# The Genesis Effect: Digital Goods in the Metaverse

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This research shows that although the used and unused versions of a digital good (e.g., virtual apparel) are identical in every pixel and functionality, consumers tend to prefer the unused version. This "genesis effect" occurs because consumers tend to perceive used (vs. unused) digital goods as virtually contaminated and because being permanently listed as the first (vs. subsequent) owner in the ownership record can confer a greater sense of status. Specifically, in study 1, analyses of large-scale field data on purchases of digital goods in the metaverse showed that consumers paid substantially more to acquire the unused (vs. used) version of the same good. Studies 2–4 causally demonstrated the genesis effect and its underlying mechanism across metaverse product categories—participants were less likely to purchase digital goods described as used (vs. unused). Virtual contamination and virtual status jointly mediated the effect. Furthermore, being the first—at the genesis of a digital product's usage history—was particularly special, such that participants were less sensitive to increases in the number of prior owners after the first one. Finally, showing participants that a used good had been digitally reconstituted attenuated the genesis effect. These findings add to the literature on consumer behavior in the metaverse and offer managerial insights on digital goods marketing.

*Keywords*: metaverse, blockchain, non-fungible token (NFT), ownership history, virtual contamination, virtual status

With the advent of the metaverse (i.e., 3D virtual, augmented, and mixed realities in which consumers can live a digital life), a new era of digital consumption has begun. For example, consumers can shop at a virtual mall for apparel items to dress up their avatars, visit a virtual art gallery, and then teleport to their condominium in a digital skyscraper to socialize with their avatar friends (figures 1–5 in web appendix F). With an ever-growing spectrum of digital goods catering to consumers' needs and wants, the metaverse is becoming a ubiquitous and economically significant realm for consumption.

Notably, digital goods in the metaverse differ from physical goods in the offline world on many dimensions. First, digital goods are not subject to the same design, production, and logistics constraints as physical goods. For instance, many digital goods, from (avatar) body parts to flying furniture to skinsuits that shrink users down to the size of insects, have no equivalent in the physical world. Once a digital good is developed, any quantity of the good can be instantaneously produced and delivered at near zero marginal cost. Second, the experiences digital goods provide depend on the underlying technologies and may differ from the experiences offered by the equivalent physical goods. For example, whereas consumers can touch and feel the ultra-soft wool of a cashmere sweater, smell the aroma of freshly cut roses, and taste the layers of sweetness of a crème brûlée in the physical world, such intricate haptic, olfactory, and gustatory experiences are currently difficult to obtain in the metaverse. Third, once used, digital goods

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are not subject to the same deterioration processes as physical goods. For example, in the physical world, a pair of used jeans may be tainted or torn; however, a pair of digital jeans previously worn by an avatar remains identical in every pixel to a new pair. Finally, with blockchain technologies, the complete ownership history of each unit of every digital good, regardless of how small the item is, can be instantly and publicly verified. Such level of ownership history transparency is not available for physical goods in the offline world.

Despite these distinct characteristics and the growing economic significance of digital goods, our understanding of this form of consumption is very limited. For instance, because digital goods do not deteriorate or decay, a used digital good can be identical to a brand new one. But might consumers prefer and be willing to pay more for the unused (vs. used) version? If so, what might be the underlying mechanism? How can firms more effectively market used and unused digital goods in the metaverse? This research seeks answers to these theoretically and managerially important questions.

Specifically, I propose that although the unused and used versions of a digital good (e.g., a virtual shirt) are identical in every pixel and functionality, consumers tend to prefer the unused version. This advantage of being at the genesis of a digital product's usage history is referred to as "the genesis effect." I further propose that this effect can be driven by two underlying processes: (1) once a digital good has been used by another person, consumers tend to perceive it as contaminated, despite that the previous person cannot have any physical contact with the item. (2) Being permanently listed as the first (vs. subsequent) owner in the ownership record of the digital good can confer a greater sense of status. I test these propositions in a series of studies across a wide spectrum of metaverse product categories. In study 1, analyses of large-scale field data on purchases of unused and used versions of digital goods in the metaverse ($N = 77{,}234$) showed that consumers paid substantially more to acquire the unused (vs. used) version of the same digital good. Subsequent experiments (studies 2–4, supplemental studies 1 and 2) further demonstrated the genesis effect and its dual-factor underlying mechanism, as well as investigated potential alternative accounts. Importantly, being the first—at the genesis of a digital product's usage history—was found to be particularly special, such that participants were less sensitive to increases in the number of prior owners after the first one. Furthermore, showing participants that a used good had been digitally reconstituted reduced perceived virtual contamination and attenuated the genesis effect.

This research makes several contributions. Complementing the literature on psychological processes of the mind as long-term evolutionary outcomes (e.g., Dennett 2017; Pinker 1997), the current work illustrates that the mind may not sufficiently adjust to consumption contexts involving radically new technologies. Specifically, this research shows that psychological processes associated with physical contamination (e.g., Argo, Dahl, and Morales 2006) can be activated in virtual consumption contexts, even though those processes should not apply. At the same time, virtual contamination has unique characteristics—perceived contamination level of a digital good does not necessarily increase with the number of prior owners; digitally reconstituting a used good can attenuate perceived contamination. Moreover, this research sheds light on consumer behavior in the context of ownership history transparency, demonstrating that ownership records can shape status perceptions and influence consumer decision-making. Finally, the findings of this research offer actionable managerial insights on how businesses can more effectively market digital goods.

## CONCEPTUAL BACKGROUND

### Digital Goods in the Metaverse

The metaverse is comprised of 3D virtual, augmented, and mixed realities in which individuals can socialize, entertain, learn, work, consume, and engage in other life activities. Represented by non-fungible tokens (NFTs), digital goods (e.g., virtual apparel and footwear) are one of the most common types of consumption in the metaverse (see web appendix F for additional information). When a brand new digital good is acquired by an individual in the metaverse, an ownership record is created in the underlying blockchain—a distributed computer network that securely processes transactions and permanently stores ownership information in linked (hence "chained") data blocks. This first ownership record contains information such as a unique identifier of the digital good and that of the first owner. If the item is resold, the second owner's unique identifier is appended to the ownership record of the digital good in the blockchain. In other words, whether a particular digital good is brand new or has been used previously is always publicly verifiable. Importantly, unlike physical goods in the offline world where prior usage can objectively degrade the goods (e.g., wear and tear), the unused versus used versions of a digital good are identical in every pixel. The current research explores this new consumption context and examines consumer preference for unused (vs. used) digital goods, the underlying mechanism and moderating factors.

I acknowledge that multiple psychological processes may influence consumer preference for unused (vs. used) digital goods (see study 2 and supplemental study 2 for investigations into three potential alternative accounts). As discussed in detail below, this research focuses on two factors—virtual contamination and virtual status—that are applicable to a wide spectrum of digital goods and that highlight the unique characteristics of consumption in the metaverse.

## Virtual Contamination

Human behaviors in the physical world are often driven by the need to avoid contaminants and diseases (e.g., Nemeroff and Rozin 1994). Prior research has focused on understanding how perceived interpersonal transmission of physical contaminants can impact consumer behavior in offline contexts (e.g., Argo et al. 2006). For instance, consumers evaluate products just tried on by another individual (vs. neatly placed on a display rack) less favorably (Argo et al. 2006). Such aversion has been characterized as originating from "a defense against microbial contamination" (Nemeroff and Rozin 1994, 161). Because psychological processes of the mind, including those related to contamination aversion, are developed through long-term evolution (e.g., Dennett 2017; Pinker 1997), consumers may not be able to sufficiently adjust these processes when they encounter consumption contexts involving radically new technologies. As such, I propose that consumers tend to activate beliefs about offline contamination even when they are in the metaverse where physical contaminants cannot possibly be transferred. That is, knowing that a digital good has been used (e.g., a virtual sweatshirt worn by another individual's avatar) tends to make the item feel tainted. Such virtual contamination can degrade consumer preference for the item.

## Virtual Status

Prior research suggests that the self can extend into the virtual realm (e.g., Belk 2013, 2016). Thus, consumers' possessions in the metaverse can become intertwined with their self-conceptions. Extant research also indicates that because consumers seek to hold a positive image of the self (e.g., Sirgy 1982), they are drawn to goods and services that can bring a sense of status to the self. This feeling of oneself being positively differentiated from others can, for instance, be achieved by possessing a higher rank in a hierarchy (e.g., Leary, Jongman-Sereno, and Diebels 2014; Magee and Galinsky 2008). In the metaverse context, by acquiring a brand new digital good, a consumer would be permanently ranked first in the ownership record of the item. If the consumer purchases a used item, however, the person would be permanently listed as a subsequent owner in this public record. Given the ownership history transparency in the metaverse, I propose that owning an unused (vs. used) version of a digital good tends to confer a greater sense of status. This difference in virtual status can lead to a lower preference for the used (vs. unused) version.

In sum, the above discussion suggests that consumer preference for used (vs. unused) digital goods can be influenced by two underlying factors—virtual contamination and virtual status. Because consumers tend to perceive the used (vs. unused) version of a digital good as virtually contaminated and as conferring a lower status, they tend to prefer the latter (vs. former). This advantage of being at the genesis of a digital good's usage history is referred to as "the genesis effect." The studies below test for this effect and investigate the proposed underlying mechanism.

# STUDY 1

Using large-scale field data on purchases of digital goods in the metaverse, study 1 sought correlational evidence for the genesis effect—whether consumers are willing to pay more to acquire the unused (vs. used) version of a digital good, even though the two versions are identical in every pixel and functionality. Study 1 also investigated whether such effect is robust after accounting for product categories, designers, rarity levels, and purchase time periods.

## Field Data

Decentraland is currently one of the largest metaverse platforms (J.P. Morgan 2022). In this metaverse, consumers can purchase digital goods such as apparel, footwear, and accessories for their avatars (see figures 4 and 5 in web appendix F for examples). For the same digital good, consumers can often choose to acquire an unused version or a used one. The two versions are identical in every pixel and in every functionality in this metaverse. From Decentraland, I obtained a large-scale dataset—77,234 transactions involving unused and used versions of 1,423 digital goods created by 456 designers across 15 product categories (e.g., hat, tiara, upper body wear, lower body wear, skin, footwear) from early June 2021 to late September 2022 (see web appendix A for additional details). Each transaction record included information on whether the good sold was an unused or used version (i.e., newly "minted" vs. not), the product category, designer, maximum number of units available in the metaverse (i.e., maximum supply quantity), transaction date, and transaction price in the cryptocurrency MANA.[1]

## Results

A set of random-intercept models (with a random intercept to account for unobserved characteristics of each digital good)[2] was used to analyze the data. Whether the item bought was the unused version (1 = unused, 0 = used) was the independent variable, and the price paid was the dependent variable. Dummy variables were created to represent specific designers, product categories, and individual months of the 16-month period. Different sets of these dummies and maximum supply quantity (measured in units of 1,000) were included in the models as control variables (table 1).

1 The average exchange rate during the period: 1 MANA = $1.63.

2 Robustness analyses using fixed-effects models showed the same pattern of results.

**TABLE 1**

STUDY 1 RESULTS

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Unused (vs. used) | 5.22 (0.14)**** | 5.23 (0.14)**** | 3.87 (0.14)**** |
| Maximum supply | −0.12 (0.03)**** | −0.14 (0.04)*** | −0.13 (0.03)**** |
| Designer dummies | | Yes | Yes |
| Category dummies | | Yes | Yes |
| Time dummies | | | Yes |
| Constant | 16.18 (1.15)**** | 9.03 (10.51) | 67.87 (8.78)**** |
| $R^2$ | 0.02 | 0.41 | 0.51 |

*$p < .05$; **$p < .01$; ***$p < .005$; ****$p < .001$
SEs are in parentheses.

Across the models, the coefficient of the independent variable was highly significant. That is, consistent with the genesis effect, consumers were willing to pay significantly more to purchase the unused (vs. used) version of the same digital good, even though the two versions were identical in every pixel and functionality. (The coefficient of maximum supply quantity was also significant across the models, indicating that scarcer goods had higher transaction prices.)

Additional analyses were conducted to further explore the behavioral patterns (see web appendix A for details). One set of analyses (table 2 in web appendix A) investigated whether the transaction price gap between unused (vs. used) versions of digital goods was greater in product categories with larger (avatar) bodily contact areas for virtual contaminant transference (e.g., apparel, skin). A dummy variable was created to represent the size of the bodily contact areas (1 = large, 0 = small), and its interaction with the independent variable (1 = unused, 0 = used) was examined. Consistent with the proposed virtual contamination mechanism, the significant positive coefficient of the independent variable (beta = 2.88, SE = 0.19, $p < .001$, 95% CI [2.51, 3.24]) was qualified by a significant positive interaction (beta = 2.05, SE = 0.26, $p < .001$, 95% CI [1.54, 2.56]),[3] indicating that the transaction price gap was greater for product categories with larger bodily contact areas.

Another set of analyses (table 3 in web appendix A) investigated whether the transaction price gap between unused (vs. used) versions of digital goods was smaller for product categories inherently associated with a higher sense of status (e.g., crown, halo). A dummy variable was created to represent an inherently higher level of status (1 = yes, 0 = no), and its interaction with the independent variable (1 = unused, 0 = used) was examined. Consistent with the proposition that virtual status can play an underlying role, the significant positive coefficient of the independent variable (beta = 4.01, SE = 0.14, $p < .001$, 95% CI [3.74, 4.28]) was qualified by a significant negative interaction (beta = −2.74, SE = 0.59, $p < .001$, 95% CI [−3.91, −1.58]),[3] indicating that the transaction price gap was smaller for goods inherently associated with a higher sense of status. Overall, the results of these additional analyses offered correlational support for the two proposed underlying factors.

3 In the above two additional analyses, the coefficient of the bodily contact-area dummy (model 3 in table 2, web appendix A) and that of the inherently higher-status dummy (model 3 in table 3, web appendix A) were not significant.

## STUDY 2

Study 2, a preregistered experiment (https://aspredicted.org/Y2X_YFR), sought to causally demonstrate the genesis effect and examine the underlying roles of virtual contamination and virtual status in a controlled setting. This study also explored a potential alternative account. Specifically, it could be argued that consumers may perceive used items to be less visually attractive than brand new items. This in turn may lower their preference for the former (vs. latter). Study 2 investigated whether this potential alternative account can explain the genesis effect.

### Method

Six hundred US consumers were recruited from Amazon Mechanical Turk to participate in the study for monetary compensation. Five hundred eighty-nine participants (47% female, $M_{age} = 34$) passed the preregistered bot check and attention check procedures (see web appendix C for details) and completed the study. They were randomly assigned to one of two conditions (used vs. unused good). In both conditions, participants were first provided a description of what the metaverse is and how purchases of used versus brand new digital goods are recorded in the blockchain system underlying the metaverse (see web appendix C). Next, they were asked to assume that they were in the metaverse shopping for "a virtual floor lamp for your avatar's room." They were shown the same 3D virtual lamp (figure 1). To hold the rarity level constant, they were told that "there are a total of 1,000 such lamps available in the metaverse." They were also informed that new lamps similar to the target item were typically sold at about $1.00 each and that the target item was priced at $0.90. In other words, price information was held constant across the conditions.

Participants were provided the respective product information of their assigned condition: those in the used condition were informed that the lamp "has been previously owned by another user for the person's avatar" and that, by acquiring the item, they would be "recorded in the blockchain system as the second owner." In the unused condition, the virtual lamp was unused and, by acquiring it, participants would be "recorded in the blockchain system as the first owner." Next, all participants indicated how likely they were to purchase the virtual lamp (1 = not likely

**FIGURE 1**

VIRTUAL FURNITURE LAMP IN STUDY 2

at all, 7 = extremely likely). For virtual contamination, participants indicated the extent to which the virtual lamp felt dirty (1 = completely dirty, 7 = completely clean) and unsanitary (1 = completely unsanitary, 7 = completely sanitary; adapted from Di Muro and Noseworthy 2013). For virtual status, participants indicated the extent to which they would feel a sense of status (1 = not at all, 7 = very much) and sense of prestige (1 = not at all, 7 = very much) for owning the virtual item (adapted from Kirmani, Sood, and Bridges 1999). For perceived visual attractiveness, participants indicated the extent to which they thought the virtual lamp was visually attractive (1 = extremely unattractive, 7 = extremely attractive) and beautiful (1 = extremely ugly, 7 = extremely beautiful; adapted from Veryzer and Hutchinson 1998). Finally, participants completed basic demographic measures (age, gender) and indicated their prior metaverse experience (1 = have never used, 7 = use every day). Participants' responses to the scale items for virtual contamination were averaged and reverse-coded to create a single measure ($r$ = 0.58), with higher values indicating higher levels of virtual contamination. Responses to the items for virtual status ($r$ = 0.80) and those for perceived visual attractiveness ($r$ = 0.73) were averaged to create the respective measure for analyses.

## Results

*Purchase Likelihood.* Demonstrating the genesis effect, an ANOVA showed that participants were significantly less likely to purchase the virtual lamp when the item was (vs. not) described as previously owned by another user ($M_{used}$ = 5.15, $SD_{used}$ = 1.44 vs. $M_{unused}$ = 5.50, $SD_{unused}$ = 1.35; $F(1, 587) = 9.31$, $p = .002$, $\eta_p^2 = 0.02$). Controlling for participants' prior metaverse experience in this and all subsequent analyses yielded the same significant patterns (see web appendix D for the auxiliary analyses).

*Virtual Contamination.* An ANOVA showed that participants perceived the virtual lamp as significantly more contaminated when the item was (vs. not) described as previously owned by another user ($M_{used}$ = 2.52, $SD_{used}$ = 1.06 vs. $M_{unused}$ = 2.26, $SD_{unused}$ = 0.96; $F(1, 587) = 9.67$, $p = .002$, $\eta_p^2 = 0.02$).

*Virtual Status.* An ANOVA showed that the virtual item offered a significantly lower sense of status when the item was (vs. not) described as previously owned by another user ($M_{used}$ = 4.99, $SD_{used}$ = 1.50 vs. $M_{unused}$ = 5.28, $SD_{unused}$ = 1.48; $F(1, 587) = 5.48$, $p = .02$, $\eta_p^2 = 0.01$).

*Perceived Visual Attractiveness.* Inconsistent with the potential alternative account, an ANOVA showed that perceived visual attractiveness did not differ across the conditions ($M_{used}$ = 5.33, $SD_{used}$ = 1.27 vs. $M_{unused}$ = 5.38, $SD_{unused}$ = 1.29; $p > .62$).

*Mediation.* A mediation analysis (PROCESS model 4; 5,000 resamples; Hayes 2017) was conducted using the experimental conditions as the independent variable (used = 1, unused = 0), purchase likelihood as the dependent variable, and virtual contamination and virtual status as two parallel mediators. This analysis showed that the indirect effect through virtual contamination (beta = −0.10, SE = 0.04, 95% CI = [−0.18, −0.04]) and the indirect effect through virtual status (beta = −0.15, SE = 0.07, 95% CI = [−0.29, −0.03]) were both significant. Furthermore, after these indirect effects were accounted for, the direct effect (beta = −0.10, SE = 0.08, 95% CI = [−0.26, 0.06]) became non-significant. Thus, supporting the proposed mechanism, virtual contamination and virtual status jointly mediated the genesis effect. Moreover, another mediation analysis using virtual contamination, virtual status, and perceived visual attractiveness as three parallel mediators, showed that the indirect effect through perceived visual attractiveness (beta = −0.01, SE = 0.03, 95% CI = [−0.08, 0.04]) was not significant, but the indirect effects through virtual contamination (beta = −0.08, SE = 0.03, 95% CI = [−0.15, −0.03]) and virtual status (beta = −0.12, SE = 0.05, 95% CI = [−0.23, −0.02]) both remained significant. That is, inconsistent with the potential alternative account, perceived visual attractiveness did not mediate the genesis effect.

To assess the robustness of the results and explore other potential alternative accounts, I conducted supplemental studies using different product categories (e.g., couch,

suitcase) and experimental setups (see web appendix E). These studies further demonstrated the genesis effect and the proposed dual-factor underlying mechanism, and showed that potential alternative accounts based on perceived usability or perceived trendiness of the target item could not explain the pattern of results.

## STUDY 3

Study 2 demonstrated the genesis effect and the underlying roles of virtual contamination and virtual status. Study 3, a preregistered experiment (https://aspredicted.org/P3S_5LX), sought to explore whether the genesis effect is strictly monotonic. On one hand, a digital good that has been used by multiple prior owners (vs. a single prior owner) might be perceived as more contaminated and as conferring a lower sense of status, hence resulting in a larger genesis effect. On the other hand, being the first—at the genesis of a digital product's usage history—might be particularly special, such that consumers are less sensitive to increases in the number of prior owners after the first one. Study 3 examined these two alternatives.

### Method

Nine hundred US consumers were recruited from Amazon Mechanical Turk to participate in the study for monetary compensation. Eight hundred and seventy-five participants (41% female, $M_{age} = 35$) passed the preregistered bot check and attention check procedures (see web appendix C) and completed the study. They were randomly assigned to one of three conditions (five prior owners vs. one prior owner vs. no prior owner). As in study 2, participants in all three conditions were first shown a description of what the metaverse is and how purchases of used versus brand new digital goods are recorded in the blockchain system underlying the metaverse (see web appendix C). Next, they were asked to assume that they were in the metaverse shopping for a virtual sweatshirt for their avatar. They were shown the same 3D virtual sweatshirt (figure 2). To hold the rarity level constant, they were told that "there are a total of 1,000 such sweatshirts available in the metaverse." They were also informed that new sweatshirts similar to the target item were typically sold at about $1.00 each and that the target item was priced at $0.90. In other words, price information was held constant across the three conditions.

Participants were provided the respective product information of their assigned condition: Those in the five-prior-owners condition were informed that the sweatshirt "has previously been owned by five other users for their avatars" and that, by acquiring the item, they would be "recorded in the blockchain system as the sixth owner." Those in the one-prior-owner condition were informed that the sweatshirt "has previously been owned by another user for the person's avatar" and that, by acquiring the item, they would be "recorded in the blockchain system as the second owner." In the no-prior-owner condition, the virtual sweatshirt was unused and, by acquiring it, participants would be "recorded in the blockchain system as the first owner."

**FIGURE 2**

VIRTUAL SWEATSHIRT IN STUDY 3

Next, all participants indicated how likely they were to purchase the virtual sweatshirt (1 = not likely at all, 7 = extremely likely). For virtual contamination, participants indicated the extent to which the virtual sweatshirt felt infected (1 = completely infected, 7 = completely clean) and contaminated (1 = completely contaminated, 7 = completely clean; adapted from Tolin et al. 1999). For virtual status, participants indicated the extent to which they would feel a sense of status (1 = not at all, 7 = very much) and sense of prestige (1 = not at all, 7 = very much) for owning the virtual item (adapted from Kirmani, Sood, and Bridges 1999). Finally, as in study 2, participants completed basic demographic measures and indicated their prior metaverse experience. Participants' responses to the scale items for virtual contamination were averaged and reverse-coded to create a single measure ($r = 0.59$), with higher values indicating higher levels of virtual contamination. Responses to the scale items for virtual status were also averaged into a single measure ($r = 0.72$), with higher values indicating higher levels of status.

### Results

*Purchase Likelihood.* An ANOVA showed that purchase likelihood differed significantly across the three

conditions ($F(2, 872) = 6.70$, $p = .001$, $\eta_p^2 = 0.02$). Further demonstrating the genesis effect, contrast analyses revealed that participants were significantly less likely to purchase the virtual sweatshirt when the item was described as used by one prior owner than as unused ($M_{used\_by\_one} = 5.41$, $SD_{used\_by\_one} = 1.48$ vs. $M_{unused} = 5.80$, $SD_{unused} = 1.11$; $F(1, 872) = 12.74$, $p < .001$, $\eta_p^2 = 0.01$). Participants were also significantly less likely to purchase the virtual sweatshirt when the item was described as used by five prior owners than as unused ($M_{used\_by\_five} = 5.53$, $SD_{used\_by\_five} = 1.41$; $F(1, 872) = 6.19$, $p = .01$, $\eta_p^2 = 0.01$). There was no significant difference between the two used conditions ($p = .28$), indicating that purchase likelihood did not necessarily decrease with the number of prior owners after the first one. This pattern suggests that being the first—at the genesis of a digital product's usage history—has a unique positive impact on consumer preference. (Controlling for participants' prior metaverse experience in this and all subsequent analyses yielded the same significant patterns. See web appendix D for the auxiliary analyses.)

*Virtual Contamination.* An ANOVA showed that virtual contamination differed significantly across the three conditions ($F(2, 872) = 7.85$, $p < .001$, $\eta_p^2 = 0.02$). Contrast analyses showed that participants perceived the virtual sweatshirt as significantly more contaminated when the item was described as used by one prior owner than as unused ($M_{used\_by\_one} = 2.47$, $SD_{used\_by\_one} = 1.03$ vs. $M_{unused} = 2.21$, $SD_{unused} = 0.93$; $F(1, 872) = 8.62$, $p = .003$, $\eta_p^2 = 0.01$). Participants also perceived the virtual sweatshirt as significantly more contaminated when the item was described as used by five prior owners than as unused ($M_{used\_by\_five} = 2.54$, $SD_{used\_by\_five} = 1.17$; $F(1, 872) = 14.22$, $p < .001$, $\eta_p^2 = 0.02$). There was no significant difference between the two used conditions ($p = .41$), indicating that virtual contamination did not necessarily increase with the number of prior owners after the first one. This pattern suggests that although virtual contamination in the metaverse shares similarities with physical contamination in the offline world, some characteristics of the two forms of contamination can still differ.

*Virtual Status.* An ANOVA showed that virtual status differed significantly across the three conditions ($F(2, 872) = 3.61$, $p = .027$, $\eta_p^2 = 0.01$). Contrast analyses showed that the virtual item offered a significantly lower sense of status when it was described as used by one prior owner than as unused ($M_{used\_by\_one} = 5.27$, $SD_{used\_by\_one} = 1.39$ vs. $M_{unused} = 5.55$, $SD_{unused} = 1.18$; $F(1, 872) = 6.20$, $p = .01$, $\eta_p^2 = 0.01$). Participants also felt that the virtual item offered a significantly lower sense of status when it was described as used by five prior owners than as unused ($M_{used\_by\_five} = 5.31$, $SD_{used\_by\_five} = 1.44$; $F(1, 872) = 4.49$, $p = .03$, $\eta_p^2 = 0.01$). There was no significant difference between the two used conditions ($p = .71$), indicating that virtual status did not necessarily decrease with the number of prior owners after the first one.

*Mediation.* A multicategorical mediation analysis (PROCESS model 4; 5,000 resamples; Hayes 2017) was conducted using the three experimental conditions as the independent variable (i.e., PROCESS utilized two dummy variables to represent the three conditions, with the unused condition as the baseline). Virtual contamination and virtual status were included as parallel mediators. Purchase likelihood was the dependent variable. This analysis showed that the indirect effect of used-by-one (vs. unused) through virtual contamination was significant (beta = −0.11, SE = 0.04, 95% CI = [−0.19, −0.04]) and the indirect effect through virtual status was also significant (beta = −0.15, SE = 0.06, 95% CI = [−0.27, −0.04]). Furthermore, the indirect effect of used-by-five (vs. unused) through virtual contamination was significant (beta = −0.14, SE = 0.04, 95% CI = [−0.23, −0.06]) and the indirect effect through virtual status was also significant (beta = −0.13, SE = 0.06, 95% CI = [−0.24, −0.02]). Thus, supporting the proposed mechanism, virtual contamination and virtual status jointly mediated the genesis effect in study 3.

## STUDY 4

The results thus far indicate that virtual contamination and virtual status are two factors underlying the genesis effect. Study 4, a preregistered experiment (https://aspredicted.org/FV9_QDK), sought further evidence for the parallel nature of the two mediators by manipulating a moderator that influences one of the mediation paths but not the other. That is, study 4 examined the distinctiveness of the two mediation paths. Furthermore, the results of studies 1–3 suggest that consumers tend to react to the used (vs. unused) version of a digital good less favorably, even though the two versions are identical in every pixel and functionality. It is hence managerially important to identify the means to improve consumer preference for used digital goods. Study 4 explored a potential approach. Specifically, if previous usage makes a virtual item feel contaminated, then "re-digitizing" the good (e.g., displaying the regeneration of each pixel of the item on the screen) may reduce perceived contamination. This in turn should increase consumer preference for the used item. Importantly, this type of intervention does not affect the ownership record—consumers who opt to acquire the used item will still be listed as a subsequent owner in the ownership record. In other words, the intervention should not alter the sense of status associated with owning the digital good and hence its underlying role in the genesis effect.

## Method

One thousand five hundred US consumers were recruited from Amazon Mechanical Turk to participate in the study for monetary compensation. One thousand four hundred and sixty-nine participants (46% female, $M_{age}$ = 37) passed the preregistered bot check and attention check procedures and completed the study. They were randomly assigned according to a 2 (used vs. unused version) × 2 (control vs. intervention) between-participants design. As in studies 2 and 3, participants in all conditions were first shown a description of what the metaverse is and how purchases of used versus brand new digital goods are recorded in the blockchain underlying the metaverse. Next, they were asked to assume that they were in the metaverse shopping for a pair of virtual shoes for their avatar. They were shown the same pair of 3D virtual shoes (figure 3). To hold the rarity level constant, all participants were told that "there are a total of 1,000 pairs of such shoes available in the metaverse." They were also informed that new shoes similar to the target shoes were typically sold at about $1.00 per pair and that the target pair was priced at $0.90. In other words, price information was held constant across the conditions.

Participants were provided the respective product information of their assigned condition. The manipulation of the used (vs. unused) factor was identical to that of study 3 (i.e., one vs. no prior owner conditions). Participants in the control condition then responded to measures identical to those used in study 3 (i.e., purchase likelihood, virtual contamination, and virtual status). Participants in the intervention condition were first shown that the used [unused] virtual item had just been re-digitized [digitized] so that "every pixel of the shoes is brand new." They then responded to the measures. The rest of the procedure was identical to that of study 3. A single measure of virtual contamination was created from the respective scale items ($r$ = 0.68), with higher values indicating higher levels of virtual contamination. A single measure of virtual status was also created ($r$ = 0.83), with higher values indicating higher levels of virtual status.

**FIGURE 3**

VIRTUAL SHOES IN STUDY 4

## Results

*Purchase Likelihood.* An ANOVA on purchase likelihood showed a significant main effect of whether the virtual shoes were described as used versus unused ($M_{used}$ = 5.14, $SD_{used}$ = 1.69 vs. $M_{unused}$ = 5.40, $SD_{unused}$ = 1.55; $F(1, 1465) = 8.95$, $p = .003$, $\eta_p^2 = 0.01$). The main effect of the intervention was not significant ($p > .08$). Importantly, there was a significant interaction effect ($F(1, 1465) = 7.77$, $p = .005$, $\eta_p^2 = 0.01$). Contrast analyses showed that, in the control condition, participants were significantly less likely to purchase the virtual shoes when they were described as used versus unused ($M_{used}$ = 4.95, $SD_{used}$ = 1.79 vs. $M_{unused}$ = 5.44, $SD_{unused}$ = 1.54; $F(1, 1465) = 16.69$, $p < .001$, $\eta_p^2 = 0.01$). In the intervention condition, however, there was no significant difference in purchase likelihood ($M_{used}$ = 5.33, $SD_{used}$ = 1.57 vs. $M_{unused}$ = 5.35, $SD_{unused}$ = 1.56; $p = .89$). Additional contrasts showed that the intervention did not significantly impact purchase likelihood when the virtual shoes were described as unused ($p = .46$), but significantly increased purchase likelihood when the virtual shoes were described as used ($F(1, 1465) = 10.28$, $p = .001$, $\eta_p^2 = 0.01$). Controlling for participants' prior metaverse experience in this and all subsequent analyses yielded the same significant patterns (see web appendix D for the auxiliary analyses).

*Virtual Contamination.* An ANOVA on virtual contamination showed a significant main effect of whether the virtual shoes were described as used versus unused ($M_{used}$ = 2.49, $SD_{used}$ = 1.27 vs. $M_{unused}$ = 2.14, $SD_{unused}$ = 1.01; $F(1, 1465) = 33.67$, $p < .001$, $\eta_p^2 = 0.02$). The main effect of the intervention was also significant ($M_{control}$ = 2.38, $SD_{control}$ = 1.25 vs. $M_{intervention}$ = 2.26, $SD_{intervention}$ = 1.06; $F(1, 1465) = 4.43$, $p = .04$, $\eta_p^2 = 0.003$). More importantly, there was a significant interaction effect ($F(1, 1465) = 6.08$, $p = .01$, $\eta_p^2 = 0.004$). Contrast analyses showed that, in the control condition, participants perceived the digital shoes as significantly more contaminated when the shoes were described as used versus unused ($M_{used}$ = 2.63, $SD_{used}$ = 1.41 vs. $M_{unused}$ = 2.13, $SD_{unused}$ = 1.02; $F(1, 1465) = 34.15$, $p < .001$, $\eta_p^2 = 0.02$). In the intervention condition, the difference in virtual contamination between the used (vs. unused) version was substantially smaller in size ($M_{used}$ = 2.35, $SD_{used}$ = 1.10 vs. $M_{unused}$ = 2.16, $SD_{unused}$ = 1.01; $F(1, 1465) = 5.57$, $p = .02$, $\eta_p^2 = 0.004$). Additional contrasts showed that the intervention did not significantly impact virtual contamination when the shoes were described as unused ($p = .8$) but significantly reduced virtual contamination when the virtual shoes were described as used ($F(1, 1465) = 10.47$, $p = .001$, $\eta_p^2 = 0.01$).

*Virtual Status.* As expected, an ANOVA on virtual status only yielded a significant main effect of whether the virtual shoes were described as used versus unused ($M_{used}$ = 4.76, $SD_{used}$ = 1.75 vs. $M_{unused}$ = 5.21, $SD_{unused}$ = 1.54; $F(1, 1465) = 26.49$, $p < .001$, $\eta_p^2 = 0.02$). The main effect of the intervention ($p = .18$) and the interaction effect ($p = .45$) were not significant. That is, regardless of the intervention, the used (vs. unused) virtual shoes offered a significantly lower sense of status.

*Moderated Mediation.* A moderated mediation analysis (PROCESS model 8; 5,000 resamples; Hayes 2017) was conducted using product version (1 = used, 0 = unused) as the independent variable, purchase likelihood as the dependent variable, and virtual contamination and virtual status as parallel mediators. Whether the intervention was utilized (1 = intervention, 0 = control) served as the moderator. This analysis yielded a moderated mediation pattern supporting the proposed mechanism: The moderated mediation index for virtual status was not significant (index = 0.08, SE = 0.10, 95% CI [−0.13, 0.28]), indicating that the indirect effect through virtual status did not significantly differ due to the intervention. However, the moderated mediation index for virtual contamination was significant (index = 0.11, SE = 0.05, 95% CI [0.02, 0.20]), indicating that the intervention significantly moderated the underlying role of this construct. Specifically, the indirect effect through virtual contamination in the control condition was highly significant (beta = −0.18, SE = 0.04, 95% CI [−0.26, −0.11]). In the intervention condition, the significant indirect effect became substantially smaller in size (beta = −0.07, SE = 0.03, 95% CI [−0.13, −0.02]). Overall, these results provide further evidence that virtual contamination and virtual status can play distinct underlying roles in the genesis effect.

## GENERAL DISCUSSION

This research seeks to shed light on consumer behavior in the metaverse. I propose that although the used and unused versions of a digital good are identical in every pixel and functionality, consumers tend to prefer the unused version. This genesis effect occurs because consumers tend to perceive used (vs. unused) digital goods as virtually contaminated and because being permanently listed as the first (vs. subsequent) owner in the ownership record can confer a greater sense of status. Through empirical analyses of large-scale field data on transactions of digital goods in the metaverse and a series of controlled experiments, this research demonstrates the genesis effect and its underlying mechanism, investigates potential alternative accounts, and examines moderating factors.

This research makes several contributions. Complementing the literature on psychological processes of the mind as long-term evolutionary outcomes (e.g., Dennett 2017; Pinker 1997), the current work illustrates that the mind may not sufficiently adjust to consumption contexts involving radically new technologies. Specifically, this research shows that psychological processes associated with physical contamination (e.g., Argo et al. 2006) can be activated in virtual consumption contexts, even though those processes should not apply. At the same time, virtual contamination has unique characteristics—perceived contamination level of a digital good does not necessarily increase with the number of prior owners; digitally reconstituting a used good can attenuate perceived contamination. Furthermore, this research adds to the understanding of consumer behavior in the context of ownership history transparency. Complementing the research streams on consumers' extended self (e.g., Belk 2013, 2016) and digital consumption (e.g., Atasoy and Morewedge 2018; Hofstetter et al. 2022; Schmitt 2019), this research shows that being permanently listed as the first (vs. subsequent) owner in ownership records can confer a greater sense of status for the metaverse self and hence shape consumer preference.

The findings of this research have important managerial implications. Given that virtual contamination degrades consumer preference, sellers of used digital goods should consider designing their metaverse stores to project cleanliness and avoid activating contamination-related cognitions. The current research shows that the virtual status derived from the ownership history of a digital good can influence consumer decision-making. This suggests that by highlighting certain virtual status (e.g., permanently ranked first), firms can bolster the effectiveness of their promotion endeavors in the metaverse. Further, study 1 findings indicate that the genesis effect can vary across product categories with different characteristics (e.g., virtual contact level, inherent status). These results inform how firms can better customize prices for used versus unused digital goods. Moreover, study 4 findings suggest that digitally reconstituting a used good can help reduce virtual contamination. Because of the digital nature of this type of approach (e.g., displaying the regeneration of each pixel of a virtual product), the marginal cost of the intervention is practically zero. But the increase in purchase likelihood can be substantial.

The findings of this research suggest several directions for future research. First, in study 1, analyses of large-scale field data on purchases of digital goods found that consumers were willing to pay a substantially higher price for the unused (vs. used) version of the same good across a wide spectrum of product categories. The subsequent experiments, which utilized controlled setups and large sample sizes, focused on investigating the underlying mechanism. While the genesis effect was consistently demonstrated across product categories, the size of the effect in the experiments was relatively moderate. Future research can leverage other approaches to further examine the

phenomenon and, more importantly, uncover additional factors that accentuate or attenuate the effect. Second, the findings of this research suggest that the extent to which each of the two underlying factors drives the genesis effect depends on the consumption context. Like physical goods consumption in the offline world, digital goods consumption in the metaverse most often involves being virtually in contact with the goods. However, for goods that do not involve any virtual contact, the underlying role of virtual contamination may be attenuated. Further, the findings of this research suggest that digital goods can vary in their inherent status. Consumers may experience a substantial sense of status for acquiring, for instance, an exclusive product by an elite designer, even if the item has been previously owned. For such type of goods, being listed as a subsequent owner in the ownership history might not significantly reduce the sense of status. Relatedly, whether the first owner is the creator of the good (vs. a regular consumer) may also lead to different reactions. Future research can explore these possibilities and further delineate the conditions under which the two mediating factors may be more or less potent. Third, this research demonstrates a negative effect of prior usage on consumer preference for digital goods. Future research can explore situations in which the opposite pattern may occur. For example, extant research on offline entities suggests that when the previous owner is perceived to be highly positive (e.g., a beloved celebrity), consumers may perceive positive contamination and value the used items more (Newman, Diesendruck, and Bloom 2011; see Huang, Ackerman, and Newman 2017 for discussions). Future research can examine the extent to which such positive contamination occurs with used digital goods. Fourth, consumers' chronic dispositions may influence their reactions to used (vs. unused) digital goods. For example, chronic sensitivity to physical contagion and/or spiritual contagion (Kim et al. 2023) may interact with different digital product categories to shape consumer preference. Future research can explore this direction and offer more insights on the psychology of virtual contagion.

More broadly, this research highlights the need to better understand consumer behavior in the metaverse. Digital goods have unique characteristics (see web appendix B) that remain unexplored. For example, unlike in the physical world, a diamond necklace/gold ring in the metaverse can cost the same to produce as a glass necklace/copper ring. Given the lack of differences in the preciousness of "raw materials" in the metaverse, research is needed to understand the implications for perceptions of value, rarity, and luxury. Moreover, it is important to examine how the metaverse may alter the psychology of ownership. For instance, prior research shows that the lack of physical interactions with digital goods makes it less likely for consumers to develop a sense of psychological ownership, causing them to value digital goods less than similar physical goods (Atasoy and Morewedge 2018; see Morewedge et al. 2021 for discussions). With the metaverse, consumers, in their avatars, are able to intimately interact with the digital goods they own. Future research can explore whether consumers develop a stronger level of psychological ownership toward certain digital possessions in the metaverse and whether the differences in valuations of digital versus physical goods may be attenuated or even reversed. It is also important to understand how the consumption of digital goods may impact that of physical goods and vice versa. Such insights can inform, for instance, when and how firms should offer a digital version of a physical product. Furthermore, this research examined non-fungible digital goods (e.g., a virtual lamp that has a unique ID and an associated ownership record in the blockchain is not perfectly interchangeable with another virtual lamp with a different ID and a different ownership record). Future research can explore how consumers react to digital items that are fungible (i.e., perfectly interchangeable). Finally, this research focused on common metaverse goods (e.g., virtual furniture, apparel). Future research can explore other classes of digital assets (e.g., virtual lands, houses, estates) and shed light on consumer decision-making involving those assets. Investigating potential research directions such as the above can help advance the theoretical understanding of consumer behavior in the metaverse and offer important managerial insights.

## DATA COLLECTION STATEMENT

The dataset used in study 1 was obtained by the author from Decentraland in September 2022. The data for experimental studies were collected by research assistants under the supervision of the author. The data were collected using Amazon Mechanical Turk and Qualtrics. The data for study 2 and supplemental study 2 were collected in May and June 2023; the data for studies 3 and 4 and supplemental study 1 were collected in October–December 2022. The author analyzed the data. All data are currently stored in a project directory on the Open Science Framework.

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