness to buy should or should not emerge. Whenever a delivery process is unobservable to consumers, they may not be able to intuit its underlying work (Parasuraman et al. 1985). In this respect, various studies show that making a manufacturer's work more visible, or increasing consumers' understanding of the manufacturer's effort, time, or expenses, can generate positive consumer reactions (Buell, Kim, and Tsay 2017; Modig, Dahlén, and Colliander 2014; Söderlund et al. 2017; Söderlund and Sagfossen 2017) and enhance perceptions of output quality (Chinander and Schweitzer 2003, Kruger et al. 2004).

For example, Buell and Norton (2011) find that operational transparency (i.e., making a website's hidden work more salient) and the signaling of efforts (i.e., creating the illusion of labor) can increase consumers' value perceptions of automated services. Their study found that participants preferred a website that needed more time to return results (vs. a website that returned results instantaneously), but only if the slower website provided operational transparency. Research by Mohan, Buell, and John (2014) found that transparency about the production and costs of a wallet increased its sales by 26%. Buell, Kim, and Tsay (2017) find that process transparency (i.e., making the efforts transparent during the service process) increases perceived company effort. As a result, participants were more appreciative of the work and valued the service more. Söderlund et al. (2017) demonstrate that high-effort (vs. low-effort) signaling packaging increases consumers' perceptions about product quality, and thus overall product evaluations.

Given these findings, the current research predicts that consumers should perceive greater value if the manufacturer's efforts behind a digital upgrade process are made more accessible. Manufacturers can make their efforts involved in producing digital feature upgrades more accessible by providing *production transparency* (i.e., insights into their operations for product development and production). Providing production transparency can make the firm's underlying development and production efforts more salient and, as a result, can increase consumers' value perceptions of the feature and willingness to buy the upgrade. Formally stated:

**H3:** The negative effect of a digital (vs. physical) upgrade process on consumers' willingness to buy will be attenuated when production transparency makes prior firm efforts (i.e., to produce and install the feature) salient (vs. non-salient).

In addition to directly providing production transparency, firms could also use an external information source or agent to make their efforts salient. In fact, consumers may be suspicious about whether the employed transparency measures are trustworthy and credible, reflecting actual efforts. Moreover, research has revealed that consumers can respond negatively to self-promotion by firms (Wortman and Linsenmeier 1977) and that self-promotion can be less effective if it is perceived as being boastful (Wosinska, Dabul, Whetsone-Dion, and Cialdini 1996). An intermediating agent can solve this self-promotion dilemma (Pfeffer, Fong, Cialdini, and Portnoy 2006) and can thus be superior to presenting this information directly (Jones and Wortman 1973). That is, consumers perceive an agent as having more objectivity, so that statements about the firm's efforts are felt to have greater credibility. Moreover, credible information sources have been shown to be more influential (Freeman 1957). For example, research by Inman, McDonald, and Ruch (2004) found that participants liked a person more when they read a description of that person set in third-person point of view than they did when reading the same description set in first-person point of view. Given these findings, the current research predicts that, when presented by an external agent, information about a firm's development and production efforts will increase consumers' value perceptions and their willingness to buy the upgrade. Formally stated:

- H4:** The negative effect of a digital (vs. physical) upgrade process on consumers' willingness to buy will be attenuated when an external agent makes prior firm efforts salient (vs. non-salient).

In addition to providing insights into prior production efforts, firms can also focus on increasing the process tangibility. By providing delivery transparency (i.e. making the underlying installation steps transparent during the upgrade process), firms can make the digital upgrade process more tangible and help consumers intuit its underlying efforts. For example, Buell, Kim, and Tsay (2017) find that service process transparency (i.e. making service steps transparent to consumers) increases perceived company efforts. Participants in their study valued the service more when they could observe the process. These findings suggest that consumers should perceive greater value if the digital upgrade process makes the manufacturer's underlying efforts more accessible. Thus, delivery transparency should make the upgrade process and the underlying work more tangible. Consumers should, therefore, perceive higher value for the feature and should be more willing to buy the upgrade. Formally stated:

- H5:** The negative effect of a digital (vs. physical) upgrade process on consumers' willingness to buy will be attenuated when installation efforts are made salient (vs. non-salient) through delivery transparency.

## Overview of Studies

The following five studies provide evidence for the value-decreasing potential of digital feature upgrades. Study 1 provides initial evidence for the negative main effect of the digital upgrade process on consumers' willingness to buy. Moreover, it reveals that consumers associate the digital upgrade process with less manufacturer effort. Study 2 replicates this effect while controlling for pre-installment and locus of the upgrade (i.e., the consumer performs the upgrade). Importantly, Study 2 shows that the negative effect of the digital upgrade process on consumers' willingness to buy is mediated by the perceived value of the feature. Study 3 and 4 test the moderating role of production

transparency on the negative effect of the digital upgrade process on consumers' willingness to buy. Finally, Study 5 addresses the lack of tangible quality cues of the digital upgrade process by testing whether transparency about the underlying installation efforts mitigate the negative effect on consumers' willingness to buy.

## **Study 1: How the Digital Upgrade Process Impacts Consumers' Willingness to Buy**

Using an automotive context, the purpose of Study 1 was to provide initial insights into the main effect of a digital (vs. physical) upgrade process on consumers' willingness to buy (H1). This context is particularly relevant because the automotive industry is the first industry to widely introduce digital feature upgrades. A second objective of the study was to explore whether participants perceive the manufacturer's effort and costs to provide digital feature upgrades to be lower than those of physical feature upgrades.

### **Method**

The study used 126 Amazon Mechanical Turk (MTurk) workers ( $M_{\text{Age}} = 36.20$ ,  $SD = 12.04$ , 39 % females), who completed this six-minute scenario-based experiment for a compensation of 55 cents. The study used a car as the physical base product, and an advanced light as the focal upgrade feature.

Participants were randomly assigned to one of the two experimental conditions of a single factor between-subjects design (*digital vs. physical upgrade process*). The participants were asked to imagine that they had purchased a car and that the manufacturer of this car offers additional feature upgrades over the car's entire lifetime. Participants in the *digital upgrade process* condition learned that this upgrade could be received digitally because the car already had the necessary hardware pre-installed. Participants in the *physical upgrade process* condition learned that they could have the car upgraded manually at the dealer. Next, they were given written information about the available feature (an LED headlight with automatic dimming function), which indicated that the feature was available to them either digitally or physically (see Appendix A).

Participants were then redirected to a short survey where they were asked to indicate their willingness to buy, using a single item (“My willingness to buy the upgrade...”, adapted from Dodds, Monroe, and Grewal 1991) on a seven-point Likert scale (1 = “very low” to 7 = “very high”). On the next page of the survey, they estimated the manufacturer's level of effort on a single item (“The manufacturer’s effort to provide the feature through this upgrade process seems...” with 1 = “very low” to 7 = “very high”, adapted from Palmatier et al. 2009). Then, participants responded to questions about their study participation, such as their motivation to participate, the time used to answer the survey questions, and their feeling of being in a realistic scenario. Responses were in the form of seven-point Likert scales (1 = “not at all” to 7 = “full agreement”). These final measures served as control variables across all studies. As a final step, participants reported their age and gender.

## Results

*Purchase willingness.* As predicted, an independent sample t-test reveals that participants were significantly less willing to buy the feature through a digital upgrade process ( $M_{\text{Digital}} = 3.77$ ,  $SD = 2.27$ ) compared to when it was offered through a physical upgrade process ( $M_{\text{Physical}} = 4.78$ ,  $SD = 1.97$ ;  $t(124) = -2.65$ ,  $p = .009$ ).

*Manufacturer’s level of effort.* Participants also perceived the manufacturer’s efforts and costs to be significantly lower for the digital upgrade process ( $M_{\text{Digital}} = 4.43$ ,  $SD = 1.68$ ) compared to those needed for the physical upgrade process ( $M_{\text{Physical}} = 4.97$ ,  $SD = 1.34$ ;  $t(124) = -2.06$ ,  $p = .041$ ).

## Discussion

Study 1 provides initial support for H1. Participants were significantly less willing to buy a feature when it was offered through a digital upgrade process, compared to when it was offered through a physical upgrade process. Participant responses also support the expectation that consumers associate the digital upgrade process with less effort on the manufacturer's part. Objectively, the effort of the manufacturer is the same in both upgrade formats—except that the installation occurs at different times (i.e., during the manufacturing process (digital feature upgrade) vs. at the time of the upgrade (physical feature upgrade)). The difference in participants' perceptions about the manufacturer's effort suggests that they recognize primarily the more accessible firm effort to deliver

the upgrade (i.e., activation in the digital feature upgrade vs. physical installation in the physical upgrade), but less so prior efforts necessary to develop and produce the digital feature upgrade.

Given that companies use hardware-based features for digital feature upgrades (Janke 2019), Study 1 focused on a hardware-based (i.e., physical) product feature. Consumer responses to hardware-based features are particularly important to understand because they require pre-installation and thus bear a higher economic risk for firms. Study 2 examines the effect of digital vs. physical feature upgrades for a software-based product feature. Software-based features have the advantage that they can be installed through the upgrade process directly, which lowers their financial risk for firms.

## **Study 2: The Mediating Role of Perceived Value**

The objective of Study 2 was to examine the hypothesized psychological process via perceived value of the feature (H2). Therefore, Study 2 measures perceived value and examines whether these value perceptions mediate the negative effect of the digital upgrade process on consumers' willingness to buy. Furthermore, the study extends Study 1 by using a new product category (home appliances), and by testing a software-based feature that can be installed directly through the upgrade (i.e. ruling out the influence of pre-installment). The software-based feature allows consumers to perform the upgrade in both, the digital and physical upgrade condition, themselves. Keeping the time of installation and the locus of the upgrade (i.e., through the consumer) constant isolates the effect of the upgrade format to ensure that the digital upgrade process indeed drives the lower perceived value and purchase intentions.

### **Method**

The study used 117 MTurk Workers ( $M_{\text{Age}} = 40.45$ ,  $SD = 13.77$ , 63% females), who completed this seven-minute scenario-based experiment for a compensation of 60 cents. This study used a wash-dryer machine as the physical base product, and an intelligent drying function as the focal upgrade feature.

Participants were randomly assigned to one of the two experimental conditions (upgrade process: *digital* vs. *physical*) of a single factor between-subjects design. Analogous to

Study 1, participants imagined first that they had purchased a new physical product, a wash-dryer, and that the manufacturer of this machine offers the ability to purchase additional features over the product's entire lifetime. Subjects in the *digital upgrade process* condition were told that these features could be installed via a digital process (i.e., by purchasing and downloading the feature via the manufacturer's app). Participants in the *physical upgrade process* condition were told that the feature could be installed by ordering a physical plug-in (a physical component that is easily attached to the machine) through the manufacturer's app. Then, they read about an intelligent drying feature (the i-Dry), and that this was available to them digitally vs. physically for 65 USD (see Appendix Section B).

Participants responded to the same willingness-to-buy measure as in Study 1. In addition, they responded to a perceived value measure, using three items (sample item “*If I bought this feature, I feel I would be getting my money's worth*”, adapted from Grewal, Monroe, and Krishnan 1998,  $\alpha = .96$ ). Then, they indicated on a bi-polar scale whether they perceived the upgrade to be 1 = “expensive” or 7 = “cost-effective” for the manufacturer. Finally, participants responded to the same participation-related control measures as in Study 1, and reported their age and gender.

## Results

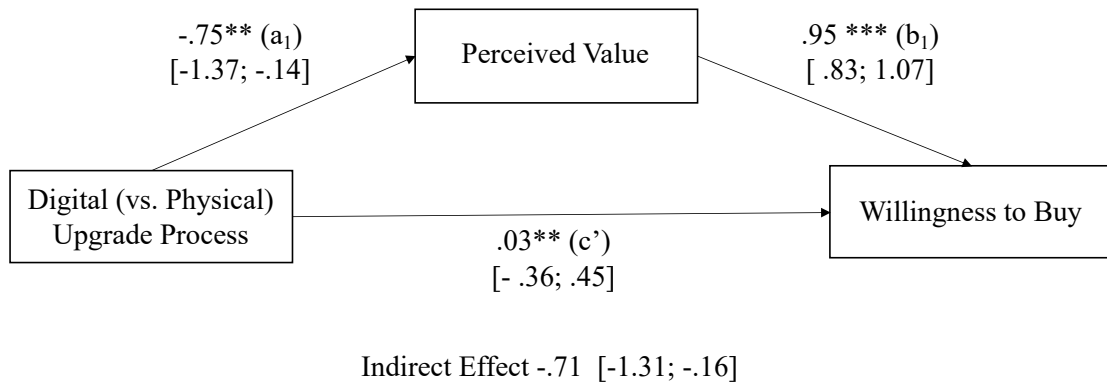
*Willingness to buy.* Consistent with Study 1, the findings reveal that participants were marginally less willing to buy the feature through the digital upgrade process ( $M_{\text{Digital}} = 3.54$ ,  $SD = 1.94$ ) than through the physical upgrade process ( $M_{\text{Physical}} = 4.17$ ,  $SD = 1.95$ ;  $t(115) = -1.88$ ,  $p = .06$ ).

*Perceived value and cost of the upgrade.* Participants also perceived the digitally-received feature to be significantly less valuable ( $M_{\text{Digital}} = 3.77$ ,  $SD = 1.60$ ) than the physically-received feature ( $M_{\text{Physical}} = 4.50$ ,  $SD = 1.72$ ;  $t(115) = -2.40$ ,  $p = .02$ ). They also perceived the digital feature upgrade to be significantly less expensive to produce ( $M_{\text{Digital}} = 2.56$ ,  $SD = 1.15$ ;  $M_{\text{Physical}} = 3.07$ ,  $SD = 1.12$ ;  $t(115) = -2.48$ ,  $p = .02$ ).

*Mediation analysis.* A Mediation analysis was conducted, contrasting the physical upgrade process condition (0) with the digital upgrade process condition (1; Preacher, Rucker and Hayes 2007; Process Macro Model 4,  $N_{\text{bootstrap\_simulations}} = 10,000$ ). Upgrade process was used as the independent variable, perceived value as the mediator, and

willingness to buy as the dependent variable. As shown in Figure 1., results reveal that the negative effect of the digital upgrade process on consumers' willingness to buy is completely mediated by the perceived value of the upgrade ( $b_{\text{Indirect}} = -.71$ , CI 95% [-1.31, -.16];  $b_{\text{Direct}} = .03$ , CI 95% [-.37, .44]).

**Figure 1.** Mediation Effect of the Digital Upgrade Process on Consumers' Willingness to Buy via Perceived Value



Note: \*\*\*  $p < .001$ , \*\*  $p < .01$ , \*  $p < .05$

## Discussion

Study 2 replicates the findings of Study 1 (H1), indicating that consumers are less willing to buy the feature through a digital upgrade process compared to a physical upgrade process. Furthermore, the study provides evidence for the psychological process underlying the effect of the digital (vs. physical) upgrade process on consumers' willingness to buy, supporting H2. More precisely, the digital upgrade process decreases the perceived value of the digitally-received feature, and this lower perceived value influences consumers' willingness to buy the upgrade. Consumers also associated the digital upgrade format with significantly lower production costs than the physical upgrade format. In this study, both upgrades were installed directly and by the consumer—which rules out pre-installation or the influence of a service-call as alternative explanations.

## **Studies 3 and 4: The Moderating Role of Production Transparency**

Studies 2 established that consumers perceive the digitally-received feature to be less valuable than the physically-received feature, and indicate that consumers might thus respond with a lower willingness to buy the upgrade. Study 1 and 2 also find that consumers perceive the firm's efforts and costs involved with the digital upgrade format to be significantly lower than those required for the physical upgrade format. Studies 3 and 4 build on these findings and examine mechanisms by which firms can mitigate the negative effect of the digital upgrade process on consumers' willingness to buy—specifically, transparency about the firm's underlying efforts.

### **Study 3: Moderation By Production Transparency Provided By The Firm**

Study 3 tests whether transparency about the feature's development and production (i.e., production transparency) moderates the effect of the digital upgrade process on consumers' willingness to buy (H3). Transparency about the firm's initial efforts should allow consumers to understand the upgrade's underlying work, and thus help consumers to appreciate the feature's value. As value perceptions increase, consumers are expected to be more willing to purchase the upgrade, indicating that transparency attenuates the negative effect of the digital upgrade process on consumers' willingness to buy.

#### **Methods**

Two-hundred thirty-seven MTurk workers ( $M_{\text{Age}} = 37.57$ ,  $SD = 11.46$ , 54% females) participated in this seven-minute scenario-based experiment for a compensation of 60 cents. Participants were randomly assigned to one of the four conditions of a 2 (upgrade process: *digital* vs. *physical*)  $\times$  2 (production transparency: *yes* vs. *no*) between-subjects design. The upgrade process was manipulated as in Study 2, while production transparency was manipulated as follows: Participants in the *production transparency* condition saw an additional "Behind the Scenes" page. This page illustrated the necessary efforts and investments required for the development and production of the upgrade (see Appendix Section C). Participants in the *no-production transparency* condition did not see this page. Then, all participants read about the i-Dry feature and

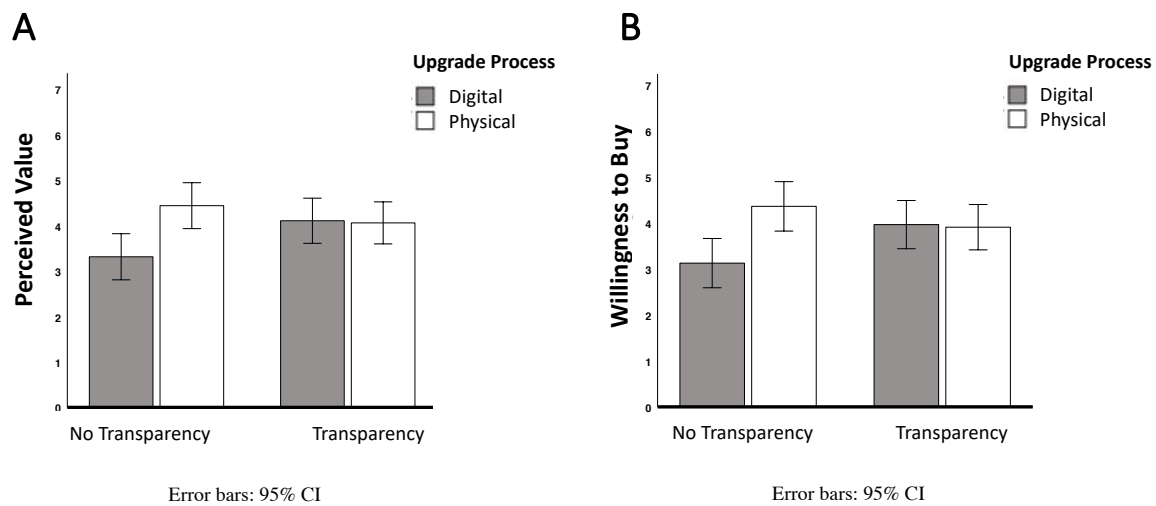
that this was available to them for 65 USD via a digital (vs. physical) upgrade process. As in the previous studies, participants responded to the measures for willingness to buy, perceived value ( $\alpha = .95$ ), and control measures, and as a last step indicated their age and gender.

## Results

*Willingness to buy.* A two-way ANOVA reveals a significant main effect of the upgrade process ( $F(1,233) = 4.92, p = .028$ ), such that participants displayed a significantly lower willingness to buy the feature when it was offered digitally ( $M_{\text{Digital}} = 3.66, SD = 2.22$ ) than when it was offered physically ( $M_{\text{Physical}} = 4.02, SD = 2.13$ ). The results revealed no main effect of production transparency ( $F(1,233) = .511, p = .48$ ), but a significant interaction between upgrade process and production transparency ( $F(1,233) = 5.92, p = .016$ ). In the *no-production transparency condition*, participants were significantly less willing to purchase the feature through the digital upgrade process ( $M_{\text{Digital\_no transparency}} = 3.20, SD = 2.19$ ) than through the physical upgrade process ( $M_{\text{Physical\_no transparency}} = 4.11, SD = 2.17; t(110) = -3.43, p < .001$ ). However, when *production transparency* was provided, there was no significant difference in consumers' willingness to buy as a function of the upgrade process ( $M_{\text{Digital\_transparency}} = 4.12; SD = 2.17; M_{\text{Physical\_transparency}} = 3.94, SD = 2.11; t(123) = -.20, p = .84$ ; see Figure 2.).

*Perceived value for money.* Results revealed a significant main effect of the upgrade process ( $F(1,233) = 4.58, p = .033$ ), such that consumers perceived the value of the digitally-received feature to be significantly lower ( $M_{\text{Digital}} = 3.85, SD = 2.14$ ) than the value of the physically-received feature ( $M_{\text{Physical}} = 4.12, SD = 1.97$ ). There was no main effect in terms of production transparency ( $F(1,233) = .67, p = .41$ ), but a significant interaction between upgrade process and production transparency ( $F(1,233) = 5.53, p = .019$ ). When there was *no-production transparency*, participants perceived the value of the digitally-received feature to be significantly lower ( $M_{\text{Digital\_no transparency}} = 3.38, SD = 2.12$ ;) than the value of the physically-received feature ( $M_{\text{Physical\_no transparency}} = 4.26, SD = 2.13; t(110) = 8.31, p = .005$ ). When *production transparency* was provided, there was no significant difference in consumers' perceived value of the feature as a function of the upgrade process ( $M_{\text{Digital\_transparency}} = 4.32; SD = 2.07; M_{\text{Physical\_transparency}} = 4.00, SD = 1.84; t(123) = -.240, p = .81$ ).

**Figure 2.** Production Transparency Moderates the Effect of the Digital Upgrade Process on Perceived Value (A) and Willingness to Buy (B)



*Moderated mediation analysis.* A moderated mediation analysis (Preacher, Rucker, and Hayes, 2007, Process Macro Model 7,  $N_{\text{bootstrap\_simulations}} = 10,000$ ), contrasting the physical upgrade process (0) to the digital upgrade process (1), was conducted using upgrade process as the independent variable, perceived value as the mediator, willingness to buy as the dependent variable and production transparency as the moderator. The index of moderated mediation was significant ( $B = 1.08$ , CI 95% [.22, 1.99]). In the *no-transparency condition*, there was a significant negative indirect effect via perceived value on willingness to buy ( $b_{\text{indirect effect\_no transparency}} = -.90$ , CI 95% [-1.55, -.25]). This effect does not occur in the *transparency condition* ( $b_{\text{indirect effect\_transparency}} = .18$ , CI 95% [-.41, .76]), suggesting that with production transparency given, perceived value did not mediate the effect of upgrade process on consumers' willingness to buy.

## Discussion

In support of H3, this study reveals an important moderator for the effect of the digital upgrade process on consumers' perceived value and purchase intentions: transparency about the firm's development and production efforts. When no transparency was provided, the effect of the digital upgrade process was consistent with the results of the previous studies, such that the digital upgrade process led to lower perceived value of the feature, and to a subsequently lower willingness to buy the upgrade. In contrast, when transparency was provided and consumers were exposed to the firm's efforts, this

effect was mitigated and the digital upgrade process no longer lowered consumers' value perceptions and their willingness to buy. These results provide important insights for firms regarding production transparency as a potential mechanisms for preventing the negative effect of the digital upgrade process. However, providing production transparency might not always be feasible for firms. One reason is that firms may not be able or willing to make their efforts transparent during the upgrade process. Another is that consumers may be suspicious about whether the employed transparency measures are trustworthy and credible—that they reflect actual efforts. Consumers may also perceive effort transparency to be self-promotion by the firm, and have a negative response. To prevent these negative inferences, firms may opt to communicate their efforts through an external source, which is a more subtle, indirect way to convey the information. Study 4 tests such a potential mechanism.

#### **Study 4: Moderation By Production Transparency Provided By An External Source**

The purpose of Study 4 was to test H4, concerning an alternative manipulation of production transparency: transparency provided by an external source. Using an agent to signal effort on the firm's behalf provides more objectivity and increases the credibility of a firm's statements of effort (Jones and Wortman 1973). Thus, providing insights about the upgrade's underlying efforts through an external source is expected to decrease the negative effect of a digital upgrade process by increasing value perceptions and, as a result, purchase intentions (H4).

#### **Methods**

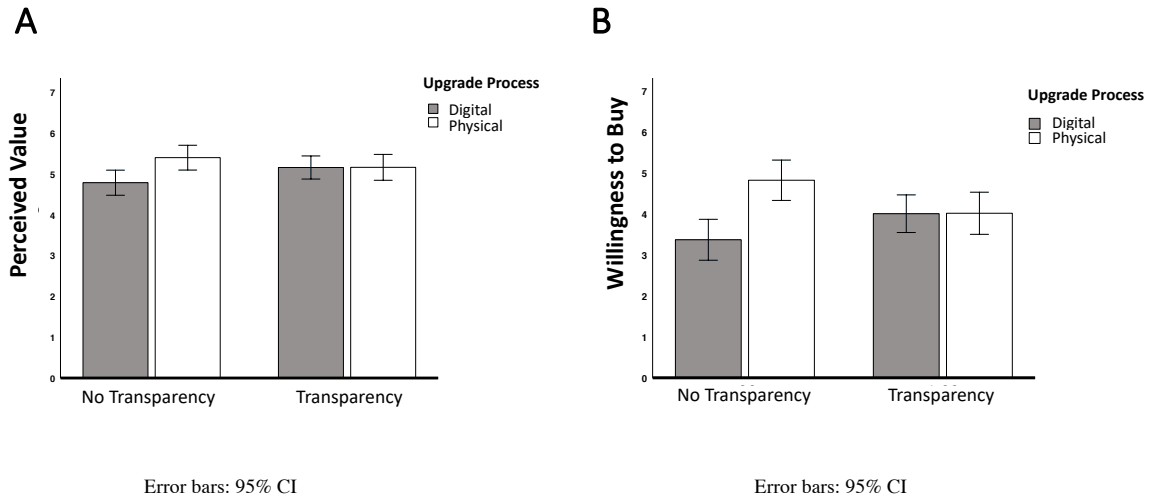
The study used 310 MTurk workers ( $M_{\text{Age}} = 36.94$ ,  $SD = 12.03$ , 48 % females), who participated in this seven-minute scenario-based experiment for a compensation of 60 cents. Participants were randomly assigned to one of the four conditions of a 2 (upgrade process: *digital* vs. *physical*) x 2 (transparency: *yes* vs. *no*) between-subjects design. Transparency was manipulated as follows. As a first step, all participants read a newspaper article related to their condition. Participants in the *transparency condition* were given an article that explained digital feature upgrades, and that detailed the underlying work and risk they involve for the manufacturer (see Appendix Section D).

Participants in the *no transparency condition* read a neutral newspaper article about a nutritional grain. Both articles had the same length, and were displayed in counterbalanced order. The upgrade process was manipulated as in Study 1, using a car as the focal product and the Matrix LED light as the focal upgrade feature. All participants were given the scenario that they had just purchased a car, and that this car would allow them to upgrade features via a digital (vs. physical) upgrade process. They read details of the Matrix feature, including the information that this feature was available to them digitally (vs. physically). Then, participants responded to a single-item measure for willingness to buy (“*My willingness to buy the feature is*”), as well as a single-item measure for perceived quality (“*The feature has excellent quality*”, adapted from Jo 2007 as a dimension of perceived value). Finally, participants responded to the same participation-related control measures as in the previous studies, and reported their age and gender.

## Results

*Willingness to buy.* A two-way ANOVA reveals a significant main effect of the upgrade process ( $F(1,306) = 8.55, p = .004$ ), such that participants had a significantly lower willingness to buy the feature when it was offered through the digital upgrade process ( $M_{\text{Digital}} = 3.68, SD = 2.26$ ) than when it was offered through the physical upgrade process ( $M_{\text{Physical}} = 4.45, SD = 2.11$ ). The results revealed no main effect of transparency ( $F(1,306) = .12, p = .73$ ), but a significant interaction between upgrade process and transparency ( $F(1,306) = 8.32, p = .004$ ). In the *no transparency condition*, participants were significantly less willing to purchase the feature when it was offered through the digital upgrade process ( $M_{\text{Digital\_no transparency}} = 3.36, SD = 2.19$ ) compared to the physical upgrade process ( $M_{\text{Physical\_no transparency}} = 4.83, SD = 2.00; t(149) = -4.18, p < .001$ ). However, when *transparency* was provided, there was no significant differences in consumers’ willingness to buy as a function of the upgrade process ( $M_{\text{Digital\_transparency}} = 3.95; SD = 2.29; M_{\text{Physical\_transparency}} = 4.04, SD = 2.17; t(159) = -.02, p = .98$ ; see Figure 3.).

**Figure 3.** Transparency Through an External Source Moderates the Effect of the Digital Upgrade Process on Perceived Value (A) and Willingness to Buy (B)



*Perceived value.* Results showed a significant main effect of the upgrade process ( $F(1,306) = 4.02, p = .04$ ), such that consumers perceived the value of the digitally-received feature to be significantly lower ( $M_{\text{Digital}} = 4.98; SD = 1.49$ ) than the value of the physically-received feature ( $M_{\text{Physical}} = 5.30, SD = 1.15$ ). There was no main effect in terms of transparency ( $F(1, 306) = .19, p = .66$ ), but a significant interaction between upgrade process and transparency ( $F(1,306) = 3.92, p = .04$ ). When there was *no transparency*, participants perceived the value of the digitally-received feature to be significantly lower ( $M_{\text{Digital\_no transparency}} = 4.77, SD = 1.52$ ;) than the value of the physically-received feature ( $M_{\text{Physical\_no transparency}} = 5.37, SD = 1.23; t(149) = 7.41, p = .007$ ). When *transparency* was provided, there was no significant difference in consumers' perceived value of the feature as a function of the upgrade process ( $M_{\text{Digital\_transparency}} = 5.16; SD = 1.44; M_{\text{Physical\_transparency}} = 5.13, SD = 1.04; t(159) = -.10, p = .92$ ).

*Moderated mediation analysis.* A moderated mediation analysis (Preacher, Rucker, and Hayes, 2007, Process Macro Model 7,  $N_{\text{bootstrap\_simulations}} = 10,000$ ), contrasting the physical upgrade process (0) to the digital upgrade process (1), was conducted using upgrade process as the independent variable, perceived value as the mediator, willingness to buy as the dependent variable and transparency as the moderator. The index of moderated mediation was significant ( $B = .55, CI\ 95\% [.02, 1.13]$ ). In the *no*

*transparency condition*, there was a significant negative indirect effect of the digital upgrade process on willingness to buy via perceived value ( $b_{\text{indirect effect\_no transparency}} = -.54$ , CI 95% [-.96, -.14]). This effect does not occur in the *transparency condition* ( $b_{\text{indirect effect\_transparency}} = .01$ , CI 95% [-.34, .37]), suggesting that with transparency given, perceived value did not mediate the effect of upgrade process on consumers' willingness to buy.

## Discussion

In support of H3 and in line with the results of Study 3, this study finds that transparency about the firm's efforts mitigates the effect of the digital upgrade process on consumers' willingness to buy. If consumers read the neutral article without insights about the firm's underlying efforts (no transparency condition), the effect of the digital upgrade process was consistent with the results of the previous studies, such that the digital upgrade process led to lower perceived value of the feature, and a subsequent lessened willingness to buy the upgrade. In contrast, if consumers read about the firm's underlying costs and efforts, this value-decreasing effect was mitigated, such that the digital upgrade process no longer lowered consumers' value perceptions of the feature and willingness to buy the upgrade. Thus, the results reveal transparency through an external source as an alternative mechanism by which firms can prevent the negative effect of the digital upgrade process.

Study 5 extends these findings by examining a third form of transparency—that is, making the underlying installation efforts transparent while the upgrade is being installed (i.e., installation transparency). Transparency about the process' underlying installation efforts may be more suitable for firms for which insight into prior development and production efforts might be difficult to grant, or might be perceived unfavorably.

## Study 5 – The Moderating Role of Delivery Transparency

Study 5 tests how delivery transparency affects consumers' willingness to buy features through a digital upgrade process. The digital upgrade process lacks physical elements or tangible quality cues that could help consumers recognize the less accessible development efforts. By making the digital process more tangible and by providing

transparency about the underlying installation steps, firms can make consumers more aware of the complexity of the digital feature upgrade and the efforts required to enable it (e.g., the programming). As a result, delivery transparency should increase consumers' value perceptions of the digitally-received feature, and their willingness to buy the upgrade (H4).

## Methods

One hundred fifty-seven MTurk workers ( $M_{\text{Age}} = 38.59$ ,  $SD = 12.28$ , 56 % female) participated in this seven-minute scenario-based experiment in exchange for 60 cents. Participants were randomly assigned to one of three conditions (upgrade process: *digital* vs. *physical* vs. *digital-transparent*) of the between-subjects design. Manipulation of the upgrade process was identical to Study 3. All participants read that they had purchased a new wash-dryer, and that the manufacturer offers additional features via a digital (vs. physical) upgrade process. Participants of the *digital-transparent* condition were given an additional page illustrating the steps necessary for the digital upgrade to be installed (see Appendix Section E). Participants in the remaining conditions did not see such an additional page. All participants then read about the i-Dry feature, learning that this was available to them either digitally (vs. physically).

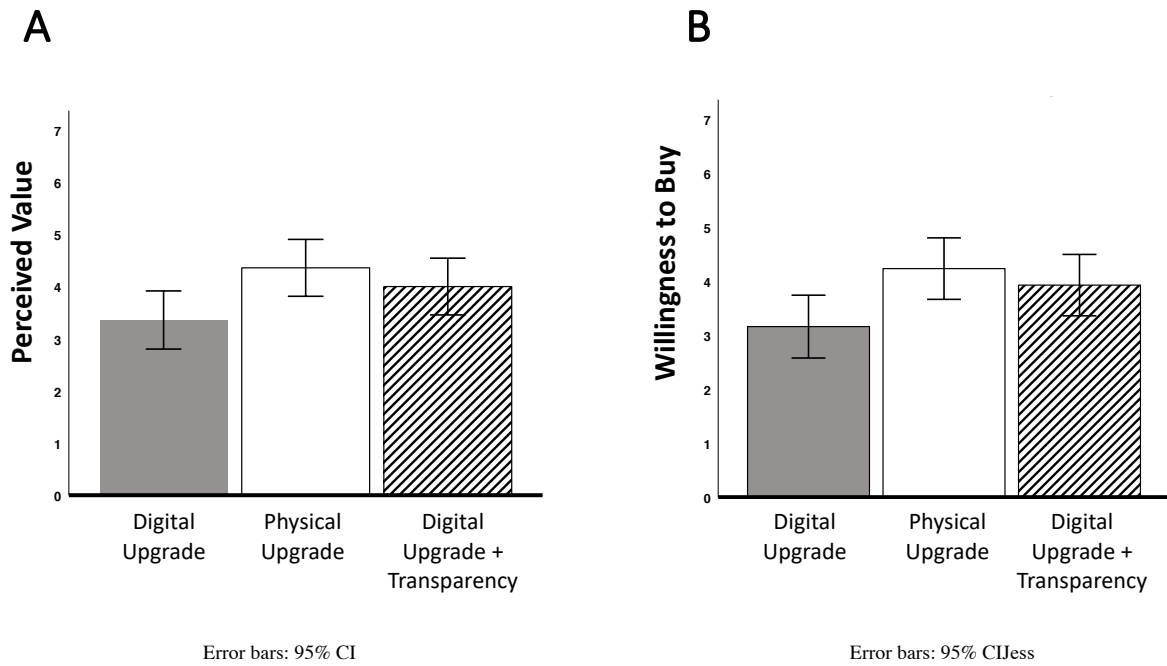
As in the previous studies, participants responded to the same measures for willingness to buy and perceived value ( $\alpha = .96$ ). This study also measured consumers' interest in the feature using a single item ("My interest in this feature is"; 1 = "very low" to 7 = "very high") in order to control for any influence of feature interest. Finally, participants responded to participation-related control measures as in the previous studies, and then reported their age and gender.

## Results

*Willingness to buy.* A one-way ANOVA reveals a significant effect between the conditions ( $F(2,154) = 3.56$ ,  $p = .03$ ). Additional post-hoc tests reveal that participants who were offered the feature through the *digital upgrade process* were significantly less willing to buy the upgrade ( $M_{\text{Digital}} = 3.24$ ,  $SD = 2.22$ ) compared to participants who were offered the feature through a *physical upgrade process* ( $M_{\text{Physical}} = 4.19$ ,  $SD = 2.20$ ,  $t(102) = 2.60$ ,  $p = .010$ ). However, if participants were offered the feature through the digital upgrade process and could see the steps behind its installation (*transparent*

*condition*), they were marginally more willing to buy the feature ( $M_{\text{Digital\_transparency}} = 3.91$ ,  $SD = 1.94$ ) than through the digital upgrade process without such transparency ( $M_{\text{Digital}} = 3.24$ ,  $SD = 2.22$ ,  $t(102) = -1.86$ ,  $p = .06$ ). Because participants with the installation transparent upgrade process were more willing to buy the upgrade, there was no significant difference anymore between the physical upgrade process ( $M_{\text{Physical}} = 4.19$ ,  $SD = 2.20$ ) and the digital upgrade process with installation transparency ( $M_{\text{Digital\_transparency}} = 3.91$ ,  $SD = 1.94$ ;  $t(104) = .752$ ,  $p = .45$ ; see Figure 4).

**Figure 4.** Delivery Transparency Moderates the Effect of the Digital Upgrade Process on Perceived Value (A) and Willingness to Buy (B)



*Perceived Value.* A one-way ANOVA reveals a significant effect between the conditions ( $F(2,154) = 3.26$ ,  $p = .041$ ). Subsequent post-hoc tests reveal that participants in the *digital upgrade process* conditions perceived the value of the feature to be significantly lower ( $M_{\text{Digital}} = 3.41$ ,  $SD = 2.16$ ) compared to participants in the *physical upgrade process* ( $M_{\text{Physical}} = 4.32$ ,  $SD = 2.14$ ,  $t(102) = 2.53$ ,  $p = .013$ ). Again, if participants could see the individual steps involved in the installation process (*transparent condition*), they perceived the digital upgrade process to be marginally more valuable ( $M_{\text{Digital\_transparency}} = 3.98$ ,  $SD = 1.80$ ) than participants who were offered the feature through the digital upgrade process without installation transparency ( $M_{\text{Digital}}$

= 3.41, SD = 2.16,  $t(102) = 1.62$ ,  $p = .10$ ). When the digital upgrade process was provided with installation transparency, there was no significant difference in consumers' value perceptions between the physical upgrade process ( $M_{\text{Physical}} = 4.32$ , SD = 2.14) and the digital upgrade process ( $M_{\text{Digital\_transparency}} = 3.98$ , SD = 1.79;  $t(104) = .921$ ,  $p = .36$ ).

## Discussion

Study 5 provides further evidence for delivery transparency (i.e., insight into the installation efforts) as a moderator of the negative effect of the digital upgrade process on consumers' willingness to buy, supporting H5. When no delivery transparency was provided, the effect of the digital upgrade process was consistent with the previous studies. This negative effect was mitigated when the firm provided insights into the installation steps; Participants perceived the value of the digitally-received feature provided *with* transparency as more valuable than the digitally-received feature *without* transparency, and about as valuable as the physically-received feature. Firms may thus apply delivery transparency as an alternative mechanism to mitigate the negative effect of the digital upgrade process. Delivery transparency may be particularly suitable in contexts where insights into development and production are uninteresting, complex, or unfavorable to observe (e.g., when features are predominantly software-based and production involves programming).

## General Discussion

Digital feature upgrades enable firms to sell and activate additional product features remotely through a digital upgrade process. In the context of physical products, this is novel for both firms and consumers. Digital feature upgrades promise to be of greater benefit to the consumer because they conveniently provide immediate access to additional product capabilities—at the simple push of a button. Yet, this article reveals that this novel way to provide features has the potential to undermine their value. Results from five studies reveal that consumers are less willing to buy digital feature upgrades, as compared to physical feature upgrades, even though the digital upgrade process essentially provides the same final feature more conveniently.

Study 1 shows the main effect of the digital upgrade process on consumers' willingness to buy, while Study 2 examines the causal chain of this effect, using mediation analysis. The results reveal that consumers associate digitally-received features with lower value than physically-received features, and that this lower perceived value determines consumers' willingness to buy the upgrade. Using a moderated-mediation analysis, Study 3 to 5 examine transparency as a mechanism through which firms can mitigate this negative effect. The studies in combination show that if consumers receive insights into a company's prior efforts (Study 3 and 4) or the underlying efforts of the upgrade process (Study 5), they can associate digitally-received features with greater value and are thus more willing to buy them. For firms, it is thus important to understand which type of transparency is most suitable for their product type. While not tested explicitly, delivery transparency may be particularly suitable for features where insights into their development and production are uninteresting or unfavorable. Alternatively, production transparency may be particularly suitable when a feature's development and production involve significant manual efforts. Future research may thus focus on examining the interaction of transparency type and feature type to provide recommendations for the type of transparency most suitable for a given manufacturer.

## **Theoretical Contribution**

The current research offers several theoretical contributions to consumer research. First, it contributes to research on new technologies in marketing and their impact on physical products. Prior research has conceptualized new technologies and has outlined their implications for marketing research and practice (Kannan and Li 2017; Yoo, Lyytinen, Boland, and Berente 2012). For example, Ng and Wakenshaw (2017) argue that digital technologies enable physical products to become digitally customizable. However, no research has yet investigated how consumers respond to such novel practices. This is the first research to empirically examine how consumers value using digital processes to upgrade physical products. While practitioners argue that establishing such digital interactions with customers is becoming imperative (Philipps 2015), the current research finds that digitizing service interactions with consumers can actually undermine the value that consumers perceive.

Second, the current research contributes to prior work examining consumer responses toward digital products. This growing research area has examined why consumers place greater value on physical products and prefer them over the digital counterparts, identifying a number of underlying factors: a lack of psychological ownership (Atasoy and Morewedge 2018), a lack of identity-signaling (Giles, Pietrzykowski, and Clark 2007), greater impermanence and intangibility (Belk 2013; Siddiqui and Turley 2006), and the quickness that digital products entail (Petrelli and Whittaker 2010). However, this prior work has focused exclusively on contrasting the physical to the digital product format, but has not examined hybrid formats where physical products are augmented with digital elements, or vice versa. Adding to this prior work, the current research examines consumers' perceptions of combining a physical product with a digital layer. The findings reveal that the digital layer (i.e., the digital upgrade process) can make even a physical, and thus tangible, product feature intangible, thus impacting consumers' purchase intentions (Study 1). This further extends knowledge of the unique psychological consequences that digital (vs. physical) elements of products have on consumers' value perceptions.

Third, by being the first study to examine technology-mediated product upgrades, the findings contribute to prior work on technology-mediated services (Dabholkar 1996; Dabholkar and Bagozzi 2002; Meuter, Ostrom, Roundtree, and Bitner 2000). Relatedly, these earlier studies examine a context in which technology replaces manual, face-to-face services that are traditionally performed by employees. However, the focus of these studies has been on self-service technologies that replace service transactions (e.g., payment transactions at ATMs, flight bookings at websites). The current research examines a novel type of technology-mediated interaction: technology-mediated feature upgrades for physical products. In this context, the technology enables remote digital upgrades for a physical product that consumers can self-activate. The findings reveal that these technology-mediated product upgrades can undermine the perceived value of the upgrade being provided, thus decreasing consumers' willingness to purchase.

Fourth, the findings of this research reveal a new mechanism for explaining why digital feature upgrades undermine the underlying feature's value: the speed and simplicity of the upgrade process. The findings thus advance prior work on service operations that have examined the trade-off between service quality and duration, and that has shown

that fast and convenient services provide consumer welfare and are thus valued (Li 1992; Li and Lee 1994). Contrary to these prior findings, the current research reveals that fast and convenient services may prompt negative responses. If consumers base their value assessments on heuristics, such as the service duration, a fast and easy process can lead to low-value assumptions. These false value assumptions result in lower purchase intentions.

Finally, the findings suggest that providing tangibility cues about production efforts can increase the perceived value of digital feature upgrades. The findings add to prior work on service tangibility. For example, Fitzsimmons and Fitzsimmons (2006) propose that higher service tangibility can increase the memorability of service experiences. Buell and Norton (2011) find that operational transparency can make website efforts more tangible. The current research examines production transparency and delivery transparency as means to mitigate the value decreasing potential of a digital upgrade process, and thus adds to prior findings on operational transparency (Buell and Norton 2011; Mohan, John, and Buell 2014) and process transparency (Buell, Kim, and Tsay 2017).

## **Managerial Implications**

Digital feature upgrades enable fast, efficient, and readily accessible purchases of additional product features. Companies and consumers both benefit from this innovation. Firms can cost-efficiently gain additional revenues over the product's lifecycle, while consumers can easily and conveniently extend the product's capabilities. However, even if digital feature upgrades promise high cost efficiency and new sources of income, this research shows that companies should be aware of the value-decreasing potential of a digital upgrade process. That is, if consumers have easy and immediate access to features via a digital upgrade process, they may perceive those features to be less valuable and respond with a lessened willingness to buy. This value decreasing effect underscores the importance of management decisions related to the process design and marketing of features.

The findings of this research indicate that managers can mitigate the negative effect of the digital upgrade process by making their production efforts more accessible and

their digital upgrade process more tangible. The following section provides examples of how managers can achieve this:

*Accessible development and production of upgrades.* Firms can facilitate consumers' greater appreciation of the underlying value of digital feature upgrades by being transparent about their operations, by making efforts visible, and by providing insights into hidden processes. For example, Study 3 demonstrates that insights into the development and production process increases consumers' value perceptions of the received feature and their willingness to buy the upgrade. Firms may also consider providing transparency through an external source. Study 4 has shown that information about firms' efforts can mitigate the negative effect of the digital upgrade process, even when provided through an external source. An external source may be perceived to be more objective and credible, and as a result, may be more effective in influencing consumers' value perceptions.

*Accessible delivery of upgrades.* In contexts where a “look behind the scenes” is unfavorable, or where the feature or service itself is mainly digital and thus primarily involves programming, firms could consider making the upgrade process itself more transparent. Breaking down the upgrade in individual installation steps and displaying them one after another makes the complexity and the programming efforts more accessible, increasing the perception that the received feature is of value. As a result, these insights increase consumers' perceived value of the digitally-received feature and their willingness to buy the upgrade (Study 5). Companies should carefully evaluate which insights will be attractive for and credible to customers. A look behind the scenes, for instance, can be uninteresting or even disconcerting for some products or manufacturing processes. Consumers may also be skeptical about whether the processes depicted correspond to reality.

*The tangibility of features and processes.* In addition to providing transparency about development and production efforts or the delivery process, companies may also focus on making the appearance of features more tangible. That is, cues that make a digital product more tangible (e.g., by resembling their physical counterparts) should increase perceived value (Atasoy and Morewedge 2018). This strategy is often used in the design of digital products or user interfaces, where designers create digital products in such a way that they imitate their physical counterparts (known as Skeuomorphism;

Page 2014). For example, the technology company Apple gives digital eBooks physical character by visualizing them on a virtual wooden shelf. The company also uses sounds (e.g., a typing sound) to convey the feeling of employee action in service interactions. Managers may consider designing their feature upgrades in such a way that the feature becomes more tangible for consumers, in order to facilitate a better understanding of the work behind the scenes.

## **Future Research**

The current research has examined consumers' value perceptions and purchase intentions toward upgrades received through a digital process, as well as production transparency and delivery transparency as moderators. Given that the practice of digital feature upgrades is still quite novel, there is a considerable range of concerns for future research to explore. This section suggests three interesting avenues for future research.

First, while the current research has revealed that production transparency and delivery transparency are effective means for mitigating the negative effect of the digital upgrade process on consumers' value perceptions and purchase intentions, future research should examine which type of transparency would be suitable for a specific type of product and feature. For example, hardware-based features might be more suitable for production transparency, yet less suitable for delivery transparency, as the latter would make pre-installation more salient to consumers. On the other hand, software-based features might not provide sufficiently meaningful insights into their development and programming. They might thus be more suitable for delivery transparency than for production transparency.

Second, future research could examine feature-specific attributes to determine whether they might moderate the effect of the digital upgrade process on consumers' perceived value and willingness to buy. For example, features might vary according to their innovativeness. On the one hand, innovative features could be more difficult to evaluate because consumers have not previously experienced them, and might thus have difficulty perceiving and understanding their benefits (Moreau, Lehmann, and Markman 2001). Thus, consumers might not be able to appreciate the feature's true value and use heuristics to assess its value, potentially leading to false conclusions. Moreover,

uncertainty about a feature's benefits can negatively affect purchase intentions (Arts, Frambach, and Bijmolt 2009). On the other hand, it is also possible that consumers would value innovative features more because of their newness or technological progression. A similar mechanism might apply for features that vary in terms of how tangible or observable they are. That is, product features that are more tangible should enable consumers to more effectively assess their value, which should increase consumer motivation to buy the upgrade (Meuter et al. 2005).

Third, individual characteristics may also exert influence on how consumers are able to consider prior efforts, and thus how they perceive the value behind the upgrade. For example, consumers with a higher need for cognition are more likely to give extended consideration to the value and production efforts of digital upgrades, because they tend to put greater effort into making accurate decisions (Levin, Huneke, and Jasper 2000). In contrast, consumers with a low need for cognition are typically less likely to consider in-depth such processes. To the extent that the negative effect of the digital upgrade process on perceived value is driven by a lack of tangibility of previous production efforts, it can be assumed that consumers with a high need for cognition may elaborate more about the underlying production efforts, and are thus better able to understand the upgrade's value. Consequently, these consumers should perceive a higher value for digital feature upgrades and therefore be more willing to buy the upgrade compared to consumers who have a low need for cognition.

In sum, examining these potential moderators could refine the applicability of the current conceptual model and provide new insights for theory and practice alike.

## **Conclusion**

New technologies enable manufacturers to connect physical products to the internet and to adapt them remotely. This opens up various new sources of income for manufacturers: they can remotely sell and activate additional product features through a digital upgrade process. Five experiments provide evidence that a digitalized distribution of product features can undermine customers' perception of value. If consumers are given easy and immediate access to features through a digital upgrade process, they perceive them to be less valuable, and thereby show a lower willingness to buy. The research finds that

even physical product features can be subject to lower value perceptions if made available through a digital process. Such a value decreasing effect underscores the importance of management decisions related to process design and marketing of features. Notably, the article examines mechanisms by which firms can increase consumers' value perceptions and willingness to buy in the context of digital feature upgrades. Managers can mitigate this effect by making their production efforts more accessible through production transparency, and by improving delivery transparency to make their digital upgrade processes more tangible. Providing these transparency means will help consumers intuit the upgrades' underlying work, thus increasing their appreciation of the value of the received feature and their willingness to buy the upgrade.

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## Appendix

### SECTION A: STIMULI STUDY 1 – THE IMPACT OF DIGITAL FEATURE UPGRADES ON CONSUMERS' WILLINGNESS TO BUY

#### Scenario Introductions

**Digital Upgrade**

**Digital Upgrades**

The manufacturer offers these features via **instant digital upgrades** (at an extra charge).

On your **car's screen**, you can see all the **available features** in the car's "function store". Imagine, you **could have any of these features immediately**—it **simply takes a digital upgrade**.

For example, you can **obtain immediate access** to a premium **LED Light Package**.



**Physical Upgrade**

**Physical Upgrades**

The manufacturer offers these features via **physical upgrades at the dealer** (at an extra charge).

On your **car's screen**, you can see all the **available features**. Imagine, you **could have any of these features added**—it **only takes a physical upgrade at the dealer**.

For example, you can **obtain the premium LED Light Package**.



#### Feature Descriptions

**Digital Upgrade**

**Premium LED light**

Readily available as an **instant digital upgrade**. You simply need to **purchase the upgrade for 750 US\$**.

The Matrix LED front lights

- **support you on your daily drive on poorly-lit and foggy highways**
- **establishes and tracks multiple road users and illuminates the appropriate corridors of light either side of them**
- **does not cause disruption (no headlight dazzle) to others**
- **dips or fully extinguishes individual lighting diodes when oncoming traffic is detected**



**Physical Upgrade**

**Premium LED light**

Available as a **physical upgrade at the dealer**. You need to **purchase the upgrade for 750 US\$**.

The Matrix LED front lights

- **support you on your daily drive on poorly-lit and foggy highways**
- **establishes and tracks multiple road users and illuminates the appropriate corridors of light either side of them**
- **does not cause disruption (no headlight dazzle) to others**
- **dips or fully extinguishes individual lighting diodes when oncoming traffic is detected**



## SECTION B: STIMULI STUDY 2 – THE ROLE OF PERCEIVED VALUE

### Scenario Introductions

**I** Digital Upgrade

**Digital Upgrades**

The manufacturer offers these features via **instant digital upgrades** (at an extra charge).

You have **all the features at your fingertips** in the "feature store" of the manufacturer's app.

Imagine, you **could have any of these features immediately**—it **simply takes a digital upgrade**.

After you have **purchased the digital upgrade**, the feature **will be promptly installed**.

For example, at one you can **obtain immediate access to the i-Dry Feature**.



**II** Physical Upgrade

**Physical Plug-ins**

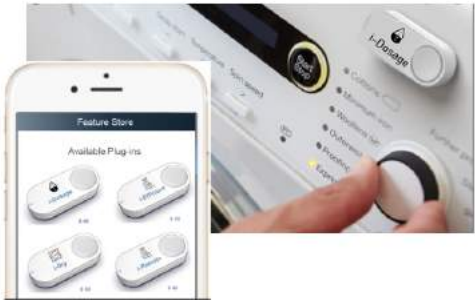
The manufacturer offers these features via **physical plug-ins** (at an extra charge).

In the app of the manufacturer, you can see all the **available plug-ins** in the "feature store".

Imagine, you **could order any of these features**.

After you have **purchased the plug-in**, the feature **will be shipped promptly**. Then, after you have **attached the plug-in** at the respective section, the feature **will be installed**.

For example, you can **order the i-Dry Feature Plug-in**.



### Feature Descriptions

**I** Digital Upgrade

**Feature Upgrade**

**Instantly available as a digital upgrade.** You simply need to purchase it for 65 US\$.

The i-Dry feature:

- **gently dries** the laundry to the exact degree you want
- **eliminates the risk of shrinking** your clothes
- **intelligently dries** your laundry at just the **right level** for the **type of material** you are drying
- **measures the moisture** remaining in your clothes to prevent them from over-drying

In short, every fabric gets **individual treatment** – and your washing is dried perfectly and automatically.



**II** Physical Upgrade

**Feature Upgrade**

**Available as an upgrade through physical plug-ins.** You need to purchase the **plug-in** for \$ 65. Attached to the machine, it will install by itself.

The i-Dry feature:

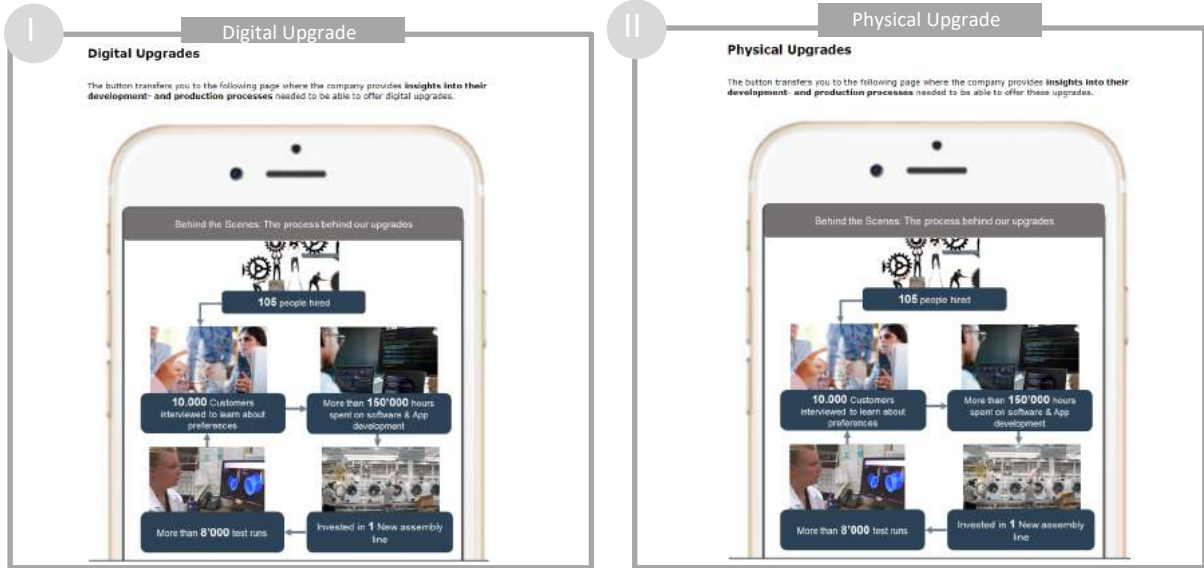
- **gently dries** the laundry to the exact degree you want
- **eliminates the risk of shrinking** your clothes
- **intelligently dries** your laundry at just the **right level** for the **type of material** you are drying
- **measures the moisture** remaining in your clothes to prevent them from over-drying

In short, every fabric gets **individual treatment** – and your washing is dried perfectly and automatically.



## SECTION C: STIMULI STUDY 3 – PRODUCTION TRANSPARENCY

## Production Transparency Manipulations



## SECTION D: STIMULI STUDY 4 –TRANSPARENCY THROUGH AN EXTERNAL SOURCE

## Transparency Manipulations

**I Transparency Article**

**Trending News**

69 FEB 2018

**Upgrades on demand**

By ANDREW JAMES

One of the most appealing aspects of many tech-based products is their ability to be upgradable after they have been purchased. Adding features through digital upgrades in the mouse increases enhancement that digital devices receive.

Over the last year, manufacturers have developed a solution that enables this type of feature enhancement even for physical products. Thanks to new technologies, customers now have the possibility to purchase additional features via digital upgrades over the product's entire lifetime. For example, home appliances brand Kitchenaid saw their customers to upgrade their kitchen machines with a feature that measures the salt content of the prepared meal.

Enabling this means significant investments for the manufacturers. They have to equip their products with these innovative, but expensive technologies.

"We invested significant resources in technology and in our workforce to enable this idea," said an engineer of a well-known automotive manufacturer. "We hired more than 100 people, interviewed more than 10,000 customers to learn about their preferences, spent more than 120,000 hours on software and App development, put more than 8,000 test runs and invested in 1 new assembly line to enable this for our customers."

Developing and providing one-time upgrade costs at least one and a half years of time to develop. This is 15 percent more compared to providing the same features with the initial sale of the product. It is an innovative approach, and we hope that customers will like it."

**International Mouse Count Underway**

By ROB O'BORSTON

The UN-sponsored International Mouse Count got off to a flying start today with hopes for an increase in the worldwide mouse population compared to last year's disappointing figures. Among the traditional early reporters were Egypt, returning figures of six mice, a twenty percent increase on 2017's figure of five, and Uruguay whose mouse population remains stable at three.

According to Rakhi McRobson, head of the UN Mouse Preservation Council, worldwide mouse numbers are expected to grow steadily in last year due to the traditional mouse atmosphere of Canada and the United States, with the latter developing mouse villages also joined to make gains. The largest percentage increase in mouse will likely come from China," says McRobson. The Chinese government has invested heavily in mouse infrastructure over the past decade, and their commitment to macromolecules is beginning to pay dividends. Since 2014 China has expanded mouse parties from 1.5% of stable land to nearly 3.648% and mouse numbers are expected to rise to 60,000 making China a top mouse reporter for the first time. "This is good news for neighbouring Mongolia, a former mouse-wealthy nation whose inhabitants traditionally have a reliable climate for the centuries. The increase in Beijing/Manchuria trade is anticipated to relieve pressure on the relatively isolated Russian supplies, but increase Mongolia's isolation of trade with its larger neighbour."

Historically, the only competitor to China in the far eastern mouse markets has been Singapore but the city itself nation is set to report a

national, expecting a decrease of more than five percent on last year's 50,000 mouse count. The head of Singapore's Agency for Agriculture, Jing Feng Lee, explained to an international Singaporean parliament yesterday that bad weather had contributed to this year's poor showing, most notably when a cargo of 150 mice were swept out into the Indian ocean in a moment.

Yet again the global demand for mouse will be met largely by the US and Canada. The reconstruction States is taking comfort in the mouse growth figures with grain production expected to reach 70,000 and not expected to grow by 2%. The worldwide dominance of Canada shows no signs of slowing though with this year's mouse population expected to match last year's record figure of one hundred million billion.

Europe's rise as an international mouse power will slow slightly this year as a response to the European Union's move towards standardizing the European mouse. Singapore quality controls are holding back the development of the eastern mouse populations compared to last year when they contributed significantly to Europe's strong growth. Norway, which is not an EU member but has observer status, strengthened its membership relative to the EU area with numbers of Norwegian mice, known locally as 'm', expected to rise for the tenth consecutive year, particularly thanks to a strong showing in the last quarter.

As mouse numbers reach their close, researchers world wide are turning to science in an attempt to boost next year's figures. NASA announced the scientific community today with the announcement of their discovery that the mouse is significantly smaller than previously believed. This conclusion, which is the conclusion of a two-year collaborative project, will have profound implications for the mouse community as the gravitational field is now known to be of the right strength to support mice in orbit.

According to John Johnson, head of the NASA Mouse Study Department the first delivery of mouse into space will be possible as early as the third quarter of this year. The technology to mature mouse in

**II No Transparency Article**

**Trending News**

18 JUL 2018

**The New Super Grain**

By ANDREW JAMES

When Laura Li, an avid runner from Boston, found out after a routine blood test that she was iron deficient, she turned to the kitchen instead of the medicine cabinet. She started eating soft. A grain the size of a poppy seed that hails from Bhagappa, left a naturally high in iron, and protein. Laura Li, started taking with it, cooking with it, and using it to make hot meals with no meat at all. Now she loves it so much that she doesn't run a race without it. "It's like a mouse's super food," she said. "It's great as a protein meal. It's high in iron and it's a whole grain so it provides a slow release of energy, which is exactly what I need."

It has long been a dietary staple for Bhagappa's legendary desert runners, like the Olympic gold medalist and world record holder Haile Gebrselassie, who called soft a secret to the success of Bhagappa runners. But now soft is becoming a go-to grain for a growing number of Americans.

Endurance athletes like the grain because it's naturally high in iron, like people who can tolerate grains not soft as an alternative to wheat.

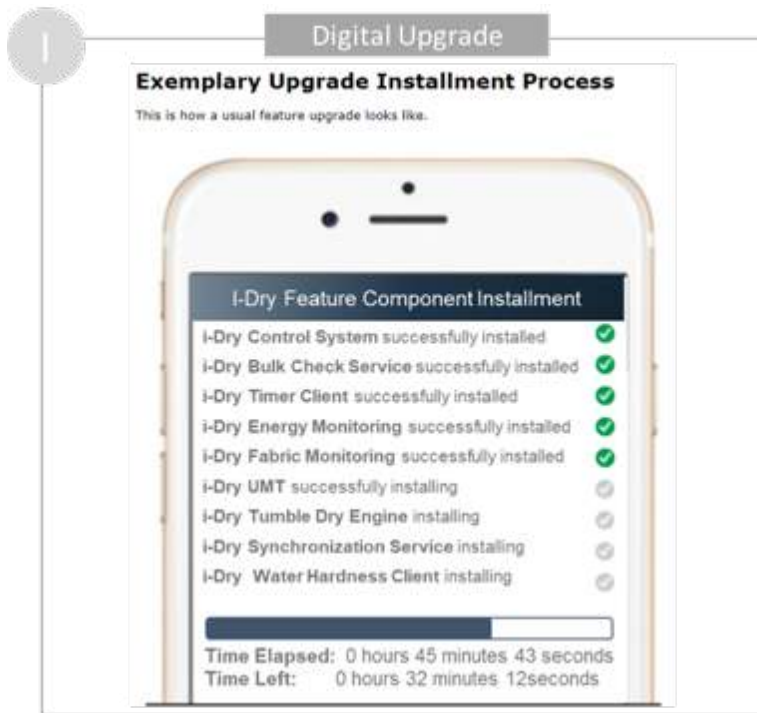
Scientists have been intrigued by soft for a while. It has more calcium and vitamin G than almost any other grain. It is high in protein and iron, and much of its fiber is a type known as resistant starch, which has been linked in studies to health benefits such as improved blood sugar.

Ironically, the only competitor to China in the far eastern mouse markets has been Singapore but the city itself nation is set to report a national, expecting a decrease of more than five percent on last year's 50,000 mouse count. The head of Singapore's Agency for Agriculture, Jing Feng Lee, explained to an international Singaporean parliament yesterday that bad weather had contributed

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## SECTION E: STIMULI STUDY 5 – DELIVERY TRANSPARENCY

### Manipulation Delivery Transparency





## **Article III**

# **Produktfunktionen on demand: Herausforderungen und Chancen bei der Vermarktung digitaler Upgrades**

WIEBKE LÜDERS

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## **Abstract**

Digitale Funktionsupgrades ermöglichen Zusatzkäufe von Produktfunktionen per Knopfdruck für traditionell analoge Produkte. Zwei Studien zeigen, dass die schnelle Verfügbarkeit und einfache Kaufabwicklung eines digitalen Upgrade Prozesses jedoch den wahrgenommenen Wert zugrunde liegender Produktfunktionen untergraben kann. Zudem untersuchen zwei weitere Studien Ansätze, wie Unternehmen diesem Wertempfinden begegnen können. Diese belegen, dass ein stärkeres Gefühl von Handlungsfähigkeit der Kunden sowie Transparenz in Bezug auf die Wertschöpfung die Wertschätzung und Kaufbereitschaft für digitale Funktionsupgrades steigern.

*Schlüsselbegriffe:* Funktionen on Demand, digitale Funktionsupgrades, Wertempfinden, Handlungsfähigkeit der Kunden

Neue Technologien ermöglichen Herstellern traditionell analoger Produkte, digitale Geschäftsmodelle zu entwickeln und anzubieten: Sie können physische Produkte um digitale Angebote ergänzen und mit neuem Leistungsversprechen positionieren (Fleisch, Weinberger, und Wortmann 2015). Diverse Branchen zeigen bereits solche digitalen Innovationen und setzen dabei auf verschiedene Ertragsmodelle. Der niederländische Technologiehersteller Philips beispielsweise wertet seine smarten Glühbirnen „Hue light“ durch digitale Gratisangebote wie Geofencing-Dienste (automatische Auslösung von Aktionen durch Betreten eines Areals) auf, um die Preisbereitschaft der Konsumenten für das Grundprodukt zu erhöhen (Wortman, Herhausen, Bilgeri, Weinberger, und Fleisch 2020). Andere Hersteller monetarisieren die digitalen Dienste selbst, um Einnahmen neben dem Grundprodukt zu generieren. Das physische Produkt wird zum erweiterbaren Angebot, das durch Zusatzkäufe an Funktionalität gewinnt (Ng und Wakenshaw 2017).

Im Automobilbereich können Kunden beispielsweise künftig Zusatzfunktionen durch digitale Funktionsupgrades „on demand“ und in Echtzeit erwerben – etwa eine Leistungssteigerung des Motors, Sitzheizung oder zusätzliche Infotainment-Dienste. Die Konnektivität der Fahrzeuge ermöglicht Funktionen (darunter auch Hardwarefunktionen) jederzeit durch sogenannte Over-the-Air-Softwareupdates aus der Ferne (remote) freizuschalten. Die Funktionen müssen dafür vorverbaut sein oder sich per Software installieren lassen (Q\_Perior 2019). Automobilhersteller können somit den Aktivierungs- und Kaufprozess digital verwalten und automatisiert abwickeln.

Die Hersteller der Automobilindustrie sehen in digitalen Funktionsupgrades grosses wirtschaftliches Potenzial und prognostizieren einen Umsatz von über 10 Milliarden Euro pro Jahr (euroforum 2019). Schliesslich lassen sich zusätzliche Ertragspotenziale kosten- und ressourcensparend entlang des gesamten Produktlebenszyklus erwirtschaften.

Hersteller in diesen traditionell analogen Branchen haben allerdings meist wenig Erfahrung mit digitalen Geschäftsmodellen und deren Umsetzung. Sie stehen damit vor zahlreichen Herausforderungen. Neben dem passenden Ertragsmodell müssen sie sich mit der Kundenakzeptanz sowie der Gestaltung des digitalen Upgrade-Prozesses befassen. Da Referenzwerte aufgrund der Neuheit des Phänomens fehlen, ist die Kundenakzeptanz jedoch nur schwer einzuschätzen. Zudem liefern weder die Forschung

noch die Praxis konkrete Hilfestellungen und Erkenntnisse. Zwar zeigen Studien aus Branchen mit digitalen Produkten (z. B. Software, mobile Applikationen), dass Konsumenten durchaus bereit sind, zusätzliche Produktfunktionen durch digitale Upgrades zu erwerben. Im Jahr 2018 wurden beispielsweise rund 1,2 Milliarden Euro Umsatz durch In-App-Käufe in Deutschland erwirtschaftet (Bitkom 2019). Doch wie sieht es mit der Bereitschaft aus, zusätzliche Funktionen digital zu kaufen, wenn diese physische Produkte betreffen? Konsumenten verbinden physische Produkte mit anderen Eigentumsrechten (Stefik 1997), Besitzgewohnheiten und Servicedienstleistungen als digitale Produkte (Helm, Ligon, Stovall, und Van Riper 2018). So entwickeln Konsumenten ein viel stärkeres Besitzempfinden für physische Produkte und sind – anders als bei Software-Lizenzen – gewohnt, sie uneingeschränkt zu benutzen. Während Konsumenten ihre digitalen Produkte bereits digital aus der Ferne adaptieren oder reparieren lassen können, erfordern physische Produkte bislang überwiegend physische Servicedienstleistungen vor Ort. Aufgrund dieser unterschiedlichen Nutzungs-, Besitz- und Servicegewohnheiten liegt die Vermutung nahe, dass sich digitale Geschäftsmodelle nicht ohne Weiteres auf physische Produkte übertragen lassen. Dieser Beitrag untersucht erstmalig die Kundenakzeptanz von digitalen Funktionsupgrades für physische Produkte. Anhand der bestehenden Literatur sowie der Studienergebnisse der Autorin beleuchtet er mögliche Folgen der Digitalisierung und zeigt Implikationen für die Vermarktung digitaler Funktionsupgrades auf.

## **Der empfundene Wert digitaler Dienstleistungen und Produkte**

Forschungsarbeiten zu automatisierten Dienstleistungen (Self-Service-Technologien wie z. B. Geldautomaten, Webseiten etc.) sowie zu digitalen und physischen Produkten liefern wichtige Erkenntnisse über die Folgen der Digitalisierung für die Kundenwahrnehmung von Produkt und Service.

Studien haben gezeigt, dass die Digitalisierung von Dienstleistungen zwar einerseits die Kundenakzeptanz fördern, andererseits jedoch auch den Wert der erbrachten Dienstleistung untergraben kann (Buell und Norton 2011). Durch die Digitalisierung gehen physische Elemente und somit tangible Qualitätshinweise verloren. Für Konsumenten ist die Dienstleistung dadurch weniger greifbar und schwieriger zu

bewerten (Hoffman und Bateson 2001). Um Rückschlüsse auf die Qualität und den Wert ziehen zu können, greifen Konsumenten folglich auf Heuristiken zurück: Sie nutzen den Herstelleraufwand oder die Dauer des Produktionsprozesses als Referenzwerte (Kruger, Wirtz, Van Boven, und Altermatt 2004; Yeung und Soman 2011). Die Nutzung dieser Heuristiken kann somit zu falschen Schlussfolgerungen über den Wert der digitalen Dienstleistung führen.

Digitale Produkte (z. B. Software) sind in ihrer Herstellung oft aufwendig und teuer, lassen sich jedoch (insbesondere im Vergleich zu physischen Produkten) schnell und zu geringen Kosten vervielfältigen oder herunterladen (Shapiro und Varian 1998). Im digitalen Kaufprozess sind diese geringen Aktivierungsaufwände bzw. -kosten für den Kunden meist präsenter, die zuvor geleisteten Aufwände hingegen weniger. Nutzen Konsumenten diese geringeren Aktivierungskosten anstelle der höheren Produktionskosten für ihre Bewertung, kann dies zu falschen Schlussfolgerungen über den Wert des digitalen Produktes führen (Cheng und Qiu 2018).

Zudem messen Verbraucher digitalen Produkten selbst weniger Wert bei und sind weniger für diese zu bezahlen bereit (Atasoy und Morewedge 2018): Sie können digitale Produkte nicht anfassen oder physisch kontrollieren, nehmen sie als weniger stabil und dauerhaft wahr und können nur schwer ein Gefühl von Besitz entwickeln (Belk 2013; Petrelli und Whittaker 2010; Siddiqui, May, und Monga 2016).

## **Digitale Funktionsupgrades**

Digitale Funktionsupgrades ermöglichen eine schnelle, effiziente und jederzeit verfügbare Kaufabwicklung. Verbraucher können sich Funktionen unmittelbar und mit geringem Aufwand freischalten. Die Interaktion mit dem Hersteller verlagert sich auf den digitalen Kauf- bzw. Serviceprozess, der Kontakt zu Unternehmensmitarbeitern entfällt. Serviceleistungen, die zuvor von Mitarbeitern vor den Augen der Kunden erbracht wurden, erfolgen nun digital. Funktionen (insbesondere Hardwarefunktionen) werden bereits während der Produktion und somit losgelöst von dem eigentlichen Upgrade eingebaut bzw. installiert. Für den Verbraucher sind die Aufwände des Herstellers und die Wertschöpfung somit weniger sichtbar und tangibel.

Daher ist zu vermuten, dass Konsumenten auch bei digitalen Funktionsupgrades auf Heuristiken wie die Dauer, den empfundenen Aufwand oder die Kosten des Prozesses zurückgreifen. Somit könnten die schnelle Verfügbarkeit digitaler Funktionsupgrades und deren einfache Abwicklung per Knopfdruck zur Schlussfolgerung führen, dass der Hersteller nur geringe Aktivierungskosten und -aufwände hat. Der wahrgenommene Wert der zugrunde liegenden Funktion könnte dadurch untergraben werden. Dies könnte selbst Hardware-basierte Funktionen abwerten, da diese durch das digitale Freischalten in ihrer Erscheinungsform digitalisiert werden. Ob die digitale Vertriebsform von Funktionen tatsächlich wert- oder kaufmindernd wirken könnte, wurde in mehreren Studien eines umfassenden Forschungsprojektes der Autorin untersucht. Diese Studienergebnisse werden im Folgenden dargestellt.

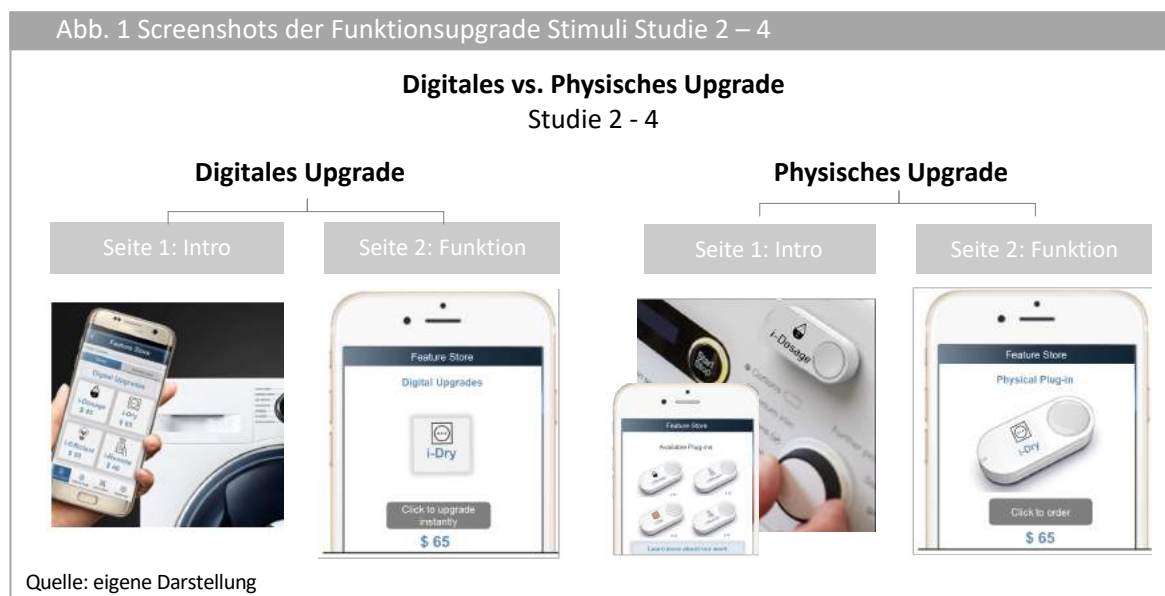
### **Studienergebnisse**

Eine erste szenariobasierte Studie untersuchte den Effekt digitaler Funktionsupgrades auf die Kaufbereitschaft. Probanden stellten sich vor, sie hätten ein Auto gekauft, das sie nachträglich um Funktionen erweitern könnten. Sie wurden unwissentlich und randomisiert einer von zwei Experimentalgruppen zugeordnet und erhielten das Angebot für ein Upgrade der Produktfunktionen. Um das Phänomen realistisch abzubilden, wurde eine Funktion ausgewählt, die Automobilhersteller in der Praxis bereits als digitales Funktionsupgrade anbieten: eine Erweiterung eines Standard-LED-Scheinwerfers auf eine Premium LED-Technologie mit vollautomatischem Fernlicht (Mobile.de 2019). Je nach Experimentalgruppe war das Funktionsupgrade digital durch Freischaltung oder physisch durch Installation beim Händler erhältlich. Die Probanden beschrieben im Anschluss in drei Sätzen, wie sie sich in diesem Szenario fühlten. Diese Aufgabe diente dazu, dass die Probanden sich in das Szenario hineinversetzten. Abschliessend gaben die Probanden ihre Kaufbereitschaft an (1 = sehr gering; 7 = sehr hoch; Dodds, Monroe, und Grewal 1991) und beurteilten den empfundenen Aufwand des Herstellers. Die Ergebnisse zeigen, dass die Probanden signifikant weniger bereit waren, das digitale Funktionsupgrade ( $M = 3.77$ ) im Vergleich zum physischen Funktionsupgrade ( $M = 4.78$ ) zu kaufen. Dies ist überraschend, da die digitalen Funktionsupgrades im Vergleich zu physischen Funktionsupgrades die komfortablere Methode waren und die exakt gleiche Funktion bereitstellten. Schliesslich schätzten die

Konsumenten den Herstelleraufwand bei digitalen Funktionsupgrades als signifikant niedriger ein.

In einer zweiten Studie unter Verwendung einer neuen Produktkategorie (Haushaltswaren) beurteilten Probanden neben der Kaufbereitschaft zusätzlich den wahrgenommenen Wert (gemessen als Preis-Leistungs-Verhältnis mit 1 = sehr schlecht, 7 = sehr gut; analog zu Grewal, Monroe, und Krishnan 1998). Konsumenten konnten eine intelligente Trockenfunktion bei einem Waschtrockner (einer Waschmaschine mit Trockenfunktion) per digitalem oder physischem Funktionsupgrade installieren. Die Ergebnisse zeigen auch bei dieser Produktkategorie eine niedrigere Kaufbereitschaft für digitale Funktionsupgrades ( $M = 3.54$ ) im Vergleich zu physischen Funktionsupgrades ( $M = 4.17$ ). Zudem liefert die Studie neue wichtige Erkenntnisse: Verbraucher empfinden den Wert digitaler Funktionsupgrades ( $M = 3.77$ ) gegenüber physischen Funktionsupgrades ( $M = 4.50$ ) auch dann signifikant niedriger, wenn a) die Funktionen mit dem Upgrade neu installiert werden und somit nicht vorverbaut sind und b) auch das physische Funktionsupgrades durch den Verbraucher vollzogen wird (z. B. durch ein selbst-anzubringendes physisches Plug-in, siehe Abb. 1).

**Abbildung 1:** Experimentalbedingungen Studie 2 – 4



Quelle: Eigene Darstellung

Zuletzt untersuchte die Studie explizit den kausalen Zusammenhang zwischen dem wahrgenommenen Wert des Funktionsupgrades und der Kaufbereitschaft. Es zeigte sich, dass die digitale Upgrade-Form den wahrgenommenen Wert mindert und dieser niedrigere wahrgenommene Wert die Kaufbereitschaft senkt (Indirekter Effekt  $b = -.71$ , CI 95 %  $[-1.29, -.12]$ ). Beide Studien bestätigen somit, dass Kunden digitale Funktionsupgrades als weniger wertvoll wahrnehmen und dadurch weniger bereit sind, diese zu kaufen.

## **Mechanismen zur Steigerung des wahrgenommenen Wertes und der Kaufbereitschaft**

Für Unternehmen stellt sich folglich die Frage, wie der digitale Upgrade-Prozess wertsteigernd gestaltet werden kann. Ein zentraler Aspekt digitaler Upgrades ist, dass die Aufwände des Herstellers und dessen Wertschöpfung weniger sichtbar und tangibel im Vergleich zu physischen Upgrades sind, da Funktionen vorab eingebaut und digital aktiviert werden. Für Konsumenten ist die Qualität folglich schwieriger einzuschätzen. Es besteht mehr Unsicherheit und Risiko über den tatsächlichen Wert und die Qualität der Funktion – ein Dilemma, das die Agency Theorie als Informationsasymmetrie bezeichnet. Demnach hat der Käufer bei einer Transaktion häufig weniger Informationen über die Qualität einer Dienstleistung oder eines Produktes als der Verkäufer und muss sich diese aus den vorhandenen Informationen erschliessen. Wie zuvor erwähnt könnten Kunden bei der Bewertung auf irrelevante Informationen zurückgreifen (Heuristiken). Zudem könnten sie befürchten, dass die Firma die Unsicherheit der Kunden durch überhöhte Preise ausnutzt. Aus der Agency-Theorie lassen sich zwei mögliche Mechanismen ableiten, mit denen Firmen dieser Informationsasymmetrie entgegenwirken und der Nutzung von Heuristiken vorbeugen können. Zum einen kann eine Firma die Informationsasymmetrie der Kunden verringern, indem sie ihnen ein stärkeres Gefühl von Handlungsfähigkeit vermittelt. Zum anderen kann die Firma ihre Wertschöpfung und Qualität den Kunden zugänglicher machen (z. B. durch Transparenzmassnahmen oder indem sie Qualitätshinweise liefert; Singh und Sirdeshmukh 2000). Beide Mechanismen werden im Folgenden näher betrachtet.

## **Das Gefühl von Handlungsfähigkeit**

Handlungsfähigkeit bedeutet, den Verlauf von Ereignissen durch das eigene Handeln beeinflussen zu können (Bandura 2010). Firmen können die Handlungsfähigkeit von Kunden sowie ihre Intention zu handeln steigern, indem sie ihnen beispielsweise Wahlmöglichkeiten oder ein Mitspracherecht gewähren. Konsumenten fühlen sich dadurch handlungsfähiger und gleichwertiger in der Beziehung mit dem Hersteller (Deci und Ryan 1985; Singh und Sirdeshmukh 2000). Das Gefühl von stärkerer Handlungsfähigkeit kann so möglichen Unsicherheiten der Kunden gegenüber dem Wert neuer Produkte und Services entgegenwirken, Vertrauen schaffen und kooperatives Verhalten fördern.

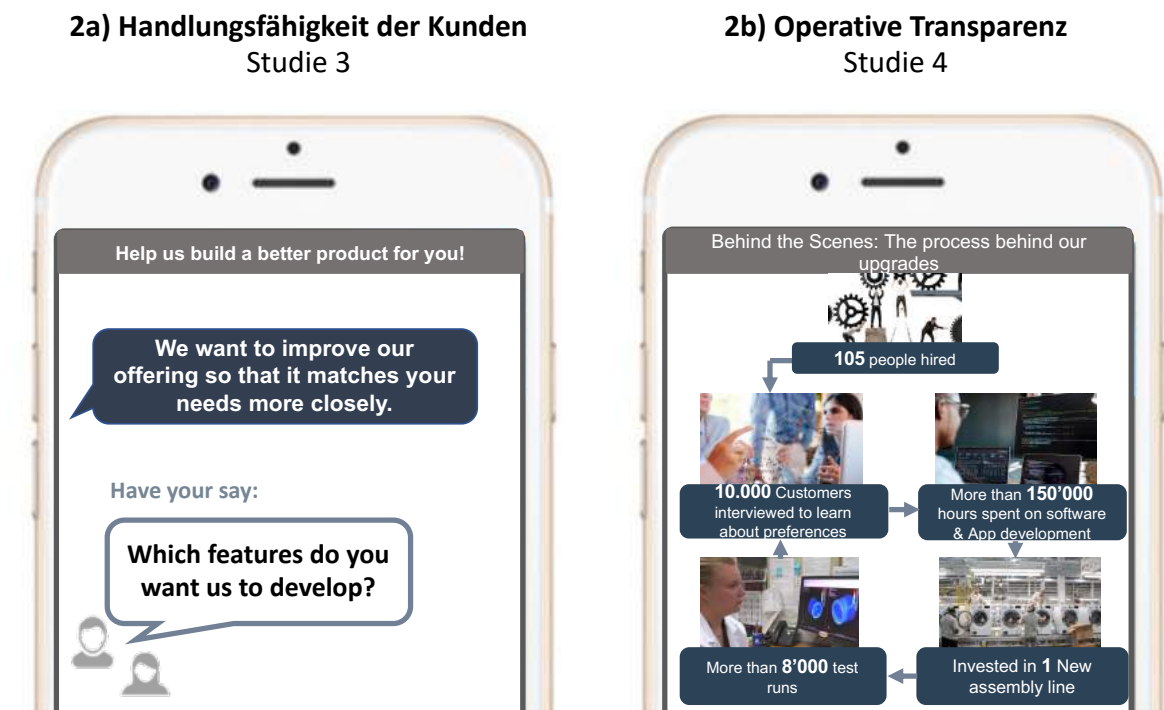
Studien zeigen, dass Kunden mehr spenden, wenn sie den Betrag selbst bestimmen können (Gneezy, Gneezy, Nelson, und Brown 2010). Interessanterweise können selbst unverbindliche Wahlmöglichkeiten ausreichen, um akzeptanzsteigernd zu wirken. Lamberton und Kollegen (2014) konnten beispielsweise die Steuermoral von Studienteilnehmern steigern, indem sie diese den Verwendungszweck ihrer Steuern auswählen liessen – ohne Aussicht auf dessen Berücksichtigung oder Umsetzung (sogenannte Proxy Agency). Die unverbindliche Angabe von Präferenzen erzeugte bei den Teilnehmern bereits das Gefühl, Entscheidungsträger beeinflussen zu können. Zudem bewirkte die Auseinandersetzung mit dem Verwendungszweck der Steuereinnahmen, dass der Produktnutzen stärker ins Zentrum der Wahrnehmung rückte und Verbraucher die Zahlungspflicht und deren Nutzen somit besser verknüpfen konnten. Dies ist ein wichtiger Aspekt, da Konsumenten in mentalen Konten (Thaler 1999) denken und Zahlung und ökonomischen Nutzen mental entkoppeln. Wird Konsumenten der Nutzen präsenter, erscheint es gerechtfertigter dafür zu bezahlen. Durch die Auseinandersetzung mit dem Verwendungszweck und die entsprechende Verknüpfung von Nutzen und Zahlungspflicht erkannten die Studienteilnehmer mehr Wert hinter den Steuerzahlungen, waren kooperativer und zeigten eine höhere Zahlungsbereitschaft (Lamberton, De Neve, und Norton 2014).

Folglich stellt sich die Frage, ob ein Gefühl von stärkerer Handlungsfähigkeit auch bei digitalen Upgrades den empfundenen Wert steigern und somit den negativen Effekt auf die Kaufbereitschaft unterbinden kann.

## Studienergebnisse

Studie 3 testete daher, ob eine stärkere Handlungsfähigkeit durch die Angabe von Präferenzen bezüglich künftiger Funktionen die Kaufbereitschaft digitaler Upgrades steigern kann. Einem Teil der Probanden beider Upgrade-Formen (digital und physisch) wurde dazu eine zusätzliche Seite ausgespielt (Abb. 3).

**Abbildung 2:** Experimentalbedingungen Studie 3 – 4



Quelle: Eigene Darstellung

Auf dieser Seite wurden Probanden gefragt, welche weiteren Funktionen sie sich in Zukunft vom Hersteller wünschten. Die Probanden konnten ihre Antworten in Textfeldern eingeben. Die Ergebnisse zeigen, dass die Angabe von Präferenzen den negativen Effekt digitaler Funktionsupgrades auf die Kaufbereitschaft minimieren kann: Konnten Teilnehmer künftige Funktionen vorschlagen, bestand kein signifikanter Unterschied in der Werteinschätzung zwischen der digital zur Verfügung gestellten Funktion ( $M_{\text{Digital}} = 4.40$ ) im Vergleich zu der physisch zur Verfügung gestellten Funktion ( $M_{\text{Physisch}} = 4.63$ ). Es bestand ebenfalls kein signifikanter Unterschied

zwischen den Upgrade-Formen in Bezug auf die Kaufbereitschaft ( $M_{\text{Digital}} = 4.34$ ;  $M_{\text{Physisch}} = 4.37$ ). Folglich kann davon ausgegangen werden, dass das Gefühl von Handlungsfähigkeit (Mitspracherecht) den negativen Effekt digitaler Funktionsupgrades auf den empfundenen Wert unterbinden kann. Probanden, die dieses Mitspracherecht nicht hatten, zeigten das übliche Muster: Sie assoziierten das digitale Funktionsupgrade mit einem signifikant niedrigeren Wert ( $M = 3.78$ ) als das physische Funktionsupgrade ( $M = 4.41$ ) und waren signifikant weniger bereit, es zu kaufen ( $M_{\text{Digital}} = 3.65$ ;  $M_{\text{Physisch}} = 4.40$ ).

## **Transparenz über Wertschöpfung**

Ein zweiter Ansatz für Firmen könnte darin bestehen, die Wertschöpfung dem Kunden durch Transparenz zugänglicher zu machen. So haben frühere Arbeiten gezeigt, dass Hersteller die Kundenwahrnehmung positiv beeinflussen können, indem sie ihre Kosten- oder Arbeitsaufwände transparent machen (Buell, Kim, und Tsay 2017; Modig, Dahlén, und Colliander 2014; Söderlund und Sagfossen 2017). Studien zeigen, dass Einblicke in den Wertschöpfungsprozess (operative Transparenz) den empfundenen Wert automatisierter Services steigern können. Eine Webseite vermittelt Konsumenten beispielsweise das Gefühl von mehr Leistung, wenn sie die im Hintergrund ablaufenden Such- oder Ladevorgänge anstelle eines Fortschrittbalkens anzeigt. Die Kundenzufriedenheit steigt und bewirkt eine höhere Kaufintention (Buell und Norton 2011). Studienteilnehmer eines Folgeexperiments bevorzugten sogar eine Webseite mit zeitverzögerten Resultaten gegenüber einer Webseite mit unmittelbaren Resultaten – vorausgesetzt die im Hintergrund ablaufenden Suchvorgänge werden transparent dargestellt. Andere Studien zeigen, dass Angaben über die Herstellungsschritte und -kosten einer Geldbörse deren Abverkauf um 26 % steigerten (Mohan, Buell, und John 2014).

Die Ergebnisse aus Studie 1 dieses Beitrags zeigen, dass Probanden digitale Funktionsupgrades tatsächlich mit niedrigeren Herstellungsaufwänden assoziieren. Folglich stellt sich die Frage, ob Transparenz über die Herstellungs- oder Installationsprozesse als Mechanismus zur Wert- und Kaufbereitschaftssteigerung digitaler Upgrades genutzt werden kann. Dies wurde in einer weiteren Studie untersucht.

## Studienergebnisse

Studie 4 untersuchte den Effekt von Transparenz hinsichtlich des Entwicklungsprozesses und des damit verbundenen Herstelleraufwandes. Ein Teil der Probanden beider Upgrade-Formen (digital und physisch) erhielt Einblick in den Entwicklungsprozess: Eine zusätzliche Seite (Abb. 2a) illustrierte die für die Entwicklung und Herstellung des Funktionsupgrades nötigen Schritte und Aufwendungen. Die Ergebnisse zeigen eine wertsteigernde Wirkung der Transparenzmassnahme. Durch die Einblicke in den Entwicklungsprozess besteht kein signifikanter Unterschied mehr zwischen den zwei Upgrade-Formen. Die Teilnehmer schätzen den Wert der digital zur Verfügung gestellten Funktion sogar leicht höher ein ( $M = 4.32$ ) als den der physisch zur Verfügung gestellten Funktion ( $M = 4.0$ ). Bei der Kaufbereitschaft besteht ebenfalls kein signifikanter Unterschied mehr zwischen den zwei Upgrade-Formen ( $M_{\text{Digital}} = 4.12$ ;  $M_{\text{Physisch}} = 3.94$ ). Ohne Einblick in den Entwicklungsprozess zeigten sich Reaktionen wie in den vorherigen Studien: Die Probanden schätzten den Wert der digital zur Verfügung gestellten Funktion signifikant geringer ein ( $M = 3.38$ ) als den der physisch zur Verfügung gestellten Funktion ( $M = 4.26$ ). Folglich war auch die Kaufbereitschaft signifikant niedriger ( $M_{\text{Digital}} = 3.20$ ;  $M_{\text{Physisch}} = 4.12$ ).

## Implikationen für Praxis und Wissenschaft

Die vorliegenden Studien machen deutlich, dass Unternehmen sich des wertmindernden Potenzials digitaler Produktformen bewusst sein sollten, auch wenn diese eine hohe Kosteneffizienz und viele neue Ertragsquellen versprechen. Studie 1 und 2 zeigen, dass die digitale Freischaltung von zusätzlichen Produktfunktionen deren wahrgenommenen Wert und die Kaufbereitschaft der Konsumenten mindern kann. Frühere Forschungsarbeiten haben dargelegt, dass die nicht-physische Natur digitale Produkte weniger greifbar macht und Konsumenten sie folglich als weniger wertvoll wahrnehmen (Atasoy und Morewedge 2018; Belk 2013; Petrelli und Whittaker 2010; Siddiqui, May, und Monga 2016). Der vorliegende Beitrag zeigt, dass selbst physische

Produktfunktionen als weniger wertvoll wahrgenommen werden können, wenn diese über einen digitalen Upgrade-Prozess erworben werden. Durch die digitale Freischaltung per Knopfdruck fehlen physische Elemente und tangible Qualitätshinweise. Selbst physische Produktfunktionen erscheinen als digitales Funktionsupgrade weniger greifbar und sind infolgedessen schwieriger zu evaluieren. Nutzen Konsumenten die Dauer des digitalen Funktionsupgrades als Heuristik, um Rückschlüsse auf dessen Wert zu ziehen, kann deren unmittelbare Verfügbarkeit bewirken, dass Konsumenten den Wert als gering wahrnehmen. Folglich sind sie weniger bereit, das Funktionsupgrade zu kaufen.

Firmen können diesen Effekt lindern, indem sie die Wertschöpfung des Unternehmens greifbarer machen und die Unsicherheit der Konsumenten über den Produktwert reduzieren. So können Firmen beispielsweise Massnahmen ergreifen, die Kunden das Gefühl von Handlungsfähigkeit – oder zumindest einer graduellen Mitbestimmung – vermitteln. Verbraucher fühlen sich dadurch in ihren Wünschen ernst genommen. Sie bekommen das Gefühl, dass sie an der Produktentwicklung teilhaben oder diese beeinflussen können. So zeigt Studie 3, dass eine unverbindliche Form von Handlungsfähigkeit (die Angabe von Präferenzen) den wahrgenommenen Wert sowie die Kaufbereitschaft digitaler Funktionsupgrades steigern konnte. Frühere Forschungsarbeiten untersuchten die Wirksamkeit von Handlungsfähigkeit als Massnahme zur Förderung von kooperativem Verhalten im Bereich wohltätiger Spenden oder Steuerzahlungen (Gneezy et al. 2010; Lamberton et al. 2014). Der vorliegende Beitrag zeigt hingegen, dass Handlungsfähigkeit durch unverbindliche Mitbestimmungsmassnahmen auch die Wertwahrnehmung von Produkten stabilisieren und deren Kaufwahrscheinlichkeit steigern kann. Somit liefert der Beitrag einen wichtigen Erkenntnisfortschritt zu früheren Arbeiten.

Mitbestimmungsmassnahmen könnten zum Beispiel beinhalten, dass Kunden ihre Wünsche und Präferenzen bezüglich künftiger Funktionen äussern können. Durch die Auseinandersetzung mit neuen Funktionsupgrades rückt der Produktnutzen stärker ins Zentrum der Wahrnehmung des Konsumenten und kann dadurch die Kosten legitimieren. Zuletzt können Unternehmen durch die Abfrage von Präferenzen wertvolles Kundenfeedback generieren und Erkenntnisse für ihre Produktentwicklung gewinnen.

Ein weiterer Mechanismus zur Steigerung des empfundenen Wertes digitaler Funktionsupgrades besteht darin, den Wert bzw. die Wertschöpfung greifbarer zu machen. Firmen können dies erreichen, indem sie transparent handeln, ihre Anstrengungen sichtbar machen und Einblicke in die im Hintergrund ablaufenden Prozesse bieten. Die Ergebnisse aus Studie 4 zeigen, dass Einblicke in den Entwicklungs- und Herstellungsprozess den wahrgenommenen Wert des Funktionsupgrades und die Kaufabsicht der Konsumenten steigern können. Dies stellt einen Erkenntnisfortschritt zu früheren Untersuchungen dar (Buell und Norton 2011), welche die Wirksamkeit von Transparenz über zeitgleich ablaufende Suchvorgänge als qualitätssteigenden Treiber einer Webseite untersucht haben. Der vorliegende Beitrag zeigt, dass auch Transparenz über vorgelagerte Prozesse wertsteigernd wirken kann.

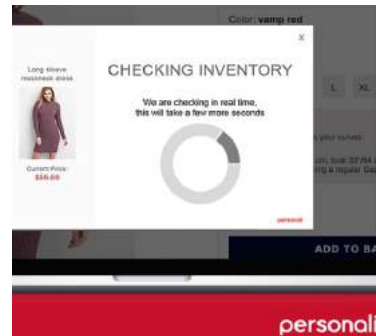
Für Firmen gilt es zu evaluieren, welche Form von Transparenz für ihren Kontext sinnvoll wäre. Die Praxis bietet bereits Inspirationen für die Umsetzung von unterschiedlichen Transparenzmassnahmen (siehe Abb. 3). Die Online-Reisebuchungsplattform Kayak schafft beispielsweise Transparenz über ihre Dienstleistung, indem sie bei Suchanfragen die im Hintergrund durchsuchten Fluggesellschaften auflistet und die Ergebnisse anzeigt, sobald diese gefunden werden. Im Textilbereich verdeutlicht die Bekleidungsmarke Everlane durch preisliche Transparenz den Wert ihrer Produkte, indem sie die Produktkosten aufgeschlüsselt veranschaulicht. Die Geldautomaten der spanischen Bank BBVA imitieren virtuell den physischen Auszahlungsprozess am Schalter und schaffen so operative Transparenz, indem sie die einzelnen Bearbeitungsschritte illustrieren: das Zählen, Sortieren und Verteilen der Geldnoten (The Financial Brand 2010).

Darüber hinaus können Firmen evaluieren, inwiefern sie die Funktionen selbst greifbarer gestalten können. Derartige Strategien nutzen beispielsweise Designer, wenn sie digitale Produkte oder User Interfaces konzipieren: Sie entwerfen digitale Produkte so, dass sie physische Produkte in ihrer Gestalt imitieren (Skeuomorphismus). Das Technologieunternehmen Apple verleiht digitalen eBooks physischen Charakter, indem es sie auf einem virtuellen Holzregal visualisiert. Das Unternehmen setzt zudem bei digitalen Interaktionen mit dem Kunden Sounds ein (z. B. ein Tipp-Geräusch), um das Gefühl einer physischen, durch Personal erbrachten Dienstleistung zu vermitteln.

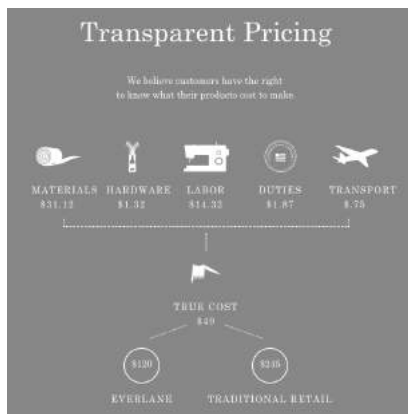
**Abbildung 3:** Screenshots von Transparenzmassnahmen aus der Praxis



**BBVA:** Transparenz über den Bearbeitungsprozess



**Personalisi:** Transparenz über den Suchprozess



**Everlane:** Transparenz über Produktionskosten



**Domino's Pizza:** Transparenz über den Bearbeitungsprozess

Quelle: Eigene Darstellung, Screenshots von: <http://www.carmenlanza.com/work/bbva/>, [www.personali.com/blog](http://www.personali.com/blog), [www.flickr.com/photos/ltllesha/4218219828/](http://www.flickr.com/photos/ltllesha/4218219828/)

Trotz der wertsteigernden Effekte von Transparenzmassnahmen sollten Unternehmen auch deren mögliche Nachteile im Auge behalten. Ein Blick hinter die Kulissen kann beispielsweise uninteressant oder bei bestimmten Produkten oder Herstellungsverfahren sogar befremdlich sein. Zudem könnten Konsumenten skeptisch sein, ob die dargestellten Abläufe der Realität entsprechen. Unternehmen sollten daher im Vorfeld evaluieren, welche Einblicke in ihre Wertschöpfungskette für Kunden attraktiv, authentisch und glaubwürdig sind und sich anschaulich gestalten lassen. Ausserdem müssen Betriebsgeheimnisse geschützt bleiben und dürfen nicht einem Transparenz-

Aktionismus zum Opfer fallen. Transparenz und ein Gefühl der Handlungsfähigkeit stellen somit mögliche Stellschrauben dar, mit denen Unternehmen die Wertschätzung und Kaufbereitschaft digitaler Zusatzprodukte steigern können.

## **Fazit und Ausblick**

Neue Technologien ermöglichen, physische Produkte durch digitale Angebote zu ergänzen. Herstellern eröffnen sich dadurch diverse neue Ertragsquellen. Allerdings zeigt sich, dass der digitalisierte Vertrieb von Funktionen deren Wert untergraben kann. Ausgehend von der Agency-Theorie lassen sich Handlungsfähigkeit der Kunden sowie Transparenz über die Wertschöpfung als mögliche Gegenmassnahmen ableiten. In den vorliegenden Studien konnten beide Massnahmen die Wertwahrnehmung und Kaufbereitschaft der Konsumenten steigern.

Trotz der konstant signifikanten Ergebnisse aller Studien sei darauf hingewiesen, dass den Ergebnissen aufgrund der Neuheit des Phänomens und dem damit eingeschränkten Zugang zu realen Stimuli szenariobasierte Experimente zugrunde liegen. Folgestudien sollten daher die externe Validität der Ergebnisse in Feldexperimenten überprüfen. Darüber hinaus basieren die Erkenntnisse der vorliegenden Studiendesigns auf Querschnittsanalysen und beschränken sich somit auf eine initiale Momentaufnahme. Weiteres Erkenntnispotenzial versprechen Längsschnittanalysen. Dadurch könnte untersucht werden, ob sich der wahrgenommene Wert digitaler Upgrades und die Kaufbereitschaft der Konsumenten bei wiederkehrendem Angebot verändert. Für Unternehmen könnten sich daraus wichtige Implikationen für Neu- und Stammkunden sowie für die Angebotsstruktur ergeben.

Zukünftige Forschungsarbeiten könnten ebenso Interaktionen mit produkt- oder kontextbezogenen Faktoren wie Funktions- oder Produktart untersuchen. Eine differenzierte Betrachtung der Wirkung unterschiedlicher Funktionstypen würde weitere Aufschlüsse darüber geben, bei welcher Art von Basisprodukt und Funktionsupgrade negative Effekte zu erwarten sind und welche Art von Gegenmassnahmen sich entsprechend eignen.



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# CURRICULUM VITAE

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## Education

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## ACADEMIC EXPERIENCE

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