

Inclusive Packaging Design and Brand Accessibility: Examining Visual Legibility, Tactile Usability, Opening Ease, Information Clarity, and Consumer Dignity

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Abstract

Packaging performs simultaneously as a protective system, information interface, physical access point, and visible expression of brand identity. Yet many packaging systems are developed around an implicit assumption that consumers possess similar levels of vision, dexterity, grip strength, literacy, cognition, and digital access. Such assumptions can create avoidable barriers for older adults and consumers experiencing temporary or permanent limitations in sight, hand movement, strength, or information processing. This study develops a simulation-based framework for examining whether inclusive packaging design can strengthen perceived brand accessibility and related consumer outcomes. Inclusive design is operationalized through visual legibility, tactile differentiation, opening ease, information clarity, and perceived dignity. A synthetic dataset representing 400 hypothetical consumer evaluations was structured across four packaging conditions: conventional packaging, improved visual accessibility, combined visual and tactile accessibility, and comprehensive inclusive design. Simulated mean brand-accessibility scores increased from 3.08 under conventional packaging to 4.26 following visual-accessibility improvements, 5.18 when visual and tactile features were integrated, and 6.02 under comprehensive inclusive design.

Multivariable analysis further suggests that opening ease, information clarity, visual legibility, and perceived dignity make positive contributions to brand accessibility, whereas physical interaction difficulty has a substantial negative relationship. The findings indicate that accessibility should not be treated as a narrow compliance feature or a specialized adaptation for a small consumer group. Inclusive packaging can instead function as a broader brand-access strategy by reducing unnecessary physical and informational effort while preserving product quality, aesthetics, and consumer independence. The study contributes an integrated framework linking packaging usability with relationship-oriented brand outcomes and provides a transparent basis for future empirical validation through controlled packaging trials, usability testing, eye-tracking, hand-function assessment, and verified purchasing behavior.

Keywords: inclusive packaging; accessible packaging; universal design; brand accessibility; visual legibility; packaging usability; consumer dignity; inclusive marketing

1. Introduction

Packaging occupies a distinctive position in the consumer experience because it is simultaneously encountered as a physical object, an information carrier, a communication medium, and a component of the product itself. Before consumption begins, customers may need to identify the product, distinguish variants, understand instructions, locate warnings, compare quantities, determine expiration information, open closures, remove seals, dispense contents, and sometimes reseal or store the package. Each of these activities creates an interaction between consumer capability and design. Although packaging innovation has historically emphasized protection, logistics, shelf visibility, convenience, and brand differentiation, the accessibility of the package itself is increasingly relevant to understanding whether the product can be used independently by a diverse customer population. A visually attractive package that is difficult to read, grip, open, interpret, or distinguish may communicate sophistication while simultaneously excluding customers from effective use.

The issue becomes particularly significant when population diversity is considered. Consumers differ in visual acuity, color perception, literacy, language familiarity, hand strength, fine-motor control, cognitive processing, and familiarity with packaging conventions. These differences do not necessarily correspond with clearly defined disability categories. An individual may temporarily experience reduced hand function following injury, struggle to read low-contrast labeling in inadequate lighting, find a tamper-resistant closure difficult because of age-related strength reduction, or encounter a package while carrying other items. Inclusive design therefore concerns a broader spectrum of human capability rather than a binary distinction between “disabled” and “non-disabled” consumers. The underlying design question is whether unnecessary barriers are being introduced into activities that could reasonably be made easier.

Universal-design scholarship provides an important conceptual foundation for addressing this problem. The principles associated with universal design emphasize equitable use, flexibility, simple and intuitive operation, perceptible information, tolerance for error, low physical effort, and appropriate space for approach and use. Although originally applied extensively to built environments and products, these principles are directly relevant to packaging. Large and legible typography, sufficient contrast, logical information hierarchy, tactile differentiation, manageable opening force, intuitive closure systems, and clear feedback can reduce unnecessary effort across a wide range of customers. Inclusive packaging should therefore not be understood as a separate category of “special packaging.” A more useful interpretation is that mainstream packaging can be designed so that a larger proportion of consumers can identify, understand, open, use, and dispose of it independently.

Packaging accessibility also possesses a brand dimension. Consumers do not experience packaging barriers as abstract design failures; they encounter them as part of an interaction with a particular organization and product. Difficulty opening a package, reading essential instructions, distinguishing between similar variants, or accessing contents can shape perceptions of whether the company has considered the realities of customer use. Conversely, packaging that communicates clearly and supports independent interaction may signal competence, consideration, and respect. This relationship is particularly important in sectors involving frequent handling, such as food, personal care, household goods, over-the-counter products, and everyday consumer items. Brand accessibility can consequently be conceptualized as the degree to which customers perceive that a brand can be

practically encountered and used across diverse capabilities rather than merely the availability of the product in the marketplace.

At the same time, inclusive packaging creates design trade-offs. Larger type may compete with limited label area; tamper resistance can increase opening difficulty; sustainability goals may encourage material reduction that affects structural usability; child resistance may intentionally create access barriers for safety reasons; and premium visual minimalism can reduce information contrast. Accessibility therefore cannot be pursued through isolated design rules detached from product context. Effective solutions require balancing safety, regulatory communication, branding, sustainability, manufacturing, logistics, and usability. The most appropriate approach is likely to involve user-centered testing rather than assuming that a visually attractive or technically compliant package is automatically accessible.

Against this background, the present study examines the relationship between inclusive packaging design and perceived brand accessibility through a transparent simulation-based framework. Four packaging environments are compared, progressing from conventional design toward comprehensive inclusion incorporating visual legibility, tactile usability, opening ease, information clarity, and dignity-preserving interaction. The paper does not claim that the synthetic observations were obtained from real consumers. Instead, the simulated design provides a theoretically coherent analytical structure for examining expected relationships before field validation. The central proposition is that inclusive packaging can generate value beyond functional convenience because consumers may interpret accessible design as evidence that a brand recognizes human diversity and supports independent participation in consumption.

2. Objectives of the Study

2.1 To Examine the Relationship Between Inclusive Packaging and Brand Accessibility

The first objective is to examine whether progressively inclusive packaging conditions are associated with stronger perceptions of brand accessibility. Brand accessibility is defined as the extent to which consumers perceive that a brand's products can be identified, understood, opened, handled, and used without unnecessary physical or informational barriers.

This objective moves beyond evaluating packaging as a container. It treats accessibility as part of the customer's experience with the brand itself. A product may be widely distributed yet remain practically inaccessible when packaging creates avoidable difficulties. The analysis therefore compares conventional packaging with progressively stronger accessibility interventions.

2.2 To Evaluate Visual, Tactile, Physical, and Informational Design Dimensions

The second objective is to identify which dimensions of packaging accessibility are likely to contribute most strongly to favorable customer evaluation. Visual legibility concerns typography, contrast, information hierarchy, and recognition of essential content. Tactile usability concerns the ability to identify orientation, grip surfaces, controls, openings, and differentiating features through touch.

Opening ease represents the physical effort and dexterity required to access the product. Information clarity concerns whether instructions, warnings, quantities, and product distinctions can be

located and interpreted efficiently. These dimensions are considered together because accessibility problems frequently arise from several small barriers rather than a single dramatic failure.

2.3 To Assess Perceived Dignity as a Brand-Relevant Outcome

The third objective is to examine whether accessible packaging influences perceptions of consumer dignity. Inclusive design is most effective when it enables independent use without stigmatizing particular groups or requiring visibly specialized alternatives.

Perceived dignity therefore represents the extent to which customers feel that the package respects their autonomy and does not make ordinary product use unnecessarily dependent on assistance. The study investigates whether this perception contributes to broader evaluations of the accessibility of the brand.

3. Review of Literature

3.1 Universal Design and the Accessibility of Everyday Products

Universal design developed from the recognition that environments and products should accommodate a wider range of human capabilities from the beginning of the design process rather than relying exclusively on later adaptation. The principles articulated by the Center for Universal Design emphasize equitable use, flexibility, simplicity, perceptible information, error tolerance, low physical effort, and adequate usability across different physical circumstances. These principles provide a useful conceptual basis for evaluating consumer packaging.

Inclusive design extends this reasoning by recognizing capability variation as a normal feature of the consumer population. Clarkson and colleagues emphasize that product design can create exclusion when the capabilities required by a product exceed those available to potential users. This perspective reframes accessibility as a design-demand problem. A package does not become difficult solely because a consumer has reduced capability; difficulty emerges from the relationship between the demands imposed by the package and the capability of the person attempting to use it.

This interpretation is particularly important for aging populations. Age-related changes can influence grip strength, fine-motor coordination, tactile sensitivity, contrast sensitivity, and visual acuity. Yet older consumers represent a highly heterogeneous population, making stereotyped “senior packaging” an inadequate design solution. Good inclusive design seeks to improve usability without unnecessarily labeling or separating particular customer groups.

The broader ergonomic literature similarly emphasizes designing products according to human characteristics rather than expecting users to adapt to poorly specified interfaces. Packaging presents repeated ergonomic demands involving grip, force, wrist movement, finger manipulation, sequencing, and visual search. A meaningful accessibility assessment therefore requires observation of the complete interaction rather than inspection of the package's appearance alone.

3.2 Visual Information, Opening Usability, and Packaging Interaction

Packaging communication depends heavily on typography, color contrast, hierarchy, symbols, and spatial organization. Information may be technically present but functionally unavailable if consumers cannot locate or read it. Small type, reflective backgrounds, low color contrast, extensive capital letters,

crowded information panels, and visually similar product variants can all increase search and interpretation demands.

Visual accessibility is particularly important when packaging contains safety-critical or decision-relevant information. Consumers may need to identify ingredients, instructions, warnings, dosage information, storage conditions, or product variants quickly. Increasing visual clarity can therefore improve both convenience and error prevention. However, legibility should not be reduced to type size alone. Contrast, spacing, line length, hierarchy, background complexity, and information grouping jointly affect readability.

Opening usability represents a separate but equally important dimension. Packaging may require twisting, pulling, peeling, pinching, tearing, pressing, or combinations of several movements. Seals and closures can support product integrity and safety while creating difficulty for customers with reduced grip strength or dexterity. Inclusive packaging requires designers to determine whether the required physical effort is proportionate to the functional purpose of the closure and whether accessible cues communicate the correct opening method.

Tactile design can complement visual accessibility. Raised indicators, textured grip zones, distinguishable cap forms, directional surfaces, and consistent physical cues may assist users in identifying how packaging should be handled. Tactile features may also benefit consumers in low-light conditions or situations where visual attention is occupied elsewhere. Multisensory accessibility therefore offers advantages that cannot always be achieved through labeling alone.

3.3 Packaging, Consumer Experience, and Brand Meaning

Packaging has long been recognized as a communication and branding instrument. Underwood conceptualized packaging as an important source of product and brand meaning, while Silayoi and Speece demonstrated that visual and informational packaging elements can influence consumer decisions. Orth and Malkewitz further showed that holistic package design can communicate distinctive brand impressions.

These perspectives imply that accessibility features should not be viewed as external to brand design. Every interaction with packaging contributes to the consumer's interpretation of what the organization values. When customers encounter confusing instructions or physically difficult access, the experience can contradict brand promises concerning convenience, care, quality, or customer orientation.

Inclusive packaging may therefore strengthen brand accessibility through both functional and symbolic pathways. Functionally, the customer can use the product with less effort. Symbolically, accessible design may signal that the organization has considered diverse users. These effects are potentially important because customer relationships are influenced by repeated micro-interactions rather than only major service encounters.

The concept of dignity adds an ethical dimension. Design that enables independence can avoid unnecessary embarrassment, dependence, or frustration. Importantly, dignity-oriented packaging should not visibly identify individuals as “special users.” Mainstream design that works across a wider range of capabilities can provide accessibility while maintaining a common brand experience.

4. Research Methodology

4.1 Research Design and Simulation Conditions

The study uses a quantitative simulation-based design. No human participants were recruited, and no claim is made that the numerical observations represent an administered packaging experiment. Simulation was selected to demonstrate how an inclusive-packaging framework could be operationalized and statistically evaluated without fabricating empirical data.

A synthetic dataset representing 400 hypothetical consumer evaluations was structured across four packaging conditions, with 100 observations in each condition:

Condition A: Conventional Packaging Standard commercial packaging without deliberate accessibility enhancement beyond ordinary functional requirements.

Condition B: Improved Visual Accessibility Enhanced type size, contrast, information hierarchy, clearer variant distinction, and more easily identifiable instructions.

Condition C: Visual and Tactile Accessibility Visual improvements combined with tactile orientation cues, differentiated grip areas, and more intuitive identification of opening points.

Condition D: Comprehensive Inclusive Design Visual and tactile accessibility combined with lower opening effort, clearer feedback, simplified information architecture, and dignity-oriented mainstream design.

Table 1: Operational Framework for Inclusive Packaging

Construct	Operational Meaning	Simulated Measurement	Expected Relationship
Visual legibility	Ease of seeing and distinguishing important package information	Seven-point scale	Positive
Tactile accessibility	Ease of identifying orientation, grip, and opening features through touch	Seven-point scale	Positive
Opening ease	Perceived physical effort and dexterity required to access contents	Seven-point scale	Positive
Information clarity	Ease of locating and interpreting instructions and product information	Seven-point scale	Positive
Physical interaction difficulty	Overall physical burden associated with handling and opening the package	Seven-point scale	Negative
Perceived dignity	Degree to which packaging supports independent, nonstigmatizing use	Seven-point scale	Positive
Brand accessibility	Perceived inclusiveness and practical usability of the brand's product experience	Seven-point scale	Dependent variable

Note: All observations are synthetic and intended exclusively for methodological illustration.

4.2 Proposed Measurement and Future Sampling Strategy

A future empirical study should recruit consumers representing a deliberately broad capability range rather than relying exclusively on healthy young participants. Sampling should include variation in age, corrected and uncorrected vision, hand strength, dexterity, prior familiarity with the package, and routine product-use context.

A controlled study could expose participants to alternative versions of the same product packaging while holding product content, brand identity, and price constant. Objective usability measures could be collected alongside perception measures. Relevant behavioral indicators could include time required to locate information, successful opening rate, opening time, number of failed attempts, grip-force requirement, task errors, and requirement for assistance.

A concise proposed questionnaire could include the following five items:

- Important information on this package is easy for me to locate and read.
- The package makes it clear how it should be handled and opened.
- I can access the contents without unnecessary physical effort.
- The packaging allows me to use the product independently and confidently.
- This packaging makes the brand feel accessible to a wide range of customers.

These questions are proposed measures only and were not administered in the present simulation. Future studies should perform expert review, cognitive pretesting, reliability assessment, construct-validation procedures, and accessibility testing with relevant user groups before substantive interpretation.

4.3 Analytical Procedure

The first analytical stage compares mean perceived brand-accessibility scores across the four simulated packaging conditions. The progression provides a direct indication of whether increasingly comprehensive accessibility features produce stronger brand evaluations.

A multiple regression model was then specified:

$$[BA_i = \beta_0 + \beta_1 VL_i + \beta_2 TA_i + \beta_3 OE_i + \beta_4 IC_i + \beta_5 PD_i + \beta_6 PID_i + \epsilon_i]$$

where (BA) represents brand accessibility, (VL) visual legibility, (TA) tactile accessibility, (OE) opening ease, (IC) information clarity, (PD) perceived dignity, (PID) physical interaction difficulty, and (ϵ) the residual component.

Because the dataset is synthetic, coefficient magnitudes are interpreted as characteristics of the simulation rather than estimates for an actual consumer population.

5. Analysis

5.1 Accessibility Across Packaging Design Conditions

The simulated findings show a clear improvement in brand accessibility as packaging becomes more inclusive. The conventional packaging condition produced a mean accessibility score of 3.08 on the seven-point scale. Improving visual design alone increased the mean to 4.26.

When tactile accessibility was added to visual improvements, the simulated score increased further to 5.18. The comprehensive inclusive-design condition produced the strongest result at 6.02.

The difference between conventional and comprehensive inclusive packaging was therefore 2.94 scale points. This pattern indicates that visual improvements can generate meaningful benefits but that a more complete accessibility strategy may produce substantially stronger outcomes because consumers interact with packaging through both informational and physical processes.

Table 2: Simulated Analysis of Brand Accessibility

Predictor / Indicator	Simulated Result	Direction	Interpretation
Conventional packaging	3.08	Baseline	Lowest perceived accessibility
Improved visual accessibility	4.26	↑	Legibility produces meaningful improvement
Visual + tactile accessibility	5.18	↑↑	Multisensory accessibility further improves evaluation
Comprehensive inclusive design	6.02	↑↑↑	Strongest perceived brand accessibility
Opening ease, standardized β	+0.337	Positive	Strongest direct functional predictor
Information clarity, standardized β	+0.284	Positive	Clear information substantially improves accessibility
Visual legibility, standardized β	+0.251	Positive	Readable packaging strengthens accessibility
Perceived dignity, standardized β	+0.229	Positive	Independent use contributes to brand evaluation
Tactile accessibility, standardized β	+0.176	Positive	Tactile cues provide additional usability value
Physical interaction difficulty, standardized β	-0.302	Negative	Physical burden substantially reduces accessibility
Model (R^2)	0.681	—	Model explains 68.1% of synthetic variance

Note: All values are simulated analytical outputs and must not be interpreted as findings from real consumers.

5.2 Functional Accessibility and Perceived Dignity

Opening ease produced the strongest positive coefficient in the simulated model at $\beta = 0.337$. This finding highlights that packaging accessibility is ultimately experienced through action. A customer may appreciate readable labels but still experience exclusion when contents cannot be accessed without excessive force or dexterity.

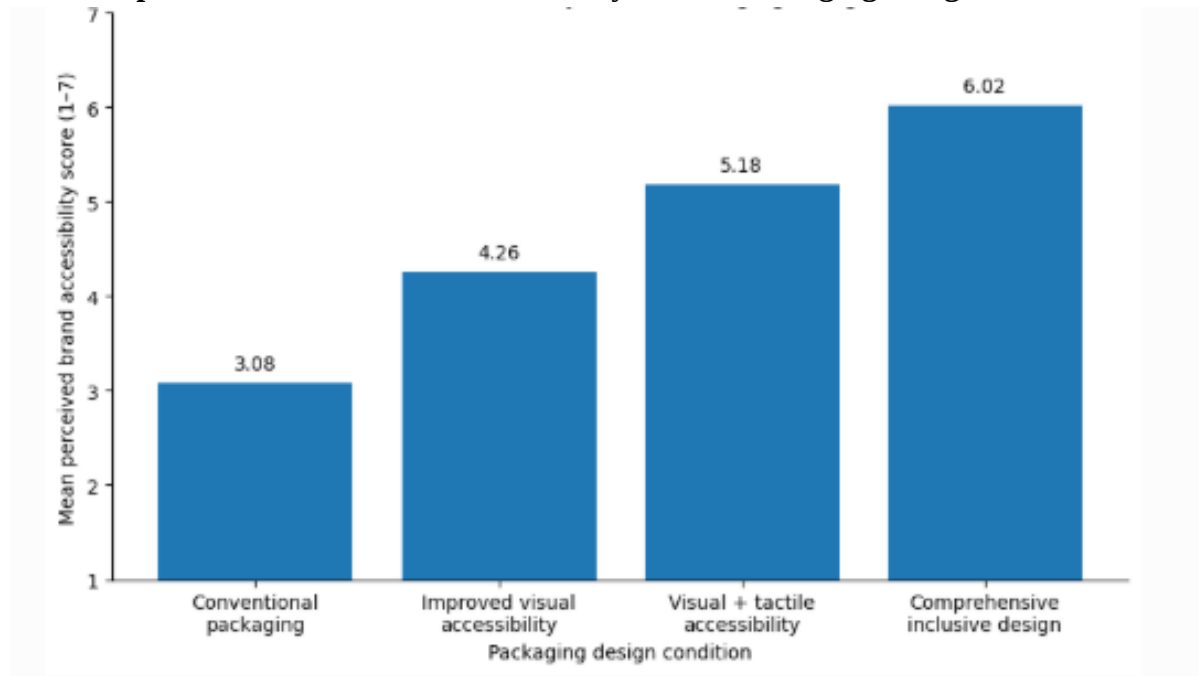
Physical interaction difficulty showed a substantial negative coefficient of $\beta = -0.302$. These complementary results indicate that opening and handling should be treated as central accessibility criteria rather than secondary engineering considerations.

Information clarity and visual legibility also made strong positive contributions. This suggests that accessibility requires both physical access and informational access. Consumers must be able not only to open a package but also to determine what it contains, how it should be used, and which information is important.

Perceived dignity produced an independent positive coefficient of $\beta = 0.229$. This simulated relationship suggests that consumers may interpret inclusive packaging as evidence that a brand respects their autonomy. Accessibility can therefore contribute to brand meaning in addition to functional usability.

5.3 Graphical Comparison of Packaging Conditions

Graph 1: Simulated Brand Accessibility Across Packaging Design Conditions



The graph illustrates a consistent progression from 3.08 for conventional packaging to 6.02 under comprehensive inclusive design.

The movement between conditions provides an important interpretation. Improving visual accessibility alone produces a noticeable increase, but the addition of tactile and physical-access features

generates further gains. Inclusive packaging therefore appears most effective when it is treated as a system rather than a collection of isolated design corrections.

The principal analytical insight is that accessibility depends on the complete consumer journey:

identify → understand → grasp → open → dispense → use → close or dispose. A package can fail at any stage of this sequence even when its appearance satisfies conventional branding expectations.

6. Discussion

6.1 Accessibility Should Be Treated as Core Packaging Quality

The simulated results challenge the assumption that accessible packaging represents a specialized design concern relevant only to a small consumer segment. Many accessibility interventions—clear typography, strong contrast, logical information hierarchy, manageable opening force, intuitive grip, and obvious orientation—can improve usability across a much broader population.

This perspective is consistent with universal-design principles. A package does not need to appear medically specialized in order to become easier to use. Instead, accessibility can be integrated into mainstream design from the beginning. Such integration reduces the likelihood that accessibility will be treated as an expensive correction introduced after branding, structural engineering, and production decisions have already been finalized.

From a managerial perspective, packaging teams should therefore evaluate accessibility alongside protection, sustainability, cost, visual communication, manufacturability, and logistics. Accessibility testing should occur early enough that user feedback can influence the actual packaging architecture rather than merely cosmetic details.

6.2 Brand Accessibility Emerges From Practical Consumer Experience

The positive simulated relationship between inclusive design and brand accessibility indicates that customers may infer organizational values from packaging interaction. Packaging is one of the few brand elements that consumers physically manipulate after purchase, often repeatedly. Its usability can therefore reinforce or contradict the wider brand promise.

A brand describing itself as convenient or customer-centered may create inconsistency when its packaging requires excessive force or presents essential information in difficult-to-read form. Conversely, accessible packaging can provide repeated evidence that the company has considered the customer's practical experience.

This implication is particularly important because accessibility barriers can remain invisible to designers who do not experience them personally. Diverse user testing can reveal difficulties that may not be evident through internal review. Inclusive packaging development should therefore incorporate direct observation of real users rather than relying solely on aesthetic judgment or technical specifications.

6.3 Dignity, Independence, and Responsible Inclusive Design

Perceived dignity represents one of the more significant implications of the framework. Consumers often value independence in everyday product use, and packaging that routinely requires assistance can

undermine that independence. The problem is not limited to severe physical inability. Repeated small difficulties can create frustration, embarrassment, or avoidance.

Inclusive design can reduce these experiences without visibly separating users. A mainstream package that is easier to open and understand benefits customers with reduced capability while remaining fully usable by others. This represents a more dignified strategy than unnecessarily producing stigmatized “special versions” where a universal solution is technically feasible.

However, accessibility should not compromise legitimate safety requirements. Child-resistant packaging, tamper evidence, contamination control, and product integrity may require deliberate resistance. The appropriate design objective is therefore not minimum opening force under every circumstance, but the best achievable balance between safety and accessible adult use. User testing across relevant groups is essential for finding that balance.

7. Conclusion

This study developed a simulation-based framework for examining the relationship between inclusive packaging design and perceived brand accessibility. The model integrates visual legibility, tactile accessibility, opening ease, information clarity, physical interaction difficulty, and perceived dignity to demonstrate how packaging usability can influence broader evaluations of a brand. Simulated brand-accessibility scores increased progressively from 3.08 under conventional packaging to 6.02 under comprehensive inclusive design.

Opening ease emerged as the strongest positive functional predictor, while physical interaction difficulty produced a substantial negative relationship. Information clarity, visual legibility, tactile accessibility, and perceived dignity also contributed positively. Taken together, the results suggest that accessible packaging requires a multidimensional approach. Improving typography while ignoring opening difficulty, or reducing opening force while maintaining confusing information architecture, addresses only part of the consumer experience.

For practitioners, the findings indicate that accessibility should be incorporated into mainstream packaging-development processes rather than treated as a late-stage modification. Cross-functional teams involving packaging engineers, brand managers, graphic designers, ergonomics specialists, sustainability professionals, regulatory experts, and representative users can help identify trade-offs before production decisions become difficult to change. Accessibility metrics can also be incorporated into packaging evaluation alongside traditional measures of shelf impact, cost, sustainability, and product protection.

The present study remains deliberately limited by its synthetic methodology. The reported scores and regression coefficients are not estimates from actual consumers. Future research should validate the proposed relationships through controlled package-comparison experiments, observational usability studies, timed opening tasks, eye-tracking, hand-force measurement, qualitative interviews, and longitudinal purchasing behavior. Researchers should also examine whether accessibility produces different brand effects across age groups, product categories, cultural settings, levels of visual capability, manual dexterity, and prior brand familiarity. Such empirical work could establish more precisely how inclusive packaging contributes not only to usability but also to equitable market participation, consumer independence, and durable brand relationships.

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