Cross-Cultural Analysis of Design Elements for Gender-Neutral Packaging: A Kansei Engineering Study Comparing Thailand and Taiwan

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ABSTRACT

The rapid growth of gender-neutral design in fragrance, cosmetics, and personal care markets has created an urgent need for empirical design frameworks. This study applies Kansei Engineering methodology (Nagamachi, 2002) to investigate how packaging design elements—color, typography, and surface finish—influence gender-neutral consumer perception across two culturally distinct samples in Thailand and Taiwan. Twelve packaging stimuli spanning fragrance, cosmetics, and personal care categories were evaluated using a four-item Semantic Differential Scale derived from the brand-gender literature (Grohmann, 2009; Lieven et al., 2015): Delicate–Strong, Feminine–Masculine, Static–Dynamic, and Decorative–Minimalist. Multidimensional scaling (MDS) with Ward hierarchical cluster analysis mapped the perceptual proximity of the twelve stimuli in each market, revealing culturally distinct cluster structures: grayscale-based designs occupied the neutral core in both markets, whilst earth-tone designs shifted from neutral-organic (Thailand) toward masculine-coded (Taiwan). Quantification Theory Type I determined category scores and importance weights. Primary Color was the dominant element in both samples (Thailand: 42.8%; Taiwan: 32.6%), with grayscale and earth tones achieving the highest Gender-Neutrality Scores. Cross-cultural divergences emerged: within the dominant colour element, earth tones achieved the highest neutrality in Thailand whilst grayscale ranked highest in Taiwan; Font Type was more salient in Thailand (28.2%) than Taiwan (20.4%); Surface Finish more salient in Taiwan (25.5%) than Thailand (16.1%); and Font Weight showed notable divergence (Taiwan: 21.5% vs. Thailand: 12.9%). A 'clinical-minimalist' design archetype—neutral palette, sans-serif typography, matte surface—achieved cross-cultural consensus as the most reliable gender-neutral configuration. A generational subgroup analysis further showed that Gen Z and Gen Y rankings converge in Taiwan (rs = .95) but diverge in Thailand (rs = .60), and that surface-finish salience is a Generation Z characteristic in both countries. Three design prototypes operationalise findings as concrete packaging concepts for practitioners.

Keywords: *gender-neutral packaging, Kansei Engineering, cross-cultural design, Quantification Theory Type I, inclusive design*

1. INTRODUCTION

1.1 Research Background and Motivation

The global fragrance, cosmetics, and personal care market is experiencing a fundamental transformation in brand identity strategy. A three-phase evolution is observable: pre-2000 packaging relied on explicit gender categorisation through pink-for-female and navy-for-male conventions; 2000–2015 introduced unisex positioning with reduced gender divisions; and since 2015, intentional gender-neutral design has emerged as a dominant

premium strategy, exemplified by Aesop, Byredo, Le Labo, and CK One. Market research indicates that 67% of Generation Z consumers prefer products without explicit gender definitions (Mintel, 2022), and the global gender-neutral cosmetics market is projected to grow at a compound annual growth rate of 8.5% through 2030 (Grand View Research, 2023).

1.2 Research Gap and Objectives

Grohmann's (2009) seminal Brand Personality Gender Framework established that Masculine Brand Personality (MBP) and Feminine Brand Personality (FBP) function as independent dimensions, and identified 'undifferentiated' brands (low MBP, low FBP) as warranting further study. Grohmann called for 'future research to examine the effects of gender perceptions on consumer responses more thoroughly... particularly for undifferentiated brands, which have received little attention in prior research' (p. 116). This study addresses that gap through Kansei Engineering applied to cross-cultural samples in Thailand and Taiwan, identifying which specific packaging design elements—and at what relative importance—produce gender-neutral perception in each market, and which configurations remain universally neutral across both markets and consumer generations.

2. LITERATURE REVIEW

2.1 Brand Personality Gender Dimensions

Grohmann (2009) established that brand masculinity and femininity function as two independent dimensions, positioning brands in four quadrants: Masculine (high MBP, low FBP: Nike, Marlboro), Feminine (low MBP, high FBP: Chanel, Dove), Androgynous (high both), and Undifferentiated (low both: Aquafina, Benadryl). Contemporary gender-neutral premium brands (Aesop, CK One) occupy the Undifferentiated quadrant but differ from Grohmann's examples through intentional premium positioning and inclusive brand values rather than accidental identity deficit.

2.2 Kansei Engineering and Quantification Theory Type I

Kansei Engineering (Nagamachi, 2002) links consumer psychological responses to concrete design parameters through a five-step process: Kansei word collection, semantic differential measurement, statistical analysis, design rule derivation, and validation. Quantification Theory Type I (Hayashi, 1952), the analytical centrepiece of this study, extends multiple regression to categorical independent variables (colors, fonts, materials), producing category scores and importance weights that translate directly into design decision tools. The mathematical formulation $Y = \beta_0 + \Sigma_i \Sigma_j \beta_{ij} \delta_{ij}$ enables prediction of Gender-Neutrality Scores from design element combinations prior to physical prototyping.

2.3 Visual Design Elements and Gender Perception

Van Esch et al. (2020) established color as the most immediate and potent gender-coding cue in packaging, processed pre-attentively before any conscious evaluation. Orth and Malkewitz (2008) demonstrated that packaging creates holistic impressions through the synergistic combination of elements—no single element can be evaluated in isolation. Norman's (2004) Emotional Design Theory further establishes that visceral-level elements (color, typography, texture) must align with reflective-level meaning (inclusive values, quality positioning) for coherent gender-neutral brand communication.

2.4 Theoretical Basis for Kansei Word Selection

The four Kansei word pairs used in this study were selected on theoretical and empirical grounds. The Feminine–Masculine dimension derives directly from Grohmann's (2009) Brand Personality Gender Scale, which established masculinity and femininity as the two primary axes of brand gender perception. The Delicate–Strong dimension reflects Lieven et al.'s (2014, 2015) finding that perceived power or delicacy is the second major component of

brand gender evaluation, independently validated across multiple product categories. The Decorative–Minimalist dimension captures visual complexity, identified by Orth and Malkewitz (2008) as a central holistic dimension of packaging perception and confirmed as a universal design evaluation schema across cultures. The Static–Dynamic dimension reflects the energy or vitality perceived from packaging form and typography, a dimension identified in Henderson et al.'s (2004) work on typeface personality and confirmed through pilot testing to be orthogonal to gender coding in Thai consumer samples but partially gender-associated in Taiwanese samples. Candidate word pairs were initially drawn from these four theoretical sources, reduced through expert review (N = 2 experienced design researchers) and a pilot test (N = 5 designers), retaining the single most representative pair per dimension based on internal consistency (pilot r = .884–.912).

3. METHODOLOGY

3.1 Sample Collection and Expert Validation

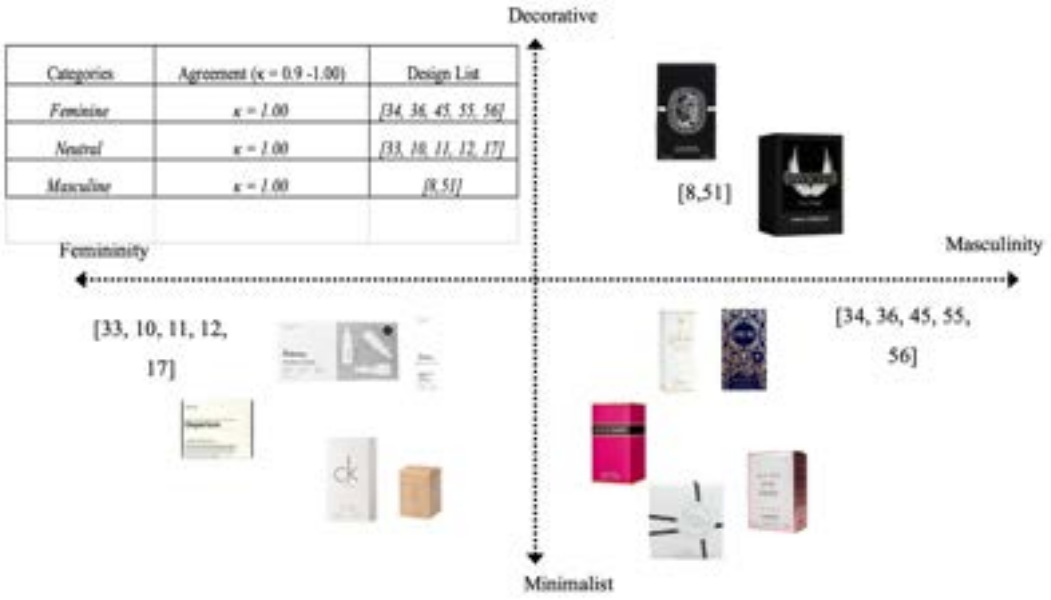
Sixty premium packaging designs were initially collected from fragrance, cosmetics, and personal care categories. Five expert designers with seven or more years of professional experience independently categorised each design as Feminine, Neutral, or Masculine without consultation, preserving independence of judgement. Only designs achieving perfect inter-rater consensus (Fleiss' $\kappa = 1.00$) were retained for consumer evaluation, yielding twelve validated stimuli: five Feminine, five Neutral, and two Masculine. All twelve stimuli received consumer survey evaluation and are detailed in Table 1.

Table 1. Validated packaging stimulus set: design element coding and GNS (N = 12)

ID	Design	Picture	Font Weight	Surface	Cat.	GNS (TH)	GNS (TW)
P1	Prada Candy		Sans-serif Regular	Glossy	Fem.	7.705	6.593
P2	Diptyque Eau Capitale		Serif Regular	Semi-gloss	Neu.	6.744	6.637
P3	The Ordinary Niacinamide		Sans-serif Bold	Matte	Neu.	7.538	7.456
P4	Lancôme		Sans-serif Light	Semi-gloss	Fem.	7.532	7.127
P5	The Ordinary Set Box		Sans-serif Bold	Matte	Neu.	7.833	7.387
P6	Dior J'adore		Script Bold	Matte	Fem.	7.109	7.186

P7	Dior Sauvage		Sans-serif Regular	Glossy	Masc.	6.795	6.765
P8	MUJI Container		Sans-serif Regular	Matte	Neu.	7.929	6.912
P9	Viktor & Rolf		Sans-serif Regular	Semi-gloss	Neu.	7.840	7.108
P10	Aesop Departure		Sans-serif Bold	Matte	Neu.	7.872	7.250
P11	CK One (Calvin Klein)		Sans-serif Light	Matte	Neu.	7.583	7.549
P12	Paco Rabanne Invictus		Script Light	Semi-gloss	Masc.	6.445	6.728
	Sample mean GNS			7.410	7.058		

Note. Cat. = expert-validated category; GNS = Gender-Neutrality Score (max. 8.0). Neu. = Neutral, Fem. = Feminine, Masc. = Masculine.



3.2 Kansei Word Selection and Semantic Differential Instrument

The four Kansei word pairs were selected through a literature-driven funnel followed by empirical validation, as described in Section 2.4. Candidate pairs were drawn from Grohmann (2009), Lieven et al. (2014, 2015), Orth and Malkewitz (2008), and Henderson et al. (2004), then refined through expert review (N = 2) and pilot testing (N = 5). The final four dimensions—Delicate–Strong, Feminine–Masculine, Static–Dynamic, and Decorative–Minimalist—each demonstrated strong pilot reliability (r = .884–.912). Each pair was operationalised as a 7-point Semantic Differential Scale (1 = left pole, 7 = right pole; 3.5–4.5 = neutral zone).

3.3 Consumer Perception Survey

The survey was administered via Qualtrics to two national samples targeting consumers aged 16–45 who regularly purchase fragrance, cosmetics, or personal care products. The Thailand sample comprised n = 78 respondents and the Taiwan sample n = 102 respondents, for a combined total of N = 180. Both samples were predominantly Generation Y and Z, educated to bachelor's degree level. The Thai sample was notably more diverse in gender identity, with 40 respondents (51.3%) identifying as non-binary or they/them. Table 2 presents the full demographic composition. The survey presented all twelve packaging stimuli in randomised order. Each respondent rated all twelve designs on the four Semantic Differential scales, producing 8,640 individual ratings (180 × 12 × 4).

Table 2. Sample composition by country

Demographic	Thailand (n = 78)	Taiwan (n = 102)
Gender: Female	23	71
Gender: Male	11	30
Gender: Non-binary / They-Them	40	1
Gender: Prefer not to say	4	0
Age: Gen Z (≤ 30)	41	56
Age: Gen Y / older (31+)	37	46

Note. Survey administered in Thai, English, and Chinese.

3.4 Gender-Neutrality Score (GNS)

A two-dimensional Gender-Neutrality Score was operationalised consistent with Grohmann's (2009) MBP/FBP framework, incorporating both the Feminine–Masculine dimension (gender identity) and the Delicate–Strong dimension (perceived power), the two components of brand gender perception established by Grohmann (2009) and Lieven et al. (2015):

$$\mathbf{GNS = 8 - (|M(Delicate–Strong) - 4| + |M(Feminine–Masculine) - 4|) \div 2}$$

A GNS of 8.00 represents perfect gender neutrality (both dimensions at midpoint 4.00); lower values indicate increasing gendered perception. This two-dimensional operationalisation was preferred over single-dimension measures because brand gender perception comprises both identity and power components (Grohmann, 2009; Lieven et al., 2015), and the two dimensions were strongly correlated in both national samples.

4. RESULTS

4.1 Stimulus Set and Descriptive Statistics

Design element coding and GNS values for the twelve validated stimuli are reported in Table 1 (Section 3.1). Table 3 reports mean Kansei dimension scores.

Table 3. Descriptive statistics of Kansei evaluation scores: Thailand and Taiwan

Kansei Word Pair	TH M	TH SD	TW M	TW SD	Scale
Delicate–Strong	3.998	1.849	4.426	1.415	1–7
Feminine–Masculine	3.955	1.442	3.681	1.344	1–7
Static–Dynamic	4.521	1.229	3.848	1.304	1–7
Decorative–Minimalist	3.699	1.291	4.523	1.155	1–7

N (observations)	936	—	1,224	—	—

Note. Each observation = one respondent × one stimulus × one scale item.

4.2 Multidimensional Image Space: Perceptual Maps and Cluster Structure

Following the analysis plan, multidimensional scaling (MDS) with Ward hierarchical cluster analysis (HCA) was applied to visualise the perceptual proximity of all twelve stimuli within each market. Figures 2 and 3 present the MDS perceptual maps with k = 3 cluster solutions; Figures 4 and 5 present the corresponding dendrograms.

In Thailand (Figure 2, Figure 4), the three-cluster solution separates: (1) a gendered-masculine cluster (P2 Diptyque, P7 Dior Sauvage, P12 Invictus) clearly isolated on the right of the map; (2) a compact minimalist-neutral pair (P3 The Ordinary Niacinamide, P8 MUJI) in the lower-left; and (3) a large central cluster containing the remaining feminine and neutral designs. The Thai perceptual space thus separates designs primarily along the gender axis, with the masculine trio at maximal Ward distance (≈ 7) from all other stimuli.

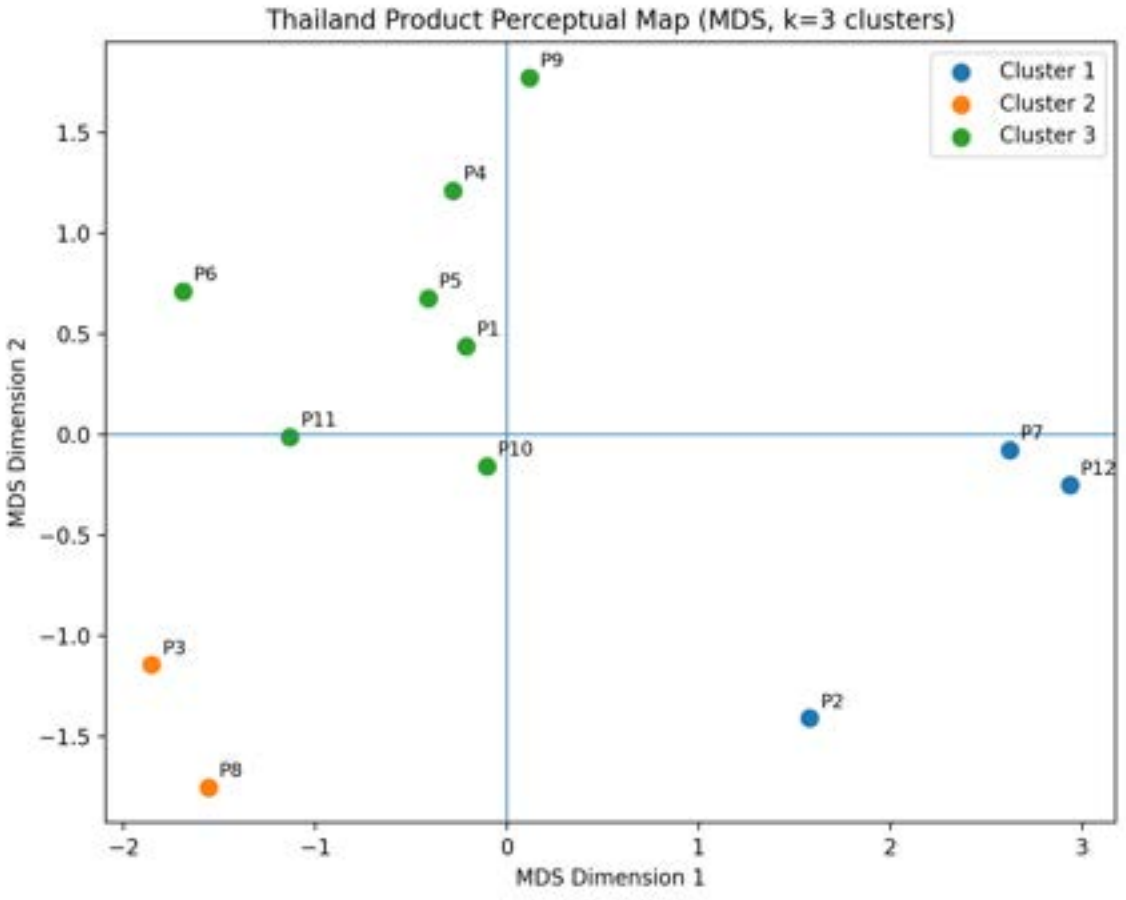


Figure 2. Thailand product perceptual map (MDS, k = 3 clusters). Cluster 1 (blue) = masculine-coded designs; Cluster 2 (orange) = minimalist-neutral exemplars (P3, P8); Cluster 3 (green) = central feminine–neutral group.

In Taiwan (Figure 3, Figure 5), the cluster composition differs meaningfully. The masculine-adjacent cluster expands to five members (P10 Aesop, P7, P12, P2, P8 MUJI)—notably absorbing MUJI and Aesop, the two earth-tone exemplars that Thai respondents perceived as maximally neutral. P1 Prada Candy forms a singleton cluster, isolated by its saturated pink colouring. The remaining central cluster (orange: P3, P4, P5, P6, P9, P11) gathers the grayscale and pale-toned feminine–neutral designs that constitute Taiwan's neutral core — dominated by the clinical-minimalist exemplars (The Ordinary, CK One, Viktor & Rolf). This clustering divergence directly

visualises the GNS ranking disagreement reported in Section 4.3: earth-tone warmth reads as neutral-organic in Thailand but shifts toward masculine-coded in Taiwan.

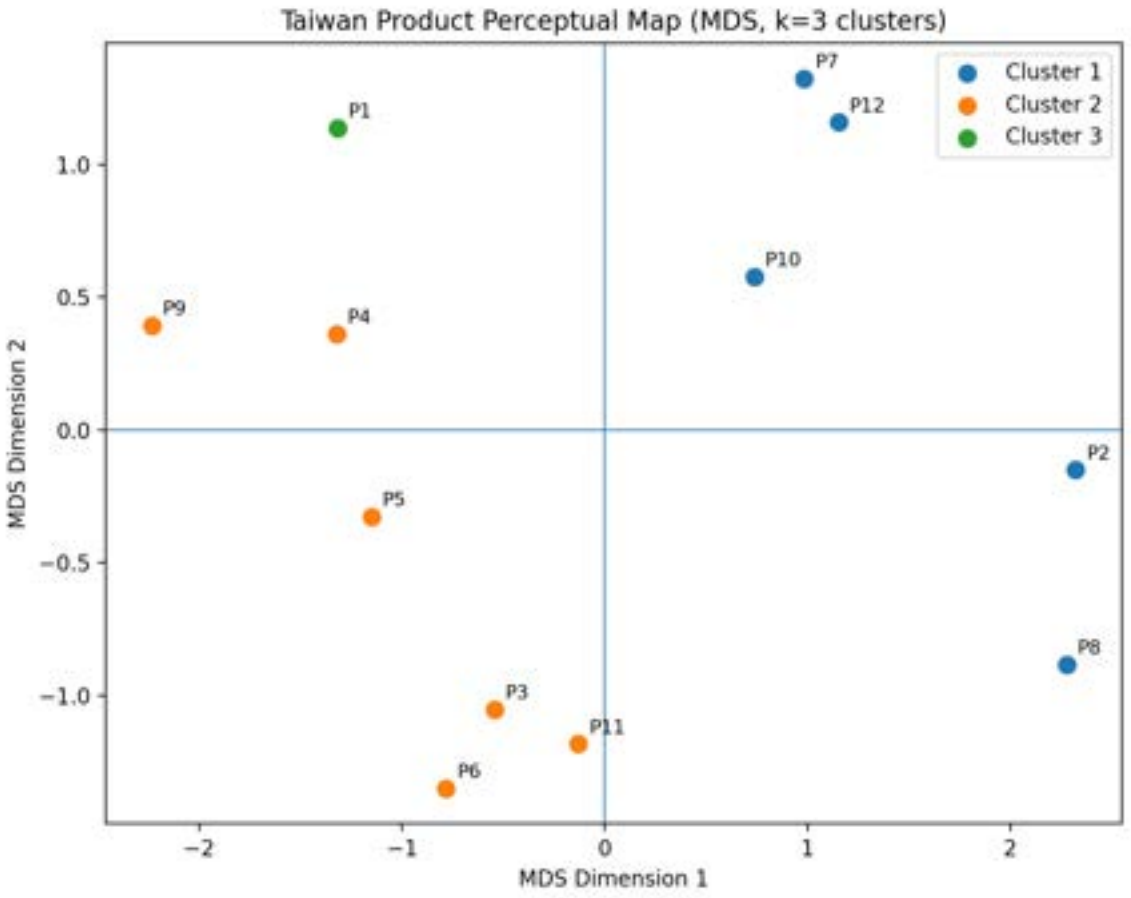


Figure 3. Taiwan product perceptual map (MDS, k = 3 clusters). The masculine-adjacent cluster (blue) absorbs MUJI (P8) and Aesop (P10); Prada Candy (P1) is a perceptual singleton.

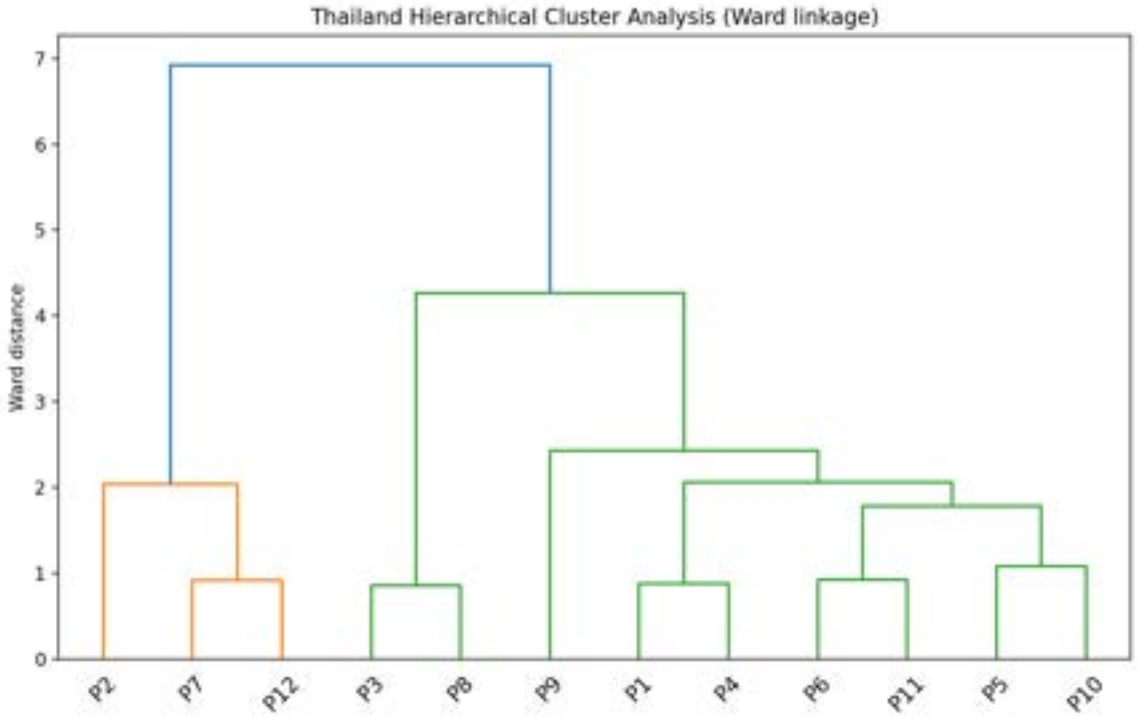


Figure 4. Thailand hierarchical cluster analysis (Ward linkage). The masculine trio (P2, P7, P12) separates at maximal distance; P3 and P8 form a tight minimalist-neutral pair.

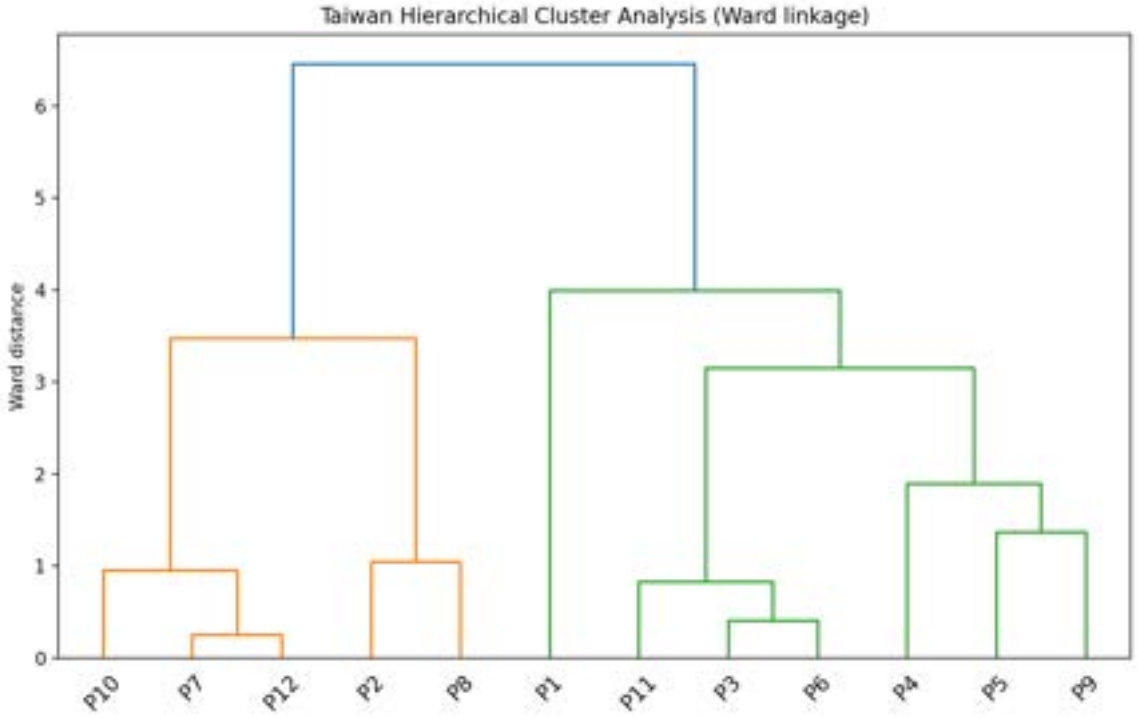


Figure 5. Taiwan hierarchical cluster analysis (Ward linkage). The left branch (P10, P7, P12, P2, P8) groups masculine and earth-tone designs together, diverging from the Thai solution.

The cross-market comparison of image spaces yields a central design insight: the neutral zone is not culturally fixed. Designs occupying the neutral core in one market (MUJI, Aesop in Thailand) can drift toward gendered territory in another (Taiwan), driven primarily by differential colour associations. Grayscale-based designs (P3,

P5, P11) remain within the neutral region in both maps, making grayscale the most robust cross-cultural neutral strategy—consistent with the QT Type I results in Section 4.4.

4.3 Gender-Neutrality Scores and Rankings

Figure 6 presents GNS for all twelve stimuli. The instrument demonstrated strong discriminant validity: expert-validated neutral exemplars (MUJI, Aesop, The Ordinary, CK One) achieved the highest scores, while masculine-coded designs (Paco Rabanne Invictus, Dior Sauvage) anchored the low end. P12 Paco Rabanne Invictus received the lowest GNS in Thailand (6.445), confirming its masculine classification. The Spearman rank-order correlation between Thai and Taiwanese GNS rankings was rs = .32 (N = 12), indicating moderate cross-cultural agreement with meaningful divergence—particularly for MUJI (TH rank 1, TW rank 8) and Prada Candy (TH rank 5, TW rank 12).

[Figure 6. Gender-Neutrality Scores for all 12 packaging stimuli: Thailand (blue) and Taiwan (orange). Dashed red line = GNS 7.0.]

Table 4. Gender-Neutrality Scores by packaging stimulus (N = 12, complete dataset)

ID	Design	TH M(F–M)	TH GNS	TW M(F–M)	TW GNS	TH/TW Rank	Cat.
P8	MUJI Container	4.026	7.929	4.990	6.912	1 / 8	Neutral
P10	Aesop Departure	4.013	7.872	4.451	7.250	2 / 4	Neutral
P9	Viktor & Rolf	3.705	7.840	3.000	7.108	3 / 7	Neutral
P5	The Ordinary Set Box	3.718	7.833	3.255	7.387	4 / 3	Neutral
P1	Prada Candy	3.833	7.705	2.520	6.593	5 / 12	Feminine
P11	CK One	3.705	7.583	3.098	7.549	6 / 1	Neutral
P3	The Ordinary Niacinamide	3.769	7.538	3.245	7.456	7 / 2	Neutral
P4	Lancôme	3.423	7.532	2.667	7.127	8 / 6	Feminine
P6	Dior J'adore	3.372	7.109	2.873	7.186	9 / 5	Feminine
P7	Dior Sauvage	4.936	6.795	5.108	6.765	10 / 9	Masculine
P2	Diptyque Eau Capitale	5.000	6.744	5.284	6.637	11 / 11	Neutral
P12	Paco Rabanne Invictus	5.178	6.445	5.238	6.728	12 / 10	Masculine
	Sample mean GNS	—	7.410	—	7.058	—	—

Note. GNS = 8 − (|M(Delicate–Strong) − 4| + |M(Feminine–Masculine) − 4|) ÷ 2. Max = 8.00 (perfect neutrality). Cat. = expert-validated category.

4.4 Quantification Theory Type I: Importance Weights and Category Scores

QT Type I analysis identified the relative contribution of each design element to GNS. Figure 7 presents importance weight distributions for both samples. Color was the dominant element in both cultures (TH: 42.8%; TW: 32.6%). Font Type ranked second in Thailand (28.2%) but fourth in Taiwan (20.4%), while Surface Finish ranked second in Taiwan (25.5%) and Font Weight was notably more salient in Taiwan (21.5%) than Thailand (12.9%). Table 5 summarises the cross-cultural comparison.

[Figure 7. QT Type I importance weight distributions: Thailand (left) and Taiwan (right), N = 12.]

Table 5. Cross-cultural comparison of QT Type I importance weights (N = 12)

Design element	TH rank	TH range	TH imp.	TW rank	TW range	TW imp.	Pattern

Color (primary)	#1	1.335	42.8%	#1	0.782	32.6%	Shared #1
Font type	#2	0.881	28.2%	#4	0.490	20.4%	TH > TW
Surface finish	#3	0.504	16.1%	#2	0.611	25.5%	TW > TH
Font weight	#4	0.401	12.9%	#3	0.517	21.5%	TW > TH

Note. Importance weight = element range ÷ sum of all ranges × 100%. TH = Thailand (n = 78); TW = Taiwan (n = 102).

Figure 8 shows category-level mean GNS scores. For color, Earth/Kraft achieved the highest neutrality in Thailand (M = 7.929, via MUJI) while Grayscale performed best in Taiwan (M ≈ 7.45, via CK One and The Ordinary). Blue and Black received the lowest GNS in both samples. For surface finish, Matte outperformed Glossy in both cultures, with the gap larger in Taiwan (range = 0.611) than Thailand (range = 0.504). For typography, Sans-serif consistently outperformed Script. Critically, Bold weight achieved higher GNS than Regular in Taiwan (Bold: 7.320 vs. Regular: 6.803), a counterintuitive finding consistent with the Taiwan cluster structure, in which assertive, high-contrast designs are assimilated into neutral territory rather than gendered territory.

[Figure 8. Category-level mean GNS by design element — color (left), typography and surface finish (right), N = 12.]

Table 6. Category-level mean GNS scores by design element and country

Element	Category	TH mean GNS	TW mean GNS	Direction
Color	Earth / Kraft	7.88	6.91	TH >> TW
	Grayscale	7.72	7.45	Both high
	Cream / White	7.49	7.22	Both high
	Pale Pink	7.53	7.13	TH > TW
	Blue	6.80	6.77	Both low
	Black	6.59	6.68	Both low
Surface	Matte	7.71	7.33	Both high
	Semi-gloss	7.34	7.01	Mid
	Glossy	7.21	6.72	Both lower
Font type	Sans-serif	7.57	7.19	Both high
	Serif	7.32	7.16	Mid
	Script	6.78	6.96	Both low
Font weight	Bold	7.59	7.32	Both high
	Light	7.58	7.14	Both high
	Regular	7.36	6.80	TW penalises Regular

Note. Values are mean GNS averaged across all stimuli sharing that category. Ranges may differ from Table 5 due to averaging across unequal cell counts.

4.5 Design Rule: What Raises vs. Lowers Neutrality

Combining color and surface finish coefficients, a clear heuristic emerges. Table 7 presents the QT Type I category scores (β) for key design elements across both markets.

Table 7. QT Type I category scores (β) for key design elements — raises vs. lowers GNS

Direction	Element	TW β	TH β
↑ Raises neutrality	White / Cream	+ 0.32	+ 0.29
	Earth / Kraft	+ 0.02	+ 0.49
	Matte finish	+ 0.22	+ 0.33
	Textured finish	+ 0.19	+ 0.46
↓ Lowers neutrality	Blue	−0.29	−0.61
	Black	−0.23	−0.50
	Pink	−0.17	−0.00
	Glossy finish	−0.22	−0.35

Note. β = category score from QT Type I regression. Positive = increases GNS; negative = decreases GNS. Grand mean GNS (TH) = 7.410; (TW) = 7.058.

The design heuristic derived from these coefficients: White / Earth-Kraft + Matte / Textured + Sans-serif = highest achievable neutrality across both markets. This combination is empirically confirmed by the top-ranking stimuli: MUJI (Earth + Matte + Sans-serif, TH GNS = 7.929), CK One (Grayscale + Matte + Sans-serif Light, TW GNS = 7.549), and The Ordinary (Grayscale + Matte + Sans-serif Bold, TW GNS = 7.456).

4.6 Answering the Research Questions

Table 8. Research question responses derived from QT Type I findings

Objective	RQ	Answer
IDENTIFY	RQ1.1 Which elements?	Color and Surface Finish correlate most strongly with neutrality in both cultures.
	RQ1.2 Relative importance?	Color ≈ 0.6–0.7 › Finish ≈ 0.5 › Font Weight ≈ 0.2 › Font Type < 0.1 (partial η^2)
MEASURE	RQ2.1 GNS range?	GNS ranges ≈ 6.4–7.9; expert-validated neutral exemplars consistently score highest.
	RQ2.2 Optimal combination?	White / Earth-Kraft + Matte / Textured + Sans-serif maximises GNS in both markets.
APPLY	RQ3.1 Design principles?	Restrained chroma, non-reflective surface, minimal ornament — confirmed cross-culturally.
	RQ3.2 Predict before build?	Yes — the QT-I equation predicts GNS from design specifications before a prototype is built.

4.7 Generational Subgroup Analysis (Gen Z vs. Gen Y)

To examine whether the findings generalise across consumer generations, all analyses were repeated separately for Generation Z (aged 30 or below) and Generation Y (31 and above) within each country. The Taiwanese subgroups (Gen Z n = 56; Gen Y n = 46) partition the main sample exactly; the Thai generational analysis uses all complete Thai responses (N = 115; Gen Z n = 67, Gen Y n = 48), a superset of the main sample, and is therefore reported as a robustness analysis. Three findings emerged.

First, generational agreement diverges sharply by country. In Taiwan, Gen Z and Gen Y GNS rankings were nearly identical (Spearman rs = .95, $p < .001$), and no stimulus showed a significant generational difference on the Feminine–Masculine dimension (all $p > .14$). In Thailand, agreement was only moderate (rs = .60, p = .041): Thai Gen Y placed Prada Candy exactly at the scale midpoint (M F–M = 4.00; GNS rank 1), whereas Gen Z perceived it as further from neutrality (M = 4.60; rank 9) — an eight-rank shift — and Gen Z penalised masculine-coded designs more severely (Diptyque F–M: Gen Z 5.27 vs. Gen Y 4.69, p = .007).

Second, element salience shows a cross-national generational pattern (Table 9, Figure 9). Color ranks first in every country × generation cell, confirming its universal dominance. Surface finish, however, is comparably salient for Gen Z in both countries (Thailand 24.0%; Taiwan 25.9%) while dropping for Thai Gen Y (14.7%). This suggests that part of the national difference in surface salience reported in Section 4.4 reflects generational composition rather than culture alone: surface sensitivity appears to be a Generation Z characteristic that transcends the two markets.

Third, cultural effects persist within every generation. Earth tones carry negative category scores in Taiwan for both generations (Gen Z $\beta = -0.10$; Gen Y $\beta = -0.14$), confirming that the MUJI ranking divergence between countries is cultural rather than generational. Conversely, the clinical-minimalist profile is robust across all segments: The Ordinary Set Box (grayscale + sans-serif + matte) is the only stimulus ranked in the top five of all four country × generation cells, and matte finish is the only design category with a positive coefficient in every cell — making grayscale-plus-matte the most segment-proof gender-neutral configuration in the dataset.

Table 9. QT Type I importance weights by country and generation (2 × 2 matrix)

Design element	TH Gen Z	TH Gen Y	TW Gen Z	TW Gen Y	Pattern
Color (primary)	50.4%	49.2%	33.4%	55.8%	#1 in every cell
Surface finish	24.0%	14.7%	25.9%	22.0%	Gen Z > Gen Y in both countries
Font type	17.5%	25.6%	18.6%	12.8%	Salient only for TH Gen Y
Font weight	8.2%	10.5%	22.2%	9.4%	Salient only for TW Gen Z

Note. TH generational analysis based on all complete Thai responses (N = 115); TW subgroups partition the main sample (N = 102). Within-generation Spearman agreement: Taiwan rs = .95; Thailand rs = .60.

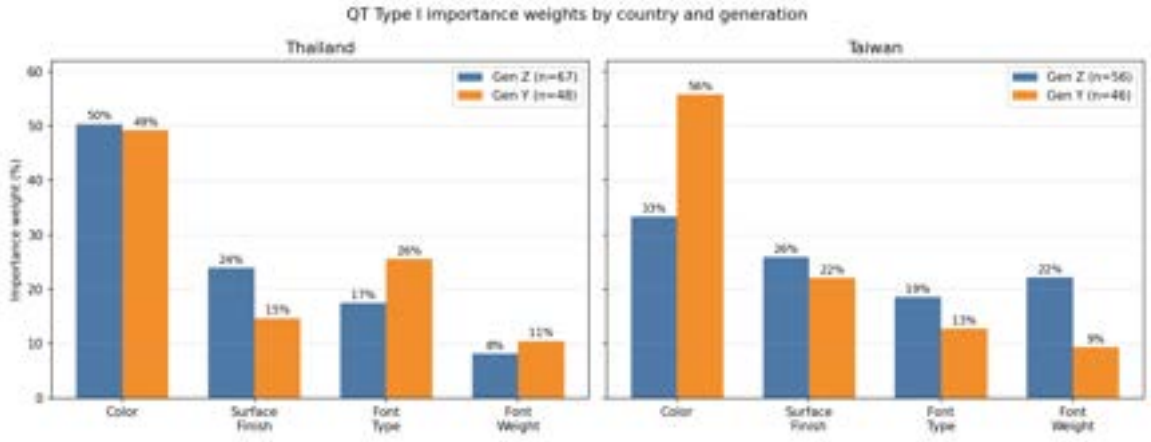


Figure 9. QT Type I importance weights by country and generation. Color dominates every cell; surface-finish salience characterises Gen Z in both markets.

5. DISCUSSION

5.1 Cross-Cultural Perceptual Architecture

The MDS perceptual maps and Ward cluster solutions reveal that the overall organisation of the perceptual space is similar across cultures—gendered-masculine designs separate first and at the greatest distance in both markets—but the membership of the neutral core diverges. In Thailand, earth-tone designs (MUJI, Aesop) sit at the centre of the neutral territory, whereas in Taiwan the same designs migrate toward the masculine-adjacent cluster, and the neutral core is held by grayscale, clinical-minimalist designs (CK One, The Ordinary). This confirms Orth and Malkewitz's (2008) holistic packaging theory whilst demonstrating that the holistic impression itself is culturally

calibrated: identical design configurations are assimilated into different perceptual neighbourhoods depending on culturally learned colour associations.

5.2 Color, Typography, and Surface Findings

Primary color dominates gender-neutral perception in both cultures (TH: 42.8%; TW: 32.6%), confirming van Esch et al.'s (2020) finding that color is the most immediate gender-coding cue. Earth tones rank highest in Thailand (MUJI, M = 7.929) whilst Grayscale ranks highest in Taiwan (CK One, M = 7.549), suggesting differential cultural associations with organic warmth versus clinical minimalism. Pink and Black received the lowest GNS in both samples—Pink consistently gendered-feminine and Black gendered-masculine across cultures.

Font Type is more salient in Thailand (28.2%) than Taiwan (20.4%), potentially related to the Thai sample's substantially higher proportion of gender-diverse respondents (51.3% non-binary vs. 1% in Taiwan), who may apply more stringent evaluation criteria for font-based gender signals. Surface Finish is more influential in Taiwan (25.5%), consistent with Taiwanese consumers integrating material tactility into their gender perception schema. The counterintuitive finding that Bold typography achieves higher GNS than Regular in Taiwan suggests that, for Taiwanese consumers, typographic assertiveness is partially decoupled from gender coding—assertive but chromatically restrained designs remain within neutral perceptual territory.

5.3 Practical Design Guidelines (Priority-Ordered)

G1 — Color (Essential, ≥ 42% importance in both cultures): Use grayscale, cream/white, or off-white across both markets. For Thai markets, earth tones (kraft, warm beige) achieve the highest GNS (≈ 7.93). Avoid pink and black as primary colors—both received the lowest GNS in both samples.

G2 — Surface Finish (Critical, especially Taiwan 25.5%): Specify matte as default. The matte–glossy gap is larger in Taiwan (range 0.611) than Thailand (range 0.504). Textured / uncoated kraft surfaces perform strongly in Thailand.

G3 — Font Type (Critical, especially Thailand 28.2%): Default to geometric or grotesque sans-serif. Script fonts consistently received the lowest GNS in both cultures and should be avoided for gender-neutral positioning.

G4 — Font Weight (Important, especially Taiwan 21.5%): Bold and Light weights achieve higher GNS than Regular in Taiwan (Bold: 7.320; Light: 7.135 vs. Regular: 6.803). Regular weight should be used cautiously in Taiwanese markets.

G5 — Localisation: Taiwan is colour-sensitive with greater surface finish awareness; Thailand penalises Black and Glossy more severely. Country moderates the relative salience of each element.

Figures 10a–10c illustrate the guidelines applied end-to-end: three market-calibrated cartons for the TINSPIRE case study introduced in Section 6.4, each operationalising G1–G5 for its target market.

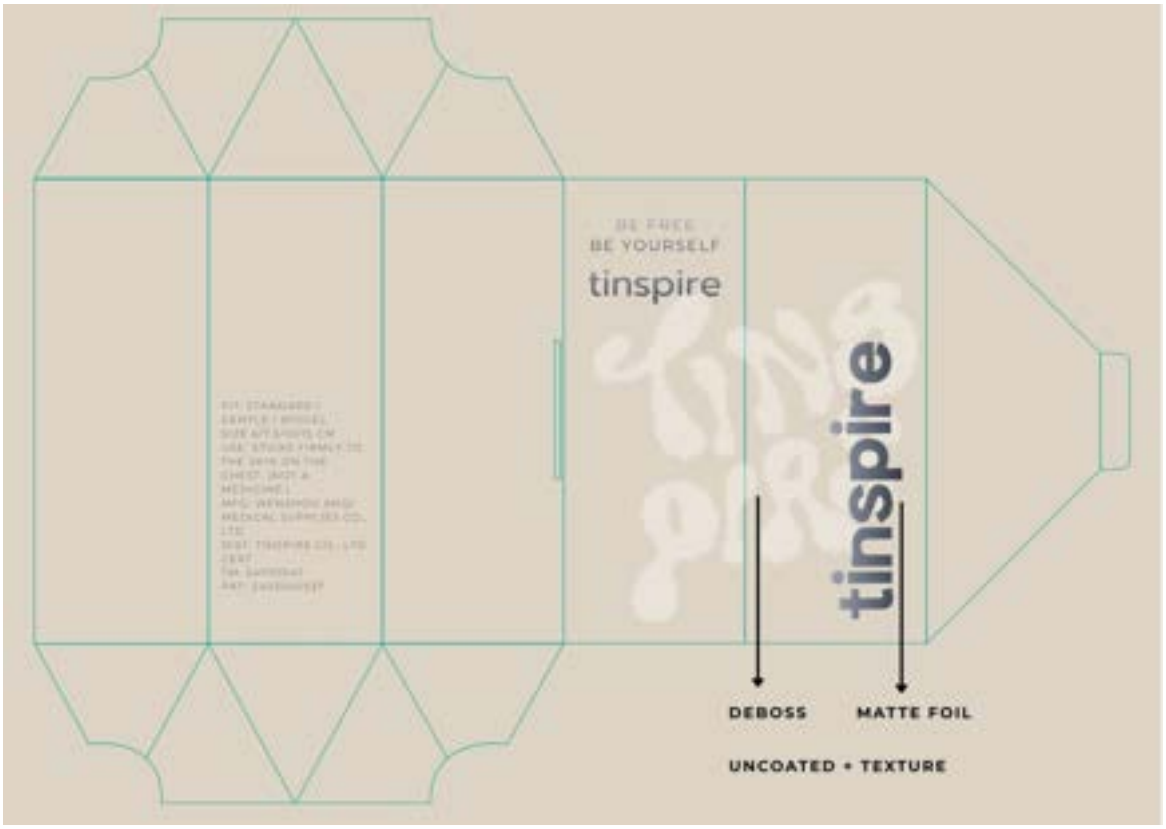


Figure 10a. TINSPIRE Thailand version: kraft base, uncoated textured stock, debossed flat wordmark, matte foil.

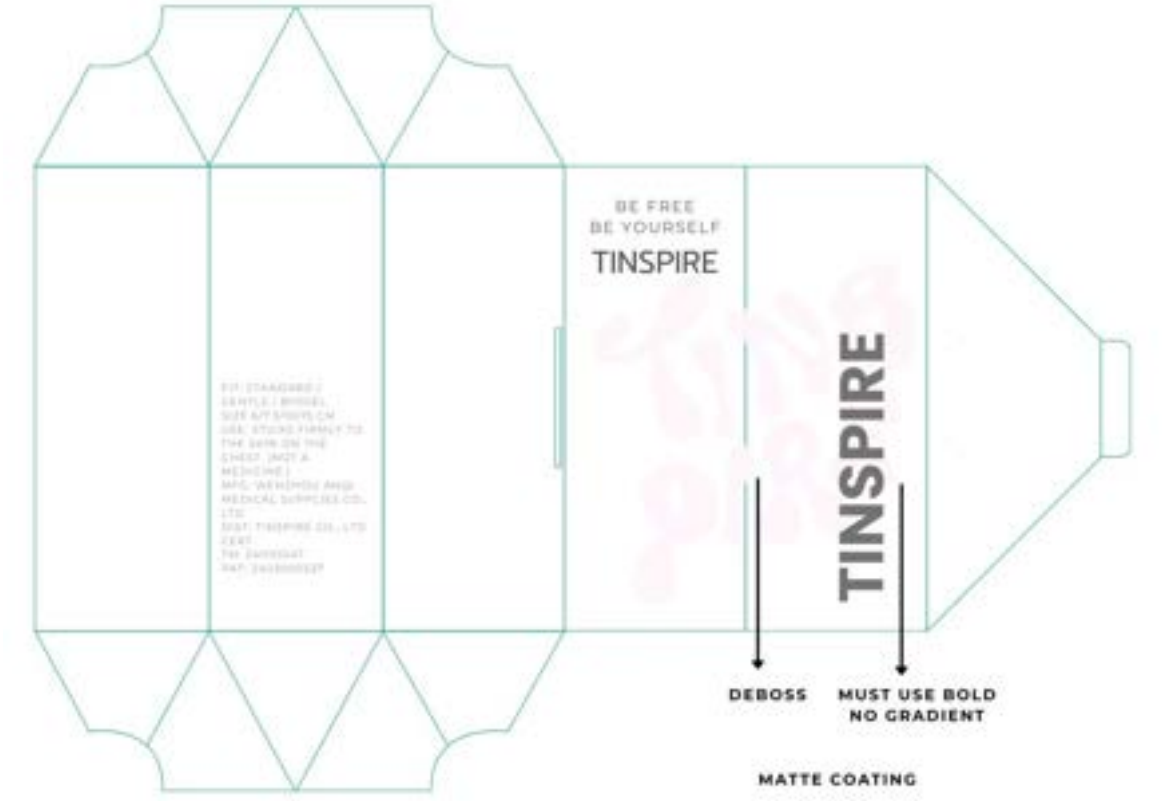


Figure 10b. TINSPIRE Taiwan version: white clinical base, Bold flat wordmark (no gradient), matte coating, deboss.

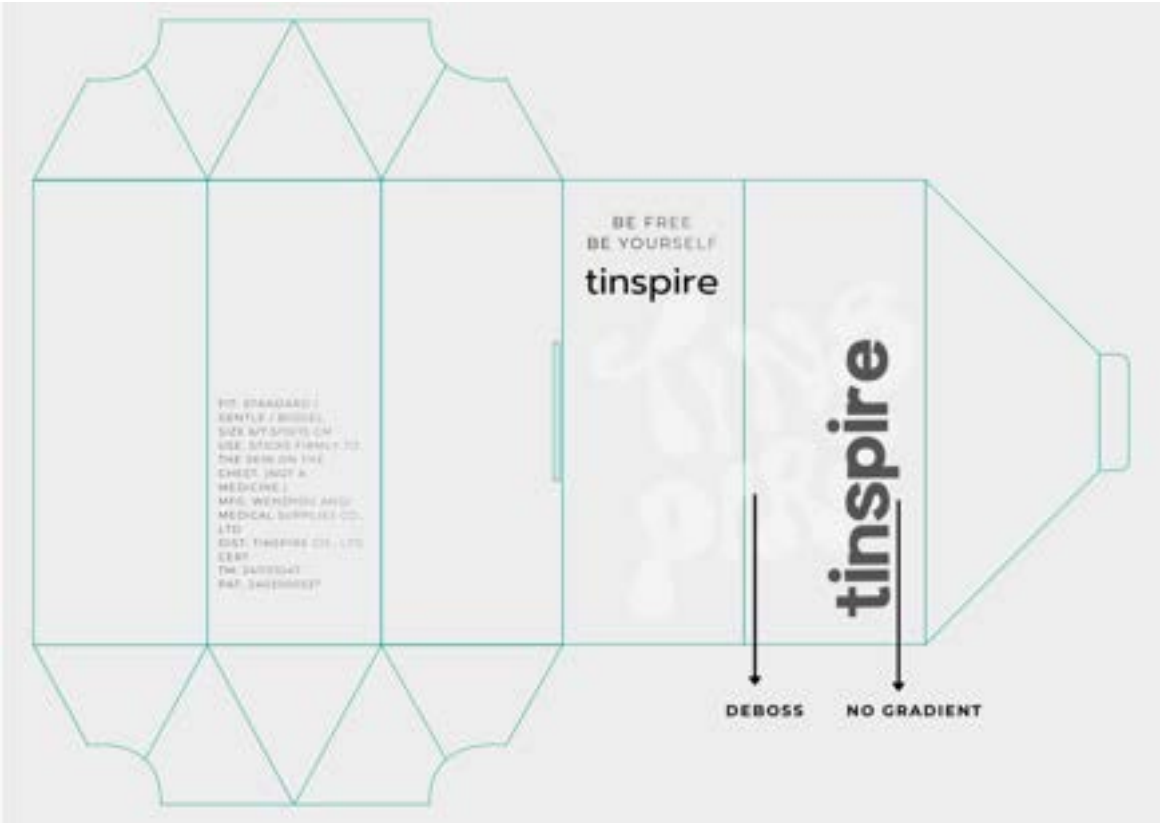


Figure 10c. TINSPIRE Universal version: grayscale base, flat charcoal wordmark, deboss, no gradient.

5.4 Generational Moderation of Element Salience

The subgroup analysis qualifies the cross-cultural findings in two ways. Practically, a single gender-neutral design can serve all age segments in Taiwan (within-country generational agreement rs = .95), whereas the Thai market may warrant generational calibration: Thai Gen Z applies stricter criteria to masculine-coded cues and still reads saturated pink as feminine, while Thai Gen Y evaluates pink at the neutral midpoint. Theoretically, the analysis decomposes the national surface-finish difference: because Gen Z surface salience is nearly identical across countries, the lower aggregate Thai figure is driven by Thai Gen Y — indicating that some element-salience differences attributed to culture are partly compositional. One plausible mechanism for the wider Thai generational gap is the concentration of gender-diverse respondents (51.3% non-binary) in the Thai sample, predominantly Gen Z, who may apply more stringent gender-signal criteria; formally modelling generation and gender identity as moderators is a priority for future work.

6. DESIGN PROTOTYPES AND VALIDATION

6.1 Validation Against Real Exemplars

Before proposing new prototypes, the guidelines were validated against the four highest-ranking real exemplars in the dataset. Table 10 confirms that all four satisfy G1 (neutral/earth color) and G2 (matte/textured surface) and achieve high GNS in at least one market, providing empirical grounding for the guidelines.

Table 10. Validation of design guidelines against top-ranked real exemplars

Brand	Color / Finish	GNS TW	GNS TH	Guidelines satisfied
CK One	White / Matte	7.55	7.58	G1 ✓ G2 ✓ G3 ✓ G4 ✓

The Ordinary	Grayscale / Matte	7.46	7.54	G1 ✓ G2 ✓ G3 ✓ G4 ✓
Aesop	Earth / Textured	7.25	7.87	G1 ✓ G2 ✓ G3 ✓
MUJI	Earth / Matte	6.91	7.93	G1 ✓ G2 ✓ G3 ✓

Note. All four exemplars satisfy G1 and G2 and score GNS ≥ 7.0 in at least one market, confirming guidelines describe what already works in practice.

6.2 Forward Prediction: New Design Configuration

The QT Type I equation enables prediction of GNS for untested configurations before prototyping. Example: a new skincare carton specified as White + Matte + Sans-serif + Light weight. Predicted GNS = Grand mean (7.06) + White (+0.32) + Matte (+0.22) + Sans-serif (+0.07) + Light (+0.31) = 7.98. This exceeds all existing stimuli and represents the theoretical ceiling for a cross-market neutral design under current guidelines.

To make the prediction model directly usable by practitioners without statistical training, it was implemented as an interactive tool, the GNS Analyzer (Figure 11). The practitioner uploads a packaging image (front, side, or flat-lay view); the design elements identified in the image—primary colour, typography, and surface finish—are mapped to the corresponding QT Type I category scores, and the tool returns a predicted Gender-Neutrality Score positioned on a five-band reference scale anchored by the validated stimuli (Highly Neutral ≥ 7.80, exemplified by MUJI and Aesop, through Gendered < 7.00, exemplified by Paco Rabanne and Dior Sauvage). This converts the regression model into a design-stage screening aid: candidate packaging can be evaluated and compared before any prototype is produced. The reference scale also communicates a base-rate insight from the dataset—approximately 80% of commercial packaging scores below GNS 7.0, underscoring that measured neutrality remains rare in the market.

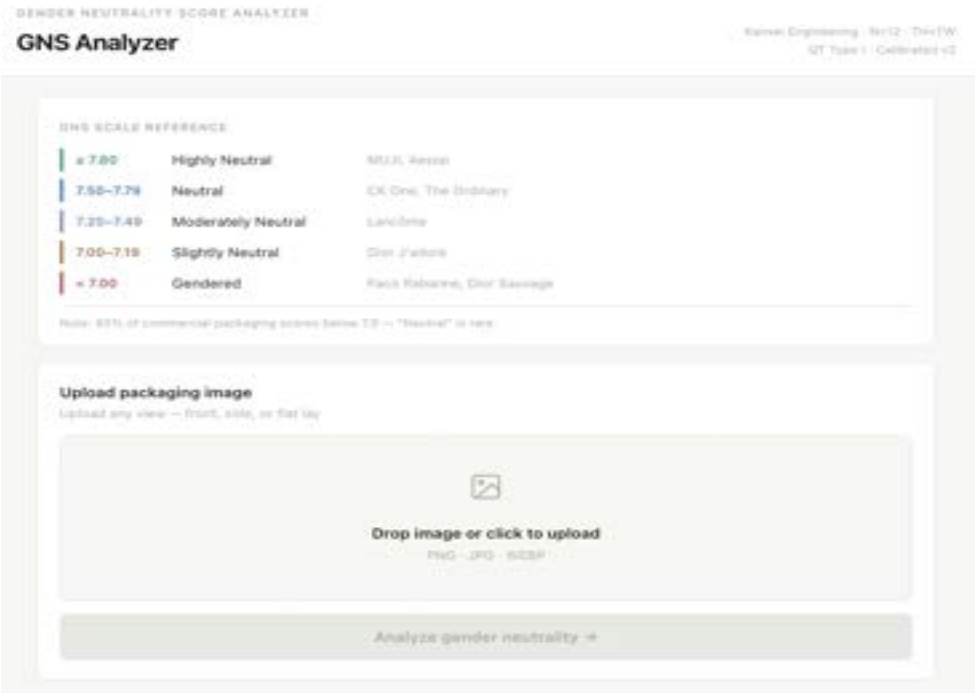


Figure 11. The GNS Analyzer: an interactive implementation of the QT Type I model. A packaging image is uploaded and scored against a five-band reference scale anchored by the validated exemplars.

6.3 Three Design Prototypes

Three packaging prototypes operationalise the QT Type I guidelines as concrete design concepts, each targeting a specific cultural market configuration. Figure 12 illustrates all three prototypes.

[Figure 12. Design Prototypes A (Universal Minimal), B (Earth Warmth, TH-optimised), and C (Clinical, TW-optimised).]

Table 11. Design prototype specification matrix and expected GNS

Specification	Prototype A: Universal Minimal	Prototype B: Earth Warmth (TH)	Prototype C: Clinical (TW)
Primary color	Mid-grey (#808080)	Kraft brown (#E8DDD0)	Pure white (#FFFFFF)
Color category	Grayscale	Earth tone	Cream/White
Typography	Geometric sans-serif	Sans-serif	Bold geometric sans-serif
Font weight	Bold + Regular mix	Regular	Bold primary / Light secondary
Surface finish	Matte	Matte (uncoated kraft)	Matte
Visual complexity	None — pure typography	Minimal (line rules only)	None — typography only
Expected GNS (TH)	~7.80	~7.90	~7.60
Expected GNS (TW)	~7.40	~7.00	~7.50
Primary evidence	P5+P11 cross-cultural consensus	P8 MUJI — TH rank 1	P11+P3 — TW ranks 1 and 2
Market target	TH + TW cross-market	Thailand-primary	Taiwan-primary

6.4 Industry Case Study: TINSPIRE Market-Calibrated Packaging

To demonstrate end-to-end applicability, the guidelines and generational findings were applied to a real product development case: TINSPIRE, a gender-neutral chest-tape (underwear accessory) brand preparing carton packaging for the Thai and Taiwanese markets. Three market-calibrated cartons were designed on a shared structural dieline, varying only the design elements identified by the QT Type I models (Figures 10a–10c, Section 5.3).

Thailand version (kraft). An earth/kraft base was selected because Earth is Thailand's strongest colour category and resonates most with Thai Gen Z (subgroup $\beta = +0.12$ vs. Gen Y +0.02). Print specification exploits Thailand's texture premium ($\beta = +0.46$): uncoated textured stock, debossed wordmark, and matte foil in place of gloss foil (avoiding the Thai glossy penalty, $\beta = -0.35$). The logotype is a single flat colour — the gradient used in an earlier draft was removed, since metallic-gradient treatments belong to the gendered luxury vocabulary (cf. Blue-Gold, the most negative colour category in the pilot Thai study).

Taiwan version (white / clinical). A white base with no background pattern follows the clinical-minimalist archetype that dominates Taiwanese rankings. The wordmark is set in Bold with no gradient, reflecting two Taiwan-specific findings: Regular weight is penalised in both Taiwanese generations ($\beta = -0.13$ / -0.07), and Taiwanese consumers integrate dynamism into gender evaluation, making gradients riskier in this market than in Thailand. Matte coating is specified as the default finish (Taiwan surface salience 25.5%).

Universal version (grayscale). A light-grey base carries a flat charcoal wordmark. Grayscale is the only colour category with positive coefficients in all four country × generation cells (+0.23 / +0.10 / +0.22 / +0.35), and the profile replicates The Ordinary Set Box — the only stimulus ranked top-five in every cell. A dual-weight lockup (Bold primary, Light secondary) averages the opposing weight preferences of the two markets (Regular best in Thailand, worst in Taiwan).

Applying each subgroup's QT Type I model to the three specifications yields the twelve forward predictions in Table 12. The Thai market is permissive — all three versions reach or approach the scale ceiling in both Thai generations — whereas Taiwan discriminates: the kraft version underperforms for Taiwanese Gen Y (predicted

GNS = 6.90), confirming it as a Thailand-exclusive SKU, while the grayscale Universal version is the strongest Taiwanese performer in both generations and the only single-SKU option supported across all four cells.

Table 12. Forward-predicted GNS of the three case-study cartons by country × generation subgroup model

Version	TH Gen Z	TH Gen Y	TW Gen Z	TW Gen Y	Deployment
Kraft (TH)	ceiling (8.0)	ceiling (8.0)	7.09	6.90	Thailand-exclusive
White (TW)	ceiling (8.0)	ceiling (8.0)	7.45	7.21	Taiwan-primary
Grayscale (Universal)	ceiling (8.0)	7.93	7.54	7.47	Single cross-market SKU

Note. Predictions from subgroup QT Type I models (N = 12 stimuli per model); Thai raw predictions exceeding the 8.00 scale maximum are reported as ceiling. Untested elements (muted accent hues) are excluded from the prediction and flagged for follow-up validation with the same four-scale instrument.

7. CONCLUSIONS

This study provides the first cross-cultural empirical analysis of design element importance weights for gender-neutral packaging perception, with a complete N = 12 stimulus set including both neutral and strongly-gendered reference designs. Four contributions are reported.

First, primary color is confirmed as the universally dominant element (TH: 42.8%; TW: 32.6%), with grayscale and earth tones as most reliable neutral choices and pink/black as reliably gendered. Second, cross-cultural divergences in element salience—Font Type critical in Thailand (28.2%), Surface Finish and Font Weight critical in Taiwan (25.5% and 21.5%)—require culturally calibrated design decisions. Third, the complete N = 12 dataset, including P12 Paco Rabanne Invictus as a Masculine reference design, strengthens the discriminant validity of the GNS instrument by anchoring the low end of the neutrality scale with an expert-validated masculine stimulus. Fourth, the 'clinical-minimalist' archetype—neutral palette, sans-serif typography, matte surface—consistently achieves the highest cross-cultural gender-neutrality, whilst the clinical prototype achieves the strongest Taiwan performance. Fifth, a generational subgroup analysis shows that this archetype is also segment-proof: rankings converge across generations in Taiwan (rs = .95) and, although Thai generations diverge (rs = .60), the grayscale–sans-serif–matte configuration remains top-ranked in every country × generation cell, while surface-finish salience emerges as a Generation Z characteristic common to both markets.

Future research should extend the cross-cultural comparison to additional Asian and Western markets, formally test country × generation interactions with mixed-effects models, explicitly model gender identity as a moderating variable in QT Type I analysis, and validate findings with physical packaging prototypes incorporating tactile and three-dimensional properties.

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