

Beyond Time Limits: How Skill-based Scarcity Enhances Brand Relationships in Metaverses

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Abstract:

This research introduces and examines skill-based scarcity (SS), a metaverse-specific form of scarcity where product acquisition depends on players' gaming abilities, comparing its effects with traditional limited-time scarcity (LTS). Through three experimental studies across multiple gaming platforms, we investigate how SS and LTS differently influence self-brand connection through social status and self-esteem. Results demonstrate that SS generates stronger immediate effects on social status and self-brand connection than LTS, but this advantage diminishes over time. However, during product re-release, the superiority of SS re-emerges. The findings extend scarcity theory by revealing how different resource requirements (skill versus time) create distinct psychological responses in metaverse environments. This research provides theoretical contributions to digital consumer behavior literature and practical implications for brands' metaverse strategies, suggesting that SS effectively fosters skill-based community hierarchies while LTS better serves long-term relationship building.

Keywords: Scarcity, Metaverse, Digital Consumer Behavior

Track: Digital Marketing & Social Media

1. Introduction

The rapid rise of metaverse platforms, particularly gaming metaverses, such as Roblox and Fortnite, has significantly transformed consumer behavior and increased demand for virtual products. Users actively use virtual fashion items on these platforms for self-expression and enhanced immersion (Belk, 2013). Many fashion brands have entered these metaverses, aiming to increase sales and strengthen consumer relationships and enhance brand awareness (Hollensen et al., 2023).

The nature of scarcity differs between the real world and metaverse. In the real world, scarcity primarily arises from production limitations and distribution adjustments based on physical constraints. In contrast, virtual products in the metaverse can be infinitely replicated without physical constraints, and artificial scarcity is imposed through programming (Belk et al., 2022). Interestingly, consumers find value in this metaverse-specific artificial scarcity (Lehdonvirta et al., 2009).

This research focuses particularly on skill-based scarcity (SS) and limited-time scarcity (LTS). SS is a game-specific form of scarcity where items can be acquired based on players' in-game achievements and abilities, while LTS refers to items available only for a limited time—a product supply method widely adopted in many metaverses.

While SS and LTS are similar in that they restrict supply methods, they differ in the consumer resources required for product acquisition. SS requires player ability, while LTS requires time. This difference in acquisition resources is expected to create variations in consumer psychological responses. In gaming metaverses, high game skill determines social status (Billieux et al., 2013), whereas abundance of time does not necessarily indicate social status. However, these differences may change with temporal distance. Further, re-release, which is frequently used in gaming metaverses, may have additional effects on SS and LTS.

Despite SS and LTS being common in gaming metaverses and potentially causing differences in consumer psychological responses, no research has examined these effects. Therefore, this study investigates the differential effects of SS and LTS on self-brand connection (SBC) through social status. SBC represents the extent to which consumers incorporate brands into their self-concept (Escalas & Bettman, 2003) and is an important marketing objective for companies entering the metaverse (Hollensen et al., 2023). We also examine the moderating effects of temporal distance (post-acquisition vs. post-sale) and re-release to reveal how scarcity effects change over time and are influenced by common

metaverse marketing practices. Additionally, we explore the impact on self-esteem as a factor shaping consumer psychological well-being to comprehensively understand scarcity effects.

This research makes several theoretical contributions. First, it provides new insights into scarcity research by comparing the effects of metaverse-specific SS and LTS. Second, it extends existing research by explaining the effects of scarcity on SBC and self-esteem from a social status perspective. Finally, it introduces new perspectives to scarcity research by examining the moderating effects of temporal distance and re-release. These findings offer practical implications for brands entering metaverses: SS can effectively enhance social status by signaling players' gaming competence, generating immediate and strong respect from other players, while LTS creates psychological value through the ownership of products that others desire but cannot obtain. Importantly, these effects evolve differently over time—the impact of SS on social status is strongest immediately after acquisition but may decrease over time, while LTS can maintain or even strengthen its effect after sales end. Understanding these temporal dynamics is crucial for brands to strategically implement and manage scarcity in their metaverse marketing initiatives.

2. Theoretical Background

2.1 Scarcity and social status

Consumers find value in scarce products, and marketers have long utilized this principle (Barton et al., 2022). While traditional research has focused on three types of scarcity—supply, demand, and time—the effects of SS remained unexamined. SS and LTS are similar in that they restrict supply methods rather than quantities (Barton et al., 2022).

Among the mechanisms explaining scarcity effects—social status, uniqueness, and conformity (Gierl & Huettl, 2010)—this study focuses on social status. Social status is a crucial mechanism closely related to self-esteem and SBC (Sivanathan & Pettit, 2010). Social status refers to individuals' perceptions of superiority, respect, and influence from others (Ivanic et al., 2011). Particularly in gaming metaverses, players' social status significantly influences interaction with others and self-expression (Billieux et al., 2013), making it an important factor in understanding virtual product selection and usage behavior.

In the metaverse, virtual products require minimal physical resources for production and can theoretically be created without limit (Belk et al., 2022). However, consumers find value in this artificial scarcity (Lehdonvirta et al., 2009). Further, with the emergence of non-fungible tokens, the ability to more precisely manipulate product quantity and scarcity has increased the importance of scarcity in the metaverse (Belk et al., 2022).

2.2 Differential effects of SS and LTS

In gaming metaverses, players' in-game skills and achievements play crucial roles (Billieux et al., 2013). SS products require skilled resources for acquisition, and game execution skill represents social status in the metaverse. Therefore, using SS products to demonstrate these skilled resources may directly contribute to social status enhancement.

Conversely, while LTS products require temporal resources, abundance of time itself does not represent social status. However, based on regret theory (Loomes & Sugden, 1982), LTS may affect social status (Shi et al., 2020). Consumers desire limited products to avoid regret and can gain envy from others who cannot possess them by acquiring limited products.

SBC represents the extent to which consumers incorporate brands into their self-concept (Escalas and Bettman 2003). It is an important marketing communication goal predicting purchase intention and brand attitude (Escalas, 2004). Self-esteem enhancement represents a key aspect of positive changes in self-concept (Rosenberg, 2015).

Products demonstrating social status enhance self-esteem (Sivanathan & Pettit, 2010), and high social status leads to improved self-esteem (Kaye et al., 2017). Therefore, we propose the following hypotheses:

H1a: SS and LTS (vs. no scarcity) positively affect social status, self-esteem, and SBC, with SS having stronger effects.

H1b: Compared to LTS, SS enhances SBC through the mediation of self-esteem via social status.

2.3 Temporal factors and re-release effects

At the point of sale end, the effect difference between SS and LTS may decrease as others can no longer obtain LTS products. SS products become expressions of past game execution ability, reducing social status advantage:

H2: SS has a stronger effect on SBC than LTS immediately after product acquisition, but this difference decreases at the point of sale end. This moderating effect occurs through social status mediation.

While research on re-release is limited (Chae et al., 2020), during re-release, SS products remain accessible only to consumers with high skills, while LTS products decrease in exclusivity and become available to more consumers, potentially reducing their effect on social status enhancement:

H3: When products are resold, the advantage of SS over LTS in affecting SBC reappears. This moderating effect occurs through social status mediation.

2.4 Preliminary survey

A preliminary survey was conducted with 188 game players (aged 20–69 years, median 45–49 years, 65% men) to examine differences in product scarcity and attachment between metaverse and real world. Participants rated their most cherished in-game skin/costume and real-world clothing on scarcity and design appreciation (0–10 scale). Analysis revealed higher ratings in the metaverse than in the real world for both scarcity ($M_{\text{virtual}} = 6.54$ vs. $M_{\text{real}} = 4.78$, $p < .001$) and design appreciation ($M_{\text{virtual}} = 9.08$ vs. $M_{\text{real}} = 8.56$, $p < .027$), with the difference being particularly pronounced for scarcity. These findings suggest that scarcity plays a more significant role in metaverse environments compared to the real world.

3. Study 1: H1a and H1b Verification

3.1 Method

To confirm the basic effects of scarcity, we recruited 280 players from Fortnite ($n = 139$) and FF14 ($n = 141$), aged 25–59 (median 40–44 years, 76% men). Nike was selected as the target brand, with virtual products being costumes (avatar skins) in Fortnite and mounts (in-game vehicles) in FF14.

Participants were presented with a Nike new product introduction scenario. In the SS condition, 15 victories were required; in the LTS condition, a 6-hour sales period was specified; and in the no-scarcity condition, long-term sales were indicated. We measured social status (Gierl & Huettl, 2010), desire to own (2 items; $\alpha = .95$), wearability (2 items; $\alpha = .94$), self-esteem (4 items; $\alpha = .89$ Rosenberg, 2015), and SBC (3 items; $\alpha = .92$ Escalas & Bettman, 2003).

3.2 Results and discussion

Manipulation checks revealed a significant main effect of scarcity ($F(2, 277) = 209.58$, $p < .001$, $\eta^2 = .60$), with $\text{SS} = \text{LTS} < \text{no scarcity}$, confirming appropriate manipulation of scarcity levels.

A one-way analysis of variance revealed significant main effects of scarcity for all variables (all $p < .001$). Multiple comparisons revealed that social status and self-esteem followed the order no scarcity $< \text{LTS} < \text{SS}$, while SBC followed no scarcity = LTS $< \text{SS}$.

To test H1b, we conducted mediation analysis (Hayes, 2022, Model 6, Bootstrap = 5000) using data from 202 participants excluding the no-scarcity condition. Results showed significant serial mediation effects of SS versus LTS through social status and self-esteem ($B = .25$, $SE = .07$, 95% $CI = .13-.42$), and significant mediation through social status alone ($B = .22$, $SE = .08$, 95% $CI = .08-.38$). Mediation through self-esteem alone was not significant ($B = .01$, $SE = .08$, 95% $CI = -.17-.15$).

Study 1 results supported both H1a and H1b. In gaming metaverses, SS enhanced SBC through the mediation of social status and self-esteem. This suggests that game execution ability constitutes a component of social status, and high-SS products function as means to demonstrate this ability. LTS also showed higher social status and self-esteem compared to the no-scarcity condition, suggesting that the existence of others who desire but cannot possess the limited products may enhance social status.

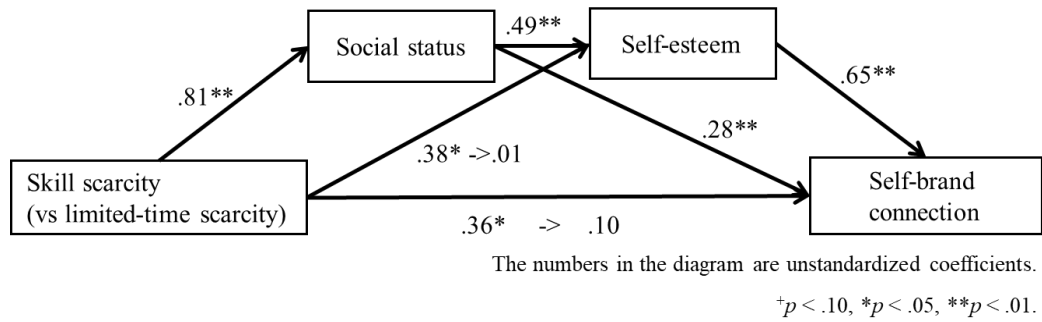


Figure 1. The result of the mediation analysis (Study 1)

4. Study 2: H2 Verification

4.1 Method

We conducted a 2 (scarcity: SS, LTS) \times 2 (temporal distance: post-acquisition, post-sale) experiment with 267 players from Fortnite ($n = 133$) and Knives Out ($n = 134$), aged 20–64 (median 40–44 years, 77% male). We measured social status ($\alpha = .83$) and SBC ($\alpha = .93$).

4.2 Results and discussion

Regression analysis revealed significant interaction between scarcity and temporal distance on SBC ($B = -.66$, $t(263) = 2.03$, $p = .04$). Simple slope analysis indicated that SS (vs. LTS) enhanced SBC in the post-acquisition condition ($B = -.50$, $t(263) = 2.20$, $p = .03$), but the effect was non-significant in the post-sale condition ($B = -.15$, $t(263) = 0.67$, $p = .50$).

Moderated mediation analysis (Model 8, Bootstrap = 5000) showed significant moderated mediation effects ($B = -.48$, $SE = .23$, 95% $CI = -.94$ to $-.02$). SS enhanced SBC

through social status immediately after acquisition ($B = .57$, $SE = .16$, 95% $CI = -.24--.88$), but this effect disappeared post-sale ($B = .08$, $SE = .17$, 95% $CI = -.25--.42$).

These results fully supported H2. Additional analyses revealed trends toward increased SBC in the LTS condition post-sale ($t(142) = 1.86$, $p = .07$, $d = .31$) and decreased social status in the SS condition ($t(121) = 1.72$, $p = .09$). This suggests possible decline in SS effects and increase in LTS effects over time.

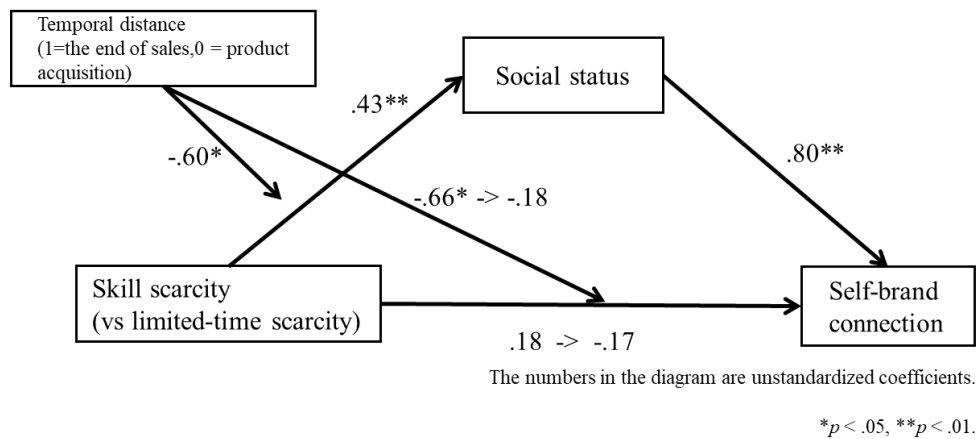


Figure 2. The results of the moderated mediation analysis (Study 2).

5. Study 3: H3 Verification

5.1 Method

We conducted a 2 (scarcity: SS, LTS) \times 2 (re-release: present, absent) experiment with 283 players from Fortnite ($n = 147$) and Knives Out ($n = 136$), aged 20–64 (median 40–44 years, 75% male), using fictional brand “Librido.”

5.2 Results and discussion

Regression analysis revealed significant interaction between scarcity and re-release on SBC ($B = .63$, $t(279) = 2.03$, $p = .04$). Simple slope analysis showed non-significant SS (vs. LTS) effects in the no-re-release condition ($B = -.02$, $t(279) = 0.09$, $p = .93$), but significant positive effects in the re-release condition ($B = .61$, $t(279) = 2.79$, $p < .01$).

Moderated mediation analysis showed significant moderated mediation effects ($B = .50$, $SE = .23$, 95% $CI = .05--.95$), with mediation effects of $B = .52$ ($SE = .16$, 95% $CI = .20--.84$) in the no-re-release condition and $B = 1.02$ ($SE = .17$, 95% $CI = .70--1.36$) in the re-release condition.

These results fully supported H3. Using a fictional brand revealed significant effects on social status even in the no-re-release condition (MLTS = 4.02, MSS = 4.69, $t(279) = 3.35$, p

$< .01$, $d = .73$), with larger effect sizes observed in the re-release condition ($MLTS = 3.13$, $MSS = 4.48$, $t(279) = 6.22$, $p < .001$, $d = 1.08$).

Through this series of studies, all hypotheses (H1a, H1b, H2, H3) were supported, demonstrating differences in SS and LTS effects and how these effects change with temporal distance and re-release.

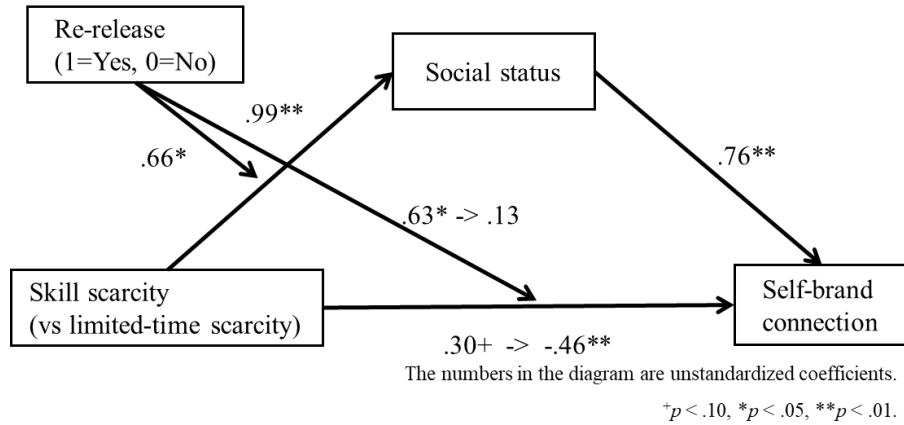


Figure 3. The results of the moderated mediation analysis (Study 3).

6. General Discussion

This research examined scarcity as a factor enhancing SBC in gaming metaverses, investigating differences between SS and LTS effects and their temporal changes. Study 1 demonstrated that SS enhances SBC through social status and self-esteem mediation. Study 2 revealed this effect decreases over time. Study 3 showed that SS effect superiority reappears with re-release.

This research makes several theoretical contributions. First, it reveals new aspects of scarcity in gaming metaverses by comparing metaverse-specific SS effects with LTS. Social status mean values were higher in LTS conditions than in no-scarcity conditions, suggesting LTS functions as an alternative to supply scarcity. Second, it extends existing research by explaining how scarcity influences SBC through self-esteem and social status. Social status enhancement via scarce product ownership strengthens self-esteem and SBC; however, excessive expectations may lead to excessive metaverse immersion (Richins 2013), requiring careful restrictions. Third, it clarifies temporal distance and re-release effects. Post-sale, SS effects decline over time, while LTS may have equal or greater long-term effects than SS. However, SS superiority reappears during re-release, necessitating caution in LTS re-release.

These findings provide important practical implications for brands operating in gaming metaverses. SS effectively fosters a skill-based community hierarchy by providing high-status products to skilled players while simultaneously creating aspirational goals for less skilled

players. This dual function of SS—rewarding existing skilled players while motivating skill development in others—can create a dynamic community ecosystem. LTS is effective for engaging users across all skill levels, making it particularly useful for broad-based community engagement and relationship building.

Our findings suggest a strategic approach where brands can implement both SS and LTS complementarily. For SS implementation, brands should carefully consider difficulty levels: too high might discourage player engagement, while too low could diminish the status value. For LTS product re-release, three key strategies emerged as particularly effective: (1) careful timing selection to maintain product value, (2) advance indication of re-release possibility to maintain transparency with consumers, and (3) addition of special benefits to preserve product uniqueness.

The temporal aspects of these effects suggest that brands should plan their scarcity strategies with both short-term and long-term perspectives. While SS creates immediate strong social status effects, its impact may decrease over time unless reinforced through strategic reissues. LTS, conversely, can maintain or even increase its effect post-sale, suggesting its value for long-term relationship building. However, the re-release effects indicate that brands must carefully manage any product reissues to maintain both types of the effectiveness of scarcity.

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