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From Cultural Heritage to Contemporary Product Design: A Four-Dimensional Framework for Translating the Aesthetic Language of Tang-Dynasty Changsha Kiln Ceramics

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Abstract

Background and Aims: Tang-dynasty Changsha kiln ceramics are widely recognized for underglaze-painted decoration, multicoloured glaze effects, and frequent poetic inscriptions. Despite substantial archaeological and scientific studies, design practice still lacks an operational framework to translate this aesthetic system into contemporary product design in a coherent and verifiable way. In this study, I re-identify the aesthetic language of Tang-dynasty Changsha kiln ceramics and propose a four-dimensional translation framework (form, colour, motifs and inscriptions, texture and surface) to support culturally grounded contemporary product design.

Methodology: The study adopted a design-led mixed-methods approach. A visual corpus was assembled from museum observation, site documentation and published records; recurring features were coded across form, colour, motifs and inscriptions, and texture and surface. These findings were then translated into operational design criteria and tested through expert review, prototype development and two rounds of exhibition-based evaluation.

Results: The findings showed that Changsha kiln aesthetics operated as an integrated perceptual system rather than a loose set of decorative motifs. Four-dimensional features were distilled into a structured translation checklist and refined through expert calibration. Across iterative application, user evaluation indicated a consistent improvement in perceived cultural recognisability and usability, with the mean satisfaction score increasing from 4.1 to 4.5 on a five-point scale, providing empirical support for the effectiveness of the framework in facilitating identity translation rather than superficial imitation.

Conclusion: This study offers a design-operational account of Changsha kiln aesthetics and proposes a reusable framework for heritage translation. It moves beyond direct formal imitation toward a process of semantic translation, in which historical visual elements are systematically reinterpreted as contemporary design parameters. Its value lies in turning historical visual evidence into practical design criteria, thereby supporting contemporary product development while maintaining cultural specificity.

Keywords: Changsha Kiln Ceramics; Heritage Translation; Cultural Product Design; Design-led Research

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Introduction

The Changsha Kiln, located in Tongguan Town, Changsha, Hunan Province—also known as the Changsha Tongguan Kiln,was established in the early Tang Dynasty and reached its peak during the *mid-to-late* Tang period (Yang, 2011). It is considered one of the most representative folk kilns of the time. With spontaneous underglaze painting, the incorporation of both Chinese and overseas decorative elements, and the innovative use of poetic inscriptions, Changsha ware broke through the earlier dichotomy of northern white porcelain and southern celadon (the so-called "south green, north white" pattern). This technical and decorative innovation has been interpreted by contemporary scholarship as a notable departure from the dominant north–south ceramic paradigm, although debate remains as to whether it represented a structural disruption or a parallel stylistic development. Its freehand brushwork, vibrant glazes, and integration of local and exotic motifs embody a distinctive heritage aesthetic. Many everyday vessels, including bowls, ewers, and jars, carry not only imagery but also short texts applied directly to the ceramic surface (Figure 1). In contemporary heritage policy, the firing technique has been listed as national intangible cultural heritage, and the Tongguan kiln site has been developed as a National Archaeological Site Park and a National 4A-rated tourist attraction in China (Zhou et al., 2025).



Figure 1 Ewer with poetic inscription (Changsha kiln ware, mid–late Tang).
Note: Photographed and Constructed by the researcher, 2025

Recent studies can be grouped into two strands. A first strand focuses on material evidence and glaze technology. Hou et al. (2022a) used chemical composition and strontium isotope ratio to discuss glaze technology and raw-material relations. Hou et al. (2022b) examined the emergence of high-temperature copper-red glaze, discussing firing technology and optical properties. Jia et al. (2024) analysed opaque glazes using compositional and microstructural methods. Yin et al. (2024) further explained how colourants and microstructures combine to

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produce diverse hues and mixed-colour effects. A second strand uses export archaeology and visual analysis to interpret Changsha ware within the Maritime Silk Road. For example, Yue (2021) classified patterns on Changsha ware from the Belitung shipwreck and discussed how motifs and decorative systems were adapted for overseas markets. These studies clarify production and circulation, yet they do not specify how heritage evidence can be operationalised as repeatable design rules or validated translation criteria. This leaves a practical gap for contemporary product design.

While archaeological and technical studies have established the historical importance of Changsha ware, a separate scholarly conversation has emerged in design research concerning how historical aesthetics can be responsibly translated into contemporary products. However, these two conversations have rarely been systematically integrated. This study addresses that gap by linking archaeological evidence and visual analysis with an operational framework for design translation and validation.

Within design scholarship, recent frameworks stress that cultural translation is a structured process: designers should research cultural context, identify cultural values, and translate those values into design concepts with explicit criteria and evaluation, rather than treating culture as surface decoration (Dhadphale, 2024; Xiang et al., 2025). At the policy level, UNESCO positions culture and creativity as part of sustainable development and calls for governance frameworks that support creation, production, and access in cultural and creative sectors (UNESCO, 2022). However, Changsha-related product development still often falls into two problems: replication of historical shapes and patterns with limited functional adaptation, or “souvenir styling” that weakens cultural specificity. To address this gap, this paper proposes a four-dimensional translation framework, covering form, colour, motifs and inscriptions, and texture and surface, and demonstrates how it can guide contemporary product design decisions.

Objectives

1. To re-identify the aesthetic language of Tang-dynasty Changsha kiln ceramics by analysing repeatable features across four dimensions: form, colour, motifs and inscriptions, and texture and surface.

2. To construct and test a four-dimensional translation framework that converts the identified aesthetic language into contemporary product design criteria and prototype directions.

Research scope

This study focuses on Changsha ware produced in the mid-to-late Tang period, when underglaze painting and polychrome decoration were mature and export circulation was strong.

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The visual corpus is built from documented museum collections, published excavation-related materials, and representative artefacts linked to Maritime Silk Road routes (including Belitung-related finds). The design-translation discussion is limited to contemporary product contexts (lifestyle goods, cultural-creative gifts, and related visual applications) where surface, narrative, and everyday use can be integrated (Figure 2).

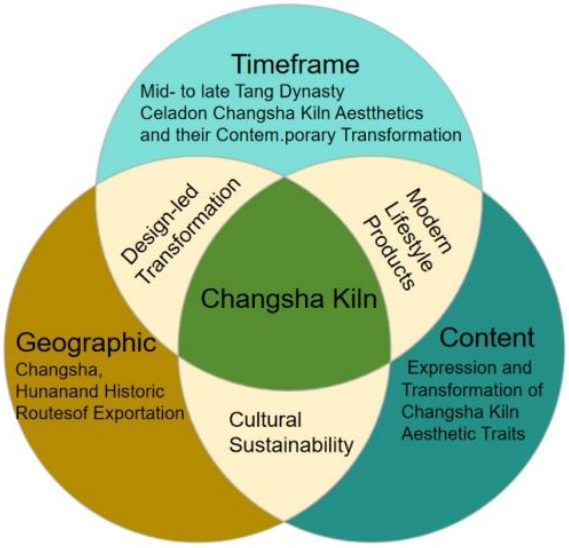


Figure 2 Diagram of the research scope.
Note: Constructed by the researcher

Literature review

Research on Changsha kiln has primarily developed along two lines: materials and technology, and export archaeology. On the one hand, Jia et al. (2024) analyse opaque glazes from the Changsha kiln through chemical-compositional and microstructural methods, while Yin et al. (2024) explain how colourants and microstructures shape layered hues, diffusion effects, and mixed-colour appearances. On the other hand, Yue (2021) studies material from the Belitung shipwreck and shows that Changsha decoration responded to overseas markets through motifs and surface patterns adapted to cross-cultural circulation. Taken together, these studies establish the historical and technical significance of Changsha ware, but they tend to interpret the objects as archaeological or material evidence. Much less attention has been given to how these visual characteristics can be reorganised as a transferable design language for contemporary products.

A second strand of literature concerns the translation of cultural heritage into product design. Dhadphale (2024) argues that culturally oriented product design requires an explicit process that moves from investigation of cultural context to the identification and translation of

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cultural values into new design concepts. In a similar vein, Xiang et al. (2025) propose a multi-level approach to cultural product design that links cultural carriers, element extraction, and product application. This body of work is important because it shifts attention away from decorative borrowing and towards structured translation. However, most of these frameworks remain general. They do not explain how a historically complex case such as Changsha kiln can be broken down into specific visual dimensions and then converted into operational criteria for design practice.

A third strand is concerned with contemporary cultural and creative production, especially user participation and value co-creation. Liu et al. (2024) show that value co-creation in cultural and creative enterprises is shaped by enterprise capabilities and customer participation, and that it has implications for both customer value and enterprise value. For heritage-based product design, this suggests that successful transformation depends not only on formal extraction from historical artefacts, but also on whether the translated design can be recognised, accepted, and reinterpreted by contemporary users. In other words, the design process needs to include feedback, testing, and refinement rather than ending with visual reproduction alone.

Against this background, the present study positions Changsha kiln aesthetics as both a historical visual system and a design problem. Existing research explains the kiln's technological sophistication, decorative diversity, and maritime circulation well, while recent design scholarship has offered useful principles for cultural translation. Yet a gap remains between heritage description and design application. This article addresses that gap by re-identifying Changsha kiln aesthetics across four dimensions—form, colour, motifs and inscriptions, and texture and surface—and by constructing a framework that translates those dimensions into contemporary product design criteria and early-stage validation.

Conceptual Framework

The conceptual framework treats Changsha ceramics as a sign system in which material form and surface decoration carry visual cues and cultural meanings. The framework therefore links four aesthetic dimensions (form, colour, motifs and inscriptions, and texture and surface) to a three-stage design action: Identify (collect and code heritage signs), Translate (map signs to contemporary meanings and design parameters), and Apply (generate, test, and iterate product concepts). This structure moves from description to operable design criteria while keeping cultural meaning and everyday use connected (Figure 3).

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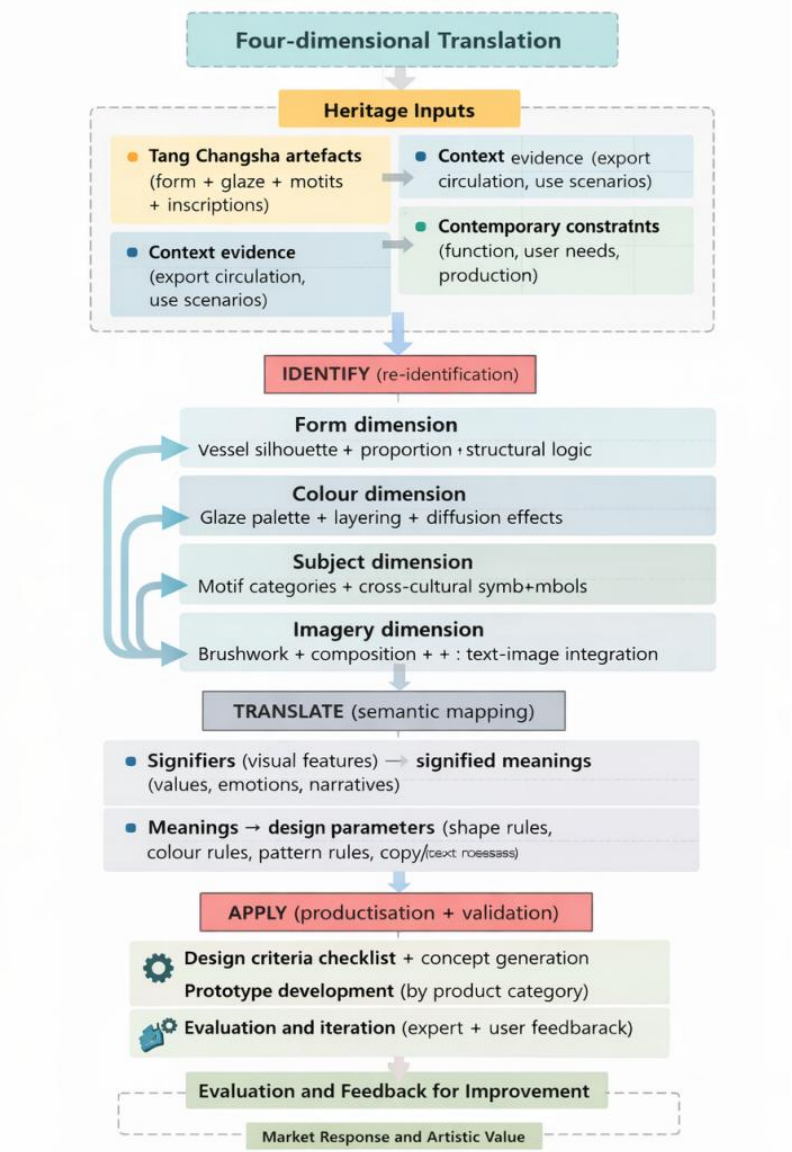


Figure 3 Conceptual framework

Note: Constructed by the researcher

Methodology

This study adopted a design-led mixed-methods approach (qualitative evidence complemented by descriptive statistics) that integrates heritage documentation, visual coding, and prototype-based validation. It follows three phases—evidence construction, translation modelling, and application verification—so that aesthetic re-identification can be expressed as repeatable design criteria rather than as subjective description.

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1. Evidence construction

First, a documentary review was conducted to define the historical and technical context of Changsha ware, with attention to recent archaeometric and export-archaeology work. Second, field observation and photo documentation were carried out in museum collections and local sites related to Tongguan/Changsha, focusing on representative vessels that show clear underglaze painting, multi-colour glaze systems, and inscriptions. Based on these sources, a visual dataset was compiled, and each artefact record was described using a common metadata template covering (1) vessel type and silhouette, (2) glaze palette and surface layering, (3) motif categories, (4) inscription content and text–image layout, and (5) texture and surface traces such as mould-impressed relief, glaze-flow pooling, or brushstroke density. Visual coding was conducted across four predefined dimensions, and repeated comparison of artefact samples was used to refine sub-features and improve consistency.

2. Translation modelling

The core analytical step is iterative coding and clustering. Features were coded across the four dimensions and then clustered to identify recurring patterns, dominant contrasts, and designable rules (for example, proportion tendencies, compositional rhythms, palette ranges, inscription placement logic, and surface-finish cues). These coded features were translated through a semantic mapping procedure: visual signifiers were linked to cultural meanings (such as everyday auspiciousness, openness to overseas markets, humour and folk sentiment), and meanings were linked to contemporary design parameters (such as form simplification strategy, colour system selection, motif abstraction rules, inscription micro-copy guidelines, and surface-material decisions). This step is aligned with culturally oriented design frameworks that emphasise explicit translation from cultural context to design concepts. In practice, the translation outcome was organised as a checklist so that observed features could be directly converted into design criteria rather than remaining descriptive only.

3. Application verification

To test whether the framework supports real design decisions, the study conducted prototype-oriented design practice in multiple lifestyle product categories. Concepts were generated by combining one primary dimension (as the “anchor”) with one or two secondary dimensions (as “support”), to avoid overloading products with cultural information. Evaluation used expert review and user feedback in two rounds, focusing on recognisability of Changsha features, perceived cultural credibility, usability in daily contexts, and overall product acceptance. In addition, the study considered co-creation and multi-actor collaboration as practical conditions for market conversion.

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Data credibility was supported through triangulation across documents, artefacts and practice outcomes. Interview notes and open-ended feedback were coded into themes that guided revisions to the translation checklist. Descriptive statistics were used to compare evaluation rounds and identify prototypes that required further iteration. Two exhibition-based evaluations were used as a market-proxy test environment, and the overall satisfaction score increased from SD4.1 to approximately SD4.5 on a five-point scale after iteration.

Results

The results are presented in two parts corresponding to the two research objectives. The first part re-identifies the aesthetic language of Changsha ware as an integrated system. The second part shows how these findings were translated into operational criteria and then tested through expert review and prototype-based evaluation.

1. Re-identified aesthetic language of Changsha ware (four dimensions)

1.1 Form: use-oriented structural logic and vernacular proportion

In the form dimension, the most stable feature was not a single canonical vessel type, but a structural logic oriented to use. Daily wares such as bowls, dishes, cups, ewers, jars and covered containers dominate the corpus, and their silhouettes are typically built from clear geometric primitives. The relationship among rim, neck, body and foot is closely tied to actions such as gripping, pouring and supporting, which makes the forms readable and adaptable for serial making. Export-facing wares often extend the same body logic with functional add-ons such as spouts, handles and lids, allowing one core structure to fit multiple scenarios.

For contemporary translation, this form language can be treated as a set of relations that can be retained while scale, material and function change. For example, the ewer can be abstracted as a ‘body, neck and directional pour’ schema, and then reapplied to modern tea tools, scent diffusers or packaging containers. This approach avoids copying a single historical object and instead preserves the underlying proportion and action logic (Figure 4).

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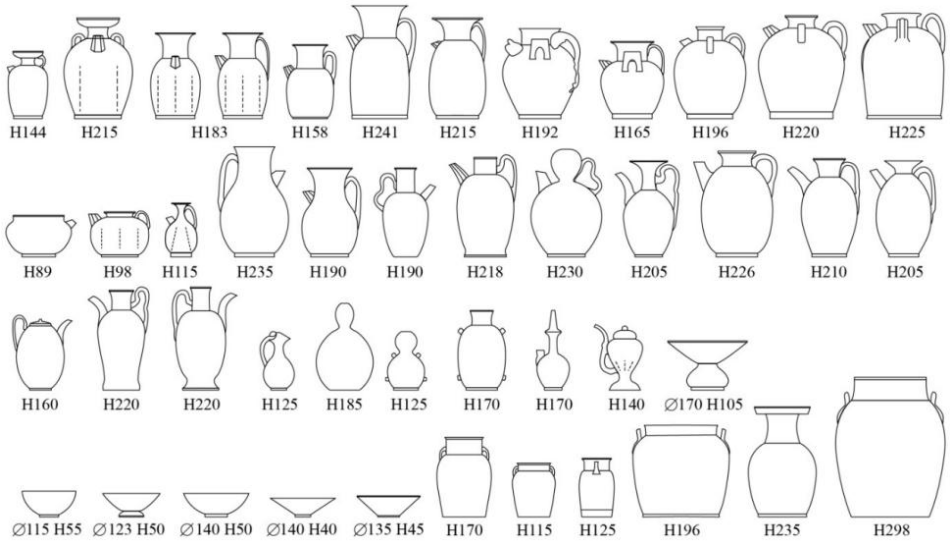


Figure 4 Outline diagrams of typical vessel shapes extracted from Changsha porcelain
Note: Drawing based on museum collections and published catalogs, 2026

1.2 Colour: a polychrome glaze system with layering and controlled emergence

Changsha colour language behaves as a surface system. The palette centres on celadon and green tones, warm sauce-brown lines, and pale bases, with copper red used as a limited accent. Two traits are especially consistent. First, colours often appear in layers, with a base glaze setting the overall temperature and painted or washed areas sitting within or above it. Second, high-temperature firing produces diffusion and soft boundaries, so the final appearance is partly planned and partly emergent.

Quantitative coding of colour combinations indicates a stable ‘dominant, secondary and accent’ tendency, with an approximate 70:20:10 proportion. Warm and cool balance is also prominent: combinations of cool celadon or green with warm sauce-brown or copper red accounted for about 82% of recorded cases, suggesting that temperature contrast is a key recognisability cue. These findings were translated into a baseline palette and a colour-card mapping to contemporary applications (Figure 5-6).

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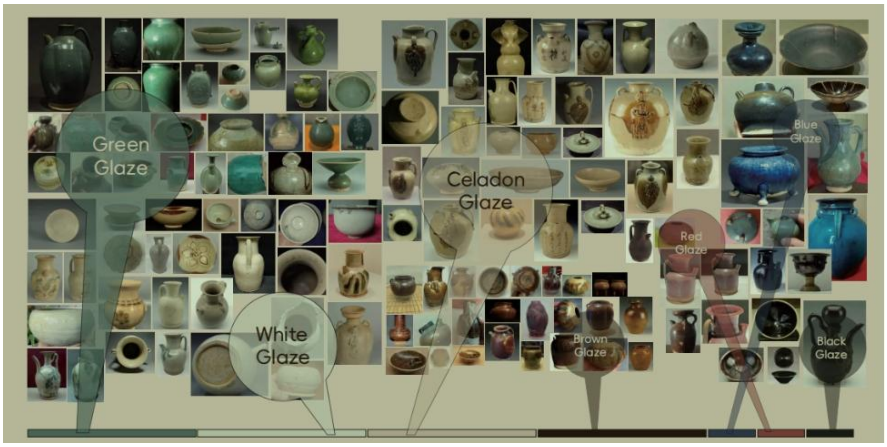


Figure 5 A Baseline Palette of Typical Changsha Kiln Glaze Colours
Note: Constructed by the researcher



Figure 6 Baseline glaze palette and colour-card mapping
Note: Constructed by the researcher

1.3 Ornamentation and inscriptions: transmissible motifs and everyday poetics

Ornamentation and inscriptions form one of the most transmissible features of Changsha ware. Rather than compiling an exhaustive catalogue, the analysis focused on thematic diversity and on image and text symbiosis, where short inscriptions and motifs together create a readable surface and a sense of ‘poetic daily life’. Motif statistics show a clear distribution across five categories: plant motifs (42%), animal motifs (28%), figure motifs (12%), geometric motifs (10%), and special motifs such as flame or Baoxiang patterns (8%). Within these groups, lotus, scrolling foliage, birds, fish and cloud patterns appear most frequently, and their semantics support direct translation into contemporary lifestyle contexts.

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Inscriptions are dominated by short Tang-style lines and vernacular verses (65%), followed by proverbs (20%). Standalone calligraphic writing accounts for around 10%, and dating or year marks appear less frequently (5%). Writing style is predominantly cursive or running script (about 85%), and placement on the belly, shoulder or base often creates a complementary layout with motifs. Composition analysis further indicates a strong preference for centralised focal arrangements (78%) and for deliberate negative space, with motif coverage typically kept between 40% and 60%. Hand-painted free brushwork is the norm (92%), which contributes to the spontaneous visual character of Changsha surfaces.

These findings were condensed into a motif–meaning–translation matrix that specifies which elements to retain, how to simplify them, and which contemporary carriers suit each category (Table 1).

Table 1 Motif categories and semantics

Motif category	Overall share	Main motifs (share within category)	Semantics / symbolic meanings
Plant motifs	42%	Lotus 28%; Date palm 15%; Grape 12%; Scroll/arabesque 35%; Floral 10%	Lotus conveys Buddhist auspiciousness; date palm and grape indicate Silk Road contacts; scroll motifs imply continuity and vitality
Animal motifs	28%	Birds 35%; Fish 25%; Deer 18%; Lions 12%; Makara-fish 10%	Birds suggest freedom; fish imply abundance; deer signify auspiciousness; lion imagery reflects Western Regions cultural influence
Figure motifs	12%	Court ladies, Hu people, monks, children-at-play, etc.; Hu motifs 45%; children-at-play 30%	Hu figures visualise cross-cultural exchange; children-at-play expresses wishes for many descendants and family prosperity
Geometric motifs	10%	Clouds 40%; Key-fret 25%; Waves 20%; Linked pearls 15%	Clouds convey dynamism; key-fret implies continuity; linked-pearl patterns derive from Central Asian artistic traditions
Special motifs	8%	Flame motifs; Baoxiang (Buddhist floral) motifs, etc.	Often associated with religious belief and iconography

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1.4 Texture and surface: technique traces, relief tactility, and glaze-flow effects

Texture and surface features were coded as either visually perceived or tactilely perceived, because many Changsha effects are designed to be read at both distances. The data show a consistent co-existence of intentional technique and naturally occurring effects. Intentional features include mould-impressed appliqué and relief decoration, painted brush traces, and carved or stamped marks. Naturally occurring features include glaze-flow and pooling, subtle crackle, kiln speckling, and minor deformations. For translation, the key is not to reproduce kiln chemistry but to preserve the visual logic of 'controlled unpredictability', for example by combining a stable base surface with localised gradient transitions or tactile relief zones (Figure 7).



Figure 7 Texture and surface references: mould-impressed appliqué, brush traces, glaze-flow and crackle effects.

Note: Photographed by the researcher, 2025

2. Operationalisation and validation of the four-dimensional translation framework

The second objective concerned the translation of the four-dimensional aesthetic system into a workable design framework. Rather than keeping form, colour, motifs and inscriptions, and texture and surface as descriptive categories only, the study converted them into operational criteria and then tested whether those criteria were usable in practice. This stage consisted of three linked steps: criteria development, expert calibration and prototype-based validation.

2.1 From aesthetic elements to operational criteria

Building on the four-dimensional element repository, the study converted recurring features into twenty-four operational criteria, with six criteria for each dimension. These criteria translated descriptive observations into design decisions: form criteria retained silhouette relations while adapting ergonomics; colour criteria managed base tone, accent contrast and local diffusion; motif and inscription guided by operational criteria extraction, density and text placement; and

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texture criteria translated tactile and surface cues into feasible material finishes (Table 2). In this way, the framework moved from aesthetic description to design guidance. Historical elements were therefore not transferred directly, but decomposed into visual units that could be reassembled in contemporary product design.

Table 2 Condensed operational criteria for four-dimensional translation

Dimension	Operational criteria (abridged)
Form	Preserve silhouette relations and proportion; redesign joints for ergonomics; avoid non-functional protrusions; standardise modules for batch making; match form to scenario; verify handling comfort.
Colour	Define baseline tone; use a warm–cool accent pair; keep diffusion localised; reserve clear zones for function; control saturation for readability; align colour with material and cost limits.
Motifs & inscriptions	Extract key stroke units; recombine into borders or repeats; control motif density and keep negative space; select short, plain inscriptions with everyday tone; align text layout with curvature; avoid stereotyped ‘foreignness’ in hybrid motifs.
Texture	Select feasible materials and finishes; reproduce relief tactility where meaningful; retain brush irregularity as a layer; use controlled crackle or speckle effects sparingly; calibrate durability for touchpoints; ensure production and maintenance practicality.

2.2 Expert calibration and framework refinement

The translation workflow received a mean score of 8.7/10, the criteria set 8.5/10, and the prototype series 8.3/10. Feedback centred on two issues: the need to make the iteration mechanism more explicit and the need to strengthen sustainability considerations. In response, the framework was refined by clarifying the feedback loop and by adding three sustainability-related criteria concerned with material choice, reuse and recyclability.

2.3 Prototype testing and validation evidence

The revised framework was then applied across several lifestyle product categories, including home display objects, daily-use ceramics, fashion and wearable accessories, cultural-creative gifts and digital accessories. Three translation patterns proved especially stable in practice: form-led translation, surface-led translation and narrative-led translation. Two rounds of exhibition-based evaluation showed that users judged the prototypes primarily through

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recognisability and cultural credibility, followed by usability and purchase intention. After iteration, the mean satisfaction score rose from 4.1 to 4.5 on a five-point scale, and gift-oriented products achieved early order conversion. Together, these findings indicate that the framework was not only conceptually coherent but also workable in prototype refinement and early market testing (Table 3).

Table 3 Summary of framework validation and application evidence

Validation stage	Evidence	Main finding	Design implication
Expert review	12 experts; workflow 8.7/10; criteria 8.5/10; prototype series 8.3/10	The framework was considered clear and feasible, but the feedback loop and sustainability dimension required strengthening.	Make iteration explicit and add sustainability criteria for material choice, reuse and recyclability.
Prototype application	Home display, daily-use ceramics, wearables, gifts and digital accessories	Three stable translation patterns emerged: form-led, surface-led and narrative-led translation.	Select one primary cultural carrier for each product and use secondary dimensions in support.
Exhibition-based evaluation	Two rounds of testing; mean satisfaction increased from 4.1 to 4.5; gift-oriented products achieved early orders	Recognisability and market acceptability improved after iteration.	Use exhibition feedback as a pre-market testing mechanism before wider production.

Discussion

The findings offer a design-operational reading of Changsha ware that sits alongside archaeological and scientific research. The colour relationships identified here—layering, diffusion and mixed hues—are consistent with materials studies that explain glaze appearance through microstructure, phase separation and copper/iron behaviour (Jia et al., 2024; Yin et al., 2024). What this article adds is a design interpretation: these technical characteristics can be recast as perceptual relationships and translated into contemporary material and surface decisions.

The emphasis on motif hybridity also resonates with export-archaeology work on Belitung material and Tang-period cross-cultural adaptation (Yue, 2021). The present study extends that

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discussion by suggesting that hybridity is most effective when treated as a compositional principle grounded in historical exchange, rather than as a direct quotation of exoticised forms. Methodologically, the framework is also in line with recent culturally oriented design research that argues for explicit stages of identification, translation, application and evaluation (Dhadphale, 2024; Xiang et al., 2025). Compared with more general frameworks, the present study contributes a more specific four-dimensional structure and a clearer route from heritage analysis to prototype validation.

At the same time, several limitations should be acknowledged. The corpus was selective rather than exhaustive, and the framework does not claim to cover every Changsha variation across periods, kilns or workshops. Exhibition-based evaluation provided a useful pre-market test, but it cannot replace longitudinal user studies or segment-specific market analysis. In addition, inscriptions raise language and intellectual-property questions; future work should treat them primarily as narrative strategies of tone, placement and rhythm rather than as fixed quotation sets.

More broadly, the study suggests that design can mediate between heritage institutions and contemporary consumer contexts. In places such as Tongguan, where conservation, tourism and workshop revival intersect (Zhou et al., 2025), a framework of this kind may support not only product development but also exhibition graphics, educational materials and digital interpretation. Its value lies in specifying which combinations of form, colour, motifs and surface cues make an outcome recognisably Changsha without reducing heritage to imitation.

Recommendation

1. General recommendations

Heritage-based product design should treat aesthetic language as a system rather than as a store of detachable motifs. In Changsha-related projects, it is useful to begin by identifying one primary carrier dimension—form, colour, motif, or text–image organisation—and one principal user scenario, such as gift-giving, daily use, indoor display or digital viewing. Clear criteria such as recognisability, usability, manufacturability and cultural credibility should then be established at the outset.

A shared resource base would also improve continuity across institutions and design teams. In practical terms, this could take the form of a compact repository containing palette sheets derived from representative glaze appearances, silhouette schemas rather than historical replicas, motif grammar sheets showing extraction and repetition rules, and inscription templates that support multilingual micro-copy without relying on direct quotation.

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Iterative evaluation should be built into the design process from an early stage. Low-fidelity prototypes are especially useful for testing whether users can perceive the intended Changsha signal before production resources are committed. This helps designers adjust density, hierarchy and usability before fine detail and cost become difficult to change.

2. Further research recommendations

Future research could extend the present framework in three directions. First, cross-cultural user studies are needed to test recognition and interpretation across different audiences. Second, material experimentation could explore how glaze-like diffusion and brushwork texture may be translated responsibly into textiles, composites and digital media while maintaining durability and environmental awareness. Third, governance and collaboration research could examine how museums, local workshops, designers and distribution channels might share value and return benefits to local communities through transparent co-creation mechanisms.

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