

Digital Memory Cues and Long-Term Brand Recall

Dr. Emilia Korhonen

Professor, University of Helsinki, Finland

Abstract

Digital consumers encounter brands through fragmented sequences of websites, mobile applications, social feeds, search interfaces, e-commerce platforms, notifications, and advertising environments. The managerial challenge is therefore not merely to obtain exposure but to ensure that brand information remains retrievable after the original encounter has passed. This study develops a simulation-based framework for examining how digital memory cues influence long-term brand recall. Three hypothetical communication conditions are compared: no structured retrieval cue, repeated visual cue, and multimodal contextual cue. A synthetic analytical sample of 450 observations, with 150 observations assigned to each condition, is used solely for methodological illustration and does not represent data collected from actual consumers. Brand recall is modeled over 1-, 7-, 14-, and 30-day intervals, alongside cue-brand association accuracy, recognition confidence, brand accessibility, and purchase consideration. The simulated 30-day recall score declines to 4.27 under the no-cue condition, compared with 5.75 for repeated visual cues and 6.72 for multimodal contextual cues.

The results support a retrieval-based interpretation of digital brand memory: cues are most useful when they are distinctive enough to reactivate previously encoded brand associations and sufficiently consistent to preserve linkage with the original memory trace. This interpretation accords with Keller's research showing that verbal and visual advertising retrieval cues facilitate access to previously encoded advertising information, Appleton-Knapp, Bjork, and Wickens's evidence concerning spaced advertising repetition, and Courbet and colleagues' demonstration that low-attention digital advertising can produce memory-related brand effects detectable months after exposure. The study concludes that digital memory design should prioritize meaningful retrieval opportunities rather than indiscriminate reminder frequency.

Keywords: digital memory cues; brand recall; retrieval cues; advertising memory; brand accessibility; spaced repetition; digital marketing; consumer memory

1. Introduction

Digital brand communication increasingly occurs through discontinuous encounters rather than through a single concentrated advertising episode. A consumer may first notice a brand in a social feed, later encounter its logo during a search, revisit a product through an e-commerce page, receive a cart or wishlist reminder, and eventually confront the brand again when making a purchase decision. The commercial significance of these exposures depends partly on whether the brand remains accessible in

memory after the original contact has faded. Keller's classic advertising-memory research established that brand decisions frequently occur after advertising exposure and demonstrated experimentally that verbal and visual retrieval cues can facilitate access to elements of an earlier advertising memory trace.

Brand recall is especially vulnerable in competitive communication environments. Consumers rarely encounter one isolated brand; multiple brands, advertisements, messages, categories, and digital stimuli compete for limited attention and memory. Keller's later work on competitive advertising showed that competing advertising can produce interference in recall and evaluation, while appropriately designed retrieval cues can partly offset these effects. This suggests that the digital challenge is not simply to increase the number of exposures but to create brand-linked cues capable of distinguishing one stored memory from competing alternatives.

Repetition nevertheless remains an important part of memory formation. Unnava and Burnkrant found that varied advertising executions can improve brand-name memory through attention and encoding variability, while Appleton-Knapp, Bjork, and Wickens demonstrated that spaced repetitions can strengthen later recall through retrieval processes occurring during subsequent exposures. At the same time, the spacing research cautions that excessive variation can become counterproductive when it prevents later exposures from effectively retrieving earlier presentations. A digital cue system therefore needs continuity as well as variety: consumers should encounter enough contextual novelty to support memory, but the distinctive brand elements must remain sufficiently stable to reactivate the same associative network.

Digital environments add another important dimension because consumers frequently process advertising under low-attention conditions. Courbet, Fourquet-Courbet, Kazan, and Intartaglia studied repeated brief Internet pop-up exposures and observed effects on brand-related judgments after seven days and, for several outcomes, after three months. Their study compared logo-only exposure with logo-plus-word and logo-plus-image combinations and demonstrated that digital exposures can leave durable perceptual and semantic traces even when participants later lack explicit memory of having seen the advertisements. Visual attention research likewise indicates that brand, pictorial, and textual advertising elements contribute differently to attention and that repeated exposure alters attention patterns over time.

The present study therefore examines digital memory cues as mechanisms for sustaining long-term brand recall rather than merely increasing immediate brand visibility. It distinguishes a no-structured-cue condition from repeated visual cues and a richer multimodal contextual condition combining stable visual identity with semantically related contextual information. Because no longitudinal consumer dataset was supplied, all numerical findings are explicitly synthetic and are used only to demonstrate the proposed model. The paper evaluates how different cue structures may influence recall retention, cue-brand association accuracy, brand accessibility, recognition confidence, and purchase consideration across delayed measurement periods.

2. Objectives of the Study

2.1 To Evaluate the Effect of Digital Memory Cues on Delayed Brand Recall

The first objective is to examine whether structured digital retrieval cues can reduce the decline in brand recall that occurs after initial exposure. The study distinguishes three conditions representing progressively stronger retrieval support: absence of a planned cue structure, repetition of stable visual

brand cues, and multimodal contextual cues combining stable brand identity with meaningful semantic context.

The primary proposition is that all conditions will display some decline over time, but the decline will be substantially slower when later exposures provide cues capable of reactivating the previously encoded brand memory. The strongest retention is expected under multimodal contextual cues because consumers receive both perceptual and semantic routes through which the brand can subsequently be retrieved.

2.2 To Examine Cue–Brand Association and Brand Accessibility

The second objective is to investigate whether effective memory cues improve not only raw recall but also the accuracy with which consumers connect a cue to the correct brand. This distinction matters because increased familiarity is not equivalent to accurate brand attribution. Repetition among competing brands can produce memory confusion, particularly where claims or visual executions are similar. Research on repeated claims has demonstrated that repetition can increase familiarity while also creating source confusion under competitive conditions.

Brand accessibility is therefore treated as the ease with which the brand becomes mentally available when the consumer encounters a category, product need, visual prompt, or relevant contextual situation. Keller's retrieval-cue research provides direct support for examining this mechanism because retrieval cues enhanced access to previously stored advertising information.

2.3 To Assess the Downstream Relationship With Purchase Consideration

The third objective is to model whether stronger delayed accessibility coincides with greater purchase consideration. Long-term memory should not be equated mechanically with purchase; consumers may remember a brand and still reject it because of price, product quality, availability, dissatisfaction, or competitor preference.

Nevertheless, memory availability is important because a brand cannot easily enter a memory-based consideration process if it is not retrieved. Baumann, Hamin, and Chong's research on brand exposure and experience found meaningful relationships between exposure, experience, brand-related evaluations, and recall across product categories. The present framework consequently treats purchase consideration as a downstream outcome influenced partly, but not exclusively, by sustained memory accessibility.

3. Review of Literature

3.1 Retrieval Cues, Associative Memory, and Brand Accessibility

Consumer memory for advertising is cue dependent. Keller demonstrated that a brand name by itself may not always retrieve the thoughts, information, or feelings originally encoded during advertising exposure. Additional verbal and visual information from the advertisement can act as retrieval cues and make stored brand information more accessible during later evaluation. This principle is particularly relevant to digital environments, where later encounters can deliberately reproduce portions of the original perceptual or semantic context.

Competitive interference complicates retrieval. Keller's 1991 experiment found that greater competitive advertising could interfere with recall and brand evaluation, whereas retrieval cues improved memory performance even when competing advertising was present. Digital marketers therefore face two simultaneous tasks: establishing a sufficiently distinctive memory structure and providing future cues capable of selectively activating that structure.

The distinction between brand exposure and memory accessibility is also important. Exposure generates an opportunity for encoding, but later retrieval depends on whether the stored representation can be accessed when needed. Digital memory cues may include stable logos, distinctive visual configurations, recognizable linguistic phrases, product-category associations, recurring audio elements, interface motifs, or context-linked reminders. The theoretical value of such cues lies not in their decorative consistency but in their capacity to reconnect the consumer with previously established brand information.

3.2 Repetition, Spacing, and Encoding Variability

Repetition is among the most widely examined mechanisms in advertising-memory research. Unnava and Burnkrant found that varied advertising executions can enhance brand-name memory and showed independent contributions from attention and encoding variability. Their findings imply that identical repetition is not always necessary for retention; consumers can benefit when a stable brand is encountered through somewhat varied executions.

However, variation must preserve retrievability. Appleton-Knapp, Bjork, and Wickens found across four experiments that spaced repetition benefits advertising recall partly because later presentations retrieve earlier presentations during learning. Their results also showed that excessive changes in advertising format and content may reduce this benefit at longer spacing intervals when those changes make earlier episodes harder to retrieve. This provides a strong theoretical rationale for preserving stable memory anchors within varied digital campaigns.

Meta-analytic evidence also supports an important role for advertising frequency. Schmidt and Eisend's synthesis of advertising-repetition research reported that recall generally continued to improve across repeated exposures, although other consumer responses can exhibit different repetition patterns. Earlier work on advertising wearout additionally cautions that very high repetition can reduce attention or create tedium. Thus, effective memory design requires calibrated recurrence rather than indiscriminate repetition.

3.3 Digital Attention, Visual Encoding, and Long-Term Effects

Visual attention determines which advertising elements receive sufficient processing to contribute to memory. Pieters and Wedel's eye-tracking study of more than 1,300 print advertisements found distinct attention effects for brand, pictorial, and textual elements, with pictorial elements particularly effective at capturing attention and brand elements helping transfer attention to other parts of the advertisement. Pieters, Rosbergen, and Wedel also found that attention duration declines across repeated advertising exposures, highlighting the importance of designing repeated cues that remain recognizable even when consumers allocate less attention over time.



Digital research provides evidence that even relatively weak-attention encounters can leave persistent memory-related effects. Courbet and colleagues exposed participants to repeated brief pop-up advertisements and examined brand responses after either seven days or three months. Several semantic, attitudinal, and purchase-related effects remained observable after the longer delay, particularly when brand logos were combined with images or category information rather than presented entirely alone.

This evidence suggests that long-term digital brand memory may benefit from combining stable perceptual identifiers with semantically meaningful contextual information. A logo creates perceptual continuity, while product-category information, imagery, usage situations, or other relevant context can establish additional associative pathways. The research gap addressed in this paper concerns how such combinations can be structured deliberately as a long-term digital memory system rather than treated as isolated advertising executions.

4. Research Methodology

4.1 Research Design and Simulated Cue Conditions

The study adopts a simulation-based longitudinal comparative design. No real participants were recruited and no actual brand campaign was deployed. The synthetic dataset was constructed only to illustrate the analytical relationships that could be examined in a subsequent empirical experiment.

The simulated analytical sample contains 450 observations, equally distributed among three digital memory-cue conditions. The No Structured Cue condition represents an initial brand exposure followed by ordinary digital environments that do not deliberately reproduce distinctive cues from the original communication.

The Repeated Visual Cue condition represents recurring exposure to stable visual brand elements such as logo structure, characteristic typography, and consistent visual identity. The broader advertisement or digital environment can change, but the primary perceptual retrieval cue remains recognizable.

The Multimodal Contextual Cue condition combines stable visual identity with semantically meaningful contextual elements, such as a recurring category phrase, recognizable product-use context, compatible imagery, or another content element linked consistently with the brand memory. This condition reflects the proposition that multiple compatible retrieval routes can slow memory decay more effectively than visual repetition alone.

Table 1: Simulation-Based Research Design

Methodological Component	Specification	Analytical Purpose
Research design	Longitudinal simulation-based comparative experiment	Evaluate delayed brand-memory retention
Synthetic observations	450	Methodological demonstration
Observations per	150	Balanced comparison

Methodological Component	Specification	Analytical Purpose
cue condition		
Condition A	No Structured Cue	Establish baseline memory decay
Condition B	Repeated Visual Cue	Test stable perceptual retrieval support
Condition C	Multimodal Contextual Cue	Test combined perceptual and semantic retrieval support
Recall measurement intervals	Day 1, Day 7, Day 14, Day 30	Evaluate memory decay over time
Primary outcome	Delayed Brand Recall Score	Measure long-term accessibility of brand memory
Secondary outcome	Cue–Brand Association Accuracy	Assess correct attribution

Note: All observations and inferential outputs are synthetically generated. They must not be described as results obtained from actual consumers.

4.2 Measurement Architecture and Proposed Questionnaire

The primary delayed brand-recall measure was modeled on a 0–10 composite scale, where higher values indicate stronger unaided retrieval of brand identity and associated information after the specified delay. Cue–brand association accuracy represents the consumer's ability to connect a presented contextual or visual cue with the correct brand rather than with a competitor.

Recognition confidence represents subjective certainty when identifying the brand after a delay. Brand accessibility refers to the ease with which the brand comes to mind when a consumer encounters a relevant product category or consumption context. Purchase consideration captures whether the brand would plausibly enter the consumer's active consideration set.

A future empirical study could employ the following five proposed questionnaire or recall items:

Q1. “Without seeing a brand list, which brand do you remember from the earlier digital communication?”

Q2. “This visual or contextual cue clearly reminds me of the brand I encountered previously.”

Q3. “I am confident that I can correctly identify the brand associated with this cue.”

Q4. “This brand comes to mind easily when I think about this product category.”

Q5. “I would consider this brand when making a future purchase in this category.”

These items are proposed instruments only and were not administered in the present simulation.

4.3 Simulation Procedure and Statistical Evaluation

Synthetic recall observations were generated for each cue condition at Day 1, Day 7, Day 14, and Day 30. All conditions begin with relatively similar initial recall so that the analytical distinction emerges principally through the rate of memory decline rather than through an artificial initial advantage.

The model assumes that absence of retrieval cues produces the steepest decay, repeated visual identity produces moderate retention, and multimodal contextual cues produce the strongest delayed accessibility. Random within-condition variability was introduced so that each group contains heterogeneous rather than identical observations.

A one-way analysis of variance was applied to the Day-30 recall scores to demonstrate the statistical comparison appropriate for a future controlled design. The synthetic ANOVA produced $F = 279.29$, $p < .001$. Because the data were generated specifically for illustration, this significance test describes only the simulated dataset and cannot be interpreted as evidence of a real population effect.

5. Analysis

5.1 Long-Term Recall Retention Across Cue Conditions

The synthetic data display comparatively similar recall immediately after initial exposure but increasingly pronounced differences as the retention interval lengthens. At Day 1, mean recall scores remain close across the three conditions, ranging from approximately 8.05 to 8.18 on the 0–10 scale.

By Day 7, the no-structured-cue condition declines to approximately 6.72, while repeated visual cues retain a mean of 7.24 and multimodal contextual cues retain approximately 7.61. The divergence becomes larger by Day 14.

At Day 30, the no-structured-cue group records a mean recall score of 4.27, compared with 5.75 under repeated visual cues and 6.72 under multimodal contextual cues. The simulated difference suggests that memory-cue architecture influences not simply whether a brand is remembered immediately but the rate at which accessibility deteriorates over time.

Table 2: Simulated Day-30 Outcomes Across Digital Memory-Cue Conditions

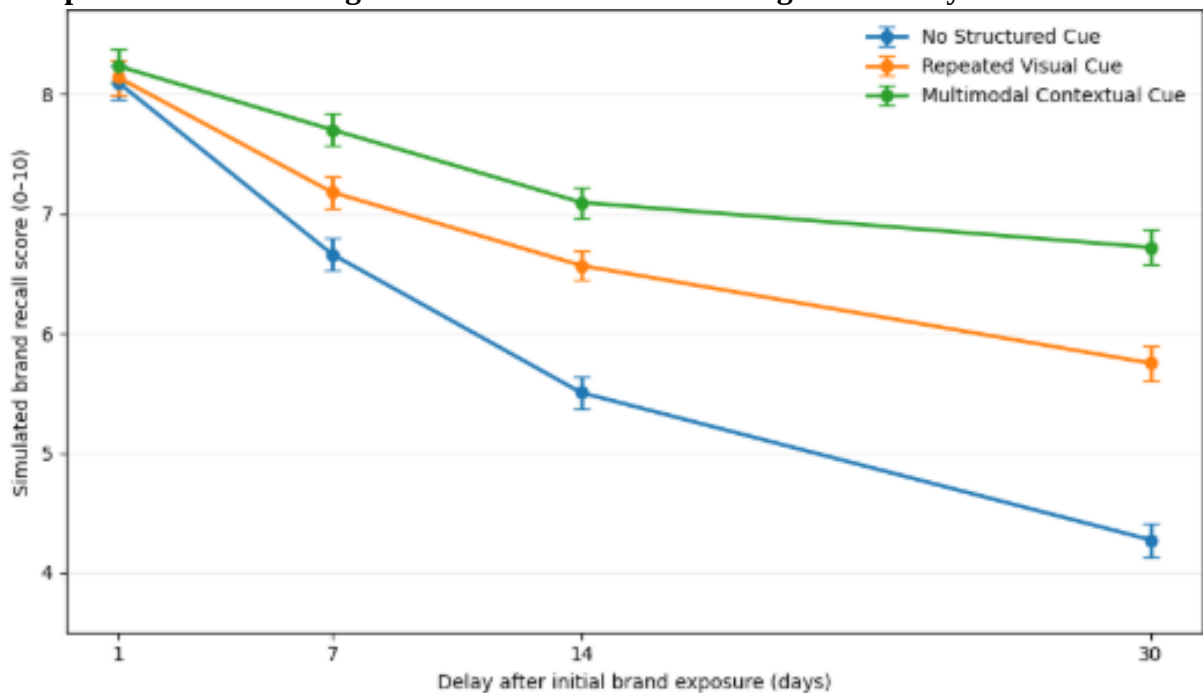
Outcome Variable	No Structured Cue	Repeated Visual Cue	Multimodal Contextual Cue	Analytical Interpretation
Day-30 Brand Recall Score (0–10)	4.27	5.75	6.72	Strongest delayed recall with multimodal cues
Cue–Brand Association Accuracy (%)	55.3	72.7	84.0	Contextual cueing improves correct attribution
Recognition Confidence (1–7)	4.08	5.21	5.91	Cue structure supports identification confidence

Outcome Variable	No Structured Cue	Repeated Visual Cue	Multimodal Contextual Cue	Analytical Interpretation
Brand Accessibility (1–7)	4.16	5.29	6.01	Multimodal cues keep brand more mentally available
Purchase Consideration (1–7)	4.29	5.07	5.63	Memory accessibility accompanies stronger consideration

The Day-30 condition difference is substantial within the simulated dataset. Importantly, the repeated visual condition performs considerably better than the no-cue condition, indicating that perceptual continuity alone provides meaningful retrieval support. The additional improvement produced by multimodal contextual cueing suggests a theoretical advantage when stable visual identity is connected with semantic information rather than presented in isolation.

5.2 Longitudinal Pattern of Brand-Memory Decay

Graph 1: Simulated Long-Term Brand Recall Across Digital Memory-Cue Conditions



Source: Author-generated synthetic observations; 150 simulated observations per condition at each measurement interval. Error bars represent approximate 95% confidence intervals.

All three curves demonstrate declining recall across the 30-day period. This decline is expected in the model because a memory cue is not assumed to prevent forgetting completely. The analytical distinction concerns the slope of that decline.

The no-structured-cue condition experiences the largest loss between Day 1 and Day 30. Repeated visual cues reduce the rate of decline, while multimodal contextual cues produce the strongest retention across each delayed interval after initial exposure.

The pattern is consistent with retrieval-cue theory and the spacing literature. Keller demonstrated that cues can improve access to earlier advertising memories, while Appleton-Knapp and colleagues show that later spaced exposures can strengthen memory partly through retrieval of earlier exposures.

5.3 Cue Distinctiveness, Recognition, and Purchase Consideration

Cue-brand association accuracy demonstrates an especially important difference among the three conditions. The simulated rate rises from 55.3% without structured cueing to 72.7% with stable visual cues and 84.0% with multimodal contextual cues.

This outcome illustrates why brand memory should not be measured entirely through familiarity. Consumers may recognize that they have encountered something before without correctly identifying the source. Competitive advertising research demonstrates that interference and source competition can impair correct recall, while structured cues can improve retrieval.

Recognition confidence and brand accessibility also increase with cue richness. Purchase consideration follows the same ordering but displays a more moderate difference, which is theoretically appropriate because commercial choice depends on many variables beyond memory.

The analysis therefore supports a two-stage interpretation. Digital memory cues first improve the probability that a stored brand representation becomes accessible. Improved accessibility then increases the probability that the brand enters a later consideration process, provided that product evaluation and other purchase conditions remain favorable.

6. Discussion

6.1 Digital Brand Memory Should Be Designed for Retrieval, Not Exposure Alone

The first major implication is that impressions and exposures should not be treated as equivalent to durable memory. An impression indicates that content was served or displayed; it does not establish that the brand was encoded strongly enough to be retrieved later.

Keller's advertising-memory research remains highly relevant to digital environments because it shows that what is available at retrieval can materially affect access to what was encoded previously. A campaign can therefore produce substantial exposure and still perform poorly at the later decision stage if its subsequent digital encounters provide few cues connected with the original brand memory.

This suggests a shift from exposure planning to retrieval planning. Campaign design should identify in advance which visual, verbal, auditory, product-category, or contextual elements consumers are expected to encounter again and which of those elements should function as memory anchors. A distinctive memory anchor should remain sufficiently stable across digital channels to support retrieval. Changing every visual element, tagline, image style, and contextual association simultaneously may increase creative novelty while weakening continuity between encounters.

6.2 Why Multimodal Contextual Cues May Outperform Visual Repetition

The simulated superiority of multimodal contextual cueing can be explained through multiple retrieval routes. A stable visual identity supports perceptual retrieval, while associated category words, images, product-use situations, or other semantic context can provide conceptual routes into the same brand network.

Courbet and colleagues' digital-advertising experiment is instructive in this respect. Their comparison of logo-only, logo-plus-image, and logo-plus-word formats showed that adding semantic or pictorial content produced distinct long-term effects and that several effects remained observable three months after exposure.

The implication is not that every digital encounter should contain more information. Additional elements become useful only when they reinforce rather than compete with the brand's distinctive cues. Excessive visual complexity, inconsistent execution, or unrelated contextual variation can create additional memory traces without strengthening the desired brand association. Unnava and Burnkrant's encoding-variability evidence supports creative variation, but Appleton-Knapp and colleagues demonstrate why variation should not destroy retrieval continuity. The most defensible strategy is therefore controlled variability: vary the execution while maintaining stable memory anchors.

6.3 Managerial Implications for Long-Term Digital Brand Building

Digital marketers can apply the framework by separating short-term campaign assets from long-term memory assets. Short-term assets may change according to product, season, promotion, audience, or channel. Long-term memory assets should remain recognizable enough to accumulate associations across repeated encounters. Examples may include a distinctive logo configuration, visual pattern, recurring verbal phrase, characteristic product framing, sonic cue, recognizable interface feature, or context that repeatedly links the brand with a particular consumer need. The strategic criterion is not whether an asset is aesthetically attractive but whether it is distinctive, attributable, and retrievable.

Spacing also deserves careful attention. Appleton-Knapp and colleagues demonstrate that later exposures can improve memory partly when they successfully retrieve earlier presentations, while Schmidt and Eisend's meta-analysis confirms the broader importance of repeated exposure to advertising recall. Digital systems capable of identifying previous engagement should therefore avoid interpreting reminder strategy purely as a frequency-maximization problem. Excessive repetition can reduce attention. Pieters, Rosbergen, and Wedel found declining attention duration over repeated ad exposures, and classic advertising-wearout research similarly indicates that very high repetition can create attention or response problems. Thus, the goal should be to create a small number of cognitively useful reactivation opportunities rather than continuous identical exposure.

The framework also suggests that long-term campaign evaluation should include delayed measures. Immediate ad recognition, click-through, engagement, and short-term conversion reveal important information, but they do not determine whether a brand remains available in memory several weeks later. Delayed unaided recall, cue-assisted recall, source attribution, category accessibility, and consideration-set entry provide complementary indicators of brand-building performance.

7. Conclusion

Digital brand competition is increasingly a competition for future retrievability rather than merely present visibility. Consumers encounter more digital content than they can maintain consciously, and many purchase decisions occur after the original advertising encounter has disappeared from immediate awareness. The present simulation-based study therefore examined whether structured digital memory cues could theoretically slow the decline in brand recall across a 30-day interval.

The synthetic results indicate that repeated visual cues preserve brand recall more effectively than unstructured exposure, while multimodal contextual cues provide the strongest retention. The simulated Day-30 recall score reaches 6.72 under multimodal contextual cueing, compared with 5.75 for repeated visual cueing and 4.27 in the no-structured-cue condition. This pattern is compatible with established evidence showing that advertising retrieval cues facilitate access to prior memories, spaced repetitions can strengthen later recall, and digital advertising exposures can continue influencing brand-related memory and judgments after substantial delays.

The principal theoretical contribution is a retrieval-centered model of digital brand memory. Under this model, successful brand building depends on three connected processes: initial encoding, subsequent cue-based reactivation, and accurate later retrieval. Repetition supports these processes when later encounters connect with the original memory trace, but variation becomes counterproductive when it prevents consumers from recognizing that successive exposures belong to the same brand structure. For practitioners, the implication is to develop stable long-term memory assets and integrate them intentionally across advertising, e-commerce, applications, search, social media, and other consumer touchpoints. Creative variation should occur around those assets rather than continuously replacing them. Brands should also evaluate delayed recall and cue attribution instead of relying exclusively on immediate digital performance measures.

The study remains limited by its simulated dataset. The numerical findings illustrate a plausible analytical framework rather than establish empirical causal effects. Future research should conduct longitudinal randomized experiments with real consumers, multiple brands, varying competitive clutter, different exposure spacing, and distinct combinations of visual, verbal, sonic, and contextual cues. Additional work should separate unaided recall from recognition and implicit memory, test established versus unfamiliar brands, and determine when cue repetition improves retrieval versus when it produces fatigue, confusion, or competitive misattribution.

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