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CAME framework: adapting traditional motifs for educational platforms

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Abstract. Effective educational communication of culturally dense decorative motifs in screen-based educational materials was treated as a continuing design challenge in digital education. This study aimed to establish and validate a design framework that supported the translation of traditional decorative motifs into clear and teachable information-visualisation posters for educational communication. A qualitative, design-oriented methodology was applied through semi-structured expert interviews, grounded-theory coding with Open Coding, Axial Coding, and Selective Coding, comparative poster design, and expert review using timed first exposure and a follow-up group interview. The interview analysis established four design dimensions, namely Consistency & Distinction, Adaptability, Multisensory Integration, and Emotional Engagement, and these dimensions were generalised as traceable design commitments for educational visuals. Two comparable posters were produced for the same motif extracted from illustrations in *"The new diagram of Confucian imagery"*, with one poster guided by the framework and the other developed as an intuition-based baseline. The expert review showed that the framework-guided poster was interpreted as having a clearer hierarchy, easier identification of key educational content under time pressure, and more stable visual coding than the baseline poster. The analysis also showed that the framework improved the explainability of major design decisions by linking these decisions to explicit criteria rather than personal preference. The results were applicable to researchers and practitioners in information visualisation and visual communication who developed educational resources for cultural knowledge dissemination in multimedia educational environments

Keywords: cultural heritage communication design; information visualisation; multimedia education; grounded theory coding; expert review; visual hierarchy; digital education

INTRODUCTION

Traditional decorative motifs, as integral components of traditional visual culture, have long carried regional memory, historical experience, and social beliefs. These patterns not only form unique visual symbols of architecture but also play a role in shaping local cultural identity and spatial memory. However, how to

effectively apply these traditional cultural symbols to digital education platforms through modern visual design methods to enhance the communicative effectiveness remains an unresolved issue. The application of traditional cultural elements in digital education platforms has gradually become a hot topic in academic research. Many scholars have focused on the integration of information visualisation design and

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cultural communication, exploring how modern technologies and design principles can make traditional patterns effectively communicate in digital formats.

According to U.B. Qusheem *et al.* (2021), traditional patterns and symbols need to be transformed through multimodal design strategies in order to better meet the needs of modern learners. Similarly, K. Tomita (2022) emphasised that when handling cultural symbols, appropriate design methods can significantly improve learners' visual understanding and emotional connection. In parallel, the latest scholarship has begun to treat illustrations and diagrams in historical books as analysable visual corpora rather than as purely archival images. According to X. Mei *et al.* (2025), historical Chinese books contain diverse visualisations and illustrations that can be systematically extracted and organised for analysis, which makes book-based motifs a traceable source for design inquiry. S. Goud *et al.* (2024) similarly noted that visual methods can improve access to ancient manuscripts and books in digital collections, yet design-oriented translation from such motifs into teachable educational visuals remains less discussed. Furthermore, C. Troussas *et al.* (2025) suggested that personalisation elements and voice design in educational settings can increase learner engagement through more humanised interaction modes. However, these studies mostly focused on simplifying information delivery and aesthetic presentation, with limited discussion on how to preserve the depth and symbolic significance of cultural symbols while integrating these symbols effectively into multimedia educational platforms.

W. Nilam (2023) pointed out that while visual embellishments play an important role in enhancing aesthetic appeal, excessive decoration may compromise the clarity and readability of the information. Therefore, K. Baer (2021) advocated that decoration should harmonise with the communicative function of content rather than relying solely on visual appeal. In the specific application of visual design, the signalling principle proposed by R.E. Mayer & L. Fiorella (2022) emphasised guiding learners' attention through effective visual cues to ensure that the learners focus on the most relevant information. This principle is particularly important when dealing with traditional cultural patterns, as these patterns are often rich in layered meanings, requiring clear visual signals for learners to understand the cultural and educational values. Additionally, R. Bañez & H. Mosteyro (2024) evaluated the sufficiency of the multiplicity functions of visual hierarchy, exploring how clear visual design can help learners better understand complex cultural information, and emphasising that such clarity can reduce cognitive load and increase the acceptability of information.

Despite the extensive research focused on the aesthetic and semiotic aspects of visual design, most studies have centred on the decorative function of design elements, with insufficient exploration of how these elements promote learner understanding and

engagement in multimedia educational contexts. Specifically, the visualisation and application of traditional motifs in visual communication design have not been systematically analysed in terms of the effects on learner perception and educational communication outcomes. The purpose of this study was to examine how motifs extracted from illustrations in "*The new diagram of Confucian imagery*", a classical illustrated Chinese text, could be translated into visual design forms suitable for short-format educational communication on digital learning platforms.

MATERIALS AND METHODS

This study adopted a qualitative, design-oriented approach to examine how traditional decorative motifs can be translated into clear and teachable visual forms for educational communication. The empirical materials were drawn from motifs extracted from illustrations in "*The new diagram of Confucian imagery*" (Verbiest, 1674). A qualitative strategy was selected because the study focused on visual reasoning, design decision-making, and meaning construction, rather than numerical measurement or statistical inference. Expert knowledge was therefore necessary to articulate design-relevant requirements from culturally dense motifs and to assess the applicability in educational visuals. The study followed three sequential stages. The first stage used expert interviews and systematic coding to derive a framework of design requirements. The second stage applied the framework to motif extraction and visual translation, producing two comparable poster sets. The third stage used expert review and a follow-up interview session with the same panel of experts to verify whether the framework provided a traceable rationale for key design decisions. This sequence was intended to keep the connection between conceptual claims, design practice, and evaluative evidence explicit.

Semi-structured interviews were conducted to construct the CAME framework, which includes Consistency & Distinction, Adaptability, Multisensory Integration, and Emotional Engagement. Seven experts participated in the study, including five university faculty members specialising in visual communication and design education and two professional designers with more than five years of experience in digital media and educational visual design. Each interview lasted approximately 45 to 60 minutes and was conducted online or in person. Participation was voluntary. Before each interview, participants received a short information sheet describing the purpose of the study, the interview procedure, the use of audio recording, and the intended use of anonymised quotations in academic publication. Informed consent was obtained before recording. All interviews were audio-recorded and transcribed verbatim. The study followed widely accepted ethical principles for research involving human participants, aligned with the principles of the Declaration of Helsinki (World Medical Association,

2013). Participants were informed about being able to decline to answer any question and withdraw at any time without consequences. Personal identifiers were removed during transcription, and quotations used in the manuscript were anonymised. Audio files and transcripts were stored on password-protected devices and were accessible only to the research team.

Interview questions focused on recurrent difficulties in translating traditional motifs into educational visuals, strategies for improving visual clarity and learner engagement, and the role of sensory

and affective factors in learning-oriented visual communication. The transcripts were analysed following grounded-theory coding procedures (Hakkak *et al.*, 2023) in three steps: open coding, axial coding, and selective coding. Open coding captured recurring concerns and practical design problems expressed by the experts. Axial coding connected these concerns into higher-level categories that clarified the causes and design implications. Selective coding then consolidated the categories into four core dimensions, which collectively form the CAME framework (Table 1).

Table 1. Grounded theory coding table for CAME framework

Open coding	Axial coding	Selective coding
Difficulty in balancing traditional symbols and clarity	Symbol-readability tension	Consistency & Distinction
Need to distinguish decorative and communicative elements	Visual functionality	Consistency & Distinction
Lack of adaptation for younger users	User-centric design	Adaptability
Importance of emotional engagement	Emotional design relevance	Emotional Engagement
Low usability of traditional motifs on digital platforms	Symbol-readability tension	Consistency & Distinction
Confusion caused by overly ornate visual forms	Visual functionality	Consistency & Distinction
Demand for multisensory engagement	Multisensory support	Multisensory Integration
Concern for cognitive overload in visual design	Visual functionality	Multisensory Integration

Source: compiled by the authors

To strengthen methodological transparency, the study used a two-step logic in framework development. First, the four CAME dimensions were derived inductively from the interview data through grounded-theory coding. Second, after the dimensions had been established, each of these dimensions was theoretically aligned with relevant multimedia learning principles proposed in R.E. Mayer & L. Fiorella (2022) and R.E. Mayer (2024) to support framework operationalisation in design practice and expert review. This alignment drew on principles related to visual cueing, information organisation, and processing management (e.g., signalling, coherence, segmenting, and modality). This alignment was used to define observable design criteria and comparative evaluation indicators, rather than to predetermine the coding categories. The visual materials consisted of traditional decorative motifs extracted from illustrations in “The new diagram of Confucian imagery” (Verbiest, 1674), with particular attention to instrument-related images. Motif extraction followed a traceable procedure that included locating relevant illustrations, inspecting enlarged details, identifying candidate motif units, and producing vector versions. Candidate motifs were included when the contours were sufficiently complete, the boundaries were visually stable, and the internal structure was clear enough to support reliable vector extraction. Motifs that appeared fragmented, heavily occluded, or ambiguous in outline were excluded. A corpus of nineteen motifs was established and grouped into three semantic classes: natural elements, symbolic figures and culturally coded creatures, and abstract

geometric structures. Motifs were digitised and vectorised using standard graphic design software – Illustrator and Figma. Shape-grammar operations, including rotation, reflection, scaling, and repetition, were applied to explore formal variation while preserving recognisable structural features.

Following motif extraction and vectorisation, the study proceeded to construct the central visual subject of the poster from the selected motif corpus. Before poster design began, the main motif shown in the posters was not taken as a single extracted fragment in isolation. Instead, eight motif samples were first selected from the nineteen-item corpus according to the sample-selection criteria described above, including contour completeness, boundary stability, and suitability for reliable vector extraction. These selected samples were then combined to form a new composite central motif, which became the primary visual subject to be communicated and explained through the poster design. This composite construction made the visualisation task more representative of real educational communication, because it required the design to explain both the symbolic meaning of each motif unit and the structural logic of the re-combination, thereby providing a stricter and more comparable test of whether CAME could offer a traceable rationale for organising complex cultural information.

Based on the CAME framework, two comparable poster sets were produced. Each set contained one information-visualisation poster, and both posters focused on the same motif drawn from “The new

diagram of Confucian imagery" (Verbiest, 1674). The design goal was educational communication, that is, to support short-form public-oriented explanation of the motif and its associated cultural meaning through a clear and teachable visual composition. The CAME-guided poster treated the four dimensions as explicit design commitments, whereas the comparison poster was developed without explicit use of the framework and relied on conventional design intuition. For verification, the same group of seven experts reviewed both posters using a qualitative rubric aligned with the four CAME dimensions. Experts rated each poster using a three-level ordinal scale, namely High, Medium, and Low, across the four CAME dimensions and provided short written comments. The choice of a three-level ordinal scale was methodologically appropriate for a timed first-exposure task with a short viewing window and limited scoring burden. Although E.C. Aybek & C. Toraman (2022) reported in Item Response Theory that three-category scales typically provide less measurement information and have a narrower range of discrimination than five- or seven-category formats, the main goal of this study was not detailed psychometric measurement, but rather a quick, comparable, and verifiable expert assessment that could be consistently recorded within one minute after initial review and then explained during subsequent discussion.

Based on the one-minute timed first exposure, experts provided an immediate judgment of (1) educational comprehensibility, (2) clarity of visual hierarchy, and (3) overall aesthetic acceptance. After the timed viewing of both posters, an in-person group interview session was conducted with the same panel and lasted approximately 20–30 minutes. Experts used the same three-level ordinal scale (High/Medium/Low) to evaluate each poster across the four CAME dimensions. Low, Medium, and High ratings were coded as 1, 2, and 3 for reporting (Mean = $\Sigma \text{score}/7$; SD = sample standard deviation). A High rating indicated that the dimension was clearly achieved under time pressure with a stable and traceable design rationale; a Medium rating indicated that the intent was generally recognisable but required additional effort or showed local inconsistencies; a Low rating indicated that the dimension was not adequately supported and hindered understanding or engagement. For Consistency & Distinction, experts considered the stability of visual codes and the separation of instructional and ornamental layers. For Adaptability, the experts considered screen legibility and audience fit. For Multisensory Integration, the professionals considered layered visual organisation and unit-based readability. For Emotional Engagement, the experts considered cultural resonance, compositional balance, and willingness to continue reading. The group interview was used to elicit explanations for comparative judgments and to clarify how specific visual decisions were interpreted in relation to the four dimensions. DeepL and ChatGPT (GPT-5.2) were used

as language-support tools during manuscript preparation, including academic translation, terminology clarification, stylistic editing, and consistency checking. All outputs were reviewed, verified, and revised by the authors. These tools were not used to design the study, collect or analyse data, generate figures or results, or draw conclusions. The authors take full responsibility for the content of this article.

RESULTS AND DISCUSSION

The expert interview analysis yielded four recurring design needs that informed the CAME framework. Across participants, the main difficulty was not the lack of cultural content, but the difficulty of making culturally rich motifs readable and instructive in screen-based learning materials. The coded data repeatedly pointed to tension between symbolic density and legibility, the need to separate decorative detail from communicative structure, the need to adjust style for a specific audience and viewing condition, and the importance of affective connection when learners face unfamiliar knowledge. These themes converged into four dimensions, which were used to summarise and organise the design requirements derived from the interviews. This pattern should not be interpreted as a rejection of ornamentation itself. Rather, the interview evidence pointed to a threshold problem in educational visual communication: decorative richness became beneficial only when it remained subordinate to an instructional reading path. This interpretation is consistent with the visualisation research by M. Alebri *et al.* (2023), which showed that embellishment can enhance engagement and perceived visual quality, but may also hinder comprehension when task-relevant structure and cues are not made sufficiently explicit. In the present study, experts repeatedly treated hierarchical stability as the condition under which cultural detail could function as teachable content rather than visual noise.

Table 2 summarised the four CAME dimensions and identified the relationship with Mayer's multimedia learning principles and the observed design criteria used to translate each dimension into visual solutions. The results showed that consistency and discrimination most closely correspond to the principles of signalling and coherence. Experts emphasised the importance of stable visual codes and clear cues that help determine the hierarchy and relevance of information. Adaptability, in turn, was associated with student relevance and information processing management. This includes personalisation, prior learning, and segmentation, as the same cultural symbols may require different approaches depending on the context and audience. Multisensory Integration, which coordinates channels and timing, was linked to the principles of redundancy and temporal contiguity, as experts noted the need to distribute information across perceptual channels to avoid overload. Emotional Engagement, in turn, corresponds to

generative processing principles such as resonance helps maintain attention and promotes personalisation, voice, and immersion, as emotional better assimilation of complex content.

Table 2. CAME dimensions, links to Mayer's multimedia learning principles, and observable design criteria used in this study

CAME dimension	Link to Mayer's multimedia learning principles	Observable design criteria used in this study
Consistency & Distinction	Signalling; coherence; spatial contiguity.	Stable visual codes (line weight, icon logic, typographic rhythm); explicit hierarchy cues; contrast used to mark learning-relevant elements; separation of instructional layers from ornamental layers.
Adaptability	Personalisation; pre-training; segmenting.	Controlled abstraction for screen legibility; platform-aware scaling and spacing; audience-fit stylistic tuning; simplified contours that preserve culturally recognisable structure; progressive disclosure of complex detail.
Multisensory Integration	Modality; redundancy; temporal contiguity.	Layered segmentation of the visual field into readable units; complementary cueing across visual variables; avoidance of duplicate cues that add noise; interface-ready regions that can support optional narration/interaction.
Emotional Engagement	Personalisation; voice; immersion.	Culturally meaningful metaphors; symmetry and balance to support aesthetic acceptance; affective cues that invite identification with cultural meaning; compositional coherence that sustains attention and curiosity.

Source: compiled by the authors based on R.E. Mayer & L. Fiorella (2022) and R.E. Mayer (2024)

From the nineteen-motif corpus, the motif units used in the composite central motif were selected according to the inclusion criteria. The selection was designed to cover the three semantic classes used in this study – natural elements, symbolic figures and culturally coded motifs, and abstract geometric structures – so that the composite motif retained

cultural recognisability while supporting clear hierarchy and teachable visual organisation. Table 3 listed the full set of motif units included in the composite central motif and summarised the semantic roles and symbolic meanings as translation cues during geometric abstraction.

Table 3. Motif units used to construct the composite central motif for the poster comparison with semantic classification and translation cues

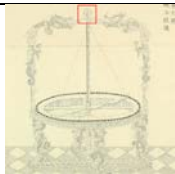
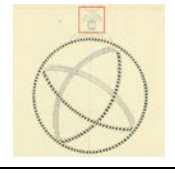
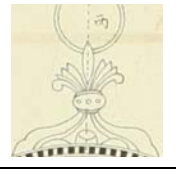
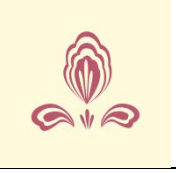
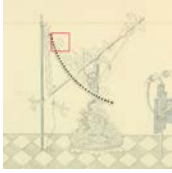
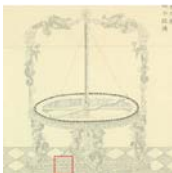
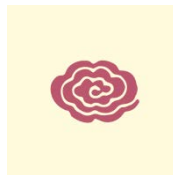
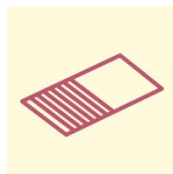
Pattern Name	Ancient book sources	Symbolic figures	Abstract geometric structures	Semantic class (three-category scheme)	Role in composite motif (design logic)	Symbolic meaning
Flame-orb pattern				Symbolic figures / culturally coded symbols	Primary carrier of focal meaning; used to establish a clear instructional focus in the composite motif.	Brightness, auspiciousness, exorcism, vitality, protection.
Treasure-phase flower pattern					Primary carrier of focal meaning; used to support "blessing/prosperity" semantics and visual centrality.	Wealth, prosperity, career, family, abundance.
Ruyi pattern					Secondary symbolic connector; used to link focal units and reinforce cultural recognisability through a conventional motif grammar.	Smoothness, fulfilment, happiness, blessings, auspiciousness.

Table 3. Continued

Pattern Name	Ancient book sources	Symbolic figures	Abstract geometric structures	Semantic class (three-category scheme)	Role in composite motif (design logic)	Symbolic meaning
Scrolling grass pattern					Secondary decorative extension; used to enhance the sense of continuity, vitality, and organic flow of the entire composite motif, while echoing the “prosperity and abundance” semantics of the core pattern.	Continuity, life, abundance, prosperity, vitality.
Key pattern					Structural framing and closure; used to provide a sense of infinite cyclicity, stabilise the visual boundary of the composite motif, and reinforce the theme of “perpetual blessings and continuity”.	Infinity, cycles, blessings, wealth, perpetuity.
Ocean wave pattern				Natural elements	Contextual and rhythmic support; used to express continuity/flow and to stabilise reading direction through repeated curvature.	Unification, integrity, peace, stability, era.
Cloud pattern					Contextual and framing support; used to provide visual breathing space and cultural resonance while maintaining motif coherence.	Heritage, blessings, longevity, continuity, harmony.
Stripe pattern				Abstract geometric structures	Structural rhythm and boundary control; used to stabilise composition, improve legibility, and separate layers (instructional vs ornamental).	Structure, order, regularity, clarity, functionality.

Source: compiled by the authors

In the composite construction, symbolic motifs functioned as the primary carriers of explicit cultural meaning, natural-element motifs provided contextual rhythm and continuity, and abstract geometric units stabilised structure and layer separation. This role division kept the visual subject consistent across the two posters while allowing the comparison to focus on whether the CAME-guided design achieved clearer hierarchy, stronger educational readability, and more traceable decision logic under the same educational communication goal. Building on this motif corpus, the study produced two comparable information-visualisation posters (Fig. 1). For Consistency & Distinction, visual stability was maintained through uniform line weight and a consistent structural rhythm,

while contrast cues differentiated core instructional layers from decorative detail, reinforcing hierarchy and supporting a legible typographic system (Günay, 2024). For Adaptability, the abstraction level and contour simplification of motif forms were adjusted to improve graphic legibility while preserving culturally recognisable features, so that educational information remained accessible in typical digital viewing conditions. Multisensory Integration was addressed through layered visual organisation and region-based segmentation, supporting stepwise viewing and unit-based reading of the content. Emotional Engagement was strengthened through culturally grounded metaphors, symmetrical composition, and balanced layout, which supported resonance and encouraged

sustained engagement with the cultural theme (Wang & Wang, 2024).

In the expert review, the two posters were treated as a direct comparison because both visualised the same motif from “The new diagram of Confucian imagery” (Verbiest, 1674), while differing only in whether CAME guided the design process. During the

one-minute first-exposure viewing, experts rated each poster using a three-level scale (high/medium/low) across the four CAME dimensions and provided short written comments. The distribution of expert ratings for both posters across the four dimensions is summarised in Table 4.

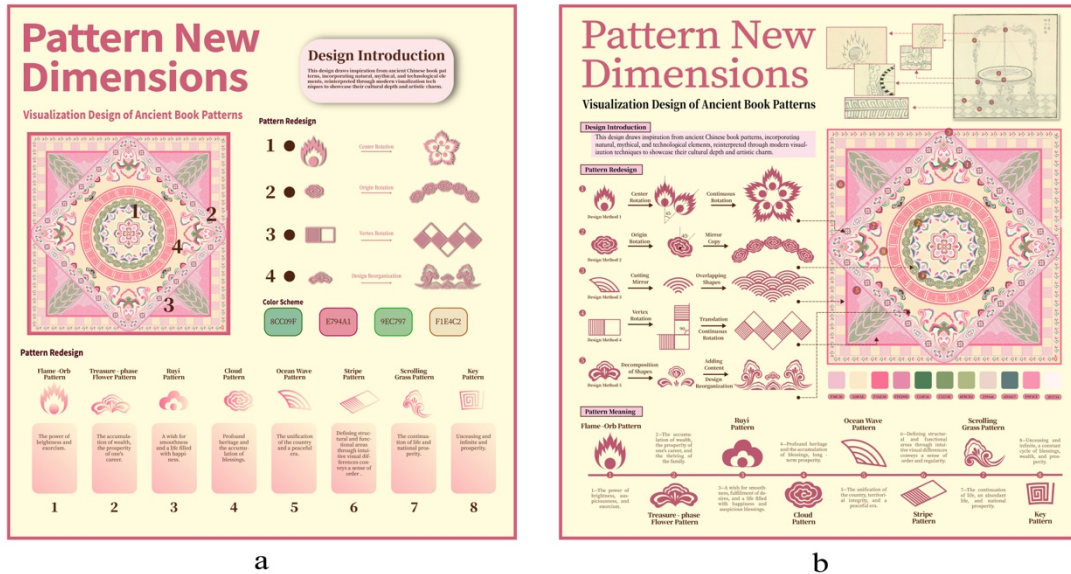


Figure 1. Pattern innovation and visual design outcomes based on the CAME framework

Note: a – a poster without explicit use of the CAME structure, in which the designer's traditional intuition served as the baseline for comparison; b – a poster created with the CAME structure in mind, in which the pattern elements were reorganised into a stable visual language system.

Source: compiled by the authors

Table 4. Distribution of expert ratings and summary statistics for two posters (n=7)

CAME dimension	Poster	Low (1)	Medium (2)	High (3)	Mean	SD
Consistency & Distinction	a	5	2	0	1.29	0.49
	b	0	4	3	2.43	0.53
Adaptability	a	5	2	0	1.29	0.49
	b	1	2	4	2.43	0.79
Multisensory Integration	a	5	2	0	1.29	0.49
	b	2	3	2	2.00	0.82
Emotional Engagement	a	7	0	0	1.00	0.00
	b	0	3	4	2.57	0.53

Source: compiled by the authors

As shown in Table 4, Poster b received higher ratings than Poster a across all four dimensions. The clearest separation appeared in Emotional Engagement, where Poster a was rated Low by all experts (Mean = 1.00, SD = 0.00), whereas Poster b concentrated in Medium to High ratings (Mean = 2.57, SD = 0.53). Poster b also showed higher mean scores in Consistency & Distinction and Adaptability (both Means = 2.43) compared with Poster a (both Means = 1.29). For Multisensory Integration, Poster b showed a moderate improvement (Mean = 2.00) relative to Poster a (Mean = 1.29), with a wider spread of ratings, indicating greater variation in expert judgments on this dimension. Across these ratings and comments, the CAME-guided poster was more often judged as having

a clearer hierarchy and more stable visual coding, which helped experts identify the intended learning content within the limited viewing time. By contrast, the comparison poster was more frequently described as mixing ornamental density with instructional structure, which made the reading path less predictable and increased the effort required to infer relationships among elements. The difference observed in the timed first-exposure review can also be interpreted in light of signalling research in multimedia learning. In a meta-analysis, M. Noetel *et al.* (2022) showed that signalling helps learners identify relevant information and organise incoming material more effectively by making structural cues more visible during early processing. Although the present study did not test learning

outcomes statistically, the experts' faster recognition of instructional focus in the CAME-guided poster is consistent with this mechanism and supports the methodological value of including a timed first-exposure task in the comparative review.

In the subsequent 20-30 minute in-person group discussion with the same panel, experts explained the reasons behind the ratings in ways that aligned with the rubric. Comments associated with Consistency & Distinction highlighted the separation of learning-relevant layers from ornamental layers and the use of explicit hierarchy cues. Adaptability was discussed in relation to controlled abstraction and simplification that improved screen readability while preserving recognisable motif structure. Remarks linked to Multisensory Integration focused on layered segmentation that supported stepwise inspection and made the composition ready for optional multimodal extension without forcing additional channels. Emotional Engagement was described through compositional balance and culturally meaningful metaphors that increased acceptance and curiosity. The findings indicated that the CAME framework provides a practical bridge between the translation of traditional motifs and multimedia learning design. Its key value lies in transforming recurring expert concerns into a set of clear design commitments that are maintained throughout the design process. This is especially relevant for screen-based learning, where the challenge often lies not in the lack of information, but in how to guide learners' attention and preserve meaning without increasing unnecessary cognitive load.

The **Consistency & Distinction** principle aligns well with established signalling theory. According to R.E. Mayer & L. Fiorella (2022), signalling supports learning by making structure and relevance visible, which helps learners allocate attention more efficiently. G. Wang *et al.* (2024) further showed, through a meta-analysis, that signalling tends to improve learning outcomes and often reduces perceived cognitive load. This logic is reflected in this study. Experts did not call for richer ornamentation but emphasised stable visual codes and clearer hierarchy. When hierarchy cues were explicit and visual codes were consistent, the reading path became more predictable, and the instructional intent was easier to extract from the image.

Adaptability in educational visuals is more than just a stylistic decision. A. Ruf *et al.* (2022) argued that interface aesthetics can enhance situational interest and help sustain engagement, which indirectly supports learning activity. This study supported the view of Adaptability as part of instructional clarity, rather than an optional refinement. In the poster designs, adaptation was not pursued for novelty but aimed to reduce avoidable visual complexity while maintaining culturally recognisable structure. This ensured that traditional motifs remained meaningful and legible across different viewing conditions.

M. Alebri *et al.* (2023) pointed out that viewers' perceptions of decorative visual elements depend on whether the decoration supports reading and interpretation, rather than on ornamentation alone.

Multisensory Integration in this study was not fully implemented through an interactive system but was instead based more on the dual-channel definition of combining text and images, adapting to the needs of multimedia education. R.E. Mayer (2024) explained that organising information effectively and hierarchically can help learners process study experience more efficiently. Multilayered visual structures were used to divide information into independent regions, allowing students to learn content step by step. This design is consistent with dual-channel theory, which suggests that cooperation between visual and auditory channels improves learning. In this study, visual segmentation and structured image processing can help students identify key information more quickly and gradually assimilate more details.

T. Doyle (2023) pointed out that learning benefits when information is organised into manageable units, because this helps learners handle essential processing demands. For example, the layered structure could be extended in a platform setting by mapping regions to optional explanatory prompts or brief narration, which would allow additional context to be accessed without changing the core visual organization, thereby further increasing the immersive learning experience. As E. Dritsas *et al.* (2025) suggested, multimodal design should be carefully coordinated to avoid unnecessary redundancy and instead enhance understanding through precise sensory integration. The design in this study offers a foundational framework for future interactive platforms, where layered visual information and potential interactive modules can effectively enhance learners' understanding and retention of complex information.

Emotional Engagement aligns with growing evidence in emotional design within multimedia learning. In a systematic review, D. Mutlu-Bayraktar (2024) reported that emotional design can foster learner engagement, although its effects can vary depending on the context and implementation. Y. Wang *et al.* (2021) also showed that emotional design can influence learning-related responses in culturally grounded materials. This aligns with the expert feedback in this study. Experts described emotionally resonant compositions as a means to invite identification with cultural meaning, which is crucial for maintaining learners' attention, especially when content is unfamiliar. The emotional advantage reported by experts should be understood as a learning-relevant design condition rather than as a purely aesthetic effect. Research on emotional design in multimedia learning by Y. Le *et al.* (2021) has shown that formal design variables, including shape and colour, can influence affective state and cognitive engagement during learning tasks. In this study, the

experts' comments suggested a comparable pattern: when compositional balance and culturally meaningful metaphor were more coherent, viewers expressed stronger willingness to continue reading, which in turn supported sustained attention to the educational message.

Overall, the results of this study confirmed that applying Mayer's multimedia learning principles through the CAME structure effectively optimises student attention and reduces cognitive load. Incorporating signalling, adaptability, Multisensory Integration, and Emotional Engagement into the design of learning materials enhances the perception and understanding of information, especially in the context of culturally meaningful motifs. Expert feedback indicated that these principles not only support learning but also create a clear and consistent structure that promotes deeper retention of material. The results also highlighted the importance of multimodal approaches in creating learning platforms that can increase student engagement and improve knowledge retention.

CONCLUSIONS

This study revealed that the CAME framework, which includes the principles of Consistency & Distinction, Adaptability, Multisensory Integration, and Emotional Engagement, can effectively translate traditional decorative motifs into educational visuals. The analysis showed that when applying the CAME framework, the resulting posters were clearer in visual hierarchy and more stable in the design, which made it easier for learners to identify key educational content. The comparison set, created without explicit guidance from the framework, struggled to separate decorative elements from instructional layers, which led to a less predictable reading path and increased cognitive effort to understand the visual relationships. It was found that the Consistency & Distinction principle aligned with the signalling theory, as it helped highlight the most relevant information and guide learner attention

efficiently. The Adaptability principle allowed the design to be adjusted to meet the needs of different audiences and viewing contexts, ensuring readability on both desktop and mobile platforms. Multisensory Integration was implemented through visual segmentation, which improved the organisation of information and laid the groundwork for potential multimodal enhancements in future iterations. Emotional Engagement was emphasised through the use of cultural metaphors and symmetrical compositions, which contributed to learner engagement by creating a meaningful emotional connection with the content. In future studies, this structure can be confirmed by data obtained from students while performing educational tasks on the platform, so that understanding, attention models, and memorisation can be verified not only on the basis of expert interpretation. It would also be appropriate to test this structure with additional motifs and illustrated sources to verify whether the four dimensions remain stable across different visual grammars and cultural contexts. It is proposed to explore additional multimedia extensions, such as short stories or simple motion cues, as controlled additions to the same visual structure to enhance educational clarity without adding unnecessary complexity.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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Фреймворк SAME: адаптація традиційних мотивів для освітніх платформ

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Анотація. Ефективна освітня комунікація культурно-насичених декоративних мотивів у екранних навчальних матеріалах розглядається як актуальний виклик для сучасного дизайну в цифровій освіті. Метою цього дослідження була розробка та валідація дизайнерського фреймворку, який забезпечує трансформацію традиційних декоративних мотивів у чіткі та придатні для навчання постери з візуалізації інформації для освітньої комунікації. У роботі застосовано якісну, орієнтовану на дизайн методологію, що включала напівструктуровані інтерв'ю з експертами, кодування за принципами обґрунтованої теорії (відкрите, осьове та селективне кодування), порівняльне проєктування постерів, а також експертну оцінку за методом першого короткочасного перегляду та подальше групове інтерв'ю. Результати аналізу інтерв'ю дозволили визначити чотири виміри дизайну: «Узгодженість і розрізнення», «Адаптивність», «Мультисенсорна інтеграція» та «Емоційне залучення». Ці виміри були узагальнені як простежувані дизайнерські зобов'язання для створення освітнього візуального контенту. У межах дослідження було створено два порівняльні постери для одного мотиву, взятого з ілюстрацій до «Нової діаграми конфуціанських образів»: один розроблявся на основі запропонованого фреймворку, а інший – як контрольний зразок на основі інтуїтивного підходу. Експертна перевірка показала, що постер, створений за фреймворком, характеризувався чіткішою ієрархією, легшим розпізнаванням ключового навчального контенту в умовах обмеженого часу та стабільнішим візуальним кодуванням порівняно з контрольним зразком. Аналіз також продемонстрував, що фреймворк підвищує рівень обґрунтованості основних дизайнерських рішень, пов'язуючи їх із чіткими критеріями, а не з особистими вподобаннями автора. Практична цінність роботи полягала у можливості застосування результатів дослідниками та практиками у сферах візуалізації інформації та візуальної комунікації, які займаються розробкою освітніх ресурсів для поширення культурних знань у мультимедійних навчальних середовищах

Ключові слова: дизайн комунікації культурної спадщини; візуалізація інформації; мультимедійна освіта; кодування за обґрунтованою теорією; експертна оцінка; візуальна ієрархія; цифрова освіта



Artistic enamel as a factor in form-making in the work of Ukrainian jewellery artists

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Abstract. The diversity of artistic enamel techniques creates scope for creative experimentation among Ukrainian jewellers, the revival of Byzantine and Old Rus' enamelling traditions, and the introduction of innovative technologies, which remains highly relevant to Ukrainian jewellery art. The purpose of the study was to analyse the main principles of jewellery design, which form the basis for technical and technological inspirations in enamelling and support the effective expression of the artistic image in the work of contemporary Ukrainian jewellery artists. The methodological basis of the study involved several scientific methods: comparative-historical, analytical-descriptive, figurative-stylistic analysis, structural-typological, the method of recording field material (interviews) in audio form, and the methods of analogy and conjecture. The study examined the specifics of the methods and principles of form creation, defined by authorial style, in particular, in the context of emphasising compositional solutions through the expressive features of artistic enamel techniques and their technological inspirations in the work of contemporary Ukrainian jewellers. The research indicated that artists apply both classical and authorial enamel techniques, combining them with gemstones and mother-of-pearl to create complex, multi-layered compositions. The analysis of the activities of the creative teams of the Dyulber Jewellery House and the Lobortas Classical Jewellery House indicated that the systematic combination of theoretical knowledge and practical experience, along with the careful development of technological charts for the production of enamel jewellery works, ensures a high quality of creative results. The combination of traditional and experimental enamel technologies shapes the development of contemporary Ukrainian jewellery, opens new creative possibilities for artists of the late 20th and early 21st centuries within the global historical and cultural context, and emphasises individual style and a high technical level in the execution of jewellery works

Keywords: Byzantine and Kyivan Rus' enamelling; technologies; traditions; experimentation; innovations; techniques; jewellery art

INTRODUCTION

The relevance of this research is determined by the need for scholarly understanding of the formative principles of artistic enamel in contemporary Ukrainian jewellery art, with regard to the transformation of technological processes and approaches of artists at the beginning of the 21st century. The intensification of experimental practices and the integration of new materials and innovative technologies into traditional enamelling techniques led to the emergence of new models of interaction between construction, material, and artistic image. This creates a need to systematise the developed theoretical

approaches and clarify the role of enamel as a formative factor in contemporary Ukrainian jewellery art.

The issue of artistic enamel was addressed in a number of Ukrainian and international studies that outline the technological, stylistic, and compositional aspects of its development within the context of jewellery art. O.O. Rogotchenko (2025) provided an analytical and generalising characterisation of contemporary practices in Ukrainian visual art and identified the specific role of formative processes in shaping innovative plastic solutions in decorative art, in particular, in jewellery art. The researcher emphasised the interrelation between technological

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innovations, the use of various materials, including enamel, and the figurative system of the artwork. G.M. Yurchyshyn *et al.* (2023) analysed the artistic and technological features of enamel in the works of Ukrainian jewellers and outlined the genesis of enamelling art in Ukraine throughout the 20th and 21st centuries. In particular, the tendencies of its development were examined in the artistic and technological aspect of traditional techniques, including *champlevé*, *cloisonné*, and painted enamel, in synthesis with various methods of artistic metalworking. The study stated that enamel functioned both as a decorative component and as a constructive element of form formation.

O.V. Barbalat (2023) investigated the transformation of the traditions of Byzantine and Old Rus' jewellery in contemporary practice, focusing on the revival of historical hot enamel technologies and their adaptation to modern artistic concepts. In a related study, O.V. Barbalat (2022) substantiated the significance of historical and cultural heritage as a source of formal and figurative solutions in contemporary Ukrainian jewellery art. V.V. Karpov & O.G. Naumov (2021) noted that since the late 20th century, the development of artistic enamel in Ukraine was characterised by innovative searches and experimental applications of the hot enamel technique in various art forms, including jewellery, together with the introduction of technological innovations. Based on the scientific discourse developed in Ukrainian art studies, O.G. Naumov (2020) concluded that enamelling art, given the specificity of its techniques and materials, appears as an intermedial artistic phenomenon represented both in decorative art, including jewellery, and in visual arts. S.V. Luts (2021) considered enamel within the system of artistic metal and jewellery as an integrative factor in the formation of the compositional structure of a jewellery piece. It was established that the combination of technological expediency and artistic concept contributed to the emergence of individualised authorial strategies in contemporary jewellery art.

In the broader international theoretical context, contemporary jewellery is also interpreted through the prism of postmodern aesthetics and conceptual approaches. In particular, S. Sirinkraporn (2022) emphasised that the study of postmodern aesthetic philosophy in contemporary jewellery design provides valuable insights for artists, designers, and students. The researcher highlighted the role of creative approaches, attitudes towards social phenomena, globalisation, aesthetic experience, and conceptual development as key factors contributing to the emergence of new jewellery styles. From this perspective, jewellery is considered both an object of material culture and a medium that integrates bodily, intellectual, and environmental dimensions, reflecting the complex interaction between individual identity and contemporary socio-cultural processes.

From a technological standpoint, recent scientific research also focuses on the optimisation and

quantification of enamelling processes. Y. Qian & X. Dai (2025) demonstrated that experimental results indicate a linear regression relationship between the mass of enamel samples and firing duration. Their study proposed and validated a regression-based model that allows the precise calculation of firing time depending on enamel characteristics. This quantitative approach enables standardised and reproducible enamelling processes and contributes to improving technical accuracy and consistency in the production of enamel elements. Such findings indicate the increasing role of scientific modelling and data-driven methods in contemporary enamelling practice, which complement traditional craftsmanship with analytical precision.

Despite the existence of a number of studies, most focused either on the historical aspect of enamel development or on the technological characteristics of particular techniques. A comprehensive analysis of the formative principles of artistic enamel as a systemic phenomenon of contemporary Ukrainian jewellery art remained insufficiently generalised. The issue of interaction between construction, material, and artistic image in the context of the synthesis of traditions and innovative technologies requires further clarification. The study focused on examining the principles underlying the creation of jewellery pieces, which determine the technical and technological approaches in enamelling, and on analysing their role in revealing the artistic vision in the works of contemporary Ukrainian jewellers.

MATERIALS AND METHODS

The present study explored the specificity of form-making processes in the oeuvre of leading Ukrainian jewellery artists of the late 20th – early 21st centuries, whose creative practice demonstrated the pivotal role of enamel techniques in articulating and embodying the artistic and figurative conception of contemporary jewellery art. The research was based on principles of systematisation and a comprehensive approach, which substantiated a complex of artistic, figurative, constructive, and technological processes that, in synthesis, created a high-level artistic phenomenon. The systemic approach ensured comprehensive acquisition of information regarding the studied processes and phenomena.

The comparative-historical method was applied to identify similarities and differences in artistic, figurative, and technical-technological processes of form creation in enamel art between contemporary Ukrainian jewellery artists and representatives of previous cultural and historical periods. The analytical-descriptive method was employed to thoroughly elucidate the quantitative and qualitative characteristics of the principles and methods of work, including the use of traditional and innovative enamel techniques, incorporation of various materials, and formation of the artistic-stylistic concept. This approach recorded specific techniques and their functioning in the creative processes of contemporary

Ukrainian jewellery artists. Figurative-stylistic analysis was used to identify the individual stylistic principles of the artists, while the structural-typological method provided for the examination of typological classifications and the analysis of the structural composition of jewellery assortments determined by artistic and constructive means. Methods of analogy and assumption were applied to explore the genesis of artistic-stylistic, compositional, constructive, and form-making techniques.

The study was conducted in several stages: existing literature and exhibition catalogues were reviewed and systematised; field documentation of selected works was collected, including interviews and audio recordings of artists' comments; analytical and comparative evaluation of the collected data was carried out; and the synthesis of results led to conclusions regarding the role of enamel techniques in contemporary Ukrainian jewellery. The study focused on the works of prominent Ukrainian jewellery artists and jewellery houses, including Stanislav Volskyi, Oleksandra Barbalat, Vadym Lesohor, Oleg Garkus, Maiia Kotelnyska, O. Savchuk and A. Savchuk, Olha Komisarova, Anatolii Sherstiuk, the Dylulber Jewellery House, and the Lobortas Classical Jewellery House. These artists were selected according to their active use of classical and experimental enamel techniques, innovative approaches to material and compositional solutions, and influence on the development of contemporary Ukrainian jewellery art. Their works served as representative cases for analysing the integration of traditional and modern enamel technologies, the formation of authorial style, and the realisation of complex artistic and figurative ideas.

Given the limited number of comprehensive scientific works on the development of contemporary Ukrainian jewellery art, the research employed the interview method to record an important part of the study of form-making processes, in which artistic enamel plays a significant role. The interviews were not anonymous and were conducted with leading Ukrainian enamel specialists, namely A. Komarova, senior enamel master at the Lobortas Classical Jewellery House, and O. Barbalat, independent jewellery artist. These respondents were selected according to their professional status, extensive experience, and significant contribution to the development and experimental application of enamel techniques in contemporary Ukrainian jewellery. The respondents provided informed consent for the publication of their statements, and the researchers adhered to the principles of the American Sociological Association's Code of Ethics (1997).

The inclusion of interviews allowed the consideration of the respondents' professional experience and supplemented the analytical, comparative, and descriptive interpretation of the data with empirical information. The discussion focused on the technical and technological processes of enamel work, the characteristics of artistic expression, and

compositional and structural approaches to the creation of jewellery. The data obtained clarified the practical aspects of applying classical and experimental enamel techniques, the selection of materials, and their combination with other components. The results of the interviews were synthesised with the analysis of scientific sources, exhibition catalogues, and field documentation, forming a comprehensive understanding of the role of enamel in contemporary Ukrainian jewellery art and in the creative processes of leading masters.

■ RESULTS AND DISCUSSION

Examining the experience of predecessors, reviving the traditions of classical jewellery techniques, in particular, Byzantine and Old Rus' enamelling, and introducing innovative ideas and technological processes are important for the effective development of contemporary Ukrainian jewellery art. The decisive potential of enamel techniques in jewellery is determined both by the current context, which encourages the revival of once nearly forgotten hot enamel techniques in Ukraine, and by the rapid development of enamelling in the international art space. Cloisonné enamel reached a particular zenith during the era of Kyivan Rus'. Gold items such as diadems, necklaces, bracelets, kolts, and book covers adorned with enamel were discovered throughout the territory of present-day Ukraine (Kara-Vasilyeva & Chegusova, 2005). Enamelling reached a high level of development during the Ukrainian Baroque and Modernism periods. After a phase of relative decline in the Soviet era, this technique is experiencing a revival in contemporary practice and emerging in a qualitatively new form (Belichko, 2008). In view of the evolutionary progress of the wide range of contemporary hot enamel techniques, it is important to consider key aspects of the historical and cultural development of this technology in a global context (Shmagalo, 2013).

Enamel is a transparent or opaque glass-like material based on silicates (traditionally lead-containing) with a relatively low melting point, coloured with metal oxides. After being applied to a metal substrate and heat-treated, it forms a hard, glossy coating with high colour fastness and protective properties. Enamelling is a specialised jewellery-making technique integrated with the main metalworking processes. Its characteristic features include the dependence of colour characteristics on firing conditions (in particular, a tendency for shades to shift towards the cooler end of the spectrum with prolonged heat treatment), the possibility of repeated firing with limited scope for correction, and the variability of the final result due to the difficulty of fully controlling the process (Belichko, 2008).

The comparative-historical and structural-typological methods used in this study enabled systematic comparison of the creative approaches of individual Ukrainian jewellery artists and the

identification of common patterns in the use of artistic enamel as a formative factor. The analysis of the works indicated shared tendencies despite the individuality of each authorial style. These include the integration of classical enamel techniques with experimental methods, the consistent combination of enamel with various materials, such as precious stones, metals, and composite elements, and emphasis on technological processes as an integral component of artistic expression. The comparative analysis demonstrated that, although each artist develops a unique

compositional and stylistic language, their approaches converge in several key aspects: the use of enamel as a structural and semantic element of the composition, the multilayered nature of visual solutions, and the pursuit of material and colour expressiveness through controlled technological processes. These similarities indicate stable typological features in contemporary Ukrainian enamelling practice, which reflect continuity with historical traditions and adaptation to modern artistic and technological contexts (Table 1).

Table 1. Techniques of artistic enamelling, their features, and examples

Technique	Main features	Technological characteristics	Artistic potential	Examples of application
Hot enamel	Application of enamel powder followed by firing at high temperatures	Multi-layer application, temperature control, and combination with a metal base	Colour depth, transparency, light effects, and durability	S. Volskyi, O. Barbalat, O. Komisarova, Lobortas Classical Jewellery House, etc.
Guilloché enamel	Enamel applied to an engraved patterned metal surface	Mechanical engraving as a base for optical effects	Visual depth, complex light reflections, decorative quality	Dyulber Jewellery House, Lobortas Classical Jewellery House
Cloisonné	Image formed using metal partitions	Use of wires or strips to create compartments	Graphic clarity, ornamentality, structured colour composition	Frequently used in designer jewellery featuring national motifs (O. Garkus and others)
Champlevé	Enamel filled into recessed metal areas	Pre-engraved or stamped metal surface	Relief, textural contrast, restrained colour palette	Decorative elements in V. Lesohor's jewellery designs
Micro-enamel	Fine detailing and multi-layer enamel application on small surfaces	Highly precise temperature regimes, complex firing processes	Refinement, miniaturisation, subtle colour transitions	Lobortas Classical Jewellery House
Experimental enamel with synthetic materials	Combination of enamel with non-traditional materials	Integration of diverse materials and techniques	Experimental nature, contemporary plasticity of form	S. Volskyi, O. Barbalat, M. Kotelnyska, O. Komisarova, masters of Lobortas Classical Jewellery House, etc.

Source: compiled by the author

For contemporary jewellery artists representing the independent state of Ukraine, ancient history and rich cultural traditions dating back to Kyivan Rus' logically involve following the technological processes of the classical hot enamel techniques mentioned above, including champlevé, cloisonné, guilloché, and finift, skilfully applied in synthesis with other jewellery techniques. An analysis of the nationwide exhibition projects "Quadra-Mini-Metal. Jewellery Art – Enamel" demonstrated the diversity of the formal language of enamel techniques, reflecting the individual stylistic approaches of the artists (Pasichnyk, 2014b). Within these practices, a spectrum of technical solutions is formed, encompassing both traditional and experimental methods integrated into contemporary jewellery discourse. According to L. Pasichnyk (2014b), the enamel and jewellery works of Ukrainian artists are characterised by a combination of contrasting aesthetic categories, the syncretism of artistic language, and operation at the intersection of classical stylistic principles and innovative individual strategies. This provides grounds for considering enamelling as one of

the key technologies that plays a significant role in the formation and realisation of artistic concepts in contemporary jewellery art.

Drawing on the traditions and experience of previous generations, Ukrainian jewellers actively experiment with enamelling techniques, compositional approaches, and methods of form creation, thereby shaping the distinctive artistic language of contemporary jewellery art. The diversity of technical possibilities offered by enamel gives rise to various principles for shaping artistic form, which directly correlate with the artist's style and determine the nature of compositional decisions. A representative example is the body of work by Stanislav Volskyi, whose formal language is based on a combination of a wide range of technological processes and technical techniques. The use of the classical hot enamel technique, reinterpreted through the resolution of complex creative challenges, takes on an innovative and experimental character in his works and testifies to the artist's high level of professional skill and technical mastery (Volsky, 2008). This is demonstrated in a

series of works from different periods of his career, including the necklace Nefertiti (2005, gold, topaz, diamonds, sapphire, hot enamel), the brooch Lily (2008, gold, diamonds, hot enamel), and the bracelet Summer (2008, gold, diamonds), among others (Fig. 1). S. Volskyi's individual stylistic language is directly conditioned by his approach to technological experimentation, particularly the controlled use of firing regimes, the precision of enamel application, and the integration of enamel with complex metal structures and gemstones. These technological decisions contribute to the creation of a refined visual balance in which colour intensity, surface texture, and compositional rhythm are carefully orchestrated. As a result, enamel in his works functions not merely as a decorative layer but as a key formative element that structures the overall composition and reinforces its spatial and plastic integrity. The consistency of technological refinement, combined with experimental approaches, becomes a defining factor in shaping the recognisable authorial style of S. Volskyi, characterised by both technical complexity and aesthetic coherence.



Figure 1. Stanislav Volskyi. Necklace "Nefertiti" (2005)

Source: personal archive

In the work of Anatolii Sherstiuk, hot enamel is employed as decorative inlays within the broader system of stylised figurative compositions. Here, elements of the technique function both as a technological accent and as a meaningful module in the artistic perception of jewellery pieces, such as the brooch Night Fairy (2012, gold, silver, diamonds, hot enamel) and the pendant-brooch Cleopatra (2013, gold, silver, diamonds, hot enamel) (Pasichnyk, 2014a). The allegorical works of Vadym Lesohor stand out for their compositional accents using cold enamel, often expressed through zoomorphic imagery. For example, in the bracelet Metamorphosis (2009, silver, gilding, chrysolite, cold enamel), the technique delicately

emphasises the compositional meaning of the piece and brings the artistic image of the jewellery to its fullest integrity (Fig. 2). In A. Sherstiuk's practice, the use of hot enamel is closely linked to the controlled layering of colour and the precise integration of enamel inserts into complex metal structures, which allows him to achieve clarity of ornamental rhythm and visual segmentation of compositional elements. The technological choices, in particular, the balance between polished metal surfaces, gemstone accents, and enamel fields, contribute to stylised imagery in which enamel acts as a unifying visual and semantic component. By contrast, V. Lesohor's reliance on cold enamel is associated with a different technological logic, where lower-temperature application enables subtle modulation of surface effects and supports more graphic and contour-based solutions. This approach reinforces the narrative and symbolic dimension of his works, while the restrained material intervention of cold enamel enhances the expressiveness of zoomorphic motifs. In both cases, the selected enamel technique directly informs the stylistic outcome: in A. Sherstiuk's works through structured ornamentation and compositional segmentation, and in V. Lesohor's works through pictorial expressiveness and semantic emphasis.



Figure 2. Vadym Lesohor. Bracelet "Metamorphoses" (2009)

Source: personal archive

In Oleg Garkus' chest ornament Four Elements (2013, brass, rubber, hot enamel), decoration Thunderbolt (2022, brass, hot enamel, coral), and other works, the hot enamel technique functions as a decorative component of the composition based on ethnic motifs of the Hutsul region. Through colour, it clearly highlights the stylised geometry of symbols, signs, and artistic techniques of folk jewellery, resonating with the Carpathians and the ethnographic features of the region (Fig. 3). In O. Garkus' practice, the use of hot enamel is closely connected to the reinterpretation of Hutsul ornamental traditions, where technological decisions are subordinated to the representation and transformation of ethnic symbolism. The combination of enamel with brass and

other materials enables the artist to achieve a clearly structured composition in which colour performs both a decorative and a sign-based function. Controlled firing regimes and the sequential application of enamel layers contribute to the formation of a saturated colour field that enhances the graphic clarity of ornamental motifs and emphasises the rhythmic organisation of form. Thus, the technological specificity of working with hot enamel becomes a defining factor in shaping the individual style of the artist, which integrates ethnocultural continuity with a contemporary interpretation of form-making principles.



Figure 3. Decoration “Thunderbolt” (2022)

Source: O. Garkus (2022)

Among the followers of O. Garkus’ practice, associated with the Kosiv school of jewellery, young artists O. Savchuk and A. Savchuk deserve mention. Their work is distinguished by interpretive stylistics in which cold enamel elements serve as final compositional accents. Motivated by the specificity of brassworking and its transformation into contemporary jewellery practices, these artists create jewellery pieces in which enamelling techniques organically emphasise the texture and qualities of the primary materials used in their craft. In the designs of Maiia Kotelnytska, the hot enamel technique appears as a compositional tool for the stylisation of geometrised surfaces (Fig. 4). Decorative enamel inserts are distinguished by their principles of form creation within a minimalist aesthetic, which remains particularly relevant in contemporary jewellery. In the works of O. Savchuk and A. Savchuk, the use of cold enamel is associated with a restrained technological intervention that allows for subtle surface articulation and the preservation of the inherent material qualities of brass. The enamel functions as a finishing compositional element, accentuating contrasts between texture, tone, and material density, thereby reinforcing the expressive potential of the object

without disrupting its structural integrity. This approach contributes to a balanced visual hierarchy in which enamel serves as a complementary rather than dominant component. In contrast, in the works of M. Kotelnytska, hot enamel is integrated into a system of compositional simplification and geometric abstraction, where controlled firing processes and precise application techniques enable the creation of clean colour planes and clearly defined forms. As a result, enamel becomes a key formative element that supports minimalist aesthetics while enhancing the clarity and coherence of the overall design. In both cases, technological choices directly inform stylistic outcomes: through subtle accentuation and material sensitivity in the Savchuks’ practice, and through geometric structuring and compositional clarity in the works of M. Kotelnytska.



Figure 4. Brooch “Geometry with enamel and amethyst” (2025)

Note: brass, hot enamel, amethyst

Source: M. Kotelnytska (n.d.)

Within the context of contemporary Ukrainian fine jewellery art, the work of Oleksandra Barbalat (Kyiv) demonstrates the systematic use of the hot enamel technique as a key means of shaping the artistic image. Her works are based on solar symbolism and mythological motifs, which serve as figurative and philosophical constructs. Such works include the pendant “Civilization of Dolphins” (2013), the set “Heavenly Ark” (2014), the series “Metamorphoses” (2014), and others (Fig. 5).

The artist employs a wide range of enamel techniques in her creative practice, with cloisonné, repoussé enamel, and painting techniques playing a dominant role. In particular, she uses the “graffito” method, which involves partially removing the top layer of enamel after preliminary firing, and polishing multi-layered coatings to achieve complex painterly effects. The variability of heat treatment regimes allows the creation of diverse colour and textural characteristics. The application of enamel to carved

relief occupies a special place, combining traditional approaches with modern technological solutions. A distinctive feature is the synthesis of different materials and technologies. The works integrate natural and synthetic materials, precious stones, mother-of-pearl, and metallised components, in particular, *fémé*, combined with crackle effects. Such combinations form hybrid technological approaches that expand the possibilities of traditional enamelling. In complex compositions, for example, “The Virgin Mary” (2016), several enamel application techniques are combined, ensuring a multi-layered organisation of artistic form and enhancing its expressiveness. The figurative and artistic language of the works is characterised by a combination of chromatic expressiveness and the textural organisation of the material, which ensures the integrity of the composition and the harmony of its elements. In this context, hot enamel acts as a basic formative component that determines the interaction of colour, texture, and the metal base (Shmagalo, 2015; Barbalat, 2023).



Figure 5. Pendant from the series “Civilization of Dolphins” (2013)

Source: personal archive

In contemporary Ukrainian enamel art, the work of Olha Komisarova stands out for its consistent use of experimental approaches to form creation in the hot enamel technique. Her artistic practice has a conceptual orientation and is based on the integration of emotional and visual content with the material structure of the work. Form creation is achieved through the interplay of the texture of the enamel coating, colour layers, the light-reflecting properties of the surface, and the plasticity of the metal base, which enables the materialisation of individual artistic experience. The technological aspect is determined by variations in firing temperatures, which affect the degree of enamel transparency, colour intensity, and the nature of cracks (crackle). The application of multi-layered enamel with intermediate firing creates depth of colour and an effect of inner glow. The use of various metal bases (copper and silver) results in variations in enamel adhesion, thermal conductivity, and colour

outcome. The combination of traditional techniques with synthetic materials allows the creation of complex relief surfaces with a pronounced tactile texture.

The form-making in O. Komisarova’s works is characterised by a combination of functionality and artistic autonomy: the objects retain the characteristics of jewellery while functioning as independent artistic forms. This brings them closer to practices of object art and small-scale sculpture. The conceptual level of the works is linked to the representation of themes such as time, the transformation of personal experience, and the fragility of existence. In this context, enamel serves both a decorative and a meaning-making function, capturing individual experience in material form. In such a way, O. Komisarova’s work demonstrates an approach to enamelling in which form-making is based on a combination of technological experimentation, material variability, and conceptual content. This is evident in the works “The City That No Longer Exists” (2022), “Heart” (2024), and “Contact of Bacteria with Organic Edible Material” (2019), where hot enamel serves as the defining element in the organisation of form, colour, and texture (Fig. 6).



Figure 6. Brooch “Contact of Bacteria with Organic Edible Material” (2019)

Source: O. Komisarova (n.d.)

Notably, in the context of contemporary Ukrainian jewellery art, there are jewellery houses that explicitly declare techniques of artistic enamelling as a priority in their collective creative practice. In particular, the technique of hot enamel on guilloché surfaces in the works of Crimean Tatar jewellers, such as Mekhti Islamov, founder and head of the Dyulber Jewellery House, introduces a special meaning into the artistic and figurative system of national motifs and conveys the main conceptual load of the works. This is exemplified in the ring *Rialto* (2005, gold, silver, diamonds, hot enamel), the earrings *Cascade* (2010, gold, silver, diamonds, hot enamel), the earrings *Al Gambra* (2012, gold, diamonds, pearls, hot enamel), and others (Fig. 7). Here, enamelling emerges as one of

the primary technological means of enhancing jewellery works, along side other traditional techniques such as filigree, which identify the art of the Crimean Tatars (Pasichnyk, 2014a). The creative practice of Crimean Tatar jewellery houses therefore demonstrates a synthesis of traditional ornamental heritage and contemporary enamelling technologies, in which hot enamel on guilloché surfaces functions as a key expressive and conceptual component that reinforces national identity, enriches decorative structure, and ensures the integrity of the artistic image within the collective authorial style.



Figure 7. Earrings “Al Gambra” (2012)

Source: personal archive

An important area of development in contemporary Ukrainian enamel art is the work of the team of enamel artists at the Lobortas Classical Jewellery House (Luts, 2013), which involves systematic research into the technological parameters of Old Rus’ hot enamel techniques, in particular, firing temperature regimes, the composition of enamel masses, and the specifics of their interaction with the metal base. The creation of jewellery pieces with a central motif formed by enamel elements requires a combination of theoretical knowledge of the physical and chemical properties of materials with practical skills, implemented through well-established methods of constructing enamel compositions. In the practice of the Lobortas artisans, a proprietary system for organising the technological process was developed, including sequential operations for preparing the metal base (grinding, polishing, degreasing, and etching), applying enamel layers, and step-by-step firing. The use of micro-enamels is an important element and requires high precision in material application and stable temperature conditions during each firing cycle. Heat treatment is conducted as a series of controlled stages with clearly defined temperature intervals, ensuring uniform sintering of the enamel, minimisation of surface defects, and predictability of the colour result.

The manufacturing process is based on calculated parameters for firing temperature and duration, which allow control over the melting, spreading, and crystallisation of the enamel layer. The application of multiple layers of enamel with intermediate firings creates depth of colour, a translucent effect, and a complex textural surface structure. In this context, hot-enamelling techniques correlate with painting principles, in particular, the glazing technique, or sequential layering, and *alla prima*, or mixing colours during application. A distinct aspect is the use of proprietary technical techniques involving the combination of different types of enamels, variations in layer thickness, and cooling regimes, which produces controlled crackle effects, changes in transparency, and surface micro-relief. This expands the technological capabilities of traditional hot enamel techniques and enhances the precision of executing complex jewellery forms. Thus, the practice of the enamellists at the Lobortas Classical Jewellery House represents a model of integrating traditional hot enamel technologies with engineering-based approaches to their implementation. The combination of controlled temperature regimes, a phased organisation of the production process, and experimental variation of materials enables the creation of multi-layered compositions in which enamel serves as the primary formative and colouristic element, defining the structural and visual integrity of the piece (Fig. 8).

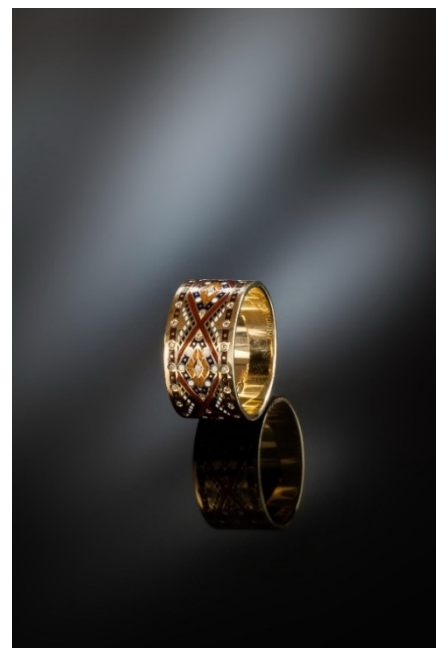


Figure 8. Lobortas Classical Jewellery House, Ring “Stozhari” (2011)

Note: gold, diamonds, hot enamel

Source: S.V. Luts (2021)

It should also be emphasised that hot enamel techniques are most often organically combined with skilful engraving, particularly of partitions, which enhance the composition of jewellery objects through the graphic quality of lines and create harmonious and

integral expression. Moreover, virtuoso engraving creates unrivalled compositions in the technique of hot enamel on guilloché surfaces, distinguished by specific effects that reveal the virtuosity and high professional level of both the enamel master and the engraver. Contemporary Ukrainian jewellery art demonstrates an active transformation of traditional enamelling practices in response to new aesthetic and technological challenges. As noted by R. Shmagalo (2015), the combination of classical and innovative techniques became a characteristic feature of contemporary jewellery objects, which is also confirmed by the results of the present study. The analysis of individual artistic works showed that artists actively experiment with combining hot and cold enamelling techniques and employ modern materials and technologies that ensure colour saturation and expressive texture. Particular attention should be paid to the conceptual aspect of enamel emphasised by Z.A. Chehusova (2002). Her studies indicated that contemporary jewellers increasingly imbue their works with semantic meaning through colour codes, geometric forms, and compositional methods.

L. Pasichnyk (2014a) noted that traditional ornaments remain dominant in regional practices. This observation is also confirmed in the present study; however, a shift in emphasis can be observed. Ukrainian jewellers are gradually moving away from purely ethnographic forms, integrating abstract and modernist elements into their works. Such a transformation may be explained by the influence of international exchange of experience, participation in symposia and exhibitions, and the formation of new aesthetic orientations. The comparison of the obtained results with previous studies supports the conclusion that 21st-century Ukrainian jewellery art exists at the intersection of traditional practice and innovative technologies. The combination of classical and experimental techniques, the integration of abstract forms, and the shift in emphasis from ethnographic motifs to conceptual approaches reflect the active transformation of artistic enamel and its significance for the development of contemporary decorative art, specifically jewellery.

According to Y. Teng *et al.* (2020), the implementation of 3D modelling and additive manufacturing technologies enables the creation of personalised jewellery objects with movable structures, where different materials are combined to achieve contrasting visual and textural effects. The authors highlighted that digital fabrication expands design variability while maintaining structural coherence. This is also evident in the present study, where the analysis of contemporary jewellery practices demonstrates a growing use of technological integration to achieve compositional complexity and individuality. However, unlike purely digitally driven approaches, the results of the present study indicate that such technologies are most effective when combined with traditional enamelling techniques,

ensuring both aesthetic continuity and material expressiveness.

In the paper of M.F. Özdemir (2023), enamel is interpreted as a traditional surface decoration method capable of producing a wide spectrum of visual effects through layered application and controlled firing processes. The researcher highlighted the importance of classical techniques such as cloisonné, champlevé, basse-taille, plique-à-jour, and Limoges painting. This aligns with the results of the present study, where traditional techniques are also identified as a foundational basis of contemporary practice. However, the present results expand this perspective by demonstrating that these classical methods are not merely preserved but actively reinterpreted within modern compositional strategies, which enhances their expressive potential. According to Y. Zhengxu *et al.* (2024), the integration of contemporary wireless enamelling techniques into educational processes enhances both technical proficiency and creative thinking among students. The researchers argued that mastering technological parameters is essential for professional development. This corresponds with the results of the present study, which also emphasised the role of technological competence in shaping modern jewellery practices. However, the present research suggests that beyond educational aspects, such technologies influence artistic outcomes by encouraging experimentation and fostering new visual languages in enamel art.

Q. Chen & S.A. Sharudin (2024) argued that the application of 3D printing technologies in enamel jewellery design significantly overcomes limitations of traditional manufacturing, particularly in terms of time, cost, and design complexity. Their findings indicated increased precision and personalisation in production. This is consistent with the present study, where digital fabrication is identified as a key factor contributing to innovation in compositional solutions. However, while Q. Chen & S.A. Sharudin primarily focus on the technological advantages of 3D printing, the present research highlighted the importance of integrating these technologies with artistic and conceptual approaches, ensuring that technical innovation supports rather than replaces artistic intent. P.G. Hangün *et al.* (2026) demonstrated that the reuse of industrial enamel frit waste within low-temperature glass formation processes supports sustainable artistic and industrial practices. The researchers emphasised the relevance of such materials in the context of circular economy principles. This observation is also reflected in the present study, where sustainability emerges as an increasingly significant factor in material selection and production methods. However, the results of the present study indicated that in Ukrainian jewellery practice, ecological approaches are still in the process of gradual adoption and are often combined with traditional material systems rather than replacing them entirely.

Thus, the comparison of the obtained results with recent publications demonstrated both convergence and certain distinctions. While previous studies predominantly emphasised technological innovation, digital fabrication, educational integration, and sustainability, the present research confirms these trends and indicates their synthesis with traditional enamelling practices and artistic conceptualisation. This indicates that contemporary jewellery art functions as an interdisciplinary phenomenon in which technological progress and artistic tradition do not oppose each other but mutually enrich one another, forming a dynamic space for the development of new expressive possibilities in Ukrainian and international enamelling practice.

CONCLUSIONS

The study established that artistic enamel techniques in contemporary Ukrainian jewellery not only serve a decorative function but also a key means of shaping form and realising artistic imagery. In this study, the shaping of form is viewed as a process in which technological solutions directly determine the structural, plastic, and colouristic characteristics of the jewellery piece in general. The analysis of the works of leading Ukrainian artists, including S. Volskyi, O. Barbalat, V. Lesohor, O. Garkus, M. Kotelnyska, and O. Komisarova, indicated that these masters organically combine classical enamel techniques, such as cloisonné, champlevé, guilloché, graffito, and cold enamel, with their own authorial technical solutions. The analysis demonstrated that each work becomes a unique experimental field, where the combination of traditional and innovative methods ensures an unpredictable and individualised artistic outcome, reflecting the distinctive features of the artist's personal style. The study showed that artists actively employ technological innovations: work with micro-enamels, multi-layered thermal treatments, the combination of enamel with gemstones, mother-of-pearl, metallised materials, and natural components. It was established that contemporary Ukrainian enamelling is at a high level of development, combining

the traditions of Byzantine and Old Rus' schools with experimental approaches. For the first time, the interrelation between technological parameters of enamel, namely multi-layer firing, temperature regimes, and material combinations, and the artistic-compositional characteristics of jewellery was identified and systematised, which constitutes the primary scholarly contribution of the present research. The regularities of form creation in contemporary Ukrainian jewellery art were generalised through the use of artistic enamel as a key means of compositional organisation. The study demonstrated that enamel in contemporary practice functions not only as a decorative element but as a full-fledged formative factor that determines the structure, plasticity, and expressiveness of the artistic image of the work.

Prospects for further research lie in the systematic study of the unexplored physicochemical and artistic-technological properties of enamel as a material, including its behaviour under multi-layer firing, compatibility with different metals and composite materials, and the influence of temperature regimes on colour stability, transparency, and surface texture. Particular attention should be paid to the development and experimental testing of new technical application methods, including hybrid approaches that integrate traditional enamelling techniques with digital technologies such as 3D modelling, additive manufacturing, and laser processing. Further research should also focus on optimising the compositional and technological parameters of enamel objects and adapting enamel to innovative and environmentally sustainable materials.

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Художня емаль як чинник формотворення у творчості українських митців-ювелірів

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Анотація. Різноманіття технік художньої емалі відкриває для українських ювелірів простір творчих експериментів, відродження традицій візантійського та давньоруського емальєрства й упровадження інноваційних технологій, що зберігає високу актуальність для ювелірного мистецтва України. Мета дослідження – здійснити аналіз головних засад формотворення ювелірних виробів, що створюють основу для техніко-технологічних інспірацій емальєрства та є засобом ефективного розкриття художнього образу в творчості митців сучасного ювелірного мистецтва України. Методологічною основою дослідження було застосування низки наукових методів: порівняльно-історичного, аналітико-описового, образно-стилістичного аналізу, структурно-типологічного, методу фіксації польового матеріалу (інтерв'ювання) у вигляді аудіозаписів, а також методів аналогій та припущень. Вивчено специфіку методів та принципів формотворення, що визначаються авторським стилем, зокрема у контексті акцентування композиційних рішень через використання мовних особливостей технік художньої емалі та технологічних інспірацій у творчості сучасних українських художників-ювелірів. Дослідження показало, що художники застосовують класичні та авторські техніки емалі, поєднують їх з дорогоцінним камінням і перламутром, створюючи складні багатопланові композиції. Проведений аналіз діяльності творчих колективів Ювелірного Дому «Дюльбер» та Класичного ювелірного Дому «Лобортас» показав, що системне комбінування теоретичних знань і практичного досвіду, а також ретельне опрацювання технологічних карт виготовлення ювелірних творів з емаллю забезпечує високу якість творчих результатів. Поєднання традиційних і експериментальних технологій художньої емалі формує розвиток новітнього українського ювелірного мистецтва, відкриваючи нові творчі форми потенціалу художників кінця XX – початку XXI століття в світовому історико-культурному контексті, підкреслюючи індивідуальну манеру та високий технічний рівень виконання ювелірних творів

Ключові слова: візантійське та давньоруське емальєрство; технології; традиції; експериментаторство; інновації; техніки, ювелірне мистецтво



Stylistic systematisation of characters as a tool for visual narrative identity formation in fashion communication

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Abstract. The character increasingly functions not as a secondary identity element but as an autonomous aesthetic system shaping stylistic codes and compositional logic. However, research lacks an integrated model that explains its impact on fashion design processes. The purpose of this study was to develop a multi-level stylistic systematisation of characters and to define their influence on compositional modelling in digital contexts. The methodological basis consisted of a combination of systemic structural analysis, semiotic approach, comparative typology, elements of morphological analysis of form, and modelling of conceptual structures. A theoretical model was proposed in which the character was interpreted as a multi-layered structure ensuring visual integrity. The model included three interrelated levels. The technological level defined morphology and modes of embodiment, from static graphics to interactive digital formats. The semiotic level identified archetypal foundations and cultural prototypes, including both historical figures and digital avatars. The functional level determined the character's communicative role as a symbolic representative, expert mediator, or stylistic dominant within brand strategy. The study substantiated the transformation of the character from a passive sign into an autonomous aesthetic mediator between digital environments and physical fashion design. It demonstrated that spatial and temporal characters generate new approaches to composition, silhouette, and form dynamics, influencing contemporary fashion trends. The findings can be applied in fashion design practice, brand strategy development, digital collection creation, and design education

Keywords: multilevel analytical model; brand semiotics; digital embodiment; symbol morphology; archetypal structures; hybrid visual environment; brand communication strategies

INTRODUCTION

The digital transformation of contemporary culture has radically shifted the interaction mechanisms between fashion brands and consumers. At the centre of this communication is the virtual character, conveying brand

values through complex visual codes. Consequently, character design has evolved from mere entertainment into an intellectual tool for strategic branding. Systematisation of these design methods is essential to ensure brand identity within a phygital reality where the

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boundary between physical objects and digital projections is increasingly blurred. In this context, G. Bonales-Daimiel & B. Moreno-Albarracín (2025) analysed avatars as carriers of digital identity in metaverse environments, emphasising their role in shaping new models of online self-presentation. C. Ríos-Llamas (2022) developed this idea, interpreting avatars as autonomous personal brands capable of functioning as independent communicative subjects in digital space. Y. Choi & C. Lee (2025) made a significant contribution to the investigation of cognitive responses to virtual images by analysing the phenomenon of avatar multiple personalities. However, their study did not consider how stylistic systematisation can unite fragmented visual images into a coherent brand strategy. Similarly, the study by A. Naz *et al.* (2025) substantiated the influence of avatars on self-perception through the mechanisms of social presence, but the graphic means of forming a visual narrative were left out of consideration. In turn, the research by V.V. Habayluk (2025) revealed the semiotic potential of style as a means of visual communication, but the proposed approach did not contain applied models for character classification that could be used in digital design and branding practices. Thus, existing studies demonstrated considerable interest in avatars as a tool for digital identity and communication, but leave insufficiently explored issues of systematic stylistic classification of virtual characters and their integration into long-term personal or corporate branding strategies.

Ukrainian discourse, notably T. Fisenko (2022), traditionally views the character as a mascot – a static graphic tool for image formation. This approach limits the character to a representative function. In contrast, contemporary fashion design requires a shift toward modelling a digital media agent. This necessitates a multi-level matrix integrating technological parameters with dynamic narrative roles. A.V. Seleznova (2024) detailed the process of developing concept art for a typical character using computer graphics, highlighting the key technological stages of its visual embodiment. The study by A. Kemp *et al.* (2023) focused on the phenomenon of narrativity in contemporary design and revealed branding strategies through storytelling, where the character acts as a key mediator in the communication process between the brand and the consumer. Despite the significance of the researcher's substantiated storytelling concept, the development of a specific visual matrix that would enable the differentiation of a character's stylistics in accordance with the semantic content of the brand narrative remains outside the scope of scholarly attention. An analysis of research in the field of digital fashion demonstrated a thorough exploration of the morphological and technical accuracy of the virtual body. Furthermore, the sociocultural dimension of design was examined by O. Kolisnyk *et al.* (2021), who interpreted it as a phenomenon of social interaction in which visual objects function as mediators between a person and a brand.

Studies have demonstrated a growing interest in integrating the concept of tactility. In particular, N. Skliarenko & O. Romaniuk (2023) focused on the role of sensory characteristics in digital design, while V. Boiko & N. Skliarenko (2024) analysed methods of emotional visualisation, rethinking the character as an object saturated with sensory properties and capable of evoking deep empathy. J. Arsenyan & A. Mirowska (2022) proved the effectiveness of using virtual agents in digital communications. However, their role in the fashion industry still needs to be systematised. This necessitates rethinking the character as an integrated structure that combines emotional expressiveness and technological dynamics within a single visual narrative.

These studies did not provide specific algorithms for classifying characters according to the level of their communicative influence. This revealed a methodological gap between the engineering precision of an object and its semiotic content, highlighting the need for a systematic classification that integrates technical accuracy with the characteristics of a character as an intellectual interface capable of managing interaction within the brand-consumer system. In summary, a significant gap exists regarding interdisciplinary character systematisation. Existing studies were narrowly focused, and a unified stylistic framework linking visual language to marketing strategies was absent. The lack of a clear algorithm for selecting stylistic approaches created obstacles for effective design practice. The purpose of this study was to provide a theoretical substantiation and to develop a multi-level stylistic systematisation of characters as a fundamental tool for shaping visual narrative identity within the contemporary fashion communication system.

MATERIALS AND METHODS

The study was based on contemporary trends in fashion visual communications, digital character modelling, and the semiotic structures of fashion narratives. An interdisciplinary approach was employed, combining systemic and structural analysis, semiotics, and conceptual modelling to examine the character as a pivotal tool for visual identity. The research followed the stages of the developed four-level systematisation. At the initial stage, systemic and structural analysis was used to establish the first level, classifying characters by their technological embodiment (2D, 3D, or generative graphics). This provided a framework for understanding their digital nature. In the second stage, a semiotic approach substantiated the second level, focusing on the signs of the artistic image. Characters were analysed as systems of visual codes: lines, colours, and textures, that transmit brand identity through graphic symbolism. The third stage involved examining characters as communication mediators, which allowed for the identification of their specific roles in visual storytelling. Through morphological analysis and modelling of conceptual structures, a fourth level was

developed, which synthesised character types according to a complex of external, social, psychological and behavioural criteria. The use of the comparative typology method allowed combining these stages into a holistic multi-level matrix, which provided a logical transition from the technical parameters of the image embodiment to its complex narrative role. At the final stage, an analysis was conducted regarding the dynamic characteristics of the digital character, whose identity and behavioural model were programmed within the brand's marketing logic. This allowed for the verification of the character's status as an active media agent, ensuring a long-term strategic brand presence in the digital environment.

To verify the proposed systematisation and confirm its universality, a sample of 22 representative characters from the fashion industry created between 2016 and 2025 was analysed. The study included digital images demonstrating various types of artistic forms: from static CGI-models (Computer-Generated Imagery) to complex space-time game avatars that systematically function in the fashion segment and are involved in collaboration with brands. A fundamental methodological decision was to focus specifically on digital characters in the fashion industry, as their presence within the communication environment was algorithmically regulated, visually constructed, and fully controlled by developers and brands. The model involved an analysis of each character across three interconnected dimensions: the level of visual realism, communicative function, and the degree of brand integration. Each parameter was coded on a three-level scale (1-3), enabling quantitative interpretation and subsequent statistical analysis.

Visual realism (dimension 1) was evaluated based on the following criteria: 1 – stylised image (the character possesses conventional, simplified, or animated plastic; anatomical proportions may be distorted; there is no photorealistic texturing of the skin and materials; the visual language tends towards illustrative or multimedia aesthetics); 2 – semi-realistic (the image combines a realistic anatomical basis with noticeable stylisation elements; proportions are close to physiological ones, but aesthetic convention is preserved); 3 – hyper-realistic (maximum imitation of physical corporeality; reproduction of micro-details, light-and-shadow models, and materiality, closeness to photographic or cinematic realism). Communicative function (dimension 2) was evaluated based on the following indicators: 1 – narrative function (the character acts as a carrier of story and symbolic identity; content is focused on plot, emotional interaction with the audience, and the development of a symbolic field, rather than direct product promotion); 2 – hybrid function (a combination of narrative and commercial elements; advertising integrations are embedded into the character's overall image and their own storylines); 3 – commercial function (includes content structured around the promotion of brands and products; featuring advertising campaigns,

collaborations, and product demonstrations). Brand integration (dimension 3) was assessed according to the following indicators: 1 – episodic cooperation (one-off campaigns); 2 – strategic (regular partnerships, recurring collaborations); 3 – ecosystemic (the character functions as a long-term digital asset of the brand and is integrated into its communication infrastructure). Data coding was carried out based on the analysis of the duration of cooperation, the repetition of campaigns, and the degree of character inclusion within the brand ecosystem. The purpose of the testing was to identify structural patterns in the distribution of cases within the model and to test the hypothesis regarding the interplay between the level of visual realism and the degree of character institutionalisation in brand communication.

RESULTS AND DISCUSSION

In the contemporary system of fashion communication, the character is a key tool for shaping visual narrative identity. According to an interdisciplinary approach, a character is defined as an artistic image or protagonist integrated into the structure of a myth, literary text, visual art, or media environment. Drawing on R. Barthes' (1983) classical concept, the character becomes a key element of the fashion system, where visual images function as semiotic structures transforming material objects into symbolic forms. According to L. Manovich (2001), the digital nature of such objects determines a new logic of existence through programmability and variability, allowing characters to adapt across diverse media contexts. In the fashion industry, this image becomes the foundation for building a dialogue between the brand and its audience. This study proposed a classification of characters according to the method of embodying the artistic image, adapted for the analysis of visual strategies in fashion. The classification is based on three types of artistic image existence, each of which plays a specific role in conveying stylistic identity: plastic (spatial) characters in fashion represent images fixed in a static dimension of form and function as visual and material carriers of artistic concepts, realised in pictorial and graphic practices (fashion illustration, collection sketches, advertising posters) and sculptural forms (mannequins, boutique installations, art objects), where the physicality of the character emphasises the architecture of the costume and the spatial organisation of the clothing (Fig. 1).

Temporal (verbal) characters in fashion are images constructed in the mind of the recipient through textual narratives and semiotic strategies of description. They are implemented in the form of literary and mythological characters (brand storytelling heroes, lookbook characters with detailed biographies) and folklore archetypes used to provide the collections with symbolic depth, cultural continuity, and semantic complexity. Spatial and temporal characters form the most complex and synthetic group, combining visual corporeality with temporal unfolding and narrative

extension. These include real media personalities (models and actors in advertising campaigns and fashion films), and synthetic images (animated characters, game design heroes, brand collaborations with video games, and digital avatars in metaverses), in which visual identity is formed through a sequential change of frames or software simulation of movement.

This segment has seen a shift in influence: previously, digital characters copied real-world fashion, but this has changed so that virtual reality now dictates trends in the physical world. The exaggerated

plasticity and distinctive digital luminosity of game characters are becoming the primary source for creating real-world collections, changing conventional design thinking. The convergence between anthropomorphic images and game avatars (for example, in Balenciaga's projects for Fortnite) demonstrated how a character becomes a digital ambassador (Fig. 2). The visual form (lines, attributes) becomes a direct carrier of style, allowing the brand's ideology to be instantly read in a hybrid environment.

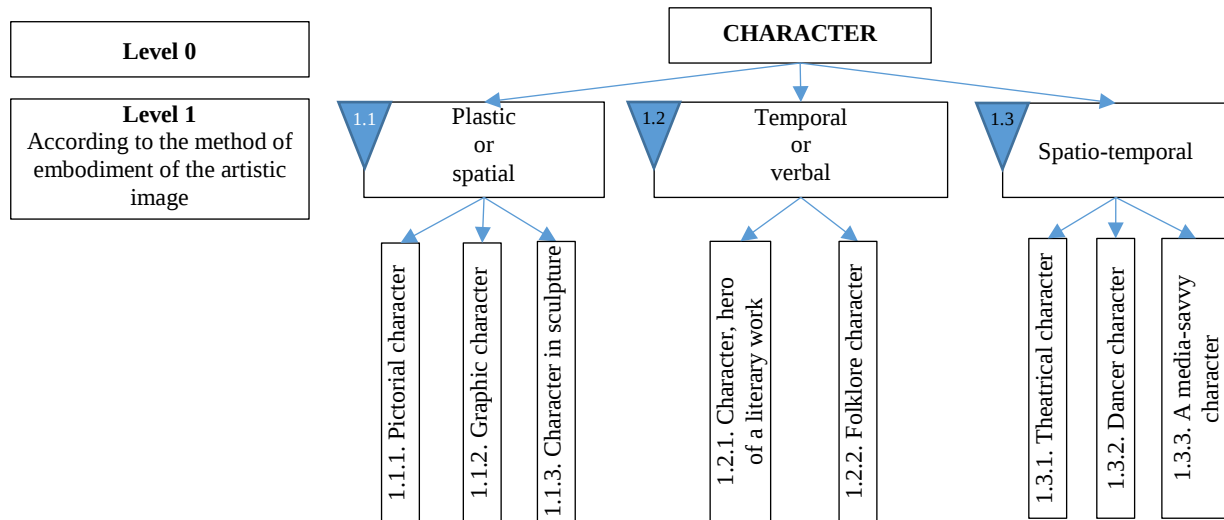


Figure 1. Systematisation of classification features of a character by the method of embodying the artistic image
Source: compiled by the authors

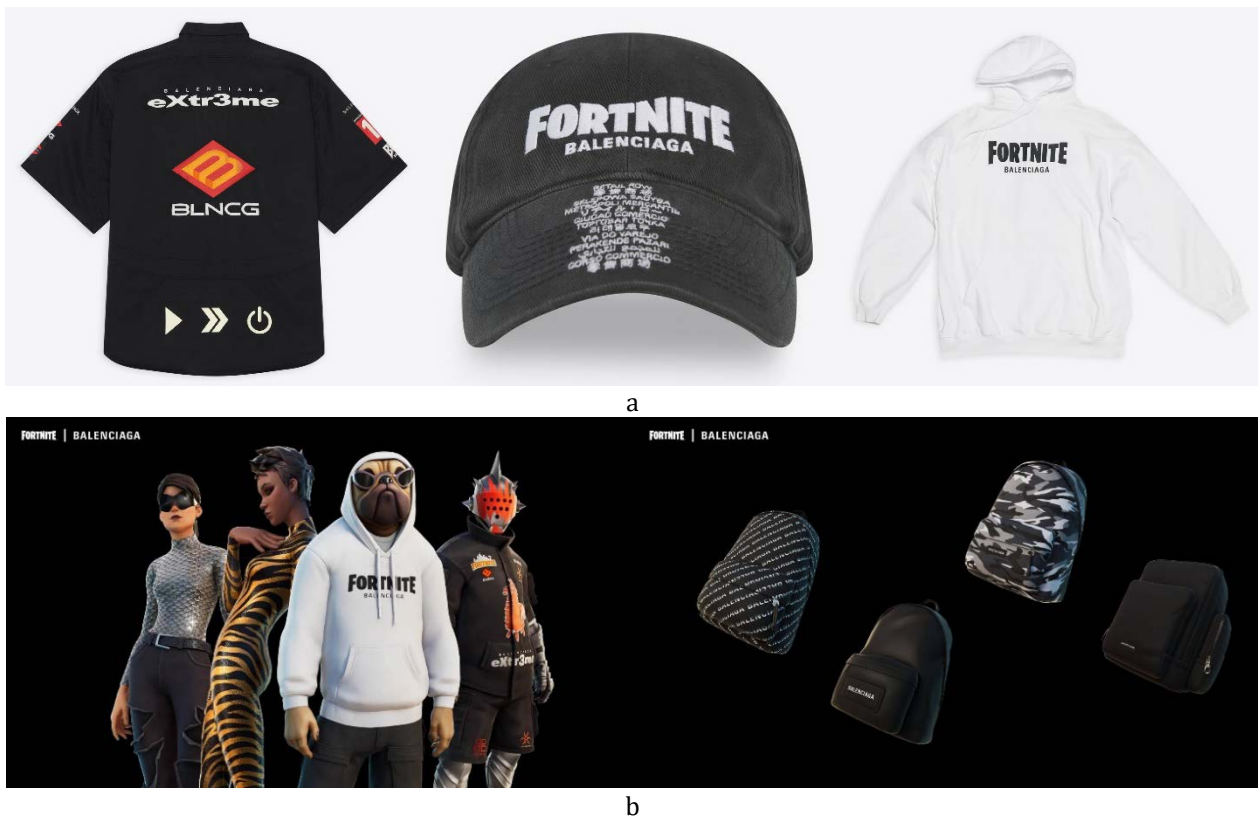


Figure 2. Balenciaga's collaboration with Fortnite and Epic Games

Note: a – physical collections; b – virtual collections in a digital gaming environment

Source: S. Yotka (2021)

Of particular importance for research is the illustrative character that emerges at the intersection of the plastic and temporal arts. This type of image is a unique hybrid: it accumulates the descriptive, semantic qualities of literature and the strict visual specificity of graphics. In the context of fashion communication, this allows the abstract idea of a brand to be transformed into a tangible visual narrative. In fashion communication, graphic characters become tools for stylistic systematisation: they allow brands to abstract themselves from specific human faces (models), creating a unique, easily recognisable visual code. Such systematisation allows disparate visual elements to be transformed into a unified narrative identity, where the character's drawing style, proportions, and colour palette convey the brand's values more effectively than traditional photography. Unlike characters made of material (decorative plastic), graphic and illustrative images have greater mobility in the digital space of fashion communication, which makes them a priority for analysis in this paper.

Spatial and temporal characters (cinema, animation, game design) are also of scientific interest within this study, as their share in the fashion industry is rapidly growing due to the development of metaverses and

virtual fitting technologies. The visual image of such characters is becoming the main object of style modelling, where compositional techniques are directly borrowed from traditional clothing design and transferred to the digital plane. The interconnection between graphic characters and dynamic models in game design allows taking a fresh look at the categories of movement and physicality. Analysis of compositional solutions in the clothing of digital heroes revealed a new pattern: not only does real fashion dictate images for virtual worlds, but the aesthetics of game design (virtual corporeality) are also becoming a powerful tool for shaping visual narrative identity and dictating real trends in the physical world. This convergence of physical and virtual aesthetics finds its practical implementation in the creation of complex brand environments, a prime example of which is the Gucci Town virtual space on the Roblox platform (Fig. 3). Functioning as a multi-layered ecosystem, this project integrates a gaming zone, an art hub, the Vault Plaza exhibition space, and a Gucci digital store. Such a multidimensional structure serves as a comprehensive model for interaction with users, where the stylistic systematisation of digital assets effectively combines entertainment, cultural representation, and digital commerce.



Figure 3. Gucci Town on Roblox as a model of communicative and commercial interaction

Source: Welcome to Gucci Town (n.d.)

Figure 4 demonstrated the adaptation of Louis Vuitton visual identity within the digital environment of League of Legends. The comparison of the physical clothing model and the virtual character design illustrated how fashion aesthetics are translated into game character styling through expressive silhouettes, decorative elements, and symbolic motifs, highlighting the growing interaction between luxury fashion and digital gaming culture.

A striking example of character transformation in the context of digital culture was the first Metaverse Fashion Week in the virtual space of Decentraland, where the user's avatar acts as a full-fledged fashion subject and style icon. The event featured digital collections from brands such as Dolce & Gabbana, Gucci, Balenciaga, Burberry, Ralph Lauren, etc., and

purely digital fashion houses such as The Fabricant. In this context, the avatar character functions as a spatio-temporal image: it not only demonstrates clothing during virtual shows, but also participates in communicative practices (concerts, lectures, parties), purchases digital items, and thus becomes an interactive carrier of brand identity. Thus, a digital character in the metaverse is not a secondary representation of a person, but an autonomous mediator of the fashion experience, where visual form, animation, and the possibility of personalisation form a new type of aesthetic and social presence.

At the second level of classification (Fig. 5), the character's artistic image is revealed through a system of visual signs and archetypes that serve as a foundation for conveying brand identity. The proposed

typology (sections 2.1-2.9), based on sign nature, enables the identification of mechanisms for adapting character semantics to the fashion communication field by strategically utilising its cultural genesis. Specifically, the historical character is treated as a specific individual whose visual recognition becomes a

tool for legitimising brand heritage or a means of retrospective style modelling. This approach aligns with the findings of B. Castillo-Abdul *et al.* (2022), who demonstrated that utilising recognisable branded content on Instagram increases audience engagement precisely by appealing to familiar cultural codes.

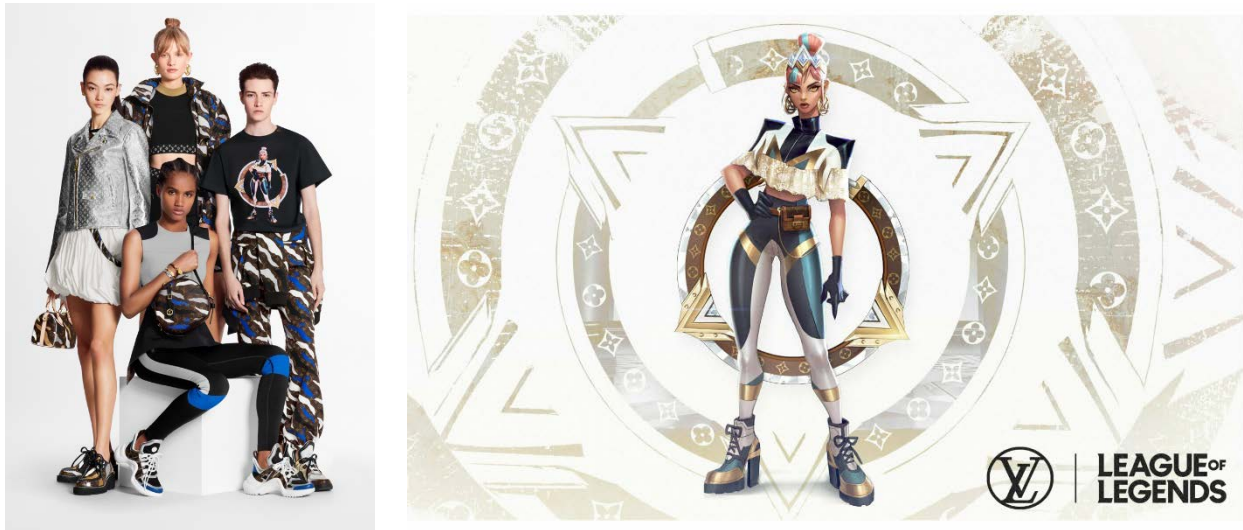


Figure 4. Integrating Louis Vuitton's visual identity into the League of Legends esports space
Source: B. Nash (2019)

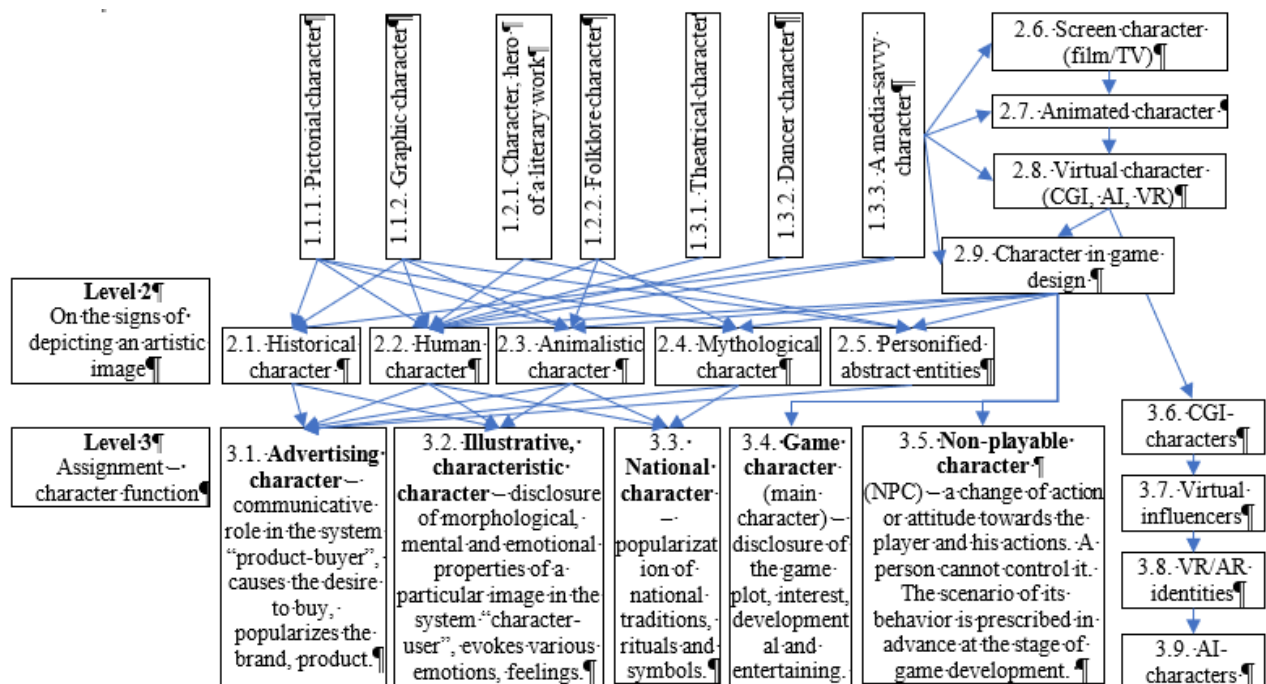


Figure 5. Systematisation of classification features according to the signs of the depiction of an artistic image and the function of the character

Source: compiled by the authors

The human character (anthropomorphic image) acts as a universal carrier of corporeality and style, through which social and aesthetic ideals are transmitted. In the context of the digital transformation of luxury fashion, as noted by A. Joy *et al.* (2022), such images become the foundation for metaverses and NFT collections, where anthropomorphic avatars function

as the primary mediators of the consumer experience. The animalistic character is based on zoomorphic motifs, where animal figures act as metaphors for specific qualities: grace, strength, or exoticism. They acquire the status of iconic elements within the visual code, serving as symbolic identity carriers for fashion houses. According to Ye. Gula *et al.* (2023), such iconic

images in the information space of graphic design ensure instantaneous brand recognition by the audience.

Mythological characters and personified abstractions, encompassing both ancient symbolic systems and fictional entities such as the concept of a digital soul, elevate the fashion product to the level of an extended narrative. These images imbue the product with symbolic transcendence, transforming it into a sacral artefact that exists beyond its material form. This creates a space for user social identification, as corroborated by C.I. Teng *et al.* (2023): avatar-mediated communication through complex entities allows consumers to integrate more deeply into the brand's ideological community. The virtual character (CGI, AI) represents the most technologically advanced group, where the artistic image functions as an algorithmically controlled (AI) identity. As noted by O. Lahoda *et al.* (2024), the use of virtual reality and digital imagery radically transforms both the creative process and audience perception, making interaction with the character immersive and tactually rich.

It is important to emphasise that in the context of visual narrative identity, these types of characters function in two ways. In the literary or descriptive component of the brand (storytelling), they exist as mental images that arise in the process of narration. However, in visual communication (graphics, fashion films, illustrations), they are transformed into illustrative symbols. It is this symbolism that allows the character to be instantly recognised by the audience: the visual form (lines, colours, attributes) becomes a direct carrier of the stylistic concept. Thus, the choice of character type at the second level of classification directly determines the nature of the visual language through which the brand constructs its narrative and engages with contemporary trends. In the digital environment, group of spatio-temporal characters requires additional detailing at the second level of classification. Within this logic, the category "Film and television characters" is distinguished, which, in the context of contemporary media convergence, covers a number of specific types of artistic images that function at the intersection of fashion, screen culture, and digital technologies. An animated character is defined as a product of computer modelling (3D animation) characterised by a high degree of visual detail and technical sophistication. This type allows brands to demonstrate the complex texture of fabrics, light and shadow effects, and the dynamics of a costume in virtual space, expanding the boundaries of traditional collection presentations. In game design, a character is interpreted as the most interactive form of artistic representation, in which the character becomes a full-fledged digital ambassador of style: their visual identity directly correlates with game mechanics, the achievement system, and symbolic prestige within virtual worlds, forming a stable model of brand value

representation in the digital environment. Digital (synthetic) characters occupy a separate analytical niche, appearing as the most complex hybrid form in the hierarchy of contemporary design. Unlike purely gaming or animated images, this type of character is based on the principles of autonomous existence and photorealistic imitation of life. In contemporary design, it is differentiated into several key varieties:

1. CGI-characters: high-tech digital models that are integrated into a real video environment or exist in completely generated worlds, demonstrating the boundary between physical and computational reality.

2. Virtual influencers: digital personalities with their own biographies and social activity on the network, functioning as independent media entities and direct marketing tools.

3. VR/AR identities: characters that exist in augmented or virtual reality, providing an immersive experience of user interaction with the brand through the effect of presence.

4. AI characters: dynamic images, whose behaviour and visual reactions are generated by neural networks in real time, allowing for the creation of a personalised communicative experience.

This expansion of classification allows viewing characters not simply as objects on screen, but as dynamic tools for stylistic systematisation. The inclusion of animated, game, and digital images in the general system of visual signs emphasises that contemporary fashion communication is no longer limited to the physical body. On the contrary, it actively uses synthetic forms to scale its narrative, turning the character into a key link between artistic intent and digital consumption. The third level of classification is related to defining the functional purpose of the character and answers the question of its role in shaping the aesthetic and cultural position of the brand. In the fashion communication system, where visual image is of paramount importance, the character acts as a mediator between the brand's underlying narrative and the consumer, translating conceptual ideas into an accessible and emotionally perceptible form. In this context, advertising characters (Fig. 6) take on particular significance, as they are seen as tools for creating a lasting emotional impression.

In the fashion industry, it represents an original, stylistically refined image – whether a person, an animalistic figure, or an anthropomorphic entity – that is associated with the company's visual code and is fixed in the collective perception of the audience. In the context of digitalisation, such a character can exist in both static form (e.g., an illustration in a glossy magazine) and dynamic form (an animated digital avatar on social networks and in virtual spaces). Its key function is to create a positive brand image, strengthen the audience's emotional attachment, and expand the circle of loyal consumers through visual storytelling and the repetition of iconic characteristics (Fig. 7).

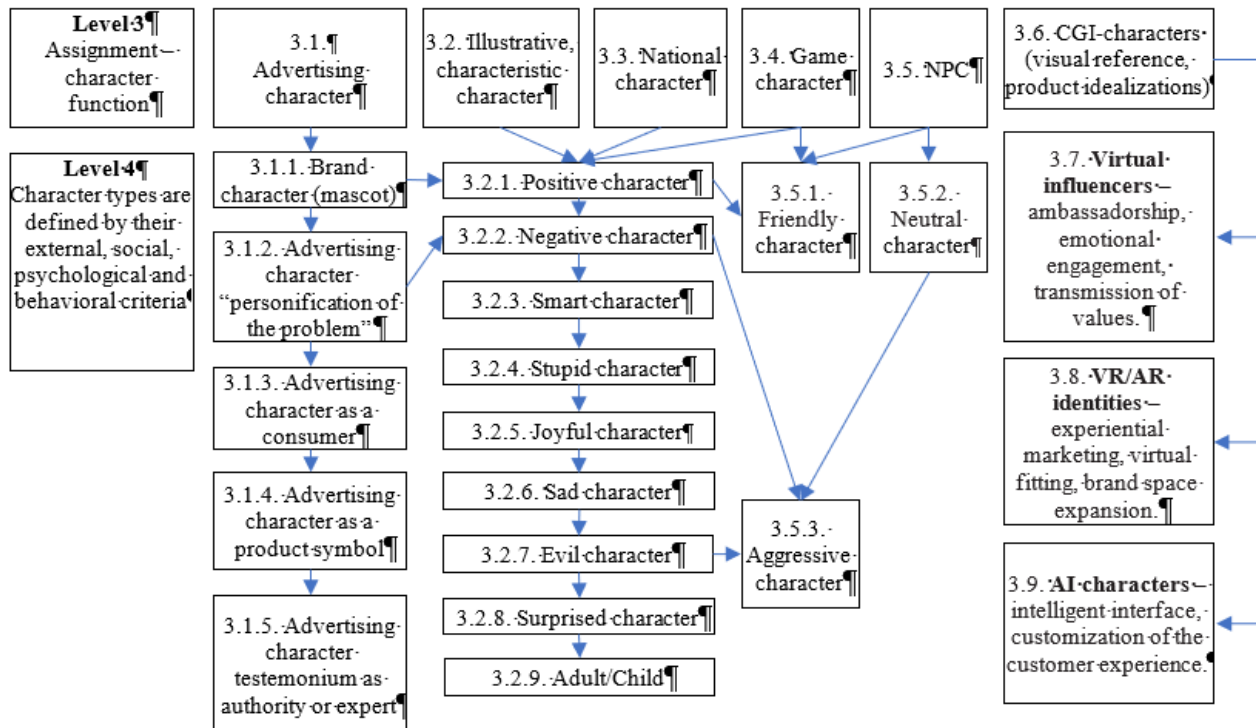


Figure 6. Typology of characters considering external, social, psychological and behavioural criteria
Source: compiled by the authors



Figure 7. Use of Virtual Face technology in the Prada Candy advertising campaign
Source: S. Salibian (2021)

Within this group, several functional types of brand characters are distinguished, each serving a unique role in fashion communication and brand identity. A brand character (mascot) is considered a visual constant within brand communication – a fictional figure that represents the brand's identity, embodies its core values, and functions as a generalised symbol of its visual representation. It performs a dual function: informative (conveying style codes) and emotional-spectacular (creating an attractive image that consumers desire to be a part of). An exemplary case is Polo Bear, the Ralph Lauren brand's mascot, which

consistently appears in clothing collections and advertising campaigns, becoming one of the brand's most recognisable symbols (Fig. 8a). Similarly, the character Vivienne (Louis Vuitton) symbolises a sophisticated synthesis of the brand's historical heritage and the spirit of modern travel, transforming traditional monogram elements into a dynamic narrative tool (Fig. 8b). In the broader context of visual communication, the Morton Salt Girl serves as a long-standing symbol of reliability and resilience in difficult situations, demonstrating how a mascot can anchor brand trust over decades (Fig. 8c). At the same time, the

Comme des Garçons Play Heart represents a shift toward minimalist, avant-garde character design, where a simple graphic icon becomes a powerful global identifier of subcultural belonging (Fig. 8d). Thus, the

mascot functions as a representative element of the brand's narrative identity, motivating emotional involvement and ensuring long-term loyalty through various stylistic forms.

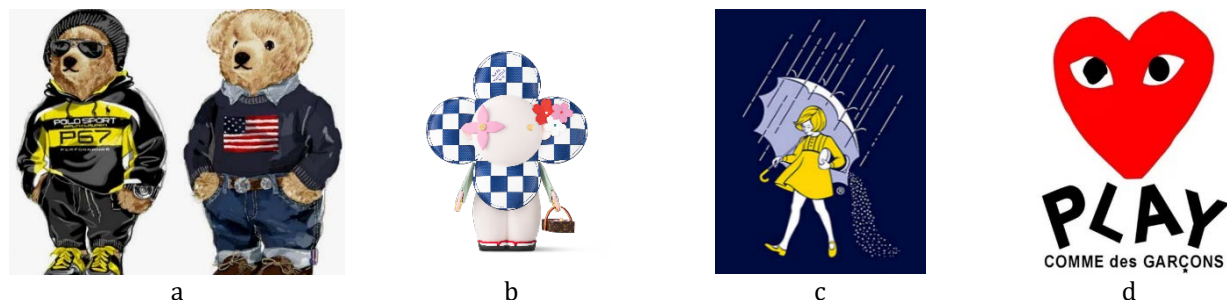


Figure 8. Classic brand characters as symbols of product qualities

Note: a – Polo Bear; b – Vivienne; c – Morton Salt Girl; d – Comme des Garçons Play Heart

Source: T. Fisenko (2022), Ralph Lauren (2024), Comme des Garçons (2025), Louis Vuitton (n.d.)

In contrast, a character that embodies a problem represents a different functional type within the system of brand visual communication. Unlike positive mascots, this type may feature negative traits, embodying aesthetic imperfection, discomfort, or a lack of style – problems that the brand claims to solve. In fashion narratives, such characters are constructed based on vivid associative imagery, illustrating a transformation from an inappropriate or outdated state to a stylish appearance and highlighting the brand's role in solving the problem. Another type is the consumer character, which serves as a typical representative of the audience. This character inspires trust due to its similarity to a real buyer, making it an effective tool for democratising fashion, particularly in the middle and mass segments. Through such a character, the brand conveys a clear consumption logic, creating an engaging and convincing message without relying on expensive celebrities. The focus here shifts from technical features to lifestyle and product design.

The character as a product symbol is a highly concentrated image that personifies specific product qualities, such as fabric softness, durability, or futuristic design. This type of character represents the visual essence of a brand, translating the physical properties of the product into artistic symbols, enhancing its visual identity and appeal. An expert character (Testimonium) leverages the authority of a well-known personality to legitimise the brand's aesthetic values. In fashion communication, an expert can be a real person (such as an influencer, designer, or actor) or a digital or animated character with high social capital. By integrating professional or media opinion, this character boosts consumer confidence in the product's quality and reinforces the brand's position as an expert in the field of style, making it an effective form of user marketing where the character acts as a guarantor of the consumer's choice.

An illustrative, characteristic character is defined by a pronounced personality, with the most significant manifestation of stylistic systematisation. This character's age, social activity, and emotional state are

conveyed through clothing and accessories. The composition of clothing – such as silhouette, form development features, and colour and texture characteristics – acts as a style marker. This characteristic can be interpreted by the fashion industry as a basis for trends and collections, making it a valuable object for design analysis. Ultimately, a game character is a digital figure in a computer game controlled by a human player, while NPC is controlled by the game's artificial intelligence. The appearance of a game character functions as a digital representation of the user and serves as a tool of self-presentation within the stylistic system of the brand. NPC, on the other hand, forms the game's contextual environment. Their visual design – whether friendly, neutral, or aggressive – dictates the stylistic atmosphere and compositional dynamics of the virtual space, shaping the player's experience within the game. Thus, brand characters in various forms – whether mascots, personifications of problems, or game figures – play distinct and crucial roles in shaping brand identity, consumer engagement, and the overall narrative of fashion and digital spaces.

The evolution of expert characters in the form of CGI influencers deserves special attention. Unlike real media personalities, such images are characterised by complete stylistic control, which gives the brand the opportunity to minimise reputational risks and ensure continuous support and control of visual identity in the digital environment. The functional role of such a character is to create a controlled narrative where every gesture, piece of clothing, and surrounding digital space works to strengthen the brand's overall image. This leads to the emergence of a new type of communication design, where the character becomes a digital twin of the brand's philosophy. The introduction of such interactive models into the communication field allows brands not only to convey aesthetic values, but also to collect data on audience preferences through game mechanics of interaction with the avatar, turning character design into a powerful tool for marketing analytics and trend forecasting. Thus, contemporary

CGI influencers have become autonomous subjects of fashion communication. Analysis of the activities of characters such as Noonnoouri, and Shudu allows

tracing the mechanisms of integrating virtual corporeality into real brand strategies (Fig. 9).

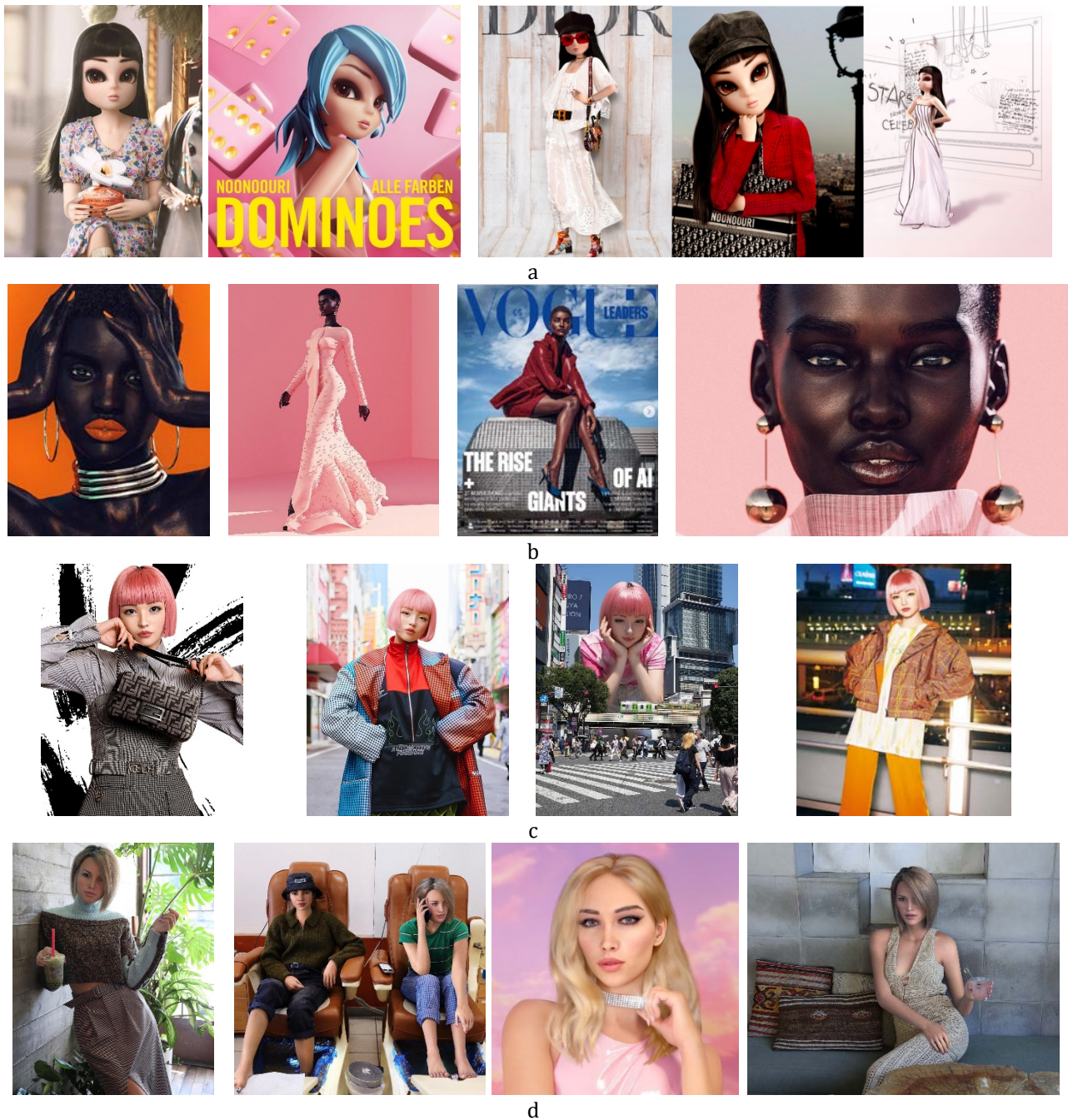


Figure 9. Virtual influencers as representatives of aesthetic strategies in digital fashion

Note: a – Noonnoouri; b – Shudu; c – Imma; d – Bermuda

Source: compiled by the author based on the analysis of official Instagram profiles (as of 2026 March 2) Noonnoouri (n.d.), Shudu.gram (n.d.), Imma.gram (n.d.), Bermudaisbae (n.d.) and official data from creative agencies Aww Inc (n.d.), and The Diigitals (n.d.)

A prime example of how such a character functions Bermuda (created by Brud studio), whose visual identity in collaboration with Chanel emphasises glossy luxury and a social media lifestyle (Fig. 9d). Another visualisation strategy is demonstrated by Noonnoouri – a stylised animated character with an emphasised fairy-tale-glamorous aesthetic (Fig. 9a). Her successful

collaboration with Dior, Versace, and Valentino illustrates the role of the character as a stylistic filter. Unlike realistic models, Noonnoouri transmits the values of brands through grotesque digital plasticity, which enhances the effect of “sacralisation” of fashion. Meanwhile, the case of Shudu (Fig. 9b), the world’s first virtual supermodel, created by photographer C.J.

Wilson, marks the intersection of the technological excellence of 3D-modelling and the current demand for cultural representation of African appearance in Balmain and Fenty Beauty projects. This line is continued by Imma (CGI-model from Aww Inc.), whose image combines streetwear and digital minimalism in collaboration with IKEA and Puma, symbolising contemporary urbanism (Fig. 9c). Combining these examples into a single system allows for the argument that digital characters in contemporary fashion act as intellectual mediators. Another prime example is Lilmiquela (n.d.). As a digital model and music artist, she demonstrates the potential for absolute stylistic consistency in collaborations with giants such as Prada and Calvin Klein. Her image, which balances on the edge of hyperrealism, allows brands to maintain strategic control over communication, eliminating the reputational risks associated with living media personalities. Continuity of the brand narrative is ensured within a hybrid environment where the boundary between the physical object and its digital projection is becoming increasingly transparent. This confirms the thesis that character design is not only an

artistic but also a strategic marketing tool for forecasting and shaping trends.

The generalisation of the obtained data allows for the statement that contemporary character design has transformed from a purely aesthetic solution into a strategic marketing tool. The dynamics of indicators presented in Figure 10 illustrated the transition from the decorative use of virtual models to their functioning as intellectual brand mediators. A detailed analysis of the sample distribution across three dimensions reveals key patterns in the development of digital brand platforms. The average score for "Integration" across the sample is 2.4, confirming the dominance of a systemic approach. The "Function" dimension demonstrated the highest stability, with 70% of the studied cases (e.g., Lil Miquela, Rozy, Noonnoouri, Lu do Magalu) receiving the maximum score of 3, indicating a priority for communicative efficiency over visual form. Conversely, the "Realism" scale proved to be the most variable, with indicators ranging from 1 point (stylised characters like Janky, Bermuda_2, and early-stage Blawko) to 3 points (hyper-realistic models such as Rozy and Margot), reflecting the coexistence of diverse graphic strategies depending on the brand's archetype.

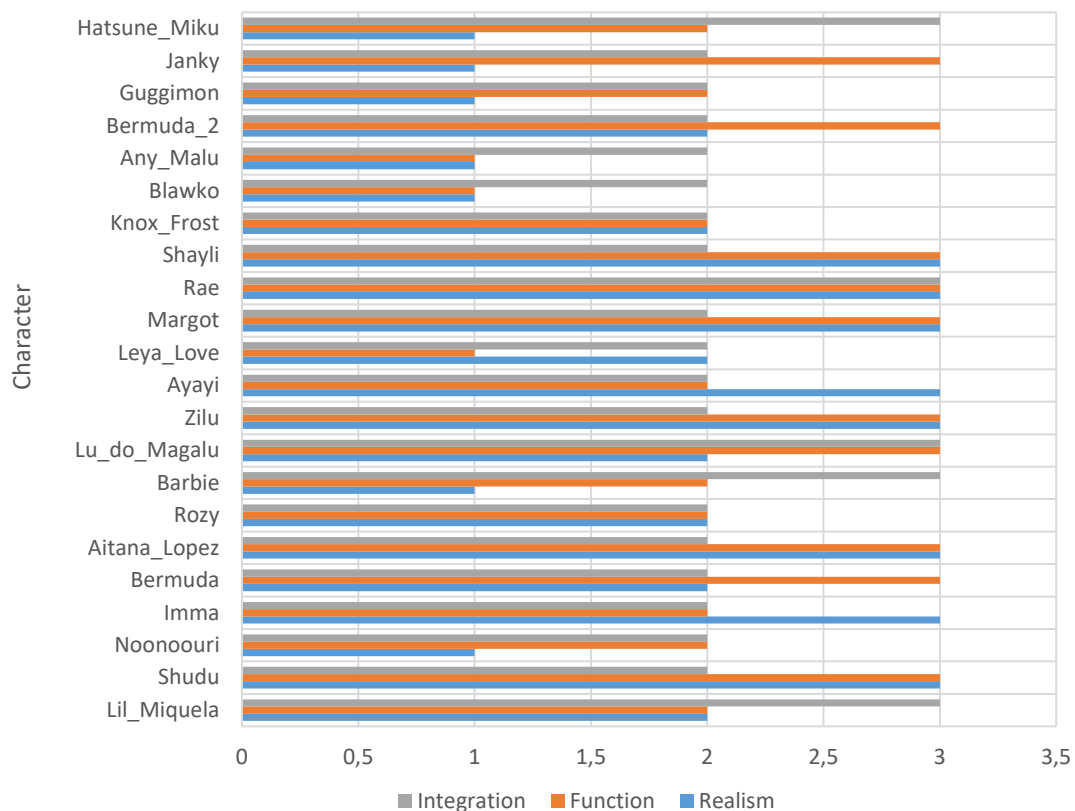


Figure 10. Comparative analysis of digital characters based on visual realism, communicative function, and brand integration parameters (n=22)

Source: authors' development

The distribution analysis demonstrated the dominance of the strategic integration level (12 samples; in particular, Lil Miquela, Shudu, Imma, Noonnoouri), indicating a transformation of digital

characters from one-off advertising tools into stable communication partners for brands. The ecosystemic level (7 samples; in particular, Lu do Magalu, Zepeto characters, Knox Frost) is characterised by the

profound integration of the character into the brand structure and their functioning as a digital asset. Episodic integration (3 samples; in particular, Bermuda and Blawko during the early stages of their brand collaborations) demonstrates the gradual replacement of one-time collaborations with systemic strategies. The evolution of CGI-influencers demonstrated the development of a new type of actor in the fashion industry – a stylistically managed digital agent, which provides brands with control over the communication narrative, predictability of reputational risks, and a long-term strategic presence in the digital environment. Hyperrealistic models are more likely to be carriers of stable commercial cooperation and are integrated into long-term brand strategies. Stylised characters function as a stylistic filter, enhancing the symbolic and conceptual dimension of the brand. In both cases, the digital avatar ceases to be just a visual image and becomes a tool for strategic brand building.

The findings confirmed that the artistic image of a character in the fashion industry has evolved from a secondary decorative element into a central strategic agent of the brand ecosystem. This shift in design thinking marks a transition from purely formal stylistic decisions to the creation of complex phygital platforms where the character ensures narrative continuity and economic integration. The proposed systematisation of character classification features allows for the organisation of contemporary scientific discourse, moving it from isolated observations toward a comprehensive system of projective modelling. However, the practical realisation of such complex strategic agents requires a high degree of technological precision and morphological accuracy.

In this context, the current research correlates with the foundational study by A. Slavinska *et al.* (2018), who established a mathematical framework for the interactive transformation of 3D mannequin surfaces into 2D garment sweeps. While A. Slavinska *et al.* focused on the engineering precision of clothing construction, authors' classification expanded this concept by adding a semiotic dimension to the described mesh and surface models. The ability to adapt 3D models to diverse body types (both typical and atypical) serves as a rigorous engineering basis for the high-quality, detailed reproduction of the anthropomorphic category of characters. The reliability of visualisation achieved by A. Slavinska *et al.* through database verification and silhouette transformation scenarios is a primary factor in establishing a character's visual realism. Consequently, the authors' concept of character systematisation bridges the gap between abstract graphic design and functional clothing engineering, enabling the character to function as a realistic mediator of brand values.

The thesis of the character as an active media agent was supported in the study by O. Kolisnyk *et al.* (2021), where design was viewed as a tool for organising social interaction. The current classification expands this approach by defining the character as the brand's

intelligent interface, ensuring narrative continuity within the brand-consumer system. The authors' findings confirmed contemporary scientific theses regarding the acquisition of parasocial subjectivity by digital objects. By separating virtual influencers into an independent group, a significant methodological gap in contemporary science has been filled. The character is no longer a passive advertising sign but a dynamic subject of communication. This perspective is further supported by O. Kolisnyk *et al.* (2021), who interpreted contemporary graphic design as a phenomenon of social interaction. This idea was emphasised by stating that the fashion character acts as an intellectual interface, organising the brand's social ecosystem through constant engagement in the narrative.

Furthermore, the integration of cultural genesis into character design, as evidenced in second level of classification, aligns with the research by O. Yezhova *et al.* (2024), who focused on the artistic and traditional cultural aspects of corporate identity, author's model demonstrated how these codes are adapted to phygital reality. The use of historical or mythological archetypes is not merely an aesthetic choice but a mechanism for legitimising brand heritage. This is consistent with the evidence provided by B. Castillo-Abdul *et al.* (2022), who demonstrated that branded content on platforms such as Instagram achieves higher engagement when it appeals to familiar cultural codes. Authors' classification provided a systematic framework for selecting these codes, ensuring that the character's semiotic nature resonates with the target audience's collective memory.

The synthesis of the proposed authors' systematisation, the emotional and technological approach of O. Slityuk & N. Nochenko (2023), and the ethno-cultural identity research by O. Yezhova *et al.* (2024) allowed defining the character as a strategic, multi-layered tool in contemporary design. Authors' thesis on the parasocial subjectivity of a digital agent is methodologically reinforced by the principles of animated characterfulness, where visual resonance is enhanced through national cultural codes and specific geometric shapes that convey leadership and professionalism. Specifically, it has been established that the use of anthropomorphic mascots, unique corporate fonts, and symbolic elements (such as circular shapes or specific colour palettes) ensures brand recognition and dynamism. The integration of AI and NFT technologies transforms these graphic constants into an autonomous digital identity, the successful representation of which relies on visual realism algorithms and engineering precision. Thus, combining the graphic language of archetypes, traditional cultural aspects, and high engineering fidelity creates a unified methodological foundation for building consumer trust and ensuring strategic brand integrity within an immersive environment.

Overall, the findings demonstrate the transformation of the character in the fashion industry from a secondary decorative element into a strategic

mediator of brand communication within the phigital environment. The proposed classification system integrates engineering precision of modelling, semiotic meaning, and cultural codes, forming a coherent methodological framework for designing characters as intelligent interfaces between the brand and the consumer. The synthesis of graphic design approaches, digital technologies, and cultural heritage allows the character to be interpreted as a multi-layered instrument for shaping narrative brand identity and supporting economic integration. In this way, the character becomes a central structural element of the brand ecosystem, ensuring visual coherence, narrative continuity, and effective communication with the audience.

CONCLUSIONS

Within the framework of the conducted research, a complex three-level model of character classification as a key tool for the development of visual narrative identity in fashion was formed and theoretically substantiated. The proposed structure allowed systematising the variety of artistic images that function in the contemporary hybrid media space. A typology has been developed based on the method of embodiment of the artistic image, which allowed combining plastic, temporal, and spatio-temporal forms into a single analytical system. This emphasised the continuity of character development from classic fashion illustration to complex synthetic models that exist in the digital dimension.

A second-level classification is proposed and detailed, where for the first time within a single approach, on-screen, animated, game and virtual characters (CGI, AI) were differentiated. This approach allowed substantiating the transition of the character

from the status of a passive object of contemplation to the role of an autonomous “digital ambassador”, whose identity was algorithmically managed and fully integrated into the brand’s marketing logic. The functional purpose of characters was systematised, which allowed identifying new roles in the media environment: from immersive interaction in VR/AR identities to intelligent customisation of the client experience using AI agents. It was substantiated that the contemporary character acts as a mediator of complex cultural meanings, ensuring the transmission of stylistic codes of the brand without being tied to the physical body of the actor or model.

Prospects for further exploration are seen in the transformation of the proposed theoretical model into an applied toolkit for designing digital images in the fashion industry. The next stages of the work involve the development of a matrix for strategic character selection based on empirical analysis, which will allow forming an algorithm for selecting image parameters (type, level of realism and function) in accordance with the specific marketing objectives of the brand. Special attention will be paid to the analysis of the correlation between the visual code (“virtual corporeality”) and the level of audience involvement, which will allow determining the optimal characteristics of the character for building trusting communication.

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CONFLICT OF INTEREST

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Стилістична систематизація персонажів як інструмент формування візуальної наративної ідентичності в модній комунікації

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Анотація. Персонаж дедалі частіше функціонує не як допоміжний елемент айдентики, а як самостійна естетична система, що визначає стилеві коди, композиційні принципи та характер комунікації. Водночас у науковому дискурсі відсутня цілісна модель його стилістичної систематизації, що ускладнює аналіз впливу персонажа на сучасне проектування костюма. Мета роботи полягала в теоретичному обґрунтуванні та розробці багаторівневої стилістичної систематизації персонажів як базового інструмента формування візуальної наративної ідентичності бренду, а також у визначенні механізмів їхнього впливу на композиційне моделювання в умовах цифрового середовища. Методологічну основу становило поєднання системно-структурного аналізу, семіотичного та іконологічного підходів, методу порівняльної типології, елементів морфологічного аналізу форми, а також моделювання концептуальних структур. Розроблено теоретичну модель стилістичної систематизації, у межах якої персонаж інтерпретується як багаторівнева структура, що забезпечує цілісність візуальної наративної ідентичності бренду. Модель включила три взаємопов'язані рівні. Технологічний рівень визначив морфологію та способи втілення образу, від статичної графіки до динамічних систем ігрового дизайну. Семіотичний рівень ідентифікував архетипні основи та культурні прототипи, включаючи як історичних постатей, так і цифрових аватарів. Функціональний рівень визначив комунікативну роль персонажа як символічного представника, експертного посередника або стилістичного домінанта в рамках стратегії бренду. Дослідження обґрунтувало перетворення символу з пасивного знака на автономного естетичного посередника між цифровими середовищами та фізичним дизайном одягу. Воно продемонструвало, що просторові та часові символи породжують нові підходи до композиції, силуету та динаміки форм, впливаючи на сучасні модні тенденції. Отримані результати можуть бути використані у дизайн-проектуванні, розробці бренд-стратегій, створенні цифрових колекцій та освітніх програмах з дизайну одягу і візуальних комунікацій

Ключові слова: багаторівнева аналітична модель; семіотика бренду; цифрове втілення; морфологія символів; архетипні структури; гібридне візуальне середовище; стратегії комунікації бренду



The logic of construction: The evolution of design philosophy in educational construction toys

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Abstract. The purpose of the study was to reconstruct the genealogy of design philosophies that transformed construction toys from closed instructional systems to open platforms and, ultimately, to socially engaged artefacts. The study employed a qualitative historical design using multiple-case comparative analysis based on primary sources (patents, designers' and educators' writings), historical commercial materials, and key educational and philosophical texts, supplemented by contemporary scholarly and industry sources. The analysis was structured around two dimensions – systematicity (connection mechanisms, materials, modular logic) and didacticism (educational philosophies, cultivated skills, and encoded cultural values) – to trace the evolution of educational construction toys. Each case was analysed along these axes: systematicity (materials, connection mechanisms, modular logic) and didacticism (educational philosophy, skills cultivated, cultural values). A clear evolutionary trajectory emerged. In the early period (1840s – early 20th century), construction toys functioned as closed systems designed to transmit philosophical or engineering knowledge. During the industrial-modernist stage (early 20th century – 1980s), supported by innovations such as LEGO “clutch power”, construction toys transformed into open platforms enriched by narrative and systemic approaches. In the contemporary era (1990s – present, 2026), the design logic diversified to address social and environmental challenges, including gender representation and sustainable materials. The study provided evidence that construction toys act not merely as playthings but as educational artefacts encoding worldviews, pedagogical strategies, and social values. The results may be useful for educational toy designers, educators, and researchers of material culture as a methodological foundation for creating and applying construction toys that align technological design, pedagogical goals, and cultural context

Keywords: toy design; systemic design; modular platforms; material culture; pedagogical artifacts; educational tool

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INTRODUCTION

As cultural artefacts, toys embody the pedagogical ideals, technological capabilities, and societal values of their time. Understanding the design evolution of these objects offers a unique lens for examining the changing relationship between education and material culture. However, while their role in child development is widely acknowledged, the specific evolution of design logic remains under-researched. Recent research has extensively examined the relationship between toy design, cognitive development, and user interaction. According to H. Saikia *et al.* (2023), the visual design elements of educational toys, such as colour, pattern, and structure, are critical factors that directly influence visual perception and the subsequent development of reading and mathematical skills in early childhood.

Building on the connection between physical form and cognition, Ç.İ. İleri *et al.* (2023) argued that construction toys offer unique affordances that elicit spatial language and gestures, suggesting that variation in design mechanics is essential for fostering mental folding and perspective-taking skills required for STEAM fields. I. Gryshchenko *et al.* (2024) examined how design education integrates research and creative activity across science, art, and engineering, showing that interdisciplinary learning strengthens professional competence. This perspective on cultivating systematic and constructive thinking in design students resonates with the evolving design philosophy of educational construction toys, in which the logic of construction itself serves as both a pedagogical tool and a reflection of broader design principles.

Shifting the focus from educational outcomes to the design process, researchers seek to categorise how these objects are conceived and used. According to J.F. Legaard & H.M. Skovbjerg (2024), construction toys possess distinct functional and narrative affordances, and the central challenge for designers lies in balancing structured instructions with the freedom of open-ended play to maintain children's engagement. A. Codner & C.A. Lauff (2024) investigated the prototyping phase of toy development, showing that the fidelity of a prototype – whether it prioritises form or function – considerably influences how children provide feedback, thereby highlighting the complexity of translating educational theories into physical products. In parallel with these functional studies, other researchers have explored the cultural and technological context of toys.

According to V. Komis *et al.* (2021), the field experienced a paradigm shift towards “smart toys”, where the focus changed from developing transversal skills such as symbolic thinking to specific 21st-century skills, including computational thinking. However, a counter-narrative re-examines traditional craftsmanship. According to Y. Yan *et al.* (2024), traditional systems such as the Chinese mortise and tenon structure can be revitalised through “emotional design” frameworks, which connect historical cultural

values with modern consumer needs at instinctive and reflective levels. Similarly, N. Yang & O. Yezhova (2025) analysed the Phoenix Stamp to demonstrate how traditional Luban lock structures can be reinterpreted as modern educational toys that preserve the mathematical complexity of ancient craftsmanship while offering engaging structural challenges. Taking a historical perspective, M. Mindrup (2023) indicated how architectural toys and models function not merely as playthings but as affective objects that shape societal concepts of domesticity and space. Despite these diverse perspectives on cognition, prototyping, and technology, a lack of genealogical research persists on how the underlying logic of construction has evolved over the last two centuries.

The purpose of this study is to reconstruct the genealogical evolution of design philosophies in educational construction toys from the 1840s to the present (2026), analysing the trajectory from closed didactic systems to open, socially engaged platforms.

MATERIALS AND METHODS

This study employed a qualitative historical research design, using a multiple-case comparative analysis to trace the evolution of design philosophies in educational construction toys. The data are drawn from a systematic review of diverse historical materials. These include primary sources such as key product patents – most notably LEGO's 1958 “stud-and-tube” coupling system (Kirk, 1961) and the 1920 Lincoln Logs “Toy Cabin Construction” patent (Lloyd, 1920) – as well as original writings by designers and educators, for example, Froebel's discussions of gifts (Provenzo, 2009). Commercial and marketing materials, such as Meccano Ltd.'s “Engineering for Boys” advertisement (The Brighton Toy and Model Museum, 2022), LEGO's gender-inclusive campaign (The LEGO Group, 2021), and early Lincoln Logs packaging slogans (Mindrup, 2023), were also examined. The corpus further includes seminal educational and philosophical works, including M. Montessori's (1912) method and S. Papert's (1980) “Mindstorms”, along with contemporary scholarship, design critiques, relevant cultural studies, and authoritative news reports documenting significant industry decisions.

The data analysis was structured around the two core concepts – systematicity and didacticism. For each historical period, the selected cases were examined from two analytical dimensions. First, systematicity analysis was used to investigate the toy's core connection mechanisms (e.g., bolts, grooves, clutch power), material properties (wood, metal, plastic), and modular logic (whether it replicates real-world structures or enables open-ended creation), to define the boundaries and characteristics of its “system”. Second, didacticism analysis was used to investigate the dominant educational philosophy embedded in the toy (e.g., idealism, pragmatism, constructivism), the key skills it is intended to cultivate (e.g., abstract thinking, mechanical principles, systems thinking), and its

encoded cultural values and ideologies (e.g., national myths, gender roles, environmental responsibility).

RESULTS AND DISCUSSION

Early designs as closed systems – from philosophical encoding to engineering models (1840s –early 20th century). In the early lineage of educational construction toys, from the 1840s to the early 20th century, the core design philosophy was not oriented toward open-ended creativity. Instead, designers focused on creating “closed systems” with explicit educational objectives. The intention was to “encode” a specific worldview or skill set through a predetermined set of rules and components, guiding users to decode them. From F. Froebel’s philosophical educational tools to Meccano’s engineering models, these early designs exhibited a strong didactic character through meticulous control over materials, forms, and connection methods. In the 1840s, Friedrich Froebel designed a series of educational toys introduced in sequential order, known as “gifts” (Fernsebner, 2003) (Fig. 1). The system introduced components in a strict sequence: starting from a uniform woollen ball (the first gift), followed by spheres and cubes representing opposing concepts (the second gift), and then progressing to divided cubes illustrating the relationship between parts and the whole (gifts three to six). This progression constituted a one-way path from simple to complex and from concrete to abstract. The systematicity and educational sequencing of this design were elaborated in detail by F. Froebel in the periodicals he founded. Each component’s form carried carefully designated symbolic meanings (Morgenstern, 1882). The sphere

represented unity, while the cube symbolised stability. Through these geometric shapes, the designer materialised abstract philosophical concepts. F. Froebel’s three modes of play – the “forms of life,” the “forms of beauty,” and the “forms of knowledge” – functioned as predefined contexts for this design language. The success of this design lay in its ability to guide users’ thinking, such as that of architect Frank Lloyd Wright, towards abstract structural reasoning.

M. Montessori’s design approach advanced further by integrating the role of the teacher into the objects themselves. Her system of educational materials achieved the clear functional goal of self-education through two core design principles. First, each material focused on a single, isolated physical attribute, such as size or colour, to maximise informational clarity and avoid cognitive confusion. For example, the Pink Tower was intentionally designed with uniform colour and texture, retaining only “size” as the variable (Fig. 2). The second principle was the physical implementation of “error checking”, representing a key innovation. This innovation was the most critical one. The designer embedded a feedback mechanism within the objects themselves, making the material the source of information. In the cylinder blocks with sockets, incorrect matches produced physical incongruities (either failing to fit or wobbling). This immediate, non-judgemental physical feedback replaced traditional correction provided by adults. As M. Montessori (1912) explained in the first English exposition of her method, this design choice aimed to directly guide user behaviour through the physical properties of the objects, fostering independence and concentration.

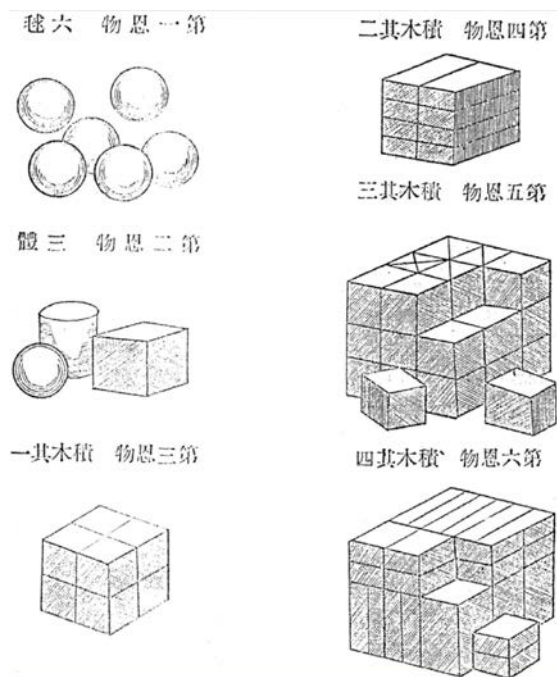


Figure 1. Diagram of Froebel’s gifts offered by the Shanghai Kindergarten Society (1909)

Source: S.R. Fernsebner (2003)



Figure 2. Montessori Pink Tower

Source: M. Esta (2017)

With the advent of the industrial era, Meccano Ltd. embodied another type of closed-system design logic – direct simulation of real-world technology (Guijarro, 2021). Its design language was directly borrowed from contemporary engineering. Reusable metal strips, angle girders, plates, nuts, and bolts were miniaturised representations of construction methods used for bridges, cranes, and other large-scale structures. Meccano's design intent was explicit: as repeatedly emphasised in its early 20th-century advertisements under the slogan “Engineering for Boys”, it functioned as a tool for imparting practical technical knowledge. Rather than aiming to stimulate unrestricted imagination, the design enabled users, through simulation, to understand and internalise dominant engineering principles and societal values of the period (Gök & Sürmeli, 2022) (Fig. 3).



Figure 3. Meccano advertisements
“Engineering for Boys”

Source: The Brighton Toy and Model Museum (2022)

During this period, the design of educational construction sets focused on creating closed systems with clearly defined learning objectives. Toys from this era promoted the development of specific skills and knowledge through a strictly organised sequence of elements and forms. They were designed to convey certain ideas or concepts through the physical properties of objects, particularly through interaction with them, thereby enabling specific educational outcomes. This approach promoted systematic thinking and structured learning, guiding users towards specific goals.

Transition to open design – from narrative layering to system empowerment (early 20th century-980s). Entering the 20th century, especially in the post-World War II era with the rise of the mass market, the design philosophy of educational construction toys underwent a pivotal shift. This period can be characterised as the Industrial-Modernist stage – a time when designers relied on industrial production, standardised materials (metal, wood, plastic), and modernist ideas (rationality, functionality, systematicity). The focus moved away from closed systems with clearly defined goals towards open platforms offering richer possibilities. This evolution manifested in two key design strategies: first, the “narrative layering” approach, exemplified by Lincoln Logs, which built cultural stories on top of existing functional designs; and second, the “system empowerment” approach, exemplified by LEGO, in which core technological innovations enabled platform-based design.

The success of Lincoln Logs stands as a classic example of “dual-layer design”, clearly demonstrating how a toy’s physical functionality and its cultural narrative can be independently designed and selected. The toy’s core construction principle – the interlocking log-beam structure – was derived from its inventor, John Lloyd Wright’s experience working on the earthquake-resistant design of the Imperial Hotel in Tokyo, Japan. This functional and highly purposeful design, aimed at developing children’s building instincts, was patented as a “toy-cabin construction” in 1920 (Fig. 4).

On the marketing side, however, the designer chose not to highlight this story of modern international engineering. Instead, he engaged in a notable act of brand storytelling by naming the product Lincoln Logs. By overlaying a national myth about President Abraham Lincoln’s log-cabin childhood and reinforcing it with the packaging slogan “Interesting playthings typifying the spirit of America”, the product was imbued with cultural values such as pioneering spirit and self-reliance (Mindrup, 2023). This deliberate separation of physical and narrative layers demonstrated that the meaning of a toy can be intentionally designed as an element independent of its physical functionality – significantly enhancing its market appeal.

If Lincoln Logs represent a straightforward combination of function and narrative, the rise of LEGO exemplifies their integration at a higher level. Through a single but transformative technological innovation, LEGO empowered an overarching design philosophy and created a truly open-ended platform. In response to the prevailing problem of a toy market lacking a coherent system, company leader Godtfred Kirk Christiansen articulated a strategic design vision: to create an integrated system of play. Its core principles – such as “unlimited imagination” and “suitable for all ages” – established open and inclusive goals for the platform.

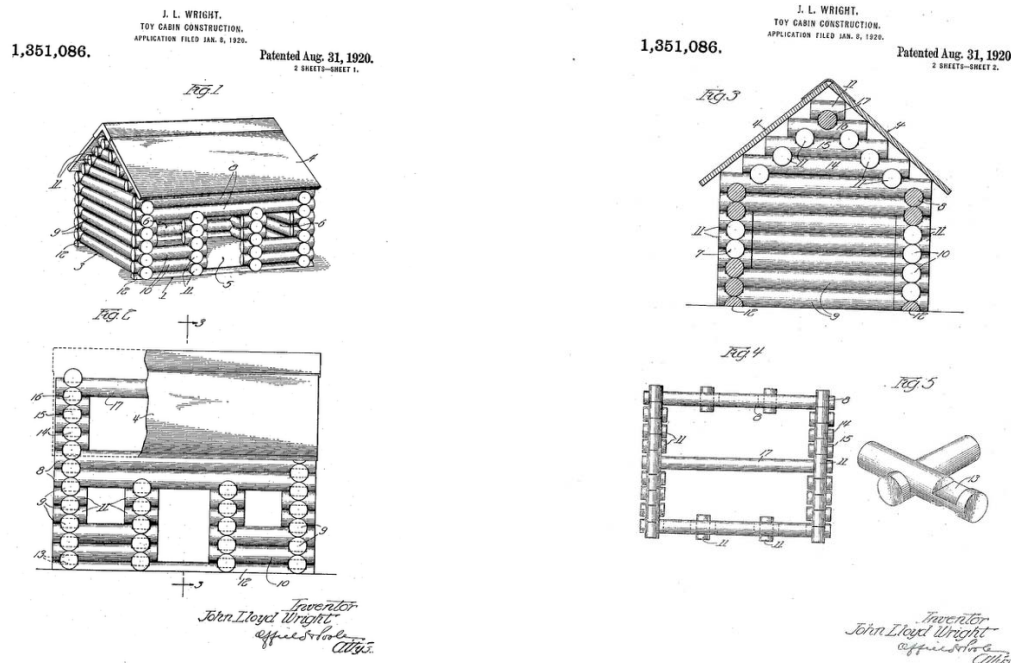


Figure 4. Lincoln Logs' patented "Toy-Cabin Construction" design

Source: W.J. Lloyd (1920)

The core technological innovation was clutch power. This ambitious philosophy could not be realised without a corresponding technical solution. The patented stud-and-tube coupling system of 1958 (Kirk, 1961) became the physical foundation of this vision. By precisely matching the hollow tubes on the underside of a brick with the studs on top, the design produced stable and reliable clutch power. This seemingly simple innovation solved the fundamental instability of earlier bricks, enabling any brick to connect securely with any other. In this way, it activated the potential of the system philosophy (Fig. 5).

LEGO's system eventually converged with S. Papert's (1980) educational theory of Constructionism. In his seminal work "Mindstorms", S. Papert advanced the idea of learning by making, which provided a strong theoretical articulation for LEGO's open-ended platform. This fusion of commercial design and academic theory culminated in the LEGO Mindstorms series, combining physical bricks with programmable digital technology. In this form, LEGO evolved from a construction toy into a cognitive exploration tool – one that enables users to construct ideas and bring them to life. Ultimately, LEGO's design logic underwent a transformation from pedagogical guidance to user empowerment (Komis *et al.*, 2021).

The evolution of construction toys from closed systems to open platforms reflects changing approaches to learning and creativity in design. At the beginning of the 20th century, design focused on clearly defined goals and strictly structured rules that promoted the development of specific skills, such as

spatial thinking or technical knowledge. Over time, toys became more flexible and open, providing opportunities for creative self-expression. Open construction systems, such as LEGO, began to combine physical construction with innovation and cultural narratives, allowing children not only to build but also to develop critical and systematic thinking. This transition indicates a shift in focus from formal learning tools to more intuitive and multifunctional systems.

The multidimensional turn: Contextualising the system (1990s – present, 2026). Since the 1990s, the design philosophy of construction toys has ceased to follow a single linear evolutionary path. Instead, it has undergone a multidimensional turn. Systematicity is no longer confined to the internal logic of connection; it has diversified into distinct approaches to construction that facilitate different cognitive outcomes and interaction modes. This period is characterised by three distinct shifts: a structural divergence from static volumes to dynamic skeletons, an interface innovation towards intangible connections, and a digital overlay that transforms toys into cyber-physical systems. Since LEGO established its dominance with stacking logic, the market has evolved into a pluralistic landscape; a new wave of systems has emerged that prioritises skeletal engineering.

Systems such as K'NEX (introduced in 1992) and VEX Robotics utilise flexible rods, connectors, and beams to create spatial frameworks. Unlike brick-laying logic, these systems mimic real-world structural engineering, prioritising force transmission, equilibrium, and kinematics (Fig. 6). This shift

fundamentally alters the cognitive demands placed on the user. Interaction evolves from static spatial arrangement (sculpting form) to dynamic systemic thinking (engineering motion), requiring the child to predict movement and structural forces. Recent academic designs extend this logic further. For instance, K. Kshirsagar *et al.* (2025) introduced

MorphBlox, which utilises kinetic tessellations – modular blocks that move and transform – to help children explore complex mathematical concepts through dynamic manipulation rather than static building. This transition from static volume to dynamic skeleton reflects a broader pedagogical shift from spatial visualisation to systems thinking.

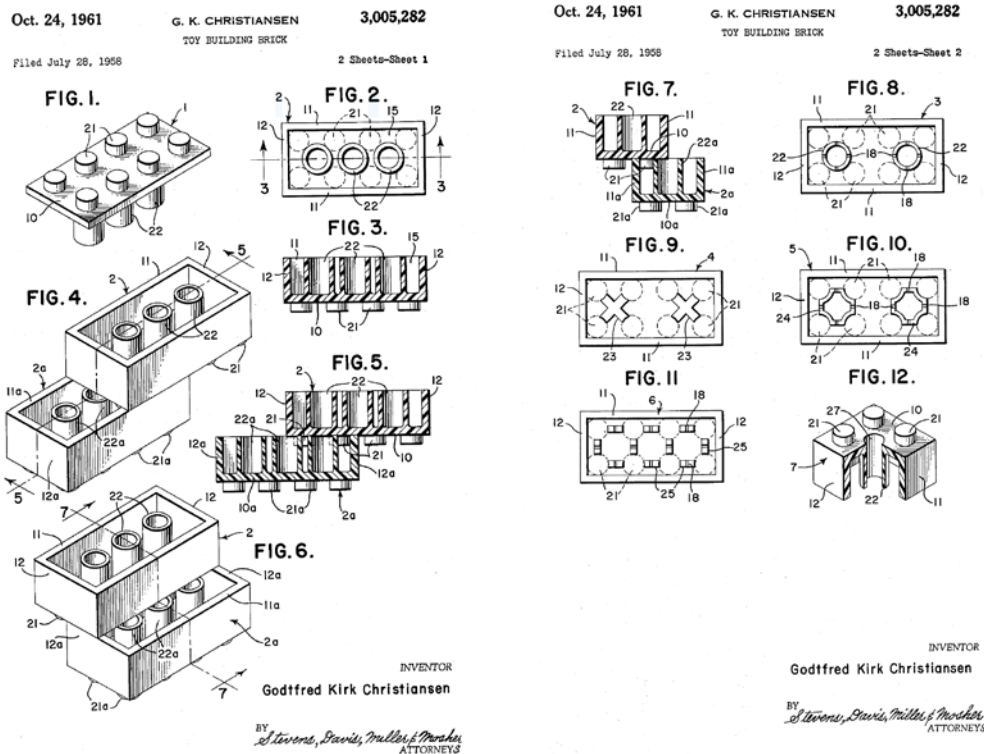


Figure 5. Schematic diagram of the stud-and-tube structure in LEGO's patented brick system
Source: C.G. Kirk (1961)



Figure 6. K'NEX 3-in-1 classic amusement park building set
Source: Basic Fun (n.d.)



Figure 7. Fischertechnik robotic model
Source: Fischertechnik official website (n.d.)

Fischertechnik is a high-precision modular engineering system that uses a groove-and-pin connection method. It enables students to simulate complex mechanical functions and mechatronic systems, allowing them to construct and understand the principles of dynamic, non-assembled machinery (Fig. 7).

Various construction systems, such as K'NEX, VEX Robotics, and Fischertechnik, offer new approaches to creating dynamic structures that promote the development of systematic thinking and motion prediction. A comparative analysis of the basic logic of these systems is presented in Table 1.

Table 1. Comparative analysis of the core logics of three construction systems

System	Core components	Interlocking mechanism	Primary construction logic	Related cognitive skills
Lego	Rectangular bricks	Stud-and-tube, clutch power	Stacking, surface creation, volume filling	Spatial reasoning, schematic construction
K'Nex	Flexible rods and connectors	Axial snap-fit	Linear, skeletal frameworks, dynamic structures	Structural engineering, kinematics
Fischertechnik	Grooved sliding blocks, electromechanical components (motors, sensors, etc.)	Groove-and-pin + plug-and-socket	Functionality-oriented construction, precision assembly, mechatronic integration	Mechanical engineering, robotics modelling

Source: compiled by the authors

While conventional mechanical systems become increasingly complex, a parallel design trend aims to lower the barrier to entry through intangible connections. The introduction of magnetic construction toys, such as Magformers, Magna-Tiles, and academic prototypes like Magnetact animals, represents a clear shift (Fig. 8). The design logic moves from physical interlocking (which demands fine motor strength and precision) to effortless magnetic interaction.



Figure 8. Magformers Basic Plus 26PC

Source: Magformers official website (n.d.)

In these systems, the connection is immediate and self-correcting. Instead of focusing on the structural rigidity of the final object, the design encourages intuitive exploration of topology – specifically, understanding how 2D planes can fold into 3D forms. By removing physical resistance in mechanical assembly, these toys allow users to focus purely on geometric logic. As K. Yasu & M. Ishikawa (2021) demonstrated, such magnetic kinetic kits enable children to construct complex structures with variable motions without the frustration of precise mechanical alignment. This effectively democratizes the experience, making the construction of dynamic mechanisms accessible to a much wider audience.

The most radical disruption in the modern era is the integration of computation as a fundamental building block. Toy systems transitioned from purely physical objects into cyber-physical systems, a trend that began with LEGO Mindstorms and later developed into modular electronic kits such as LittleBits and Makeblock. The computational block system, exemplified by littleBits, encapsulates complex electronic functions (such as input sensors, logic gates, and output signals) within simple, colour-coded magnetic modules. This approach fundamentally shifts the assembly logic from “shaping forms” to “shaping behaviours”. A block is no longer defined solely by its physical geometry, but by its function. Consequently, children can construct complex interactive systems using the same familiar logic as building with static blocks (Fig. 9).



Figure 9. Littlebits STEAM+ Coding Kit

Source: Littlebits official website (n.d.)

Researchers highlight the expanded definition of construction. Z. Chen *et al.* (2024) illustrated this through “Softy’s Magic Touch”, showing how modular interactive components can be attached to ordinary

objects (such as plush toys) to endow them with digital behaviours. Similarly, Y. Lyu *et al.* (2024) argued that modern play is characterised by the “4Rs” – recallable, relaxing, repayable, and reconnected – where digital overlays bridge the gap between tangible interaction and virtual feedback. Ultimately, the “logic of construction” now extends into the logic of programming, effectively treating code as an intangible

material that binds physical parts together. The evolution of construction toys from conventional mechanical systems to systems with magnetic connections and integrated computing represents a significant shift in design, increasing accessibility for a wider audience. A comparative analysis of physical and computational block systems was presented in Table 2.

Table 2. Comparative analysis of physical versus computational block systems

System type	Core components	Interlocking mechanism	Primary construction logic	Related cognitive skills
Physical blocks	Standard passive bricks, plates, structural beams	Mechanical interlocking e.g., stud-and tube friction/ clutch power	Stacking, volume filling, Static modeling	Spatial reasoning, structural balance, schematic construction
Control logic	Microcontrollers (CPUs), sensors, motors, smart bricks	Electronic interfaces, magnetic data-snaps, wireless connectivity	Defining behaviours, programming logic	Computational thinking, mechatronic logic, system-level problem solving

Source: compiled by the authors

Beyond technical and digital integration, contemporary design logic expanded to address socio-cultural challenges, particularly gender representation. A noteworthy case is the introduction of LEGO Friends (Fig. 10), which marked a strategic shift from a universal but often male-centric system towards a design language tailored to diverse social play patterns. While controversial, this approach demonstrates how modern construction toys function as socially engaged artefacts, encoding values of inclusivity and cultural diversity into modular systems.



Figure 10. LEGO Friends

Source: The LEGO Group (2021)

The evolution of construction toys demonstrates a shift from conventional mechanical systems to open platforms that integrate digital and computational technologies. Open construction systems such as LEGO and K'NEX changed approaches to learning, allowing children not only to create physical structures, but also to develop programming and systems thinking skills. The use of magnetic and computational blocks, such as Magformers and LittleBits, considerably simplifies the construction process, opening new opportunities for creativity and scientific development. These changes

also reflect social and cultural trends, including inclusivity and diversity in contemporary toy design.

Discussion of the evolution of construction toy logic in contemporary research. Findings on the “closed system” logic of early educational toys align with and extend contemporary research on the evolution of pedagogical artefacts. According to F. Finlay *et al.* (2023), the 19th-century focus on toys with specific educational purposes resulted from the Enlightenment, which redefined childhood as a distinct developmental stage requiring structured play tools. This historical context is reinforced by M. Mindrup (2023), who identified building kits such as Froebel’s gifts as structured instruments designed to cultivate order and spatial awareness through precise micro-architectural models. While H. Saikia *et al.* (2023) emphasised the importance of visual perception in toy design for cognitive development, this study demonstrates that early designers specifically employed “visual isolation” – as seen in Montessori’s materials – to direct attention towards isolated physical attributes.

Furthermore, the intricate structures of traditional systems highlighted by J. Fu & J. Chen (2021) can be interpreted as a deliberate mechanism of closed instruction guiding the user towards a single, predetermined outcome. This differs from the multi-faceted visual and communicative system of interaction described by N. Skliarenko *et al.* (2023); while contemporary researchers view these objects as broad cultural systems, the original design philosophy analysed in this study was intentionally linear and restrictive. Moreover, G. Du *et al.* (2023) noted that structural innovations in traditional toys can promote spatial imagination and cultural identity; however, this study clarifies that early systems such as Meccano prioritised technical simulation and mechanical precision over open-ended imagination. Thus, the early period of educational construction toy design is characterised by the creation of closed systems that

translated complex philosophical and engineering ideals into physical form. By embedding prescriptive rules and feedback mechanisms directly into toys, designers decentralised the role of the teacher, allowing the physical logic of the object to guide the pedagogical path. This era established a foundational design grammar focused on encoding specific worldviews through structural stability and restrictive, goal-oriented interaction.

The transition from the rigid, instruction-based systems of the 19th century to the open-platform logic of the mid-20th century represents a paradigm shift in how design mediates the relationship between play and learning. This evolution is rooted in what J.F. Legaard & H.M. Skovbjerg (2024) defined as the expansion of functional and narrative affordances. While early toys provide a singular path of interaction, the design of Lincoln Logs and LEGO creates a dual-layer logic, following which physical construction is decoupled from a specific ideological outcome. As identified in this study, the success of Lincoln Logs lies in its ability to layer a cultural myth onto a functional system – a strategy that A. Codner & C.A. Lauff (2024) suggested is critical in toy prototyping to ensure high interaction fidelity and play value. By separating meaning from mechanics, these designs maintain children's engagement through diverse narrative paths.

Furthermore, the emergence of the LEGO system of play provides a physical foundation for constructionist theories. Findings regarding clutch power as a technical enabler are strongly supported by the developmental psychology perspective of Ç.İ. İleri *et al.* (2023). Their study indicated that construction play offers unique affordances that elicit spatial language and gestures, facilitating the development of mental rotation and perspective-taking. By providing a stable, modular environment through high-precision coupling, LEGO design allows children to shift cognitive load from the basic stability of the structure to higher-order structural problem-solving. Long before the era of smart toys, the modular logic of the postwar era already trained children in symbolic thinking and iterative design. Unlike the wooden structures analysed by J. Fu & J. Chen (2021), which requires specific, exquisite, and ingenious unlocking methods rooted in embodied cognition, the LEGO system moves towards a universal, abstract logic. This universalism prioritises individual agency over fixed craftsmanship. Thus, openness in this period represents a deliberate design choice that transforms toys from pedagogical tools into creative laboratories, with the most effective designs providing tools for “how to build” while instilling a belief in “what can be built”. It is therefore justified that the postwar evolution of construction toys marks a definitive move from prescriptive tools towards open-ended systems of creative empowerment. By integrating narrative flexibility with high-precision modular technology, designers successfully transform toys into cognitive platforms capable of supporting diverse learning paths. This transition establishes the system as the primary

unit of design, shifting educational value from the completion of a specific model to the mastery of an infinitely adaptable creative language.

The analysis of the contemporary period highlights a fundamental fragmentation in the logic of construction. Unlike the unified trajectory of the modernist era, current design philosophies are pulling in opposing directions: towards high-tech complexity and towards intuitive simplicity; towards physical permanence and towards digital fluidity. A comparative analysis of recent studies revealed three critical tensions defining this era: the cognitive trade-offs of structural divergence, the democratisation of engineering through interface innovation, and the redefinition of play value in hybrid systems. The divergence between stacking (LEGO) and skeletal (K'NEX, VEX) systems is not only about visual style, but also changes how users think. While classic construction toys enhance mental rotation and spatial skills (İleri *et al.*, 2023), the introduction of dynamic, kinetic systems expanded this pedagogical scope. K. Kshirsagar *et al.* (2025) noted that kinetic construction kits such as MorphBlox provide specific affordances for embodied mathematics, allowing users to physically feel and manipulate geometric transformations that are difficult to grasp in static models. This suggests that construction evolved from representation (building a house) to simulation (building a machine). However, as emphasised by C. Bartneck & E. Moltchanova (2018), the increasing number of specialised parts can make systems difficult for beginners to learn. In contrast, new kinetic systems aim to bridge this gap by embedding complex mathematical rules into the physical behaviour of the blocks themselves, rather than requiring the user to engineer them from scratch.

The shift from mechanical interlocking to magnetic and intangible connections represents a democratisation of design authority. This aligns with findings by N. Talu *et al.* (2024) in Fab Lab environments, in which accessible prototyping tools allow students to bypass constraints of mass-produced commercial categories and engage in unstructured play that fosters deeper creativity. The integration of digital logic constitutes the most radical shift. The system is no longer contained within the physical box but extends into the digital realm. Y. Lyu *et al.* (2024) suggested that the future of toys lies in reconnected experiences, where the tactile benefits of physical toys are merged with the interactivity of digital layers. This is echoed by Z. Chen *et al.* (2024), whose study on modular interactive designs (Softy's Magic Touch) demonstrated that systematicity can now be applied to non-systematic objects (such as plush toys) through modular electronic add-ons. This suggests a paradigm shift based on which the toy is no longer a finished product but a platform for cyber-physical creation. However, this hybridisation requires careful balance.

The definition of systematicity expanded to include the ethical dimension of material lifecycles. C. Yadou *et*

al. (2025) proposed a holistic sustainable design system that integrates life cycle assessment with modular manufacturing, arguing that the logic of construction must now extend beyond physical assembly to include the entire environmental footprint of the product from extraction to disposal. Complementing this macro-view with material innovation, M.J.M. Kamil & S.A. Shaukat (2023) indicated through the “Ebee” robot case study that biodegradable polymers such as polycaprolactone can successfully replace toxic plastics while retaining the complex, interchangeable modularity required for modern construction play. This shift confirms that contemporary toy systems are evolving from purely functional structures to environmentally responsive artefacts.

Thus, the modern construction toy system evolved from a single standard to a diverse ecosystem of logic. Through MorphBlox’s kinetic geometry, Magnetact animals’ magnetic interaction principles, and the digital integration of modern LEGO systems, the definition of a “construction toy” expanded considerably. It is no longer limited to assembling individual components, but extends to organising and manipulating complex systems that include structural, magnetic, or computational elements. Construction toys now not only promote the development of spatial and cognitive skills, but also open new opportunities for interactive and multidimensional learning. This transition requires users to think strategically and remain flexible in problem-solving approaches, ensuring a more comprehensive and dynamic educational process.

CONCLUSIONS

The study demonstrated a clear evolutionary trajectory of educational construction toys, transforming from closed instructional systems to open, socially engaged platforms. First, analysis of early designs such as Froebel’s gifts and Meccano showed that 19th-century

toys functioned as closed systems. These artefacts prioritised the transmission of specific philosophical or engineering knowledge, where the design logic dictated a singular, correct outcome. Subsequently, the study indicated that the industrial-modernist era shifted this paradigm towards open systems. The case study of LEGO demonstrated how the innovation of clutch power acts as a physical enabler for system empowerment, decoupling mechanical construction from ideological instruction. The analysis showed that this shift allows toys to evolve from tools of replication into platforms for infinite creative expression, as seen in the separation of narrative and function in Lincoln Logs. In the contemporary era, results indicated a multidimensional divergence. The comparison between K’NEX’s skeletal logic and LittleBits’ digital overlays confirmed that modern systematicity expanded to include kinetic, intangible, and cyber-physical connections, reflecting a complexification of play. Future studies should extend this genealogical framework to explore cross-cultural variations in toy design, particularly in non-Western contexts. Furthermore, cognitive science experiments are recommended to quantify how these evolving construction logics – specifically the shift from static stacking to dynamic engineering – impact children’s spatial reasoning and problem-solving strategies in real-time interaction.

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Логіка конструювання: еволюція філософії дизайну в розвивальних іграшках-конструкторах

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Анотація. Метою дослідження була реконструкція генеалогії дизайнерських філософій, що трансформували конструктори від закритих інструктивних систем до відкритих платформ і, зрештою, до соціально залучених артефактів. У цьому дослідженні використано якісний історичний метод з використанням порівняльного аналізу кількох прикладів на основі першоджерел (патентів, праць дизайнерів та освітян), історичних комерційних матеріалів та ключових освітніх і філософських текстів, доповнених сучасними науковими та галузевими джерелами. Аналіз структуровано навколо двох вимірів – систематичності (механізми зв'язку, матеріали, модульна логіка) та дидактизму (освітні філософії, культивовані навички та закодовані культурні цінності) – для простеження еволюції навчальних конструкторів-іграшок. Кожен приклад проаналізовано за двома вимірами: систематичність (матеріали, механізми з'єднання, модульна логіка) та дидактизм (освітня філософія, навички, що розвиваються, культурні цінності). Виявлено чітку траєкторію еволюції. У ранній період (1840-ті – початок XX ст.) конструктори функціонували як закриті системи, призначені для передачі філософських або інженерних знань. В індустріально-модерністський етап (початок XX ст. – 1980-ті), завдяки інноваціям, зокрема «силі зчеплення» LEGO, іграшки-конструктори трансформувалися у відкриті платформи, збагачені наративними та системними підходами. У сучасний період (1990-ті – дотепер, 2026) зафіксовано диверсифікацію дизайнерської логіки з орієнтацією на соціальні та екологічні виклики, зокрема гендерну репрезентацію й стали матеріали. В роботі обґрунтовано, що іграшки-конструктори виступають не лише розвивальними іграшками, а й освітніми артефактами, які кодують світогляди, педагогічні стратегії та суспільні цінності. Результати можуть бути використані дизайнерами освітніх іграшок, педагогами та дослідниками матеріальної культури як методологічна основа для створення й застосування конструкторів, що поєднують технологічний дизайн, педагогічні цілі та культурний контекст

Ключові слова: дизайн іграшок; системний дизайн; модульна платформа; матеріальна культура; педагогічні артефакти; освітній інструмент



Communication and cultural potential of graphic patterns in the fashion industry

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Abstract. The aim of this study was to identify the communicative and cultural potential of graphic patterns, taking into account the requirements of the contemporary fashion industry and the mechanisms of their influence on consumers. The research was based on the application of a comprehensive interdisciplinary approach, incorporating methods of visual and semiotic analysis, elements of cultural and art historical research, as well as a comparative analysis of contemporary fashion design samples. The study examined the key types of graphic patterns used in the fashion industry across various cultural contexts, including floral, geometric, and ornamental motifs. It was established that patterns containing floral and foliage elements perform the function of creating harmony and rhythm, while also contributing to the emotional colouring of the visual image. Geometric figures and line-based patterns were identified as universal semiotic forms, representing different symbols of stability, strength, and spiritual integrity depending on their orientation and cultural context. The research also revealed that the scale of patterns and their colour diversity play a significant role. For example, small-scale compositions (Fendi) create a sense of restraint and structural order; medium-scale patterns (Etro, Hermès) provide a balance between harmony and detail; while large-scale patterns (Dolce & Gabbana, Versace) enhance emotional impact and emphasise the distinctive identity of the brand. Colour palette decisions were likewise shown to exert a considerable influence on emotional and psychological perception. The analysis of the compositional principles of repetition, rhythm, and balance demonstrated that they contribute to a stronger emotional connection between consumers and particular prints, while also expanding the communicative possibilities of graphic design in fashion. The findings may be utilised by designers, brands, and cultural institutions in the creation of patterns that take into account cultural specificity and communicative effectiveness within the fashion environment

Keywords: design semiotics; prints; ornament; cultural code; visual communication; fashion design

INTRODUCTION

The fashion industry, as a sphere of visual communication, employs graphic symbols that require accurate and precise interpretation. In this context, knowledge of cultural specificities is essential when creating a “harmonious” pattern, with the avoidance of ambiguity representing a key objective. The issue of graphic patterns and prints in contemporary design

and the fashion industry has attracted the attention of a number of Ukrainian researchers, who have examined both the theoretical and practical aspects of their application. A. Osadcha (2025) systematised the experience of using traditional Ukrainian symbols in contemporary design, particularly in fields such as graphic design, branding, fashion, architecture and digital art. The main findings of the study confirmed that Ukrainian symbolism, particularly ornaments,

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colours and imagery, has been actively integrated into various fields of contemporary design. It was also established that the contemporary interpretation of national symbols has contributed to the formation of a positive image of Ukraine as a culturally rich nation, whilst supporting its cultural identity on the international stage. N. Chuprina & O. Tereshchenko (2024) also investigated the relevance of using Ukrainian folk ornaments in contemporary design, their varieties, and the systematisation of materials used to create textured surfaces and ethnic elements in contemporary clothing.

In their article, S. Borysova & P. Kiichenko (2023) traced the evolution of graphic design on T-shirts using prints. The authors emphasised that, in the context of globalisation, the print has ceased to be merely a decorative element and has become an important means of individualisation and self-expression. The results of their study demonstrated that prints in the field of mass and youth fashion fulfil not only an aesthetic but also a communicative function, reflecting current socio-cultural trends. The work by K. Pashkevych & C. Liu (2023) examined decorative embellishments in 20th-early 21st-century clothing design with the aim of identifying the artistic techniques used to create them and the innovative technologies involved. One of the key trends of the season was the draping of fabrics that already featured a certain type of embellishment, such as a small print or a gradient effect. This type of embellishment emphasised the role of colour schemes and smooth transitions in ensuring aesthetic harmony and the innovative nature of visual images. The uniqueness of patterns plays a significant role in shaping brand identity and demonstrates that it is precisely individually created patterns that can lend collections originality and recognisability. The study by N. Lee & S. Suh (2024) examines the influence of digital technologies on the formation of contemporary trends in fashion design, particularly on the development of graphic patterns and prints. The authors demonstrated that the use of big data and digital tools enables the creation of designs that reflect current socio-cultural trends and the personalisation of clothing. This confirms the role of patterns not only as a decorative element but also as a communication tool in the contemporary fashion industry.

A significant contribution to the study of visual culture was made in E. Thiriet (2024), which examined artistic practices through the prism of the contemporary cultural space, emphasising the role of visual codes in social communication. A separate section was devoted to the study of the cognitive and psychological mechanisms of pattern perception. The works of S. Stanischewski *et al.* (2020) and J. Friedenberg (2022) demonstrated that the rhythm, symmetry and orderliness of patterns directly influence emotional perception, provide aesthetic value and create a sense of harmony. The study by S.R. Rech *et al.* (2026) analysed how cultural and territorial heritage can shape graphic patterns in

contemporary textile and fashion design. The authors demonstrated that the integration of local symbols, ornaments and colour schemes into prints not only emphasises aesthetic harmony but also helps to strengthen the cultural identity of brands. These findings highlighted the significance of patterns as a means of communicating cultural values within the context of intercultural interaction in the fashion industry.

An analysis of academic publications revealed a diversity of approaches to this issue – ranging from ethnocultural and art-historical to cognitive-psychological. However, despite the broad coverage of related aspects, the question of how patterns function as a systemic element of brand identity in the context of intercultural communication in the fashion industry remains overlooked by researchers. The aim of the study was to determine the communicative and cultural potential of graphic patterns as a tool for intercultural interaction in the contemporary fashion industry, as well as to identify the mechanisms through which they influence consumers' emotional and sociocultural perceptions.

MATERIALS AND METHODS

The study employed an interdisciplinary approach drawing on a range of scientific research methods. This facilitated a comprehensive examination of the cultural and communicative potential of graphic patterns in the fashion industry. In particular, methods of visual, semiotic, cultural, art-historical and comparative analysis were employed, alongside a cognitive-psychological approach. Using visual analysis, the structure of the composition and scale of the patterns, their forms, and colour schemes were examined in detail using examples from contemporary collections by leading brands (Fendi, Etro, Hermès, Dolce & Gabbana, Versace, Diyanu, Anita Dongre). This method was used to assess how decorative elements are organised within the composition, and which principles of repetition, rhythm and balance are employed to enhance the emotional impact on the consumer.

Semiotic analysis was applied to decode the symbolic meaning of graphic elements, as the interpretation of geometric and botanical patterns varies significantly depending on the socio-cultural context – and it is precisely this method that allows to uncover deep-seated cultural codes that are inaccessible through a purely formal description. This made it possible to uncover the deep-seated cultural codes embedded in the symbolism of the visual elements. Cultural and art historical analyses have outlined an understanding of the historical and cultural components of ornaments, revealing their origins in folk decorative and applied arts and in the traditions of various countries and regions, such as South Asia, Africa, Ukraine and others. The analyses conducted helped to trace the transformation of traditional elements into contemporary design trends. Through comparative analysis, conclusions were drawn regarding intercultural communication via graphic

elements. This became apparent when comparing patterns from different cultures and brands, as well as the specific ways in which they are used in contemporary fashion design. A cognitive-psychological approach was applied to elucidate the neuroaesthetic mechanisms of pattern perception: drawing on data from the psychology of perception and neuroaesthetics, this approach enabled to substantiate how compositional techniques (repetition, rhythm and balance) and colour choices shape the consumer's emotional responses.

The study utilised methodologies from leading authors in this field, specifically the principles of compositional repetition, rhythm and balance as outlined in the research by S. Stanischewski *et al.* (2020) and J. Friedenberg (2022). To substantiate the neuroaesthetic aspects, materials from specialised resources were drawn upon, notably Research Design Connections (n.d.). The research was conducted in several consecutive stages. Initially, visual information was selected from the collections of well-known global brands, as well as samples of traditional ornamentation. During the second stage, forms, symbolism and colour schemes were systematised using visual and semiotic analyses. In the third stage of the study, the identified patterns were compared across different cultures and brands, taking into account principles of composition. Finally, the functional and communicative aspects of the patterns were outlined using the data obtained in conjunction with cognitive-psychological theories of perception. The analysis of the works was carried out according to the following criteria: pattern type (floral, geometric), scale (small-scale, medium-scale, large-scale), colour palette (warm, cool, contrasting shades), compositional principles of organisation (repetition, rhythm, balance), cultural context and symbolic meaning. The influence of pattern composition on emotional perception and communicative effectiveness within the framework of brand identity was also assessed.

RESULTS AND DISCUSSION

Graphic design plays a decisive role in shaping the mechanisms of fashion perception and the nature of the consumer's interaction with it. Clothing functions as a non-verbal means of communication, conveying information about the wearer's social status, personal identity and cultural affiliation. The integration of graphic patterns into the structure of clothing enhances this communicative function, transforming the garment into a powerful means of self-expression and targeted influence on the intended audience. They can also create a sense of integrity and coherence, as well as enhance the emotional perception of the composition and explain social and cultural contexts. The principles underlying pattern design originate from the fundamental concepts of graphic design, which are widely applied by designers to create coherent and expressive compositions (Sung, 2024). A visual pattern is understood as a structural element that, through the

systematic repetition of forms, lines, or colour rhythms, establishes the organic unity of a visual image.

The phenomenon of semantic ambiguity in the context of graphic patterns manifests itself in the contradictory or ambiguous interpretation of visual elements depending on the recipient's cultural environment. In particular, a pattern that symbolises harmony and stability within the Western tradition may acquire a sacred or fundamentally different meaning in Eastern cultures. Similarly, colour ambiguity arises when colour choices are made without taking into account cultural semantics or psychological mechanisms of perception, leading to unwanted connotations and reducing the pattern's communicative effectiveness. It is precisely the avoidance of ambiguity that prevents the emergence of irrelevant associations and intercultural conflicts. This allows a brand not only to strengthen its own identity but also to foster a positive social dialogue, where graphic design serves as a precise yet sensitive tool of communication. Culture and communication are interdependent systems that mutually define one another. Taking into account the cultural characteristics of the target audience, its values, norms and symbolic conventions is a prerequisite for developing effective visual communication design (Fig. 1). Consequently, pre-project analysis of the socio-cultural context should be viewed not as an optional stage, but as a methodological requirement for any design decision in the fashion industry.

Some forms have a universal meaning, yet from the perspective of cultural influences, they can give rise to different interpretations. Patterns used in textile and fashion design can be classified into various categories, including botanical, geometric, and so on. In graphic design practice, plant-inspired motifs are regarded as a structural element of composition, setting the rhythm, harmony and emotional tone of the visual message. Indeed, a study of contemporary approaches to the use of botanical illustration by M. Tkachenko (2025) demonstrated that botanical motifs are used by designers as an effective means of shaping composition and conveying the content of a visual work. They are actively used in the creation of patterns, as their diverse forms and adaptability ensure that the images are easily interpreted. Patterns became particularly widespread in South Asian culture (Fig. 2a), where their development was significantly influenced by the natural environment, and floral motifs (Fig. 2b) subsequently became key elements that shaped the evolution of the visual language of clothing. Leaves in a graphic composition can take on various forms and, depending on this, be interpreted in different ways (Hiliazova, 2025). For example, elongated and straight leaves create a sense of dynamism and directionality, curly or curved ones establish a decorative rhythm, whilst rounded ones emphasise softness and harmony. Floral elements enhance the emotional impact of the composition, creating expressive accents and emphasising the symbolism of beauty, renewal or the

cyclical nature of life. In graphic design, plant patterns have universal application. They can form a cohesive composition as a dominant element or serve as a general background that balances and subordinates

other visual elements. Their rhythmic repetition allows for a sense of order, whilst the variability of forms creates the necessary dynamism.

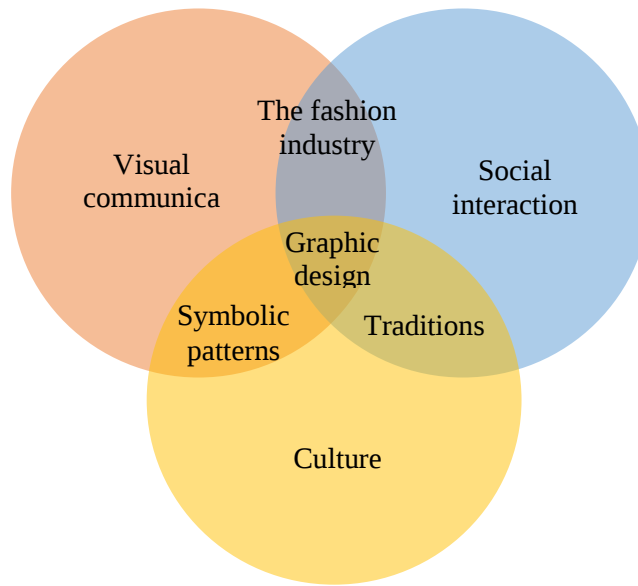


Figure 1. Graphic design in the fashion and culture industry

Source: compiled by the authors



Figure 2. Floral patterns in traditional and contemporary fashion design

Note: a – Dress (robe à l'anglaise), printed cotton skirt, c. 1770-1790; Wesserling Textile Museum; b – example from a contemporary collection by the clothing brand Anita Dongre, India

Source: The Soane Journal (2025), Anita Dongre (n.d.)

The scientific and theoretical perspective views the geometric pattern as an expression of a universal semiotic language, as its structure appeals to the deep psychophysiological mechanisms of visual perception. The foundation of these motifs lies in such geometric shapes as triangles, squares, and circles. At the same time, the same form can be interpreted differently across cultures. In Western traditions, the triangle is often associated with a symbol of spiritual unity and

harmony, thus lending it a sacred meaning (Castro García, 2015). In Eastern cultures, it reflects the harmony of energies or the feminine-masculine duality. The aspect of orientation must also be taken into account. An upward-pointing triangle creates a sense of strength, stability and elevation. In patterns, it is often used to emphasise masculinity, being associated with dynamism and activity. When analysing women's clothing collections, such a motif can be interpreted as

a metaphor for independence and inner strength. A downward-pointing triangle, on the other hand, symbolises softness, fertility and feminine energy. Thus, compositionally, it creates an impression of fluidity and a connection to the earth, which blends organically with themes of femininity and naturalness in contemporary design. The circle largely represents the idea of unity and infinity, but in some cultures it takes on the meaning of cosmic wholeness, whilst in others it symbolises earthly cycles and the passage of time. For example, in Indonesian tradition, the circle symbolises the harmony of the cosmos and the cyclical nature of life (Jamaludin *et al.*, 2024), whereas in Islamic artistic practice it emphasises the spiritual order and infinity of God (Shaw, 2022), demonstrating the difference in cultural interpretations of the same form. The square serves as a marker of stability, order and structure, and in fashion design is used to create a clear organisation of the surface and to emphasise the geometric rigour of the silhouette. From a graphic design perspective, geometric patterns manifest in various formats: from textural patterns (vertical, horizontal, diagonal) and compositions on everyday shirts to complex modular solutions that shape the visual dynamics of contemporary collections. Patterns featuring triangular motifs emphasise energy and movement, whilst circular or wavy elements create a softer, more harmonious atmosphere.

By working with traditional motifs when designing a pattern, the designer is effectively encoding cultural information visually. Many examples combine the divine and earthly worlds and have deep religious or spiritual connotations. Such patterns stem from cultural traditions and may incorporate symbols passed down from generation to generation. This approach varies from culture to culture. For example, patterns from Asian countries predominantly use plant and organic forms, reflecting humanity's close connection with nature. Patterns featuring leaves, flowers and grapevines symbolise fertility, the continuity of life and harmony with the environment. In fashion design, these are realised through flowing lines and rhythmic repetitions that create the illusion of continuity.

Western Europe is characterised by geometric and heraldic motifs, which have their roots in medieval symbolism. The symmetry, rhythm and balance of these patterns create a sense of order and authority. It is worth noting that in contemporary graphic design, they are often used to create understated yet prestigious designs. Vibrant geometric patterns with contrasting colours are very common in African cultures, symbolising the energy of the community, ritual practices and spiritual unity (Fig. 3). Such an approach is regarded as a powerful visual tool due to its large-scale forms and vibrant colour palette.

In Ukraine, patterns are closely associated with folk decorative arts, including embroidery, pysanka decoration, and weaving. Geometric forms such as the rhombus, cross, and square carry protective

symbolism, while floral motifs reflect ideas of fertility, beauty, and spiritual renewal. In this way, they serve as distinctive markers of national identity, combining both local and global dimensions. Table 1 presents the symbolic meanings and psychological perceptions of geometric forms in patterns.



Figure 3. African pattern featuring geometric motifs
Source: Diyanu (n.d.)

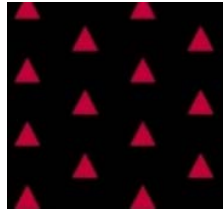
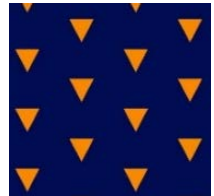
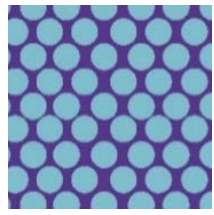
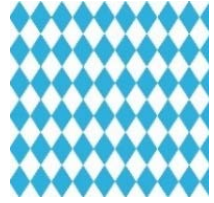
Repetition, rhythm and balance are fundamental, as they determine the structure and perception of patterns. Within the context of the fashion industry, these principles acquire particular significance, as they influence not only the aesthetic appeal of a garment but also its communicative role as a whole. The findings of E. Wassiliwizky & W. Menninghaus (2021) confirmed and expanded upon the conclusions of this study: compositional principles, colour schemes and ornamental structures not only ensure the aesthetic appeal of a pattern but also trigger cognitive responses mediated by the interplay of cultural and social meanings. Building on the authors' proposed integration of a cognitive perspective into the analysis of aesthetic experience, this study argues that an interdisciplinary approach is not only desirable but also methodologically necessary for the development of communicatively effective design solutions in contemporary fashion. The generalised characteristics of these identified principles are described in Table 2.

Thus, repetition, rhythm and balance, when combined harmoniously, form a powerful tool for establishing an emotional connection between a design and a potential consumer, opening up opportunities for graphic design in cross-cultural interaction through the fashion industry. Previous research has shown that non-verbal communication in the form of images is perceived and interpreted by humans more quickly and effectively than verbal communication (Stanischewski *et al.*, 2020). The human brain's connection to patterns is both complex and instinctive, as they influence the wearer's emotional state, the way they are socially

perceived, and even the cognitive processes that regulate attention and memory. In particular, the brain

processes organic, flowing patterns differently from geometric and clearly structured forms.

Table 1. Symbolism and use of geometric forms in patterns

No.	Shape	Symbolic meaning	Psychological perception	Illustrative example
1	Triangle (pointing upwards)	Strength, elevation, and spiritual unity; in Eastern cultures, it is interpreted as the harmony of energies.	Dynamism, independence	
2	Triangle (pointing downwards)	Fertility, femininity, connection to the earth	Smoothness, calmness, naturalness	
3	Square	Stability, order, structure, protection	Harmony, continuity, softness	
4	Circle	Unity, infinity, cosmic wholeness	Rationality, reliability, restraint	
5	Diamond	A symbol of fertility and growth; a protective talisman (particularly in Ukrainian culture)	Dynamism within symmetry, a sense of growth	

Source: compiled by the authors

Table 2. Compositional principles in the construction of graphic patterns

No.	Principle	Graphic means	Functionality	Manifestation in fashion
1	Repetition	Lines, stripes, dots, logo modules, tile grids, seamless patterns.	Creates a sense of order, stability and predictability.	They serve as a means of brand identity; striped lines in business suits; the repetition of logos in luxury brands.
2	Balance	Asymmetry, symmetry, colour contrasts and harmonious forms.	Ensures harmony and balance within the pattern's structure when viewing the composition.	Balancing large elements against a neutral background; asymmetrical geometries in contemporary collections for a dynamic look.
3	Rhythm	Various intervals, progressions, undulating or alternating structures achieved by varying the scale of the pattern.	Organises the visual flow of elements and directs the viewer's attention.	Wavy motifs and large-scale rhythmic patterns in contemporary streetwear collections.

Source: compiled by the authors

Patterns play an important role in structuring visual experience, as the repetition and rhythm of forms

contribute to a sense of order and the integrity of perception (Research Design Connections, 2022). Thus,

the repetition and rhythm of graphic forms not only organise visual space but also evoke a sense of stability and order in the viewer. It has been emphasised that patterns have the power to stimulate emotions and influence cognitive abilities, as humans are inclined to seek patterns in their surroundings. This means that patterns integrated into fashion garments are capable of forming positive associations, a sense of harmony or, conversely, tension in the viewer's mind – depending on the compositional structure and choice of colour palette.

The neurological basis of psychological influence mechanisms explains the ability of different types of patterns to trigger distinct emotional responses in the fashion industry. Firstly, patterns affect mood through the level of visual stimulation: designs characterised by visual balance, rhythm, harmony, and related attributes are generally evaluated more positively than designs lacking these qualities. Secondly, they evoke emotional responses through associations with personal memory. A person's personal experiences and memories play a significant role in forming an emotional connection with textiles. Thirdly, the same pattern in different colours creates significantly different psychological effects, demonstrating its role as a powerful modifier in perception. Thus, colours can enhance or balance the visual characteristics inherent in a pattern (Jeon *et al.*, 2020). Warm colours (red, orange) enhance its dynamism and stimulating potential. In contrast, cool colours (blue, green) create a sense of unity and coherence, associated with harmony, naturalness and environmental friendliness. Complementary colour combinations (for example, blue and orange, red and green) are used in the fashion industry as a strategic communication tool, reinforcing brand identity and defining its stylistic uniqueness. Contrasting colour schemes are widely used in patterns as a means of attracting attention and stimulating an emotional response, as colour itself carries powerful cultural significance and is capable of evoking a wide range of associations and symbolic meanings. At the same time,

research into colour harmony by U.K. Dogar *et al.* (2024) showed that the highest levels of aesthetic harmony are demonstrated by combinations of colours with similar hues or saturation and moderate differences in brightness. In contrast, colour pairs with sharp variations in brightness receive significantly lower harmony ratings, indicating the need for a nuanced approach to contrast: its use is justified as a communicative technique, but requires consideration of the psychophysiological limits of perception. In addition to type and colour, the scale of the pattern also significantly influences its psychological impact and reflects the stylistic strategies of specific brands (Table 3).

The example of the Fendi brand illustrates small-scale patterns based on the rhythmic repetition of logo elements, creating the effect of a structured surface and rhythmic order. Such compositions give the consumer a sense of visual stability and a sense that the composition is complete (Fig. 4).



Figure 4. Jacket featuring the FF logo pattern, Fendi
Source: Fendi (n.d.)

Table 3. Classification of patterns by scale and their visual characteristics

No.	Pattern type	Key visual characteristics	Psychological impact	Communicative and social role	Brand examples
1	Small-scale patterns	The composition consists of repeating elements; the use of clear geometric or small decorative forms; a high level of detail.	Convey a sense of precision and attention to detail; create a formal and structured overall impression.	They are perceived as conservative and more traditional, emphasising restraint and discipline.	Burberry, Etro.
2	Medium-scale patterns	A combination of rhythm and balance in the medium-sized elements; a balance between detail and generalised forms.	Evoke a sense of psychological comfort and harmony; ensure clear image recognition without excessive visual clutter.	A blend of traditional cultural symbols and contemporary aesthetic trends.	Hermès, Versace.
3	Large-scale patterns	Dominant forms and striking colour accents; large-scale geometric or organic elements.	Create a powerful emotional impact; used to emphasise the brand's boldness.	A defining feature is their ability to evoke an emotional response and capture attention; they are associated with confidence.	Dolce & Gabbana, Alexander McQueen.

Source: created by the authors

Etro makes extensive use of floral motifs, combining intricate detail with simplified forms, which creates a sense of harmony and sustainability (Fig. 5a). In the case of Hermès, a graphic design of intertwined cords and metal rings creates visual unity and emphasises the structural organisation of the fabric's surface (Fig. 5b).

Large-scale patterns are characteristic of the Dolce & Gabbana and Versace brands. Dolce & Gabbana uses bold, oversized floral motifs that heighten the strong emotional impact and visual dominance (Fig. 6a). Versace, in its "Barocco" print, draws on its classical heritage through large-scale heraldic and ornamental compositions, creating a sense of status and confidence (Fig. 6b).



Figure 5. Medium-scale patterns in contemporary branded fashion design

Note: a – Jacket featuring a floral motif, Etro; b – “Palefroi Remix” print, Hermès

Source: Etro (n.d.), Hermès (n.d.)

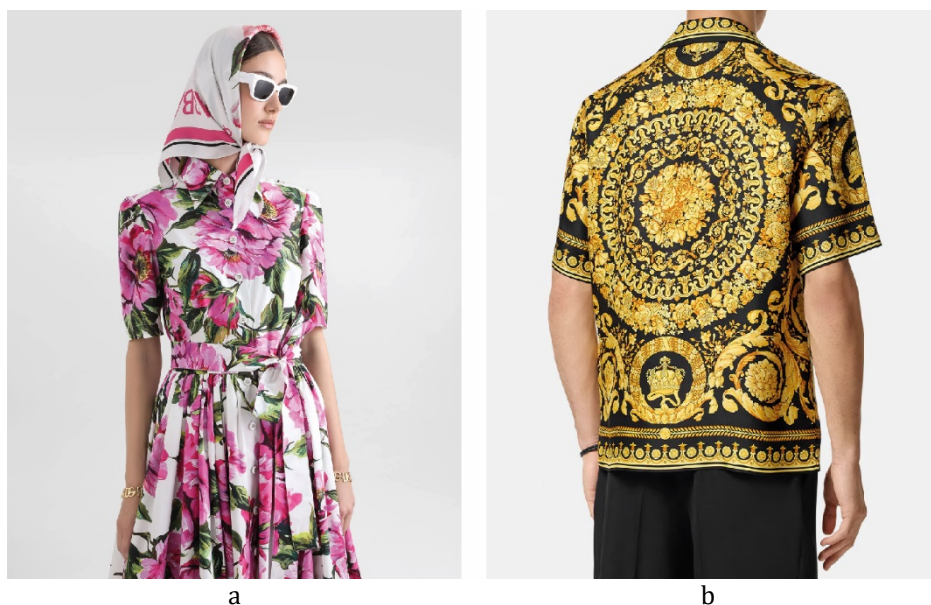


Figure 6. Large-scale patterns as a means of visual dominance in fashion

Note: a – Cotton shirt dress featuring a peony floral print, Dolce & Gabbana; b – Silk shirt with the “Barocco” print, Versace

Source: Dolce & Gabbana (n.d.), Versace (n.d.)

Thus, the scale of a pattern serves not only as a formal and compositional feature, but also as an important communicative tool that defines the nature of a brand's visual message, enhances its emotional expressiveness, and shapes its cultural and aesthetic identity within the fashion sphere. A comparison of the

results obtained with the findings of R. Rafiyev *et al.* (2024) revealed a common trend: in the context of digitalisation and the spread of minimalism, geometric patterns with clear lines demonstrate greater adaptability to the online environment. However, unlike the aforementioned authors, who viewed the

simplification of form as an unambiguously productive strategy, this study found that excessive reduction of visual complexity risks the loss of a brand's semiotic specificity and reduces its recognisability. An important aspect is the integration of traditional ornamentation into contemporary design. Analysis of the results obtained suggests that graphic patterns in the fashion industry function as a complex semiotic system. A comparison of the author's data with the study by Y. Wang (2025) revealed a similarity in views on the combination of digital technologies with traditional visual codes. This approach demonstrated how graphic patterns serve as a link between the past and the future, adding a contemporary touch to clothing design whilst preserving authenticity. This aligns with the author's conclusions that contemporary patterns serve not only to decorate garments but also act as intermediaries between global technologies and local identity.

Similar conclusions were reached by S. Ugale & N. Thakur (2021), who analysed how Indian culture influences contemporary design objects through colours, materials, and finishes, known as CMF design. The present study expands upon this concept by demonstrating that graphic patterns can be an even more flexible design tool than the material itself. It was found that ornamental motifs within patterns are more easily adapted to the global market than traditional materials. This can be explained by the fact that graphic design allows the recognisability of tradition to be preserved without compromising the ergonomics of contemporary clothing. The cultural approach likewise confirmed the importance of considering local traditions when developing graphic patterns for the global fashion industry.

The relationship between the psychological impact on consumers and their perception of contemporary patterns on different fabrics was investigated by T. Naveed *et al.* (2024). The author demonstrated the significance of dynamic visual elements in contemporary fashion design and confirmed that motion-style graphic patterns possess greater aesthetic appeal. At the same time, the type of fabric, which significantly influences the perception of graphics, was investigated. Silk materials received more positive feedback than polyester ones. A. Sharma (2023) highlighted the psychological aspects of the influence of colour and form on brand perception, noting that carefully designed graphic patterns are capable of forming emotional connections with the consumer, thereby influencing brand loyalty and recognition. The authors' data confirmed that certain rhythmic patterns can evoke trust, a sense of harmony and security. Minor discrepancies in the results were observed when compared with the findings of A. Sharma, who focuses significantly on sustainability as a fundamental driver of change in design. Although the current study does not deny the importance of the environmental factor, it has been established that, for consumers, the cultural value and visual appearance of a pattern are often prioritised over its environmental origins. Thus, the

effectiveness of visual code communication sometimes conflicts with ethical principles of consumption. This creates scope for further research and discussion.

Environmental issues in fashion design remain a subject of debate, a topic also addressed by U.K. Dogar *et al.* (2024). Based on the results of their study, it was concluded that form and colour play an important role in promoting sustainable fashion and the use of eco-friendly graphic design. The present study confirmed the assertion that the use of plant textures and floral motifs visually associates a brand with sustainability even before consumers read the material composition. However, a certain critical threshold was identified. U.K. Dogar *et al.* considered any eco-design to be unquestionably positive, but it was established that the excessive use of natural motifs can lead consumers to suspect marketing manipulation, so-called "greenwashing", if the brand is not supported by a genuine sustainable sustainability strategy.

A comparative analysis has shown that graphic patterns in the contemporary fashion environment are a multifunctional phenomenon that maintains a balance between technological innovations, psychological mechanisms of perception, cultural specificity and the requirements of sustainable development. This study expands the existing academic discourse, arguing that the communicative potential of patterns in the contemporary fashion industry is realised through a productive combination of digital technologies and cultural authenticity – and it is precisely this interaction that determines the pattern's ability to serve as an effective mediator between global trends and local identity.

CONCLUSIONS

The study confirmed that graphic patterns in the fashion industry function as a complex semiotic system that goes beyond a purely decorative role: they are a fully-fledged tool of visual communication, capable of conveying cultural codes, value systems and elements of brand identity. It has been established that the communicative potential of a pattern is realised through the interaction of three determining factors – semiotic structure, psychological mechanisms of perception and the cultural context of the audience. It has been demonstrated that the interpretation of forms, ornamental motifs and colour combinations varies significantly depending on the recipient's cultural environment, and ignoring this factor inevitably leads to semantic ambiguity and a reduction in the effectiveness of the visual message. These conditions have made it necessary for graphic designers to take into account the social and cultural characteristics of the target audience.

The study systematises the main compositional principles of graphic pattern structure (repetition, rhythm and balance) and substantiates their influence on consumers' emotional and psychological perception. It has been found that plant motifs provide organic harmony and emotional warmth to the visual image,

whilst geometric patterns evoke a sense of order, stability and strength, which testifies to their pronounced semiotic potential. An analysis of compositional solutions demonstrated that scaling is an important communicative tool that determines the nature of a brand's visual message and its positioning. Thus, small-scale compositions (using Fendi as an example) were analysed, conveying ideas of restraint and structure; medium-scale patterns (Etro, Hermès) – an optimal balance between detail and visual harmony; and large-scale motifs (Dolce & Gabbana, Versace), which evoke intense emotional responses and emphasise the uniqueness of the design style. Prospects for further research lie in studying the impact of design digitalisation on traditional

ornamental structures. Another important area is the analysis of how modern technologies are changing the semiotics of patterns and whether algorithmically generated prints are capable of preserving the deep cultural codes identified in this study.

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CONFLICT OF INTEREST

None.

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Комунікаційний та культурний потенціал графічних патернів в індустрії моди

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Анотація. Мета дослідження полягала у виявленні комунікаційного та культурного потенціалів графічних патернів, враховуючи вимоги сучасної модної індустрії та механізми їх впливу на споживача. Робота побудована на застосуванні комплексного міждисциплінарного підходу, що включив методи візуального та семіотичного аналізу, елементи культурологічного та мистецтвознавчого дослідження, а також порівняльний аналіз зразків сучасного фешн-дизайну. У дослідженні було проаналізовано ключові типи графічних патернів з різноманітних культурних контекстів, що використовуються в індустрії моди: рослинні, геометричні та орнаментальні мотиви. Встановлено, що патерни, які містять флористичні та листяні елементи, виконують функцію утворення гармонії та ритму, а також емоційного забарвлення візуального образу. Універсальними семіотичними формами виступили патерни геометричних фігур та ліній, які виступають різними символами стабільності, сили та духовної цілісності в залежності від орієнтації та культурного контексту. Також виявлено, що важливу роль відіграє масштаб патернів та їх колірна різноманітність. Так, наприклад, дрібномасштабні композиції (Fendi) створюють відчуття стриманості та певної структури, середньомасштабні (Etro, Hermès) патерни забезпечують баланс між гармонією та деталізацією, а великомасштабні (Dolce & Gabbana, Versace) підсилюють емоційність і підкреслюють унікальний стиль бренду. Не менш важливий вплив на емоційне та психологічне сприйняття показують рішення кольорової гами. Проведений аналіз композиційних принципів повтору, ритму та балансу продемонстрував, що вони сприяють більш емоційному зв'язку споживача із певними принтами, а також розширюють комунікативні можливості графічного дизайну в моді. Результати можуть бути використані дизайнерами, брендами та культурними інституціями для створення патернів, що враховують культурну специфіку та комунікативну ефективність у модному середовищі.

Ключові слова: семіотика дизайну; принти; орнамент; культурний код; візуальна комунікація; фешн-дизайн



The evolution of visualisation tools of Chinese children's sign systems: Semiotic aspect

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Abstract. The relevance of this study lies in examining how child-oriented wayfinding in public spaces shifted from basic safety measures to culturally and emotionally charged mediators amid changing standards, policies, and digital technologies. This study aimed to investigate the evolution of visualisation tools in Chinese children's sign systems from a semiotic perspective. Drawing on Bronislaw Malinowski's cultural stratification theory, the research combined diachronic analysis of national and local standards, policy documents, and representative cases from children's hospitals, kindergartens, theme parks, and cultural venues. A semiotic-stratification approach was applied to interpret changes at three levels: material apparatus, institutional regulation, and spiritual-emotional meanings, highlighting links between visual codes and broader sociocultural transitions. The findings identified three historical phases in the evolution of Chinese children's sign systems: a Safety-Dominant phase (1983-2008) characterised by standardised pictograms, high-contrast colours, and warning semantics; a Cultural-Consciousness phase (2009-2018) that incorporated regional motifs, local food symbols, and intangible heritage elements to reconstruct identity and reduce anxiety; and a Digital-Intelligence Innovation phase (2019-present) that integrated augmented reality, IoT, and interactive interfaces to create multisensory, affective guidance experiences and data-informed spatial management. Taken together, the semiotic-stratification analysis showed that standardised safety grammars, culturally embedded visual identities, and digitally mediated multisensory interfaces accumulated rather than simply replaced one another over time, revealing the co-evolution of design practice with policy agendas and social expectations. The findings offer conceptual implications for child-friendly city initiatives and for future wayfinding design that considers both technological innovation and the continuity of local cultural narratives

Keywords: wayfinding system design; child-friendly environments; cultural stratification theory; visual communication design; emotional experience

INTRODUCTION

Children's sign systems in China are not only instruments of navigation and safety but also mediators in cognitive development, cultural cultivation, and social integration. In everyday environments, they help

children build spatial awareness and a sense of security while gradually developing symbolic cognition. At the same time, these systems embed cultural motifs and aesthetic traditions, enabling children to form identity and belonging through routine interactions with public

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spaces. In the context of rapid urbanisation and digital transformation, child-oriented wayfinding must reconcile basic safety, age-appropriate cognition, and locally grounded cultural narratives within increasingly complex built environments.

In parallel with these practical demands, research on wayfinding and visual communication expanded along several interdisciplinary trajectories. V. Mehta & C. Auffrey (2022) demonstrated that wayfinding in complex urban environments involved balancing legibility with place-based identity, showing that signage functioned not only as navigational infrastructure but also as a mediator of spatial meaning. V. Manchia (2022) situated signage and information design within debates on environmental and sustainable communication, and emphasised that public visual systems responded to ecological and social responsibilities rather than purely instrumental demands. Semiotic and visual communication studies deepened this perspective by treating pictograms and graphical interfaces as cultural codes rather than neutral information carriers. G. Aiello (2020) argued that visual communication in public environments was embedded within power relations and cultural hierarchies, and that signage participated in the negotiation of visibility, identity, and belonging. S. Jamshidi & D. Pati (2024) complemented this view by analysing how contemporary public information symbols balanced international standardisation with local adaptation, thereby foregrounding the semiotic tensions between global norms and culturally specific meanings in complex wayfinding systems.

From a cognitive perspective, studies examined how children interpreted iconic and multimodal cues in learning and navigation contexts. Y. Motamedi *et al.* (2024) found that degrees of iconicity and redundancy in visual symbols shaped children's ability to infer meaning from unfamiliar signs, suggesting that symbol design needed to align with developmental stages of symbolic cognition. O. Bock *et al.* (2024) highlighted how visual attention and strategy use influenced children's search and wayfinding behaviour in complex visual displays, pointing to the importance of cue salience, layout, and task structure. In addition, Z. Qiu *et al.* (2025) showed that audio-visual temporal integration affected perceived continuity and user comfort in dynamic environments, indicating that multisensory guidance systems required careful calibration for different age groups.

Within the Chinese context, scholars began to address user diversity and spatial complexity through interdisciplinary integration and system-level thinking. Z.Y. Lu & X.J. Zhan (2024) analysed wayfinding in mega-structures and transport hubs through spatial hierarchy and behavioural patterns, demonstrating that signage systems adapted to multi-layered circulation networks and varied user expectations. W. Huang *et al.* (2023) discussed how Chinese wayfinding projects increasingly combined branding, cultural storytelling, and service design, reflecting a shift from purely functional markers

toward behaviourally and culturally meaningful guidance systems. Earlier work also noted the relevance of cultural specificity and large-scale planning perspectives in signage and wayfinding, but these accounts did not provide a sustained, child-focused semiotic explanation of how such systems evolved in China.

Despite these advances in research and policy, recent national guidelines for child-friendly cities and communities also underscored the need to align public-space design with children's developmental characteristics and rights to participation (Ministry of Housing and Urban-Rural Development, 2022; China Association for Community Development, 2024). However, research on child-oriented sign systems in China still showed two gaps. First, few studies offered a diachronic semiotic account of how children's signage evolved alongside cultural change, technological development, and urban policy, from early public-information standards to current digital-intelligent environments. Second, this historical evolution rarely was interpreted through Bronislaw Malinowski's tripartite cultural stratification – material apparatus, social institutions, and spiritual life – to explain how safety functions, institutional codes, and emotional-cultural meanings were layered in children's visual communication. Against this backdrop, the present article aimed to trace the evolution of Chinese children's sign systems from the 1980s to the present, to interpret this trajectory using Malinowski's cultural stratification theory, and to outline an analytical perspective linking safety, cultural identity, and emotional experience in the design of child-oriented wayfinding systems.

MATERIALS AND METHODS

This study adopted a qualitative, diachronic research design to examine the evolution of China's child-oriented sign systems from the 1980s to 2025. Grounded in a semiotic perspective and drawing on B. Malinowski's (1944) theory of cultural stratification, the research focused on how children's sign systems shifted from purely functional safety tools to carriers of cultural identity and emotional experience. Within this theoretical framework, Malinowski's tripartite structure of "material apparatus – social institutions – spiritual life" revealed the interactive logic between technological iteration and cultural praxis. Applied to children's wayfinding systems, the material stratum emphasised physical carriers and visual syntax, focusing on the implementation of safety functions. The institutional stratum concerned sign conventions and cultural semantics, demonstrating how design languages embed regional cultural elements. And the spiritual stratum highlighted emotional resonance and value identification, reflecting the functional transition from information transmission to emotional empowerment.

For empirical analysis, twenty-six representative cases of child-oriented sign systems were selected, including kindergartens, hospitals, theme parks, and

museums. These cases were chosen for their visibility in public design discourse, the availability of visual and textual documentation, and their coverage of different facility types and historical phases. While the full case set informed the identification of phase-typical patterns, only six particularly illustrative cases are discussed in detail to avoid overburdening the Results section. The broader corpus serves as a reference for general trends and recurring design elements. In parallel, the study reviewed a diachronic set of normative and policy documents to establish the regulatory and institutional context in which children's sign systems evolved. The corpus included national standards and technical guidelines, as well as technical

drafting guidance focused on child safety and relevant local standards (Standardisation Administration of China, 1983; 1988; 1994; 2008a; 2008b; 2008c). Where applicable, an international reference standard was consulted (International Organisation for Standardisation, 1980). The policy set covered cultural-industry and cultural-service documents (General Office of the State Council of the People's Republic of China, 2009) and child-friendly urban construction (Shanghai Municipal People's Government Office, 2021). Representative municipal programmes were also reviewed to contextualise digital-infrastructure implementation. All cited documents were consolidated in Table 1.

Table 1. Major standards and policy documents shaping the evolution of child-oriented sign systems in China

Phase	Year	Standard / policy document	Issuing body
Safety-dominant phase	1983	GB 3818-1983 Public Information Graphical Symbols	Standardisation Administration of China
	1988	GB 10001-1988 Graphical Symbols for Public Information Signs	
	1994	GB 10001-1994 Graphical Symbols for Public Information Signs	
	2008a	GB 2894-2008 Safety Signs and Guidelines for Use	
	2008b	GB/T 7291-2008 Technical Guidelines for Graphical Symbols Based on Consumer Needs	
	2008c	GB/T 20002.1-2008 Drafting for Special Aspects in Standards – Part 1: Child Safety	
	2020	DB54/T 0226-2020 (local standard for child welfare institutions)	Tibet Autonomous Region Administration for Market Regulation
Cultural-consciousness phase	2009	Cultural Industry Revitalisation Plan	State Council of the People's Republic of China
	2011	Decision on Deepening Cultural System Reform	
	2012	The Ministry of Culture's Twelfth Five-Year Plan for Doubling Cultural Industries	Ministry of Culture of the People's Republic of China
	2015	Guidelines on Accelerating Modern Public Cultural Service Systems Ministry of Culture of the People's Republic of China	State Council of the People's Republic of China
	2016	Opinions on Promoting Cultural Creative Product Development	
Digital-intelligence phase	2019	Guiding Opinions on Promoting the Deep Integration of Culture and Science and Technology	Publicity Department of the CPC Central Committee, Cyberspace Administration of China, Ministry of Finance, Ministry of Culture and Tourism, National Radio and Television Administration
	2021	14th Five-Year Plan (2021-2025)	National People's Congress of the People's Republic of China
	2022	Guidelines for Child-Friendly City Construction (revised)	Ministry of Housing and Urban-Rural Development / China Association for Community Development
	2021	Digital infrastructure and smart-city action plans (Beijing)	Beijing Municipal Bureau of Economy and Information Technology
	2021	New infrastructure and digital transformation plans (Shanghai)	Shanghai Municipal People's Government Office

Source: compiled by the authors based on Standardisation Administration of China (1983; 1988; 1994; 2008a; 2008b; 2008c), Tibet Autonomous Region Administration for Market Regulation (2020), General Office of the State Council of the People's Republic of China (2009; 2016), The State Council of the People's Republic of China (2011), Ministry of Culture of the People's Republic of China (2012), National People's Congress of the People's Republic of China (2021), Ministry of Housing and Urban-Rural Development (2022), China Association for Community Development (2024), Beijing Municipal Bureau of Economy and Information Technology (2021), Shanghai Municipal People's Government Office (2021)

Analytically, the investigation proceeded in three steps. First, the normative documents and case materials were aligned diachronically to identify periods of concentrated regulatory change and corresponding shifts in design practice. Second, Malinowski's tripartite cultural stratification – material apparatus, social institutions, and spiritual life – was applied as an interpretive lens to organise observations across cases and documents. Specifically, the material stratum addressed changes in sign carriers and visual grammars (e.g., pictogram form, colour/contrast strategy, layout, and ergonomic visibility); the institutional stratum addressed standardised requirements and organisational logics embedded in wayfinding (e.g., information hierarchy, compliance constraints, and service-flow cues); and the spiritual-emotional stratum addressed affective and identity-related meanings in children's experience (e.g., reassurance, cultural belonging, and participation cues). Third, cross-case comparison of these observations supported the identification of phase-typical configurations and the delineation of three analytical phases – Safety-Dominant, Cultural-Consciousness, and Digital-Intelligence Innovation.

RESULTS AND DISCUSSION

The analysis identified three phases in the evolution of child-oriented signage design in China from the early 1980s to 2025: a Safety-Dominant Phase (1983-2008), a Cultural-Consciousness Phase (2009-2018), and a Digital-Intelligence Innovation Phase (2019-present). Overall, the Safety-Dominant Phase established a standardised, safety- and risk-oriented visual grammar; the Cultural-Consciousness Phase reoriented signage towards place identity and cultural storytelling; and the Digital-Intelligence Innovation Phase extended these layers through responsive, multimodal media. Rather than mapping neatly onto calendar decades, the periodisation synthesises recurring shifts in dominant design priorities, visual/material strategies, and the ways children are positioned as users within public sign systems. The boundaries between phases were inferred from converging evidence in the diachronic corpus of standards/policies and the selected cases, especially shifts in safety standardisation (1983-2008), cultural-policy orientation (from 2009), and culture-technology integration and child-friendly city agendas (from 2019).

Safety-Dominant Phase. Historically, child-related signage in China developed alongside the broader standardisation of public information symbols. During the early period of the People's Republic of China (1949-1978), public environmental signage received limited attention and remained largely unsystematic (Shen *et al.*, 2019). Following the Reform and Opening-Up policy, accelerated economic globalisation and social change generated demand for rationalised graphical languages in public spaces. National standards such as GB 3818-1983 and the subsequent GB 10001 series gradually consolidated pictograms and usage rules for core public facilities

(Standardisation Administration of China, 1983). Reviews of the GB/T 10001 series also documented how these standards expanded through later revisions (Zhang, 2007). Later safety standards, notably GB 2894-2008, and local derivatives such as DB54/T 0226-2020, extended requirements for warning content, placement, and visibility into children's activity spaces (Standardisation Administration of China, 2008c; Tibet Autonomous Region Administration for Market Regulation, 2020).

The analysis of early child-related environments shows that these standards established a prototypical safety paradigm based on high-contrast chromatic schemes, simple geometric configurations, and concise pictograms. Standardisation prioritised functional orientation and aligned with widely used principles of simplicity and recognisability articulated in ISO 7001:1980 (*International Organisation for Standardisation, 1980*). In practice, children were not addressed as a distinct user group, yet their presence was implicitly acknowledged through symbols such as "priority seating for passengers with children" and "slippery surface warnings" in circulation spaces. In children's hospitals and kindergartens, designers typically derived child-facing signs by scaling, recolouring, or slightly softening existing safety pictograms while retaining their normative semantics. This pattern positioned children primarily as vulnerable subjects who had to be protected from specific risks, and it framed sign systems as instruments for clearly signalling danger and appropriate behaviour rather than as media for participation (Fig. 1).

A second configuration identified in the case corpus concerns the integration of ergonomic and perceptual parameters. With the expansion of the GB/T 10001 series and the introduction of GB/T 7291-2008 and GB/T 20002.1-2008, guidelines began to incorporate consumer needs and child safety into technical drafting criteria (Standardisation Administration of China, 2008a; 2008b). In analysed projects such as Suzhou Xinzhou Kindergarten, the Children's Hospital affiliated with Zhejiang University School of Medicine, and Beijing Happy Valley, sign installation heights were typically adjusted to roughly 0.9-1.5 metres to match children's eye level, and high-saturation colours ($a > 20$, $b > 30$) were used to increase conspicuity in busy environments. Behaviour management symbols such as "No Touching", "Mind Your Head", or "No Climbing" were clustered around staircases, corners, and equipment zones (Fig. 2). These practices indicate a gradual shift from simple transplantation of adult-oriented signs towards a more systematic consideration of children's physical stature and perceptual thresholds, even though the overall visual language still reproduced adult safety norms.

From a broader perspective, these findings both confirm and nuance existing accounts of standardised wayfinding. V. Mehta & C. Auffrey (2022) argued that public signage in complex urban environments must

balance legibility with place-based identity, yet in the Safety-Dominant Phase legibility in the analysed cases was pursued almost exclusively through codified safety pictograms and high-contrast colour schemes, with little attention to local character. S. Jamshidi & D. Pati (2024) described contemporary public information symbols as negotiating between international standardisation and local adaptation; in the case corpus this negotiation

appears only in embryonic form, as child-related signs are directly derived from adult-oriented ISO and GB systems with minimal semantic modification. At the same time, the emphasis on visual salience and redundancy resonates with cognitive studies showing that highly visible, iconic cues support children's comprehension of safety information (Motamedi *et al.*, 2024; Bock *et al.*, 2024; Wang *et al.*, 2025).

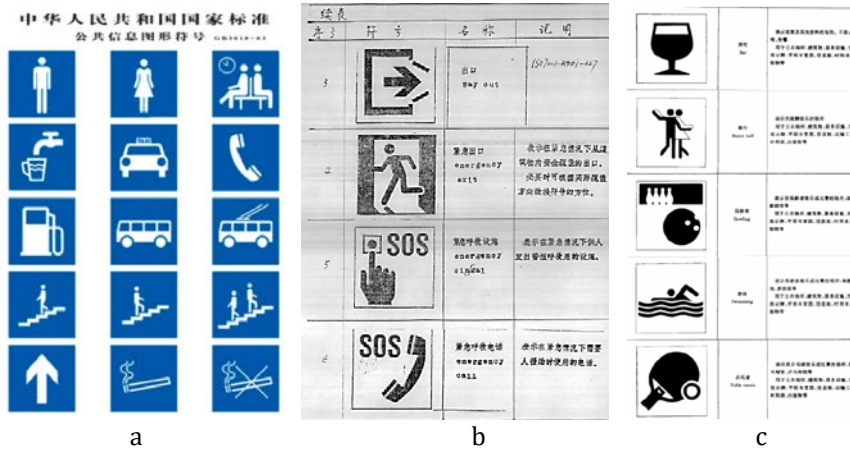


Figure 1. Historical public information graphical symbols in China

Note: a – designed by Chen Hanmin (partial), later incorporated into China's national standard GB 3818-1983, b – Cover page of the draft GB 10001-1988 Graphical Symbols for Public Information Signs and selected adopted symbols, c – Newly added public information graphical symbols in GB 10001-1994 (partial)

Source: CSRES (n.d.a; n.d.b), WeChat Official Account (n.d.a)



Figure 2. Child-oriented wayfinding design examples

Note: a – Suzhou Xinzhou Kindergarten (2005), b – Insect Carnival signage design at Beijing Happy Valley (2007), c – Children's Hospital affiliated with Zhejiang University School of Medicine (2006)

Source: WeChat Official Account (n.d.b), Mafengwo (n.d.), Zhejiang University School of Medicine Children's Hospital (n.d.)

Overall, the safety-dominant phase established a unified visual grammar for public information symbols and extended its influence into emerging child-oriented environments. In this period, children were primarily

framed as vulnerable subjects requiring protection, and sign systems focused on making risk states and safety instructions highly visible. Although cultural and emotional considerations remained largely implicit, the

basic repertoire of pictograms, colour strategies, and ergonomic parameters for children's spaces was gradually consolidated. This phase therefore provided the material and regulatory infrastructure upon which later cultural-conscious and digital-intelligence developments could build. It also clarified the baseline from which the functional transformation of children's sign systems – from pure safety tools toward richer cultural and emotional mediators – would later unfold.

Cultural-Consciousness Phase. The cultural awakening of China's child-oriented sign systems represented a structural response to the long-term absence of cultural expression in earlier design practices. As N.V. Skliarenko *et al.* (2022) argued, visual communication design should be understood not only as a functional tool but also as a framework aligned with sustainable development and ecological strategies, which reinforces the necessity of embedding cultural and social values into child-oriented signage. Before the

Cultural Industry Revitalisation Plan (General Office of the State Council of the People's Republic of China (2009), several factors constrained cultural consciousness in public spaces. Policy priorities centred on functional safety, as shown by the 1983 Public Information Graphical Symbols national standard, which unified signage but largely excluded cultural expression from institutional frameworks (Standardisation Administration of China, 1983). In parallel, the "quantity-over-quality" logic of rapid urbanisation (2000-2010) fostered reliance on universal design templates (Cheshmehzangi, 2018), exemplified by the 2005 signage for Suzhou Xinzhou Kindergarten, which prioritised generic safety symbols over regional cultural DNA. Technological and conceptual limitations further relegated cultural symbols to decorative roles, as in the 2007 Insect Carnival signage at Beijing Happy Valley, where visual playfulness diverged from deeper cultural connotation (Fig. 3).

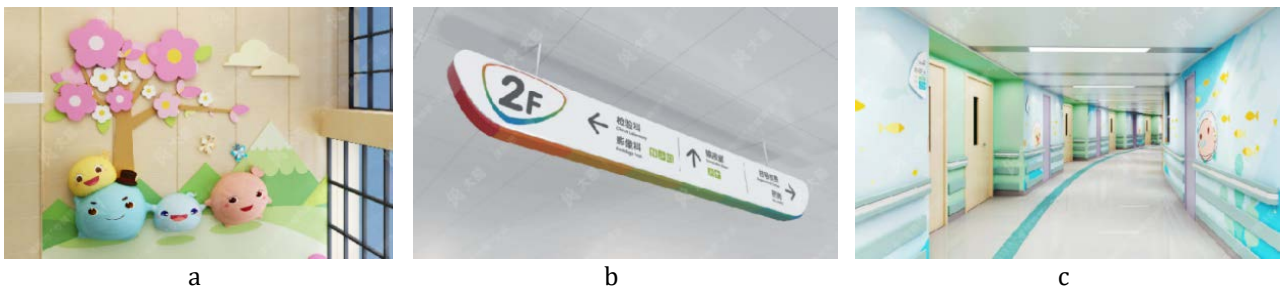


Figure 3. Wayfinding system design for Ningbo Women and Children's Hospital

Note: a – Hospital Partial Decorative Wall (2014), b – Hospital Wayfinding Signage Design (2014), c – Hospital Corridor Visual Design (2014)

Source: Ningbo Women and Children's Hospital (2014)

From 2009 onwards, a cluster of national policies repositioned culture as a strategic resource and gradually normalised its integration into public space design. The 2009 Cultural Industry Revitalisation Plan designated cultural industries as a "national strategic sector" and called for the integration of cultural resources with modern production and technology (General Office of the State Council of the People's Republic of China, 2009). The 2011 Decision on Deepening Cultural System Reform and the 2015 Guidelines on Accelerating Modern Public Cultural Service Systems further linked cultural development targets to fiscal incentives, land use, and public service provision, emphasising both socialist core values and regional distinctiveness (The State Council of the People's Republic of China, 2011). Subsequent Five-Year Plans and the 2016 Opinions on Promoting Cultural Creative Product Development stressed the "living inheritance and modern reinterpretation" of cultural heritage and explicitly encouraged child-cognition-adapted cultural derivatives for museums, parks, and other public venues (General Office of the State Council of the People's Republic of China, 2016). These cultural-policy milestones, synthesised in Table 1, provided institutional incentives and resources for embedding local cultural motifs into children's sign systems rather than treating them as optional decoration.

Ningbo Women and Children's Hospital North Campus offers a representative example of this cultural turn. Its 2014 expansion into a "dual-campus synergy" model prompted Dalue Design Institute to reconceptualise wayfinding as cultural storytelling and emotional interaction (Ningbo Women and Children's Hospital, 2025). By deconstructing Ningbo's cultural genealogy, the designers extracted the local "Tangyuan" (glutinous rice ball) as a cultural genome and reconstructed it into a cognitively universal "Reunion Family" IP system. This translation of local cultural "genomes" into contemporary visual systems echoes recent work on integrating intangible cultural heritage elements into product and furniture design through symbolic semantics and multi-criteria evaluation (Chen *et al.*, 2025). The design transposed Tangyuan's material "irregularity" and "adhesiveness" into embodied expressions within children's behavioural cognition models, aligning irregular forms with childhood individuality and interpersonal bonding. At the same time, the IP's dynamic combinatorial structure mirrored the functional complementarity and resource-sharing mechanisms between the hospital's northern and southern campuses, establishing a dual semiotic system of spatial narrative and institutional innovation (Fig. 3). At the material level, the case reconfigures sign carriers and spatial markers into soft, rounded, tactile forms; at

the institutional level, it encodes hospital management and service flows within a coherent visual identity; at the spiritual-emotional level, it constructs a reassuring image of reunion and care for children and their families.

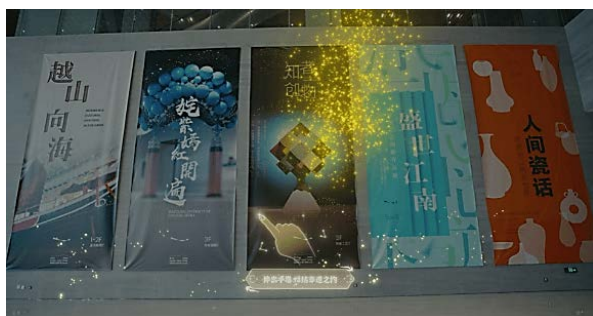
From a broader perspective, the Cultural-Consciousness Phase aligns with research that frames signage as a vehicle for local identity rather than neutral infrastructure. M. Zeng (2015) showed that contemporary sign systems foreground regional motifs and narratives; the Tangyuan “Reunion Family” case concretises this shift by turning a local food symbol into a spatial IP that structures children’s emotional experience. N.V. Skliarenko *et al.* (2022) argued that visual communication should be linked to sustainable and ecological strategies; in the study material this appears in the way recurring cultural genomes stabilise community meaning across institutional settings. G. Aiello (2020) highlighted how public visual communication participates in negotiations of visibility and belonging, a dynamic reflected in how hospital signage repositions children and caregivers from anonymous patients to members of a culturally defined “family”. L. Chen *et al.* (2025) similarly emphasised the potential of intangible heritage motifs to mediate affect in everyday design.

Overall, the Cultural-Consciousness Phase marks a shift from purely safety-oriented graphics towards sign systems that actively embed regional culture and institutional narratives into children’s environments. In this period, cultural symbols begin to move from superficial decoration to structured visual languages that support place identity and emotional reassurance. Children’s sign systems increasingly serve as mediators between everyday space and local cultural memory, while still operating on the safety foundations established in the earlier phase. This lays the groundwork for later digital-intelligence developments, in which cultural semantics and emotional experience are further extended through interactive and intelligent media.

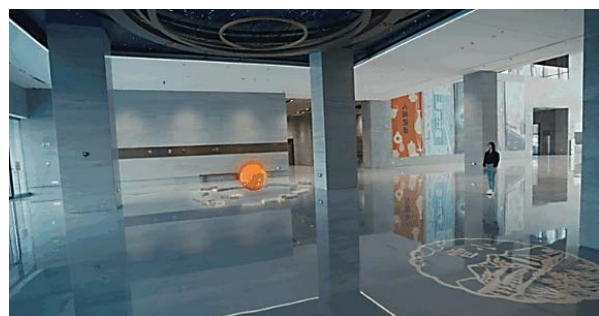
Digital-intelligence Innovation Phase in children’s signage evolution. The digital-intelligent transformation of China’s child-oriented sign systems is closely tied to recent national strategies for digital public services and child-friendly urban construction. The 14th Five-Year Plan (2021-2025) mandates the

“equalisation of digital public services” and sets targets for building “digital twin communities” in most cities by 2025 (National People’s Congress, 2021). Updated guidelines for child-friendly cities introduce “intelligent wayfinding systems” as mandatory indicators, calling for Augmented Reality/Mixed Reality (AR/MR)-based upgrades that enhance the emotional, interactive, and educational qualities of signage (China Association for Community Development, 2024). Under these frameworks, pioneering cities such as Beijing and Shanghai have invested in digital infrastructures that support dynamic updates and interactive experiences in child-oriented environments (Beijing Municipal Bureau of Economy and Information Technology, 2021; Shanghai Municipal People’s Government Office, 2021). These policy and infrastructure developments, summarised in Table 1, provide the institutional and technical backdrop against which digital-intelligence innovations in children’s sign systems have emerged.

Analysis of cases shows that digital technologies primarily operate as extensions of the material and cultural layers established in earlier phases. At the Zhejiang Intangible Cultural Heritage Museum, Rokid AR guidance technology uses point cloud scanning and six-degrees-of-freedom tracking to achieve centimetre-level positioning; children and caregivers wearing AR glasses can simultaneously perceive physical exhibits and virtual overlays, completing tasks that weave navigation with encounters with traditional craftsmanship (Fig. 4). This direction is consistent with findings that AR-based museum applications can enhance visitors’ learning motivation and academic achievement, especially for younger audiences (Cheng *et al.*, 2025). In the examined projects, digital devices – screens, sensors, AR terminals – do not replace static signage but cluster around key decision points and narrative nodes, creating “thickened” wayfinding zones where safety instructions, spatial cues, and cultural content are layered in time. In this configuration, Malinowski’s material stratum is upgraded from fixed pictograms to adaptive interfaces, while the institutional stratum expands to include software rules, content management systems, and data protocols that govern how guidance information is generated and updated.



a



b

Figure 4. AR experiences at Zhejiang Intangible Cultural Heritage Museum

Note: a – AR Experience View 1 (2025), b – AR Experience View 2 (2025)

Source: Zhejiang Intangible Cultural Heritage Museum (2025)

At the experiential level, the corpus reveals an increasing reliance on multimodal cues that align with children's cognitive and emotional characteristics. IoT sensors and edge-computing architectures enable the real-time capture of movement trajectories, dwell durations, and interaction patterns through touchscreens and audio-visual feedback (Open Systems Committee, 2012), while machine learning algorithms can dynamically adjust information hierarchies and delivery strategies based on spatiotemporal data (Cai *et al.*, 2022). These technical capacities resonate with broader national agendas promoting cultural-technological integration (General Office of the State Council of the People's Republic of China, 2009) and can be repurposed from entertainment to cultural contexts: for example, targeting systems similar to those used in Shanghai Disneyland's "Buzz Lightyear Planet Rescue" can be adapted so that when children hit AR-projected traditional motif targets, they receive both navigational

shortcuts and short narratives about local heritage. In parallel, multimodal interaction research indicates that integrating visual, auditory, and tactile channels can significantly enhance children's wayfinding efficiency when aligned with developmental characteristics (Petrini *et al.*, 2016; Negen *et al.*, 2019). Studies on audio-visual temporal integration (Qiu *et al.*, 2025), visuo-haptic processing in children with atypical development (Purpura *et al.*, 2024), multi-channel cognitive models (Ulusoy, 2023), and surveys of multimodal human-computer interaction (Tao *et al.*, 2022) together provide system-level frameworks for designing cognitive-compliant interaction loops in complex public environments (Fig. 5). Considered alongside the case corpus, these findings suggest that child-oriented digital signage should be treated as a multisensory guidance ecology rather than a set of isolated screens.



Figure 5. Interactive scene from "Buzz Lightyear Planet Rescue" at Shanghai Disneyland

Note: a – Game Start Screen (2019), b – Game Score Interface (2019), c – Game Control Joystick (2019)

Source: Shanghai Disney Resort (n.d.)

Viewed against broader human-computer interaction and learning research, this phase refines rather than overturns existing accounts of AR-based and multimodal guidance. A. Cheng *et al.* (2025) showed that AR museum applications can enhance young visitors' motivation and learning; similarly, F. Xu *et al.* (2024) reported that AR-based egocentric visualisations improve indoor route learning and navigational efficiency. In the analysed cases, these effects appear within a layered semiotic structure where AR tasks interweave navigation with encounters with local craft. K. Petrini *et al.* (2016) and J. Negen *et al.* (2019) emphasised that combining visual, auditory, and tactile cues improves spatial performance when information is tuned to developmental constraints, a principle echoed in the multisensory zones around key decision points in the analysed cases. At the same time, multimodal interaction surveys by J. Tao *et al.* (2022) and N. Ulusoy (2023) underscored the need for system-level models, which is extended here by embedding such interfaces into embedding such interfaces into child-friendly city strategies and data-governance frameworks.

Overall, the Digital-Intelligence Innovation Phase marks a transition from static safety signage to responsive guidance ecologies that link physical space, data flows, and cultural narratives. In this period, children's sign systems become multi-layered

interfaces that register movement and emotion while projecting culturally meaningful content. At the material level, sensors, displays, and AR devices reconfigure sign carriers into adaptive, multimodal surfaces; at the institutional level, data governance frameworks and smart-city platforms embed wayfinding into integrated service systems; at the spiritual-emotional level, participatory and playful interactions cultivate agency, curiosity, and reassurance for children and their caregivers. These shifts prepare the ground for an integrated evolutionary model in which digital intelligence extends, rather than replaces, the safety and cultural layers established in earlier phases.

CONCLUSIONS

China's child-oriented sign systems underwent a clear evolution from the 1980s onward, progressing from material provision to emotional empowerment within a semiotic framework. This study examined that trajectory and identified three developmental phases – Safety-Dominant, Cultural-Consciousness, and Digital-Intelligence Innovation – each associated with distinct transformations in the functions and meanings of signage. In the Safety-Dominant Phase (1983-2008), standardised visual grammars of high-contrast colours and geometric forms constituted the basic symbolic

repertoire for ensuring children's safety in public environments. In the Cultural-Consciousness Phase (2009-2018), signage was reinterpreted as a symbolic medium for identity construction, embedding regional motifs and cultural codes to support children's sense of belonging and reduce anxiety in sensitive spaces such as hospitals and kindergartens. In the Digital-Intelligence Innovation Phase (2019-present), semiotic principles were increasingly combined with intelligent technologies, and signs began to function as dynamic mediators that linked spatial guidance with children's cognitive characteristics and affective experiences. Taken together, these three phases demonstrated that semiotics operated not only as an analytical perspective but also as a design-oriented way of structuring decisions in child-oriented environments. By applying cultural stratification theory to children's wayfinding systems, the research articulated a stratified model that related material apparatus, institutional regulation, and spiritual-emotional meanings across historical stages. Rather than establishing a closed methodological system, the study proposed a structured analytical approach that connected cultural stratification theory with contemporary design strategies for child-friendly public spaces and helped clarify how safety, cultural identity, and emotional reassurance could be layered in practice.

Future research could build on these findings in several directions. First, empirical studies involving children, parents, and educators could systematically evaluate how different combinations of safety, cultural, and digital elements influence navigation behaviour,

emotional responses, and symbolic learning in real environments. Second, comparative case studies across regions and countries could test the transferability of the three-phase, three-layer model and identify context-specific adaptations. Third, design-oriented research could translate the stratified model into practical tools such as evaluation checklists, co-design guidelines, or scenario-based prototypes – to support interdisciplinary collaboration among planners, designers, and policymakers. Finally, as digital-intelligent infrastructures continue to expand, further work is needed to address issues of data governance, accessibility, and inclusivity in children's sign systems, ensuring that technological innovation remains aligned with ethical, cultural, and developmental considerations.

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Еволюція засобів візуалізації знакових систем Китаю для дітей: семіотичний аспект

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Анотація. Актуальність цього дослідження полягає у вивченні того, як система самоорієнтування у громадських просторах, спрямована на дітей, перейшла від базових заходів безпеки до культурно та емоційно заряджених посередників на тлі змін стандартів, політики та цифрових технологій. Це дослідження мало на меті дослідити еволюцію інструментів візуалізації в китайських дитячих знакових системах з семіотичної точки зору. Спираючись на теорію культурної стратифікації Броніслава Малиновського, дослідження поєднало діахронічний аналіз національних та місцевих стандартів, політичних документів та репрезентативних випадків з дитячих лікарень, дитячих садків, тематичних парків та культурних закладів. Семіотично-стратифікаційний підхід було застосовано для інтерпретації змін на трьох рівнях: матеріальний апарат, інституційне регулювання та духовно-емоційні значення, підкреслюючи зв'язки між візуальними кодами та ширшими соціокультурними переходами. Результати дослідження визначили три історичні фази в еволюції китайських дитячих знакових систем: фаза домінування безпеки (1983-2008), що характеризується стандартизованими піктограмами, високо-контрастними кольорами та попереджувальною семантикою; фаза культурної свідомості (2009-2018), яка включала регіональні мотиви, символи місцевої їжі та елементи нематеріальної спадщини для реконструкції ідентичності та зменшення тривожності; та фаза інновацій цифрового інтелекту (2019-дотепер), яка інтегрувала доповнену реальність, Інтернет речей та інтерактивні інтерфейси для створення мультисенсорного, афективного досвіду керівництва та просторового управління на основі даних. У сукупності семіотично-стратифікаційний аналіз показав, що стандартизовані граматики безпеки, культурно вбудовані візуальні ідентичності та цифрово опосередковані мультисенсорні інтерфейси накопичувалися, а не просто замінювали один одного з часом, що виявляє коеволюцію дизайнерської практики з політичними програмами та соціальними очікуваннями. Результати пропонують концептуальні наслідки для ініціатив, орієнтованих на дітей, та для майбутнього дизайну орієнтирів, який враховує як технологічні інновації, так і безперервність місцевих культурних наративів

Ключові слова: дизайн системи самоорієнтування; середовище, орієнтоване на дітей; теорія культурної стратифікації; дизайн візуальної комунікації; емоційний досвід



Аналіз архітектурно-художньої відповідності носіїв зовнішньої реклами дизайн-коду та стилістиці міського середовища

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Анотація. Дослідження мало на меті оцінити зовнішню рекламу міста на предмет її візуальної відповідності архітектурі та дотримання міського дизайн-коду. Шляхом проведення експертних та соціологічних досліджень визначати ступінь інтегрованості рекламних носіїв в архітектурну концепцію міста. Проаналізована відповідність рекламних конструкцій загальній стилістиці простору та дотримання ними вимог локального дизайн-коду. Як показало опитування, більшість опитаних вважають розміщення зовнішньої реклами в місті хаотичним. Зокрема, такої думки дотримуються 54% жінок та 52% чоловіків. Натомість протилежну оцінку (впорядковане розміщення) дали лише 17% жінок та 21% чоловіків. Оцінюючи візуальну складову рекламних стендів (виразність форми, композицію, світло, колір та креативність), 45% чоловіків та 52% жінки назвали їхній дизайн невиразним і монотонним. Як свідчать дані опитування, 45% чоловіків та 47% жінок переконані, що зовнішній вигляд рекламних конструкцій потребує стилістичного доопрацювання. Крім того, майже третина респондентів відзначає їхню візуальну дисгармонію із загальним середовищем. Зовнішня реклама викликає в опитаних неоднозначні емоції, проте більшість респондентів (52% чоловіків та 54% жінок) сприймають її передусім як комерційну. Ще майже п'ята частина аудиторії (22% чоловіків та 23% жінок) бачить у ній переважно анонси розважальних чи культурних подій. Ключовою вимогою до реклами є її архітектурна сумісність. Інтеграція в наявний архітектурний контекст забезпечує прихильність місцевих жителів. Перевантаженість рекламою в місцях відпочинку та транспорті створює візуальний хаос, що сприймається вкрай негативно. Наукова новизна дослідження визначається розробкою теоретичних засад гармонійного просторового розміщення реклами, яка враховує архітектурну спадщину та сучасні соціокультурні запити жителів міста. Розроблено рекомендації щодо гармонійної інтеграції рекламних носіїв в архітектуру та ландшафт міста для покращення його візуального образу.

Ключові слова: дизайн середовища; рекламні носії; образ міста; архітектурне середовище; дизайн-код; стилістика; ландшафт; міський простір

ВСТУП

Зовнішня реклама давно стала невіддільним елементом урбаністичного простору, що задає архітектурний стиль вулиць та впливає на емоційний фон містян. Класичні та динамічні цифрові рекламні носії виконують не лише

комерційні цілі, а й відіграють значну соціокультурну роль у житті мегаполіса. Як невіддільна частина урбаністичного простору, зовнішня реклама здатна як руйнувати естетику вулиць, так і створювати їхній унікальний характер. За умови грамотного підходу вона

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працює як потужний іміджевий інструмент, що викликає приємні емоції.

Зовнішня реклама, створена з урахуванням архітектурного контексту, здатна підкреслити унікальність та культурний код міста [21, 22]. Проте домінування типових рекламних конструкцій призводить до візуального забруднення та перевантаження міського середовища, створюючи ефект візуального шуму.

Ключовим аспектом успішної зовнішньої реклами повинен бути її здатність враховувати місцеві культурні та історичні контексти. Реклама, яка використовує місцеві символи, традиційні палітри та архітектурні мотиви, сприймається мешканцями як більш близька та значуща. Врахування культурного коду, історії та локального контексту перетворює звичайний рекламний щит на мистецький об'єкт, який викликає довіру та позитивні емоції [21].

Це доводить, що зовнішня реклама має гармонійно вписуватися в архітектурний ансамбль завдяки автентичним формам, палітрі та матеріалам. У такому разі вона перестає бути просто носієм інформації, а стає невіддільною частиною культурного обличчя та самобутності міста.

Теоретичним підґрунтям даного дослідження слугували публікації українських та іноземних авторів за цією проблематикою. Більшість авторів акцентують на тому, що міська реклама активно конструює візуальне середовище, впливаючи на соціокультурний портрет мегаполіса, його візуальну естетику та світоглядні цінності населення.

У науковій роботі M. Adam et al. (2022) аналізується вплив яскравості та габаритів зовнішньої реклами на візуальне сприйняття міського середовища. Дослідники зазначають, що надмірна концентрація та висока інтенсивність світіння LED-екранів створюють ефект засліплення, перевантажують простір і знижують загальну естетичність вулиць.

Візуальна айдентика міста – це результат гармонійного поєднання архітектурних форм, природного ландшафту, світлових рішень, рекламних конструкцій та стріт-арту зазначає U. Conti (2024). У дослідженні U. Conti (2024) Берлінський стріт-арт (Німеччина) аналізується як інструмент візуальної соціальної взаємодії. У роботі детально досліджується, як графіті й мурали трансформують міське середовище, взаємодіють із глядачами та формують місцеву ідентичність. Значну увагу автор приділив тому, як саме глядач сприймає міський простір. Їхня взаємодія є ключовою у створенні самобутньої атмосфери та унікального образу міста.

Дослідники J. Krase et al. (2020) аналізуючи багаторічні фотоматеріали міського середовища США, Франції, Польщі та Італії, дійшли висновку, що справжніми творцями міського простору є самі містяни, а не професійні архітектори чи

забудовники. Автори акцентують, що саме жителі наповнюють місто життям через фасадний декор, оформлення вітрин, облаштування стихійних зон відпочинку та розміщення релігійних чи культурних символів.

За висновками досліджень W. Li & P. Liu (2023) в Макао (Китай) графіті та рекламні конструкції є невіддільним елементом міської культури, що здатні кардинально змінювати сприйняття урбаністичного простору. На думку авторів, дизайн зовнішньої реклами виступає інструментом трансляції місцевої ідентичності та пам'яті.

Згідно з дослідженням X. Liang et al. (2023) надмірне розміщення рекламних конструкцій на міських вулицях призводить до ефекту візуальної поліфонії. На думку дослідників, зовнішня реклама виступає потужним чинником, який змінює візуальне середовище міста. Вона порушує баланс між матеріальними об'єктами (будівлями, дорогами та зеленими насадженнями) та емоційним сприйняттям простору.

Згідно з дослідженнями N. Vangelov (2025) сучасна зовнішня реклама має адаптуватися до міської архітектури та культурних традицій населення. Дослідник пропонує аналізувати поведінкові моделі споживачів у режимі реального часу, що дозволяє створювати релевантний контент, який гармонійно вписується в міський архітектурний ландшафт.

Аналізуючи рекламні білборди в Джок'якарті (Індонезія) S.I. Liyana et al. (2021) дійшли висновку, що рекламні носії слугують активним просторовим елементом, який структурує та спрямовує життя міста. У роботі чітко простежується, як вербальні та візуальні елементи реклами конструюють суспільну ідентичність та нав'язують певні ідеологічні погляди, виходячи далеко за межі звичайної торгівлі.

Оцінка візуального забруднення в центрі Гнезно (Польща), яку виконали K. Borowiak et al. (2024) на основі аудит-дослідження та думок мешканців, підтвердила: реклама на будинках шкодить місту. Вона діє як візуальний забруднювач, нівелюючи унікальний архітектурний образ та пошкоджуючи фасади. Дослідники звертають увагу на три головні проблеми зовнішньої реклами: візуальне перевантаження міського простору, відволікання уваги водіїв та світлове забруднення, яке завдає дискомфорту мешканцям.

Згідно з результатами опитувань та польових досліджень, проведених E. Gelan (2025), жителі Аддис-Абеби (Ефіопія) виявляють незадоволення надмірною кількістю рекламних конструкцій, їхнім розташуванням поблизу історико-архітектурних пам'яток, а також занадто яскравим підсвічуванням. Автор виділяє низку ключових факторів, що викликають відторгнення жителями: надмірну концентрацію, хаотичне розташування конструкцій, дисгармонія з архітектурою міста, відсутність

чіткої нормативної бази та відсутність контролю, а також їхній дисонанс із загальним міським дизайном. Дослідник наголошує, що суворий контроль за зовнішньою рекламою необхідний для збереження візуальної привабливості міста.

Згідно з дослідженням М. Kozak (2022), проведеним у Любліні (Польща), кріплення рекламних щитів на фасадах руйнує автентичний вигляд будівель, наслідки якої стають особливо очевидними після демонтажу конструкцій. Як відзначає автор, надмірна реклама є одним із ключових чинників руйнування архітектурного вигляду будівель.

Швидка урбанізація створила зовнішню рекламу обличчям міста. Як зазначають Jialing Chen et al. (2025) це диктує гостру потребу у створенні чітких критеріїв для оцінки її естетики.

Аналіз праць багатьох іноземних дослідників показує, що якісний рекламний носій має бути не лише привертати увагу лаконічністю і контрастом, а й гармонійно доповнювати міський архітектурний ландшафт. Також критично важливим є дотримання етичних норм: повага до громадського простору, місцевих традицій та культурних цінностей.

Українські науковці також приділяють значну увагу дослідженню зовнішньої реклами, зосереджуючись на критеріях її візуальної дієвості та гармонійного поєднання з міським архітектурним ландшафтом.

Дослідники, зокрема І.В. Пономаренко та ін. (2025), підкреслюють потужний вплив візуального оточення (архітектура, медіа, реклама, цифрові та дизайн-рішення) на соціальні взаємодії, задаючи стандарти поведінки та формуючи культурні орієнтири суспільства. На думку науковців, зовнішня реклама та елементи міського благоустрою повинні гармонійно вписуватися в архітектурний ансамбль.

На переконання А.М. Осадчої (2024) гармонійна інтеграція засобів зовнішньої реклами (банерів, білбордів, сітілайтів) у міський простір дозволяє не лише досягти комерційної мети, але й забезпечити їх сприйняття суспільством як повноцінні естетичні елементи.

На думку Л.В. Плукчі (2021) баланс між функціональністю та естетикою є головною умовою ефективності рекламних носіїв. Свої висновки автор підкріпив дослідженням різних рекламних конструкцій, акцентуючи увагу на сучасних цифрових носіях, розміщення яких вимагає глибокого аналізу особливостей міського ландшафту.

Дослідниця Н.Є. Новосельчук (2020) звертає увагу на те, що надлишок зовнішньої реклами створює візуальний хаос на вулицях українських міст. Авторка пропонує вирішити цю проблему шляхом створення універсальних правил для реклами, які допоможуть зберегти історичну спадщину, об'єднавши зусилля експертів, законодавців та комерційного сектору.

За спостереженнями Н.О. Євтушенко та ін. (2023) у період воєнного стану сучасна зовнішня реклама в Україні вийшла за межі суто комерційного інструменту. Вона стала індикатором патріотизму, що суттєво змінило візуальний ландшафт міст та їхнє сприйняття суспільством. Автори зазначають під час війни реклама трансформувалася в інструмент патріотичного виховання та підтримки, що виводить її вплив на суспільство на якісно новий рівень.

На думку М. Мельника (2023) впровадження інноваційних рекламних носіїв, таких як цифрові екрани та медіафасади, в архітектурне середовище сприяє візуальному збагаченню вулиць, зростанню рівня міського комфорту та збільшенню прибутковості підприємств. Серед головних переваг автор виокремлює оновлення міської інфраструктури, формування неповторного іміджу міста та потужне залучення громадськості при дизайні рекламних носіїв.

Зовнішня реклама, за визначенням О.О. Балюна (2020) є обов'язковою складовою міського середовища, що визначає його візуальну привабливість, динаміку та загальне сприйняття. Оскільки зовнішня реклама є невіддільною складовою міського ландшафту, підхід до її розміщення має бути комплексним та збалансованим, наголошує О.О. Балюна.

Дослідники Г.П. Євсєєва та ін. (2017) переконані, що елементи зовнішньої реклами та навігації мають органічно вписуватися в архітектурний ансамбль. Їхня ключова функція – сприяти промоції послуг, спрощувати міську орієнтацію, інформувати про об'єкти та формувати сучасний вигляд міста.

На думку М.В. Ковінько та ін. (2025) як хаотична реклама, так і гармонійно інтегровані інформаційні елементи, є важливими чинниками, що формують візуальне сприйняття окремих мікрорайонів та міста в цілому. У працях дослідників міське середовище розглядається як ключовий концепт, що відображає природу міста як простору для концентрації населення та як функціональної системи, важливої для суспільного розвитку й просторової організації території.

Дослідниця Н. Дядюх-Богатько (2024) зазначає, що хоча різноманітна зовнішня реклама (від білбордів до медіаекранів) міцно вписалася в міський пейзаж, вона часто порушує візуальну гармонію та естетику сучасного урбаністичного середовища.

Науковець С.А. Петрашук (2023) переконаний, що сучасні інновації не витісняють традиційні вивіски з натуральних матеріалів (каменю, дерева чи металу). Якщо такі елементи вдало інтегровані в міський простір, вони перетворюються на справжні витвори мистецтва, над якими не владні ані час, ані мінлива мода.

Дослідники Ю. Поляков та ін. (2025) підкреслюють, що адаптація реклами до нових цифрових

реалій та криз вимагає зміщення акцентів на інтерактивність, дотримання етичних норм і глибоку персоналізацію маркетингових повідомлень.

Незважаючи на значну кількість наукових праць, присвячених адаптації зовнішньої реклами до міського середовища, питання архітектурно-художньої відповідності рекламних носіїв дизайн-коду та загальній стилістиці міста залишається недостатньо висвітленим.

Метою дослідження є оцінка зовнішньої реклами міста на предмет її візуальної відповідності архітектурі та дотриманню міського дизайн-коду. Завдання дослідження – шляхом проведення експертних та соціологічних опитувань визначити ступінь інтегрованості рекламних носіїв в архітектурну концепцію міста.

МАТЕРІАЛИ ТА МЕТОДИ

Дослідження ґрунтується на поєднанні якісних і кількісних методів, доповнених методами систематизації та узагальнення. Якісний аналіз складався з контент-аналізу рекламних носіїв та вивчення літератури, що дозволило впорядкувати

наявну теорію та додати нову інформацію. Кількісний метод – опитування та анкетування забезпечив збір і аналіз структурованих статистичних даних.

Інтеграція сучасної зовнішньої реклами в урбанізоване середовище здійснюється через розгалужену систему носіїв. До них належать як стаціонарні конструкції та фасадні елементи, так і мобільні об'єкти й спеціалізовані креативні формати, зокрема, аеростати та асфальтова графіка [21].

Найкращим для рекламістів є розміщення реклами безпосередньо на будинках. І не просто на рядових будинках, а на найбільш представницьких, естетично виразних, включаючи і пам'ятки історії та культури. Зовнішня реклама безпосередньо впливає на вигляд міста: вона здатна як доповнювати архітектуру та створювати візуальну гармонію, так і спотворювати її, порушуючи загальний естетичний баланс.

Ключовий вплив зовнішньої реклами на архітектуру полягає у кардинальній зміні візуального сприйняття міського простору (Рис. 1).



Рисунок 1. Основні аспекти впливу зовнішньої реклами

Джерело: узагальнено авторами

Зовнішня реклама істотно впливає на міське середовище, формуючи візуальний вигляд вулиць, впливаючи на споживчу поведінку та соціальні процеси. Ключові аспекти зовнішньої реклами включають створення унікальної динаміки міста, візуальне забруднення при надлишку конструкцій, формування споживчих переваг, а також трансляцію соціальних смислів (Рис. 1).

Для привернення уваги, презентації товарів чи інформації на виставках, у торгових залах та на вулицях використовуються різні види мобільних та

стаціонарних конструкцій рекламних стендів. Серед них [22]:

- Мобільні стенди: Roll-up (ролерні), X-banner ("навуки"), Pop-up, буклетниці – портативні рекламні системи, що відрізняються швидким без інструментальним монтажем та легкою вагою.

- Торгові POS-стенди — це спеціалізоване брендоване обладнання (від англ. Point of Sale — місце продажу), призначене для зручної викладки, зберігання та реклами товарів.

- *Інформаційні рекламні стенди* – це спеціальні стаціонарні або мобільні конструкції (щити, панелі, дошки) із пластику, металу чи скла, призначені для розміщення рекламних матеріалів, новин, оголошень та документів.

- *Виставкові рекламні стенди* – це спеціально обладнані, часто мобільні конструкції (каркаси з банерами, вітринами), призначені для презентації товарів, послуг та бренду на виставках, конференціях та промо-акціях.

- *Вуличні конструкції: Білборди, щити, штендери* – великогабаритні стаціонарні конструкції на високій опорі.

- *Фасадні рекламні панелі* – це високо-ефективні зовнішні конструкції (світлодіодні екрани, медіафасади, лайтбокси, консолі), що монтуються на будинках для трансляції динамічного контенту, тексту або графіки.

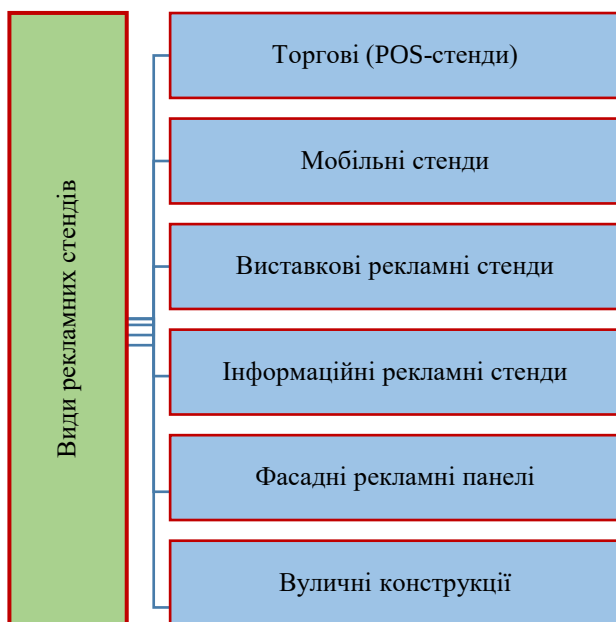


Рисунок 2. Основні види рекламних конструкцій
Джерело: систематизовано авторами

Рекламні стенди також діляться на статичні, змінні та інтерактивні, відрізняючись за матеріалами, розміром і місцем розміщення (Рис. 2).

Фасадні рекламні панелі забезпечують максимальне привернення уваги за рахунок яскравого світлодіодного підсвічування, креативного дизайну та розміщення в зонах високої прохідності, підвищуючи впізнаваність бренду та забезпечуючи цілодобову видимість. Варіанти конструктивного рішення фасадних рекламних панелей можуть бути різними. Серед основних видів можна назвати такі:

- *Фасадні LED-екрани* – це високояскраві вуличні світлодіодні системи, що встановлюються на будинках для демонстрації динамічної реклами та створення сучасних медіафасадів. Вони працюють на базі LED-технологій (SMD, DIP),

привертаючи більше 95% уваги аудиторії за рахунок високої яскравості та контрастності, залишаючись видимими навіть за яскравого сонця.

- *Медіафасади* – це масштабний світлодіодний (LED) екран, інтегрований безпосередньо в архітектуру будівлі.

- *Світлодіодні (LED) панелі та рухомі рядки* — це сучасні пристрої на основі LED-технологій, на яких відображається текст, що рухається, а також проста графіка чи час які виконують.

- *Лайтбокси (світлові короби)* — це об'ємні рекламні чи інформаційні конструкції з внутрішнім підсвічуванням, які слугують яскравими вивісками або елементами інтер'єру.

- *Консольні вивіски (або панель-кронштейни)* — це рекламні конструкції, які кріпляться до фасаду будівлі на бічних кронштейнах перпендикулярно до стіни, потоку пішоходів та транспорту.

Грамотно інтегровані фасадні рекламні панелі поєднують рекламну функцію з архітектурним декором будівель, перетворюючи їх із звичайних конструкцій на динамічні елементи міського середовища (Рис. 3). При встановленні фасадних рекламних конструкцій важливо враховувати їхню відповідність архітектурному стилю будівлі.

Зовнішні рекламні носії надають суперечливий вплив на міське середовище, виступають одночасно джерелом додаткового освітлення вулиць, підтримують соціальні ініціативи, інформують про заходи та сприяють економічному розвитку за рахунок інвестицій у рекламні конструкції та формують динамічний вигляд мегаполісів, але при надмірному використанні спотворюють архітектуру та перевантажують сприйняття. До позитивних впливів рекламних носіїв на міське середовище можна віднести різні фактори (Рис. 4).

При правильному плануванні зовнішня реклама перетворюється із суто комерційного інструменту на функціональну частину міського простору. Зовнішня реклама позитивно впливає на міське середовище, виступаючи елементом вечірнього освітлення, візуально поживляючи ландшафт та формуючи динамічний вигляд мегаполісу. Якісні конструкції підтримують культурні заходи, забезпечують додаткову безпеку за рахунок підсвічування, сприяють економічному розвитку та часто інтегруються до міської архітектури (Рис. 4).

Успішна інтеграція зовнішньої реклами до міського середовища вимагає балансу між комерційними інтересами та збереженням архітектурної цінності міста. У той час неконтрольоване розміщення рекламних носіїв часто суперечить принципам комфортного міського середовища, створюючи візуальний шум, спотворюючи історичні фасади та формуючи візуальне забруднення. До негативних впливів зовнішньої реклами на міське середовище можна віднести такі фактори (Рис. 5).

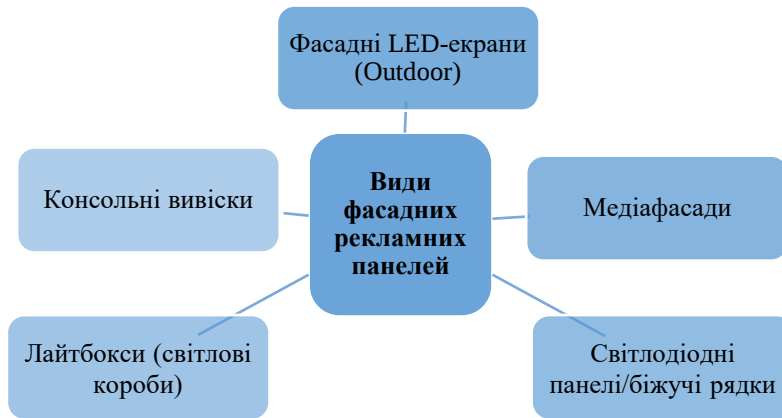


Рисунок 3. Основні види фасадних рекламних панелей

Джерело: систематизовано авторами



Рисунок 4. Позитивний вплив зовнішніх рекламних носіїв на міське середовище

Джерело: узагальнено авторами

Незважаючи на позитивний ефект, надлишок зовнішньої реклами негативно впливає на міське середовище, створюючи візуальний шум, руйнуючи архітектурний образ історичних будівель і знижуючи безпеку дорожнього руху. Надлишок конструкцій викликає у мешканців психологічний дискомфорт, формує непотрібні потреби та захаращує суспільний простір, порушуючи естетичну гармонію вулиць (Рис. 5). Для мінімізації негативного впливу

застосовуються дизайн-коди, що регламентують розмір, стиль та місце розміщення рекламних конструкцій.

РЕЗУЛЬТАТИ ТА ЇХ ОБГОВОРЕННЯ

Для досягнення поставленої мети цього дослідження використовувалися як якісні, так і кількісні методи дослідження, а також метод систематизації та узагальнення. Якісний аналіз включав контент-аналіз існуючих рекламних носіїв, а також збір та аналіз літературних даних, що дозволило систематизувати і узагальнити наявні теоретичні матеріали і додати нову інформацію. Кількісний метод включав опитування місцевих жителів та гостей міста для збору статистичних даних, спрямованих на об'єктивну оцінку ставлення мешканців до зовнішньої реклами шляхом збирання та аналізу структурованих даних.

Збір даних здійснювався шляхом вуличних інтерв'ю та експертних опитувань у робочих кабінетах. Під час опитування учасники скористалися можливістю обрати варіант з переліку або вписати власний.

У дослідженні застосовувалися два методи збору первинної інформації: експертне опитування та інтерв'ювання городян, засноване на безпосередньому усному спілкуванні через питання та їх фіксацію. До експертного опитування увійшли співробітники Департаменту архітектури та містобудування, які відповідають за зовнішній вигляд міста, а також рекламодавці (власники щитів, конструкцій) та рекламні агенти. Всього в експертному опитуванні взяло участь 32 особи (13 представників влади та 19 представників бізнесу).

Загалом в інтерв'юванні взяло участь 457 мешканців та гостей міста віком від 16 до 75 років, які мають різний рівень освіти та соціально-професійного статусу, проживають у різних районах міста, що забезпечило репрезентативність вибірки та достовірність отриманих даних. Соціологічне дослідження

проходило протягом 2025 року у місті Черкаси. Метою дослідження стало вивчення рівня відповідності зовнішніх рекламних носіїв до

міської архітектури. У Таблиці 1 наведено розподіл опитаних за професіями.

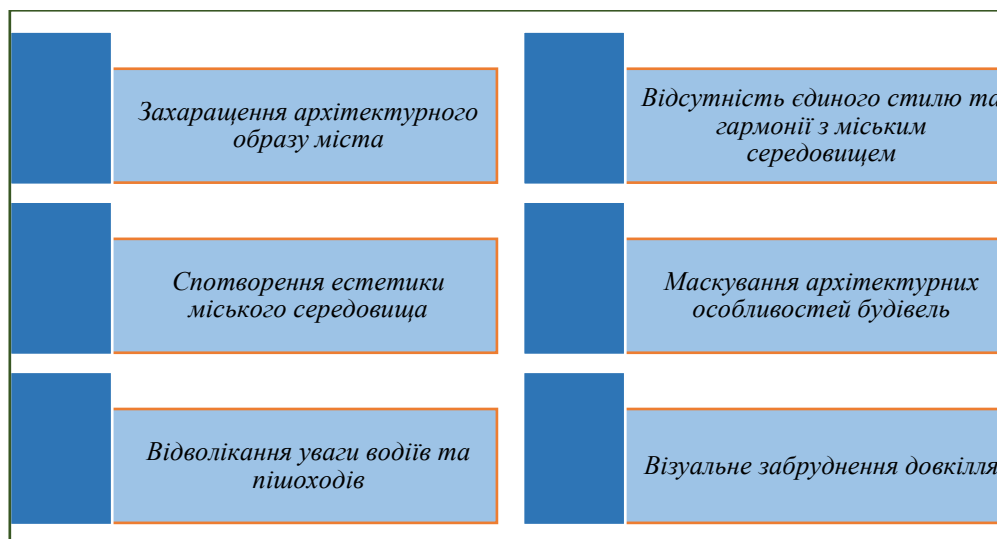


Рисунок 5. Негативний вплив зовнішньої реклами на міське середовище

Джерело: систематизовано авторами

Таблиця 1. Розподіл респондентів за професіями

Респонденти	Освітняни	Здобувачі освіти	Державні службовці	Працівники бізнесу	Інші	Всього
Резиденти	44	135	38	63	51	331
Гості міста	11	34	12	47	22	126
Всього	55	169	50	110	73	457

Джерело: складено авторами на основі власного опитування

Розподіл респондентів за професіями демонструє різноманітність зайнятості, де значну частку складають працівники бізнесу (24%) та здобувачі освіти (37%), а менші частки охоплюють державних службовців (11%) та інших спеціалістів 12% (Рис. 6).



Рисунок 6. Розподіл респондентів за професіями

Джерело: підготовлено авторами на основі власного опитування

Опитування проводилися авторами та студентами Черкаського державного

технологічного університету (ЧДТУ), які добровільно допомагали авторам.

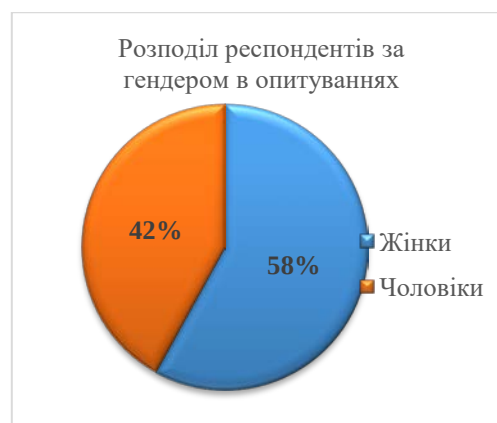


Рисунок 7. Розподіл респондентів за гендером в опитуваннях

Джерело: підготовлено авторами на основі власного опитування

Розподіл респондентів за гендером варіюється залежно від тематики опитування, загалом в процентному відношенні складає – 42% чоловіків і 58% жінок. В опитуванні більш активну участь брали жінки (58%) (Рис. 7).

Аналіз результатів соціологічного дослідження. Відповідно до цілей дослідження респондентам було запропоновано відповісти на сім відкритих питань із запропонованими варіантами відповідей та одне вільне питання, щоб респонденти могли вільно висловили свою думку (Таблиця 2–8).

Для точної оцінки виду розміщення зовнішніх рекламних носіїв використовувалися дані оперативного опитування жителів. У критерії оцінки локації зовнішньої реклами включалися облік пішохідного та транспортного потоків, помітність (кут огляду, відстань), відсутність перешкод та поєднання з образом архітектурного середовища. Понад половина опитаних (54% жінок та 52% чоловіків) вважають розміщення зовнішньої реклами в місті хаотичним. Протилежну думку висловили лише меншість респондентів: 17% жінок та 21% чоловіків назвали рекламні конструкції впорядкованими (Таблиця 2).

Таблиця 2. Оцінка локації зовнішньої реклами у місті, %

Оцінки	Чоловіки	Жінки
Хаотичне	52	54
Упорядковане	21	17
Змішане	27	29

Джерело: складено авторами на основі власного опитування

Оцінка візуальної виразності рекламних стендів базувалася на поєднанні креативності, лаконічності, асоціативності, гармонійності із стилем архітектури міського середовища. Аналіз якісних характеристик рекламних стендів щодо ясності форм, композиції, колірних і світлових акцентів, креативності ідей, які впливають на естетичне сприйняття людиною, респондентами було зазначено, як невиразний і монотонний 45% чоловіків і 52% жінок (Таблиця 3).

Таблиця 3. Оцінка візуальної виразності рекламних стендів, %

Оцінки	Чоловіки	Жінки
Виразний	18	14
Невиразний	45	52
Слабо виразний	37	34

Джерело: складено авторами на основі власного опитування

Оцінка естетики зовнішніх рекламних носіїв городянами неоднозначна: близько 38–45% чоловіків і жінок сприймають її позитивно через інформативність, тоді як 42–50% – негативно, через візуальне забруднення довкілля (Таблиця 4). Містяни цінують інформативність, але ключовими аспектами сприйняття є візуальна естетика та вплив на вигляд міста. При цьому нейтрально сприймають зовнішню рекламу 20% чоловіків і 5% жінок. Опитування показує, що жінки частіше

звертають увагу на естетику зовнішньої реклами та більше помічають зміни у вигляді міста (Таблиця 4).

Таблиця 4. Оцінка естетичного сприйняття зовнішніх рекламних носіїв городянами, %

Оцінки	Чоловіки	Жінки
Позитивно (через інформативність),	38	45
Негативно (через візуальне забруднення)	42	50
Нейтрально (цінують масштабність та яскравість)	20	5

Джерело: складено авторами на основі власного опитування

Оцінка поєднання рекламних стендів зі стилістикою архітектури міста базується на гармонійному включенні конструкцій у фасад, відповідно до стилістики будівлі (кольори, матеріали) та дотримання міських норм. Ключові критерії включають візуальну відповідність стилістиці будівель, дотримання принципів візуальної перспективи, відсутність захаращення архітектурних деталей, дотримання меж розміщення (частіше до 2-го поверху) та дотримання нормативів. Результат опитування показує, що 45% чоловіків та 47% жінок вважають, що стилістична інтеграція рекламних конструкцій потребує коригування та близько третини опитаних, вважають, що спостерігається дисгармонія у стилістичному вирішенні (Таблиця 5).

Таблиця 5. Оцінка стилістичної інтеграції рекламних конструкцій з архітектурою міста, %

Оцінки	Чоловіки	Жінки
Гармонійне	11	9
Дисгармонійне	29	30
Місцями поєднується	15	14
Потребує коригування	45	47

Джерело: складено авторами на основі власного опитування

В оцінку насиченості міського простору рекламними стендами входили аналіз їх щільності та концентрація розміщення. Це оцінка того, наскільки часто і щільно рекламні конструкції розміщені на конкретній території або на будинках та спорудах. 47% чоловіків та 43% жінок відзначили високу концентрацію розміщення рекламних носіїв, особливо вздовж ключової магістралі та центральної частини міста (Таблиця 6).

Низька концентрація зовнішньої реклами спостерігається на периферії міста, що забезпечує підвищення комфорту міського середовища та формування більш якісного образу міста, покращуючи сприйняття мешканцями та

туристами. Тут можна відзначити необхідність дотримання принципу «Дизайн-коду міста» та розумний баланс між комерцією та архітектурним образом міста.

Таблиця 6. Оцінка насиченості міського простору рекламними стендами, %

Оцінки	Чоловіки	Жінки
Висока концентрація	47	43
Середня концентрація	38	41
Низька концентрація	15	16

Джерело: Складено авторами на основі власного опитування

Зовнішня реклама має суперечливий вплив на міське середовище, виступаючи одночасно інструментом економічного розвитку та чинником естетичного забруднення. Приблизно третина респондентів (30% чоловіків та 33% жінок) сприймають зовнішню рекламу, тільки як комерційний продукт. Четверть опитаних (25% чоловіків та 27% жінок) зазначають, що рекламні носії мають негативний вплив на архітектурний вигляд міста. Також 20% чоловіків та 18% жінок стверджують, що рекламні носії створюють візуальне забруднення та погіршують естетику міста (Таблиця 7).

Можна відзначити, що грамотно інтегровані рекламні конструкції висвітлюють вулиці, вписуються в міську тканину, надаючи їй динаміки та характеру і формують образ міста, тоді як хаотичне розміщення переважніше ландшафт, викликаючи роздратування у мешканців. Регулювання зовнішньої реклами, включаючи вимоги до розмірів та місць розміщення, необхідно для мінімізації негативного впливу та збереження дизайн-коду міського простору.

Таблиця 7. Оцінка впливу зовнішньої реклами на міське середовище, %

Оцінки	Чоловіки	Жінки
Має тільки комерційну мету	30	33
Формує образ міста	15	13
Негативно впливає на образ міста	25	27
Гармонійно вписується у міське середовище	10	9
Створює візуальне забруднення та погіршує естетику	20	18

Джерело: Складено авторами на основі власного опитування

Контент зовнішньої реклами – це лаконічні візуальні та текстові повідомлення, спрямовані на привернення уваги та інформування широкої аудиторії про товари, послуги та бренди, часто з використанням яскравих візуальних образів, логотипів і коротких слоганів, що запам'ятовуються.

Дослідження показує, що зовнішня реклама викликає в опитаних змішані враження, але переважає її комерційне спрямування – на це вказали 52% чоловіків та 54% жінок. Водночас близько п'ятої частини опитаних (22% чоловіків і 23% жінок) розцінюють такий контент як інформаційну афішу різноманітних заходів (Таблиця 8).

Активне залучення населення до формування міського середовища є критично важливим процесом, що включає опитування, фокус-групи та аналіз потреб мешканців для створення комфортних суспільних просторів. Ефективна участь городян допомагає покращити якість міського середовища, знаходити баланс між інфраструктурними потребами та культурно-дозвільною діяльністю. У зв'язку з цим, у рамках цього дослідження респондентам було поставлено питання: «Ваша думка про зовнішні рекламні носії?». В результаті отримали різні думки, сфокусовані на негативних та позитивних впливах рекламних носіїв на міське середовище, основні з них показано на Рис. 8.

Таблиця 8. Оцінка диференціації контенту зовнішньої реклами у муніципальному середовищі, %

Контент	Чоловіки	Жінки
Соціальний контекст	10	8
Комерційний контекст	52	54
Символи та неофіційні образи міста	11	10
Афіші заходів та розваг	22	23
Інше	5	5

Джерело: Складено авторами на основі власного опитування

Сприйняття жителями рекламних носіїв (білбордів, вивісок, екранів) залежить від їхньої інтеграції до міського середовища та доречності. Позитивно сприймається реклама, що відповідає контексту місця, тоді як надлишок конструкцій у парках чи перехрестях викликає негатив (Рис. 8). Загалом громадська думка формується балансом між корисністю інформації та рівнем дискомфорту, який вона створює. Навіть суб'єктивна оцінка та думка мешканців найчастіше відображає реальний стан та існуючі проблеми публічних просторів, а отже, може бути використана як джерело інформації при прийнятті містобудівних рішень місцевою владою.

Рекомендації щодо інтеграції рекламних носіїв з елементами міського середовища. Для гармонізації рекламних стендів з міським середовищем потрібні комплексні підходи: розробка єдиного дизайн-коду та кольорової гами, інтеграція з архітектурою будівель, застосування сучасних матеріалів, використання медіафасадів для динамічного контенту, обмеження розміру та

кількості, а також жорсткий контроль та законодавче регулювання, щоб реклама не захарашувала його архітектуру.

Інтеграція рекламних носіїв з елементами міського середовища та фасадами будівель досягається за рахунок гармонійного поєднання конструкцій рекламних стендів з архітектурою; розробки загальної моделі освітлення міста, де реклама гармонійно вписується в загальну світлову панораму; розробки дизайн-коду для зовнішньої реклами, що враховує ландшафт, стиль,

традиції; створення єдиних інформаційних стендів та застосування медіафасадів; а також регулярного контролю та інспекції, що сприяє дотриманню естетичних та етичних норм у місті. Це створює єдиний естетичний простір, підвищуючи ефективність впливу на аудиторію. Реклама має бути естетичною, не захарашувати простір і функціональною. При цьому основними напрямками можуть бути принципи інтеграції рекламних носіїв до міської архітектури (Рис. 9).



Рисунок 8. Думка мешканців міста про рекламні носії

Джерело: Розроблено авторами на основі власного опитування

Дотримання дизайн-коду міста	Рекламні конструкції повинні відповідати ландшафту та архітектурі навколишнього середовища
Використання діджитал-білбордів	Діджитал-білборди повинні зробити вулиці яскравішими, уникаючи світлового забруднення
Креативна інтеграція	Використання елементів паркового та міського декору (арт-об'єкти) замість нав'язливих рекламних стендів
Ефективні локації	Місця розміщення реклами мають бути доступні для огляду, але не заважати пішоходам та руху транспорту
Узгодження та дозвіл	Рекламні конструкції встановлюються виключно на підставі дозволів уповноважених органів
Візуальний вплив	Рекламний стенд повинен формувати візуальну гармонію уникаючи дратівливого сприйняття у городян
Структурування простору	Рекламні стенди повинні організовувати простір, виступаючи інструментами навігації та зонування
Постійний контроль	Контроль за контентом, розміщенням, формою та стилем рекламних стендів

Рисунок 9. Принципи гармонійного поєднання елементів зовнішньої реклами з архітектурним середовищем міста

Джерело: Запропоновано авторами на основі власного опитування

Інтеграція реклами до міського середовища вимагає дотримання балансу між комерційними цілями та збереженням архітектурного вигляду міста. Ключові рекомендації включають використання сучасних медіаформатів (Digital Out-of-Home цифрова зовнішня реклама, сіті-формати), створення унікального дизайну, що гармоніє з навколишнім середовищем, та суворе дотримання регламентів розміщення.

■ ВИСНОВКИ

Хоча зовнішня реклама є невід'ємним атрибутом сучасних міст, аналіз архітектурно-художньої відповідності носіїв зовнішньої реклами дизайну та стилістиці міського середовища показує, що вона не відображає унікальності та ідентичності мешканців міста.

Згідно з опитуванням, понад половина респондентів (54% жінок та 52% чоловіків) вважають, що зовнішня реклама в місті розміщена хаотично.

Оцінка виразності, композиції, світла, кольору та креативності рекламних носіїв показала, що більшість опитаних — 52% жінок та 45% чоловіків — відзначили їхню монотонність та невиразність.

Учасники опитування зазначають, що зовнішня реклама порушує естетику міського середовища та вступає в дисонанс із архітектурою.

Згідно з дослідженням, 78 % рекламних вивісок на будівлях розташовані безсистемно та порушують архітектурний ансамбль, дисонуючи із загальним стилем і палітрою».

Аналіз показує, що рекламні носії мають бути технологічними, лаконічними та гармонійно вписаними в архітектуру міста та працювати на підвищення якості міського середовища, а не лише на комерційну вигоду.

Тенденція сучасних рекламних носіїв має бути спрямована на гармонізацію та стильову єдність із міською архітектурою через використання індивідуальних дизайн-проектів, світлових рішень та цифрових технологій.

■ ПОДЯКИ

Автор висловлює подяку всім особам, які приділили свій час та досвід для участі в опитуванні для цього дослідницького проекту.

■ ФІНАНСУВАННЯ

Дослідження не отримувало фінансування.

■ КОНФЛІКТ ІНТЕРЕСІВ

Немає.

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Analysis of the architectural and artistic compliance of outdoor advertising media with the design code and stylistics of the urban environment

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Abstract. The study aimed to assess the city's outdoor advertising for its visual compliance with the architecture and compliance with the urban design code. By conducting expert and sociological research, the degree of integration of advertising media into the architectural concept of the city is determined. The compliance of advertising structures with the general stylistics of the space and their compliance with the requirements of the local design code is analyzed. As the survey showed, the majority of respondents consider the placement of outdoor advertising in the city to be chaotic. In particular, 54% of women and 52% of men hold this opinion. In contrast, only 17% of women and 21% of men gave the opposite assessment (orderly placement). Evaluating the visual component of advertising stands (expressiveness of form, composition, light, color and creativity), 45% of men and 52% of women called their design inexpressive and monotonous. According to the survey data, 45% of men and 47% of women are convinced that the appearance of advertising structures requires stylistic refinement. In addition, almost a third of respondents note their visual disharmony with the general environment. Outdoor advertising evokes mixed emotions in the respondents, but the majority of respondents (52% of men and 54% of women) perceive it primarily as commercial. Almost a fifth of the audience (22% of men and 23% of women) see it mainly as announcements of entertainment or cultural events. The key requirement for advertising is its architectural compatibility. Integration into the existing architectural context ensures the favor of local residents. Overloading with advertising in places of rest and transport creates visual chaos, which is perceived extremely negatively. Scientific novelty of article is determined by the development of theoretical principles of harmonious spatial placement of advertising, which takes into account the architectural heritage and modern socio-cultural needs of city residents. Recommendations have been developed for the harmonious integration of advertising media into the architecture and landscape of the city to improve its visual image.

Keywords: environmental design; advertising media; city image; architectural environment; design code; stylistics; landscape; urban space



Rhizomatic structures and marginal aesthetics in art clusters

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Abstract. This article examined marginalised art clusters as specific urban formations that emerge within semi-abandoned or transformed industrial spaces outside institutional planning frameworks. This study aimed to conceptualise such art clusters as rhizomatic structures in the sense of Gilles Deleuze and Félix Guattari, and to interpret their aesthetic significance through the spatial and sensory experience articulated by Gaston Bachelard. The methodological framework was based on an interdisciplinary approach that combines urban analysis, philosophy of space, cultural studies, and the study of artistic practices, with particular attention to street art and temporary interventions. The analysis used the concepts of rhizome, deterritorialisation, and the poetics of space, which make it possible to interpret art clusters as non-linear network formations and to assess their aesthetic potential. The findings indicated that marginalised art clusters are not the result of deliberate design but emerge as dynamic, rhizomatic structures shaped by multiple creative practices, spontaneous interactions, and artistic interventions within semi-abandoned spaces. Street art, performative actions, and temporary installations function as semiotic markers that transform neglected environments into aesthetically significant spaces with poetic and sensory dimensions. The scientific novelty of the study lied in integrating the concept of the rhizome with the analysis of marginal art clusters as aesthetic formations in post-industrial spaces. This approach allowed them to be understood not only as social or cultural phenomena but also as forms of experience and becoming within the urban environment. The practical significance of the research lies in its potential application to the reconsideration of approaches to the revitalisation of neglected territories and the development of non-institutional artistic practices

Keywords: art clusters; rhizome; street art; ruin aesthetics; urban studies; industrial design; deterritorialisation

INTRODUCTION

In the context of accelerating post-industrial transformation and the reorganisation of urban environments, contemporary cities are increasingly characterised by fragmentation, discontinuity, and the emergence of spaces that evade traditional frameworks of planning and control. These processes are closely linked to the decline of industrial production, shifts in economic structures, and changing patterns of spatial use, which together generate a growing number of abandoned, underused, or transitional territories within the urban fabric. Such spaces, often situated at the margins of institutional attention, challenge established dichotomies between function and dysfunction, centre and periphery, order and disorder. As a result, they prompt a reconsideration of

fundamental assumptions about what constitutes valuable, productive, or meaningful urban space.

Contemporary urban theory is increasingly shifting its focus from stable, planned environments to transitional, indeterminate, and often marginal spatial conditions. In this context, particular attention is being paid to spaces that exist beyond formal systems of regulation, design, and economic productivity. Such environments, frequently characterised by abandonment, incompleteness, or functional obsolescence, challenge dominant paradigms of urban development that prioritise order, efficiency, and control. Rather than being perceived solely as residual or problematic territories, these spaces are now approached as dynamic fields of potential where alternative spatial practices, social relations, and aesthetic forms can emerge. This shift reflects a

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broader rethinking of the urban environment as a processual and open system in which instability, temporality, and marginality become integral conditions of spatial production.

In contemporary urban discourse, abandoned and partially ruined spaces are increasingly viewed not only as symptoms of crisis or degradation within the urban environment. Instead, they are understood as potential milieus for the formation of new cultural, spatial, and aesthetic configurations. In the context of post-industrial transformation, such territories function as “urban voids”, which, according to M.R. Rahman & A. Habib (2025), are not only the result of economic and political changes but also arenas for rethinking spatial practices and power relations.

C. O’Callaghan & C. Di Felicianantonio (2021), among others, analysed urban ruins as spaces that disrupt linear narratives of development, emphasising their capacity to function simultaneously as extra-institutional and politically significant environments. They argued that such spaces exist “outside formal regulations”, thereby creating conditions for alternative practices of urban use. This perspective closely corresponds to the understanding of marginalised art clusters in this study as autonomous and non-hierarchical structures. In the research of J. Gardner (2024), abandoned territories are examined through the lens of “contemporary archaeology” as complex material formations that combine waste, ruins, and traces of urban transformation. The author argued that such spaces emerge not only as a result of decline but also as specific cultural landscapes with their own logic of existence. In a similar vein, M. Angelidou *et al.* (2025) emphasised that emerging urban formations increasingly operate through hybrid, bottom-up dynamics that blur the boundaries between formal and informal spatial production. These approaches resonate with the interpretation of marginalised art clusters as environments in which spatial meaning is continuously negotiated rather than imposed.

The study by M.R. Dionisio & J. Carr (2022) proposed the concept of “prismatic immersion”, in which ruins are understood as multidimensional spaces that integrate the historical, social, and cultural dimensions of the city. The authors highlighted that ruins can contribute to community formation, preserve polyvocality, and remain open to transformation. Within the framework of ruin aesthetics, E. Scarbrough (2023) examined contemporary industrial ruins as part of a “neo-pictorial” landscape, emphasising their cultural and artistic value. The author notes that the transformation of such spaces is often accompanied by a loss of authenticity due to excessive regeneration. This observation is significant for understanding art clusters as environments where tension persists between neglect and institutionalisation. Furthermore, A. Cervesato *et al.* (2024) argued that ruins should not be treated solely as objects of preservation, since their “museumification” may diminish their potential for reinterpretation and contemporary use. This approach

supports the idea that neglect can serve as a resource for new forms of cultural production.

This study aimed to interpret marginalised art clusters as forms of becoming within the urban environment that emerge in semi-abandoned spaces, and to conceptualise them as rhizomatic structures in which neglect appears not as a state of decline but as a productive condition for the formation of new aesthetic and spatial qualities. The objectives of the study were: to identify the theoretical foundations for interpreting marginalised art clusters within philosophical, urban, and cultural approaches, including the application of the concept of the rhizome developed by G. Deleuze & F. Guattari (1987) to the analysis of non-linear spatial processes; to examine the role of artistic interventions, including street art, performative practices, and temporary installations, and the aesthetic and sensory dimensions of interaction with such environments through the lens of G. Bachelard’s (1994) poetics of space; and to determine the mechanisms of deterritorialisation and reappropriation of space, as well as the role of marginality and neglect in shaping rhizomatic structures, new spatial identities, and aesthetic experiences.

LITERATURE REVIEW

A distinct field of inquiry into the aesthetics of ruins and neglect has been developing within the humanities. In the study of J. Hell & A. Schönle (2009), ruins are frequently interpreted as cultural constructs that represent complex temporal layers and create space for alternative narratives of modernity. Similarly, T. Edensor (2005) emphasised that abandoned industrial environments generate a particular sensory experience in which the materiality of ruins, together with the sonic and tactile dimensions of space, activate modes of perception distinct from those of the ordered urban landscape. T. Edensor interpreted ruins not as passive remnants of the past but as active environments of experience that shape specific perceptual regimes through materiality, sensoriality, and embodied interaction. He argued that ruined spaces disrupt the normative organisation of the urban environment, opening possibilities for alternative practices of movement, observation, and interaction.

At the same time, within contemporary visual and media discourses, neglect acquires the status of an aesthetic category. Publications on platforms such as Yellowtrace (Hughes, 2016) and The Guardian (Patman, 2019), as well as analytical essays on the “aesthetics of decay”, draw attention to the phenomenon of “beauty in decay”, in which ruins appear as objects of visual fascination and reflection. In this context, abandoned spaces cease to be “empty” and instead become saturated with new meanings through photographic practices, artistic interventions, and everyday urban exploration.

Non-institutional artistic practices, particularly street art and temporary interventions, play a particularly important role in reinterpreting such

environments. As demonstrated in the work of RomanyWG (2011), abandoned spaces become a kind of “open canvas”, where artistic practices function as tools of symbolic appropriation and as representations of urban experience. These interventions not only transform the visual character of the environment but also generate new modes of interaction with space, shifting it from the category of the marginal into the sphere of cultural significance. Such spaces become objects of artistic reflection, highlighting their capacity to combine materiality and poetic quality while also reflecting social processes through aesthetic forms. This reinforces the argument concerning the role of neglected spaces as environments of creative reinterpretation.

Within this theoretical framework, the question becomes particularly relevant: can neglect be understood not as a final stage of decline, but as a process of becoming? To conceptualise this phenomenon, the concept of the rhizome by G. Deleuze & F. Guattari (1987) proves especially productive, as it allows urban formations to be interpreted as non-linear, decentralised networks without a fixed hierarchy. From this perspective, marginalised art clusters can be understood as dynamic structures emerging through multiple connections, intersecting practices, and spontaneous forms of interaction, rather than as the result of intentional design. Thus, in this study, marginalised art clusters are examined through a framework that combines rhizomatic theory and the aesthetics of spatial experience.

The theoretical foundation of the research draws on the studies of various scholars whose approaches allow for a comprehensive understanding of the phenomenon of marginalised art clusters. In particular, studies of industrial ruins and abandoned spaces are represented in the research of T. Edensor (2005), who analysed them as environments of sensory experience, as well as in *Ruins of Modernity*, where ruins are interpreted as cultural constructs. The urban dimension of abandonment is articulated in Christopher Silver's concept of “urban voids”. At the same time, the concept of the rhizome by G. Deleuze & F. Guattari (1987) was used to analyse non-linear, decentralised structures. An additional analytical dimension is provided by G. Bachelard (1994), which emphasises the intimate and sensory experience of inhabiting space. From this perspective, abandoned spaces and the art clusters formed within them can be understood as sites where material ruin is transformed into a poetic image, and marginality becomes a source of aesthetic potential.

MATERIALS AND METHODS

Within the framework of this study, a qualitative approach was employed, designed to analyse marginalised art clusters emerging in semi-abandoned industrial spaces, with a focus on an illustrative case in Tel Aviv, Israel. Case selection was conducted using the case study method, based on the following criteria: the presence of spatial transformation in abandoned or partially functioning

industrial sites; the absence of, or only minimal, institutional regulation; the presence of informal artistic practices, including street art, performances, and temporary installations; and evidence of non-linear, network-based development of the environment. This approach made it possible to consider art clusters not as stable entities but as processual formations existing in a state of continuous transformation.

Methods of visual, semiotic, and spatial analysis were applied for data collection and interpretation. Particular attention was paid to the study of street art, graffiti, temporary artistic interventions, and architectural fragments as carriers of symbolic meanings. This approach enabled the identification of mechanisms underlying the formation of the aesthetic and semiotic identity of abandoned spaces, as well as the tracing of processes of their reinterpretation through artistic practices. The analysis also took into account the affective and embodied experience of interaction with space, in line with the approaches of T. Edensor (2005), who emphasised the materiality and sensoriality of ruins.

The study also included the analysis of publicly available sources, such as media publications, including Yellowtrace (Hughes, 2016) and The Guardian (Patman, 2019), photographic essays, online archives, social media pages, and informal curatorial descriptions. This made it possible to trace the formation of narratives surrounding abandoned spaces and to identify how they are represented as aesthetically appealing and culturally significant environments. The theoretical framework of the study was based on works in urban studies, cultural geography, and the philosophy of space. The analysis of ruin aesthetics is grounded in approaches presented in *Ruins of Modernity* (Hell & Schönle, 2010), where ruins are understood as cultural and temporal constructs.

The methodological strategy is based on a combination of comparative and interpretative analysis. This makes it possible to identify common patterns in the formation of marginalised art clusters, as well as the specific features of their development in different contexts. The results are interpreted within an interdisciplinary framework, drawing on the philosophical concept of the rhizome by G. Deleuze & F. Guattari (1987), which allows art clusters to be understood as decentralised network structures, as well as on G. Bachelard's work (1994), which enables the analysis of the sensory and aesthetic experience of interaction with abandoned environments. The chosen methodology allows for a comprehensive examination of marginalised art clusters as dynamic, rhizomatic formations emerging at the intersection of the materiality of ruins, artistic practices, and alternative modes of experiencing urban space.

RESULTS AND DISCUSSION

According to S. Shkoliar (2025), contemporary art clusters in the post-industrial urban environment can be productively examined through the lens of two

fundamental types of formation: art clusters formed through underground transformation and managed creative zones, including marginalised art clusters. The first type emerged as a result of the spontaneous appropriation of abandoned industrial territories by artistic communities, often outside the legal framework and without prior planning. The second type, by contrast, is formed within the framework of urban revitalisation strategies involving public authorities or cultural institutions, which implies prior conceptualisation, infrastructural support, and integration into the economy of creative industries.

This study focused specifically on marginalised art clusters of the underground type, which function as spaces of non-institutional becoming. Their key distinction lies in the absence of an initial project-based logic: they emerge as the result of multiple, decentralised practices, corresponding to the concept of the rhizome (Deleuze & Guattari, 1987). This type of cluster demonstrates a non-linear, networked structure of development, in which each new intervention – graffiti, installation, or performance – is not subordinated to a single centre but instead expands the space horizontally.

Marginalised art clusters are primarily formed within abandoned industrial sites – factories, warehouses, and depots – that have lost their original function. Contemporary studies of industrial heritage emphasise that such spaces possess a unique material and sensory quality that stimulates alternative modes of perception (Pinder, 2005; Henshaw, 2014). Unlike the ordered urban environment, the ruin does not impose a fixed function but opens up a field for interpretation and experimentation. In this context, neglect functions not as a deficit but as a resource for becoming, ensuring openness to creative practices.

In this context, the concept of the rhizome, proposed by G. Deleuze & F. Guattari (1987), acquires key significance for interpreting marginalised art clusters as specific spatial formations. In contrast to traditional hierarchical models of organisation, that is, so-called “arborescent” structures, the rhizome describes a mode of thinking and structuring based on principles of non-linearity, multiplicity, decentralisation, and openness. It has neither beginning nor end but exists as a continuous network of connections that constantly expands in multiple directions.

G. Deleuze & F. Guattari (1987) identified several key principles of rhizomatic organisation. First, there is the principle of connection and heterogeneity, according to which any element can be connected to any other, regardless of its nature. Second, there is the principle of multiplicity, whereby the structure is not reducible to a single centre or essence but exists as a constellation of equal elements. Third, there is the principle of asignifying rupture, which refers to the system’s capacity to break and reconstitute itself in new configurations without losing its integrity. The principles of cartography and decalomania are also important: the

rhizome produces its own “maps” of reality, which remain open to change and transformation.

In contrast to the arborescent model, which presupposes a clear hierarchy, centre, and subordination, the rhizomatic structure is fundamentally anti-hierarchical. This distinction is visually illustrated in Figure 1, which compares two spatial models: the tree-like, or arborescent, structure, which presupposes a linear and hierarchical order originating from a root, and the rhizomatic structure, characterised by non-linearity, multiplicity, and the continuous formation of connections without a predefined hierarchy. This characteristic makes it possible to apply the rhizomatic model to the analysis of marginalised art clusters, which are formed without centralised control and do not follow a single developmental logic.

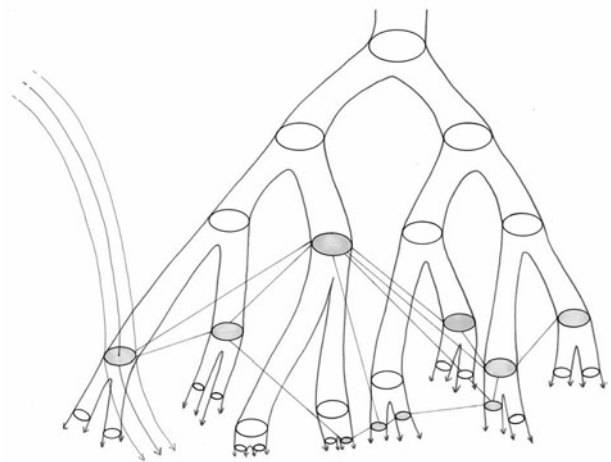


Figure 1. Rhizome and arborescent structures
Source: Happy Sleepy (n.d.)

A marginalised art cluster of the underground type thus functions as a rhizome within urban space. It does not possess a clearly defined centre, such as a gallery, institution, or administrative core, but consists of multiple points of activity: individual artists, temporary studios, graffiti-covered walls, improvised exhibition spaces, and performative events. Each of these elements is autonomous yet simultaneously embedded within a constantly shifting network of interactions. In this sense, the space of the art cluster is a process of continuous “unfolding”, similar to a rhizome that expands not according to a predetermined plan but through multiple, often accidental connections.

Schematic representations are important for understanding why art clusters formed through underground transformation are examined in this context. As shown in Figure 2, institutionalised art clusters, such as managed creative zones or art centres, are characterised by a hierarchical organisation with a clearly defined core. This core, typically represented by ownership or administrative structures, generates and controls subordinate elements, forming a system in which functional components are dependent on and spatially organised around a central node.

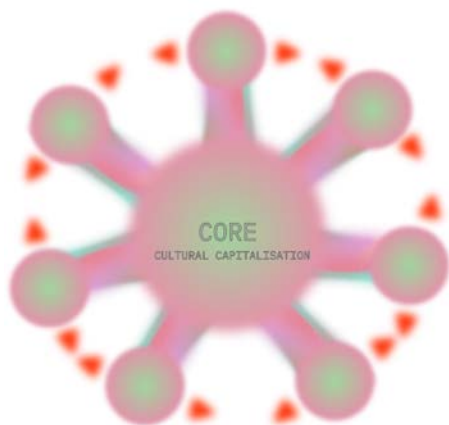


Figure 2. Hierarchical structure of a managed art cluster. Illustration by the author, 2026.

Source: created by the author

By contrast, Figure 3 illustrates the structure of a marginalised art cluster at the stage preceding cultural colonisation. In this case, the organisation is rhizomatic: it lacks a single governing centre, and its development occurs in an anarchic and non-linear manner. Such clusters emerge through processes of industrial squatting and evolve through the spontaneous and chaotic distribution of functions, resulting in a network of interconnected yet independent elements.



Figure 3. Rhizomatic structure of an underground art cluster

Source: created by the author

It is important to note that such rhizomatic organisation is directly linked to the anarchic nature of the way marginalised art clusters are formed. This does not refer to political anarchism in a narrow sense, but rather to the absence of centralised control, regulation, and hierarchy in the development of such clusters. The space is formed through chaotic, spontaneous actions by various actors who are not coordinated by a single institution. This produces an effect of unpredictability, fragmentation, and openness to change. This logic of development corresponds to the staged formation of art clusters outlined by S. Shkoliar (2025). The initial phase is abandonment, when an industrial site loses its function and enters a state of physical and social decline.

This condition creates the preconditions for the next stage – industrial squatting, that is, the unauthorised appropriation of space by artists and creative communities. It is precisely at this stage that the rhizomatic structure begins to form most intensively: initial nodes of activity emerge, without rigid connections, but they gradually develop into a network.

Further development occurs through spontaneous cultural colonisation, when new participants join the space, the number of artistic interventions increases, and temporary events and informal practices emerge (Shkoliar, 2025). Importantly, up to this point, the structure of the art cluster remains chaotic and non-linear, rather than being subordinated to any centralised logic. Each new element does not integrate into an existing hierarchy but instead transforms the configuration of the space itself, generating new connections and branches. Thus, prior to the stage of cultural colonisation, the marginalised art cluster functions as an open rhizomatic system with a distinctly anarchic structure, in which stable centres, clear boundaries, and fixed roles are absent. It is precisely this disorder and decentralisation that secure its capacity for intensive creative development, forming an alternative model of urban becoming that contrasts with institutionally controlled forms of spatial organisation.

At the same time, the results indicate that the development of marginalised art clusters is not teleologically directed and does not necessarily involve progression through all stages of transformation. Such formations may remain at any stage, including abandonment, industrial squatting, or early cultural activation (Shkoliar, 2025). In cases where the art cluster does not transition to the stage of cultural colonisation, its spatial and social structure retains its rhizomatic character. In particular, remaining at the stage of industrial squatting implies the absence of institutional formalisation, a stable functional structure, and centralised management. In this condition, space is organised through multiple local initiatives that do not follow a unified logic. This corresponds to the concept of the rhizome formulated by G. Deleuze & F. Guattari (1987), which emphasises non-hierarchical organisation, decentralisation, and a multiplicity of connections.

Within this theoretical model, the rhizome is also associated with the idea of anti-hierarchical or unstructured social systems, where there is no centre of power or organisation, and interactions occur horizontally. In this context, the marginalised art cluster can be understood as a space in which such a model is practically realised, where social, creative, and spatial processes unfold without rigid regulation. The absence of hierarchy, the instability of functions, and openness to change create an environment that can be interpreted as a form of “spatial anarchy” in the analytical sense, that is, as a system without centralised control. An empirical example of such a structure is the Shvil HaMeretz art cluster in Tel Aviv (Fig. 4), which

developed within former industrial sites and consists of several separate buildings. The space is characterised by the absence of a unified compositional or functional centre: individual buildings function as autonomous units that include creative studios, galleries, workshops, and other mixed-use spaces (Fig. 5).

The visual environment of the cluster is formed primarily through various forms of graffiti and street art covering building façades, inner courtyards, and transitional spaces (Fig. 6). In this context, one can observe the prevalence of anarchic graffiti and spontaneous inscriptions applied directly to architectural surfaces (Fig. 7). Such visual

interventions, which would typically be classified as vandalism within formal urban environments, are not only tolerated within the territory of the art cluster but are also implicitly legitimised as part of its cultural and spatial identity.

The absence of institutional control over these practices contributes to the formation of a dynamic visual layer, in which multiple authors continuously redefine the aesthetic and semantic structure of the environment (Fig. 8). In this sense, the façades operate as open canvases, enabling ongoing artistic production and reinforcing the rhizomatic, non-hierarchical nature of the cluster.



Figure 4. Buildings of the Shvil HaMeretz art cluster, Tel Aviv, Israel

Source: taken by the author



Figure 5. One of the buildings in the Shvil HaMeretz art cluster, Tel Aviv, Israel, featuring a mural

Source: taken by the author



Figure 6. Fragment of the façade of one of the Shvil HaMeretz art cluster buildings, Tel Aviv, Israel, featuring graffiti and signs of industrial ruins

Source: taken by the author



Figure 7. Fragment of the façade of one of the Shvil HaMeretz art cluster buildings, Tel Aviv, Israel, featuring layers of graffiti

Source: taken by the author

These interventions lack centralised control or a unified stylistic framework, further emphasising the decentralised nature of the spatial organisation. At the same time, the cluster includes a local navigation

system in the form of signage indicating buildings and room numbers, which performs the utilitarian function of orientation without establishing a hierarchical structure (Fig. 9 - Fig. 11).

These elements provide minimal spatial legibility, allowing users to navigate between studios, galleries, and shared facilities while preserving the open and fragmented character of the cluster. At the same time, informal and handmade navigational markers, such as wall drawings and improvised directional signs, extend this system through spontaneous user-generated interventions (Fig. 12), further reinforcing the rhizomatic logic of decentralised spatial communication.

According to ethnographic observation, a rental mechanism operates within the space: individual premises are leased to artists. However, even in the presence of such an organisational element, the space does not acquire a clearly structured management centre, as there is no single institution regulating all processes within the cluster. Shvil HaMeretz thus

exemplifies an art cluster situated at the threshold between squatting and cultural activation while maintaining a rhizomatic, non-hierarchical structure. Thus, the possibility of an art cluster remaining at the early stages of development without transitioning to cultural colonisation results in its preservation as an open, decentralised system. In such cases, the rhizome functions not only as an analytical model but also as a real form of spatial organisation, manifested in the absence of a core, the multiplicity of connections, and horizontal interactions. This structure is directly linked to the material conditions in which such art clusters emerge – primarily abandoned industrial environments. In this context, it becomes necessary to consider the industrial ruin as an environment that enables processes of deterritorialisation and aesthetic reinterpretation.

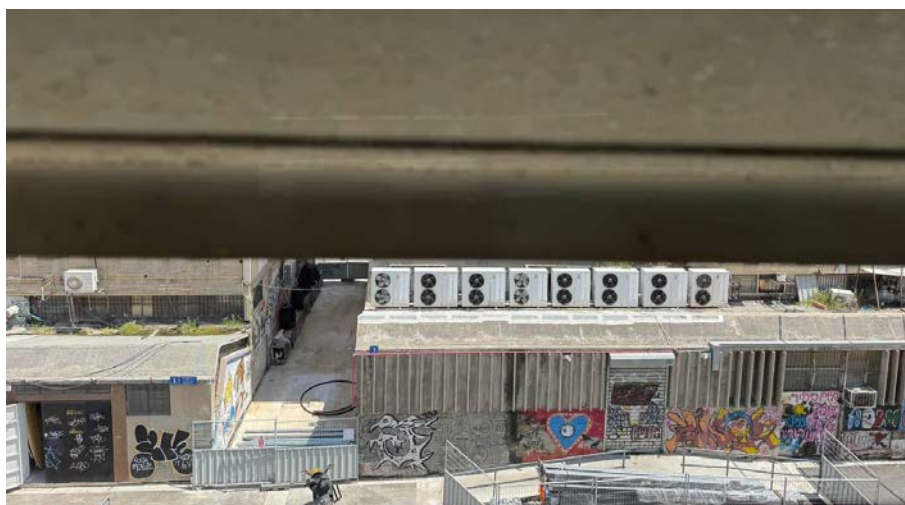


Figure 8. View from the window of an art studio within one of the Shvil HaMeretz buildings, overlooking graffiti, Tel Aviv, Israel

Source: taken by the author



Figure 9. Element of the navigation system indicating Building 3 and its functions, Shvil HaMeretz art cluster, Tel Aviv, Israel

Source: taken by the author



Figure 10. Element of the navigation system indicating the location of Dvir Gallery at the Shvil HaMeretz art cluster, Tel Aviv, Israel

Source: taken by the author



Figure 11. Element of the navigation system indicating Building 3 of the Shvil HaMeretz art cluster, Tel Aviv, Israel

Source: taken by the author

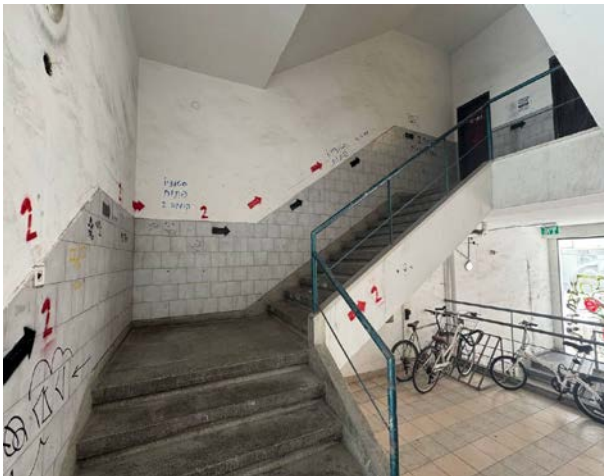


Figure 12. Stairwell in the Shvil HaMeretz art cluster with a homemade navigation system in the form of wall drawings, Tel Aviv, Israel

Source: taken by the author

In contemporary architectural and urban discourse, industrial ruins are traditionally considered within two primary approaches: demolition or adaptive reconstruction, that is, revitalisation. This dichotomy reflects the dominant logic of functionalist thinking, in which space is evaluated primarily in terms of its utilitarian suitability and compliance with contemporary standards. In the first case, demolition, industrial sites that have lost their original function are treated as spatial “defects” to be eliminated in order to enable further use of the territory. In the second case, reconstruction, they are integrated into new urban scenarios through adaptation to contemporary functions, including residential, cultural, and commercial uses. Both approaches imply controlled intervention aimed at organising space and bringing it into a normatively defined condition. In most cases, a significant proportion of such sites retain structural integrity and load-bearing capacity even after prolonged periods of abandonment. This suggests that

their demolition is often determined not so much by technical factors as by aesthetic and ideological considerations. A key argument in favour of demolition is the perception of industrial ruins as “non-aesthetic” objects. Within modernist and postmodern architectural traditions, the aesthetics of the urban environment have long been associated with categories such as cleanliness, order, completeness, and novelty. Accordingly, surfaces that are devoid of traces of time, wear, damage, or external intervention are perceived as conforming to normative notions of “quality” space.

In this context, any manifestations of material degradation, such as cracks, corrosion, layers of paint, and graffiti, are interpreted as disruptions of visual order. As noted by T. Edensor (2005), such surfaces exceed the bounds of controlled aesthetics and are perceived as “excessive” or “undesirable”, as they resist easy interpretation within standardised architectural codes. Consequently, the aspiration to “cleanse” space of temporal traces forms part of a broader tendency towards the sterilisation of the urban environment. Research critiques this understanding of aesthetics as limited, emphasising that it excludes alternative modes of spatial perception. In particular, industrial ruins offer a different aesthetic paradigm: an aesthetics of processuality, incompleteness, and material memory. Within this framework, traces of time, such as scratches, layers, and graffiti, are understood not as defects but as carriers of information about the spatial history, shaping its unique identity. The dominant perception of aesthetic value as the absence of temporal traces is socially and culturally constructed. It reflects a desire for control, standardisation, and predictability characteristic of modern urbanism. In contrast, industrial ruins, because of their material heterogeneity and openness to interpretation, offer an alternative model of aesthetic experience that becomes the foundation for the formation of marginalised art clusters.

Further analysis, in accordance with the aim of this study, requires consideration not only of the structural, or rhizomatic, organisation of marginalised art clusters but also of their aesthetic and sensory dimensions, which are formed under the conditions of abandoned industrial environments. Within marginalised art clusters, these properties of ruin become the basis for the formation of an aesthetics of becoming, where space is not completed or stabilised but exists in a process of continuous transformation. This corresponds to both the rhizomatic logic of G. Deleuze & F. Guattari (1987) and G. Bachelard’s (1994) concept of the poetics of space, in which the environment is understood as a source of intimate, sensory experience. In this sense, neglect acts as deterritorialisation – a concept that denotes a rupture with the previous functional and symbolic structures of space. When an industrial site loses its original function, it moves beyond established urban scenarios and becomes open to new forms of appropriation. As noted by J. Novy & C. Colomb (2016), such spaces are characterised by a

high degree of flexibility, allowing different social groups to reinterpret them according to their own needs and practices.

Within marginalised art clusters, the process of deterritorialisation is directly linked to artistic interventions. Street art, temporary installations, and performative practices function as mechanisms of reappropriation, or reterritorialisation, endowing space with new meanings. According to contemporary studies of street art, such practices not only transform the visual image of the environment but also alter the ways in which it is used socially, generating new scenarios of interaction. Thus, the marginalised art cluster emerges as a space in which processes of deterritorialisation – neglect, decay, and loss of function – and reterritorialization – artistic interventions and social practices – intersect. This duality defines it as a space of becoming, where aesthetics is formed not through completed forms but through processuality, openness, and indeterminacy.

Of particular importance in this context is the sensory experience of interaction with space, which extends beyond purely visual perception. As emphasised by T. Edensor (2005), ruins activate multisensory perception: sound, including echoes and creaking structures; tactility, including surface roughness; and smell, including dampness and dust, form a complex experience that is not typical of ordered urban environments. In marginalised art clusters, these sensory qualities intersect with artistic interventions, creating a hybrid aesthetic space in which the materiality of ruin interacts with the symbolic layers of art. The aesthetic significance of marginalised art clusters, therefore, lies not only in the visual transformation of abandoned sites but also in the formation of new modes of experiencing the urban environment. Such clusters function as spaces where the materiality of ruin, rhizomatic structure, and artistic practices interact, producing alternative models of urban experience.

An empirical example is the Shvil HaMeretz art cluster in Tel Aviv, which represents a type of marginalised environment formed within partially abandoned industrial sites. The spatial organisation of this cluster is characterised by the absence of a compositional centre, the presence of several buildings, and a fragmented navigation system. Signage in the form of plaques indicating room numbers and functions creates the minimum necessary infrastructure but does not establish a hierarchical structure, thereby confirming its rhizomatic character. The visual environment of the cluster is saturated with various forms of street art, including the following:

1. Graffiti (tagging, throw-up, murals) – as a basic form of spatial marking that signals presence and the symbolic appropriation of territory.

2. Street art (figurative murals, stencil art) – as more complex compositions that create visual accents and influence the aesthetic perception of space.

3. Sticker art – as small-scale interventions placed on doors, walls, and navigation signs, forming a layered, accumulative visual structure.

4. Paste-ups and temporary installations – as paper-based or mixed-media objects with a limited temporal lifespan.

Particularly illustrative is the use of sticker art as a form of micro-intervention that corresponds to rhizomatic logic: it is not centrally placed, spreads non-linearly, and forms a network of visual traces that overlap with one another. As noted by R. Campos (2021), such practices produce an “accumulative surface aesthetic”, in which meaning is generated not by individual images but by their aggregation. Within the context of ruin aesthetics, these visual layers interact with the materiality of the abandoned environment. Worn surfaces, cracks, remnants of paint, and industrial textures become the basis for artistic interventions, supporting the thesis of spatial co-production (DeSilvey & Edensor, 2013), where the material and the symbolic form a unified system. Graffiti and street art do not merely cover the surface but engage with it, enhancing its texture and visual complexity.

From the perspective of contemporary street art studies, such practices should be understood as a form of spatial communication that operates outside institutional frameworks (Young, 2013). They generate alternative narratives that are not subordinated to official mechanisms of urban image production. In marginalised art clusters, this is manifested in the absence of a unified stylistic code: diverse artistic practices coexist, conflict, and interact, forming a polyphonic visual environment. This allows the art cluster to be interpreted as a space in which street art performs the function of a semiotic framework that structures the environment without centralised control. Such a structure directly corresponds to the concept of the rhizome, in which any element can connect with any other, and meaning emerges through interaction rather than hierarchy (Deleuze & Guattari, 1987). Furthermore, artistic practices in such environments should be considered manifestations of underground art practices formed outside official institutions. As noted by R. Campos (2021), underground art is characterised by autonomy, temporality, and resistance to commercialisation. In the case of marginalised art clusters, these characteristics are intensified by spatial conditions: abandonment and the absence of control create opportunities for free artistic experimentation.

Thus, it can be argued that street art in marginalised art clusters transforms the visual image of space and shapes its structural and aesthetic logic. Through multiple, decentralised interventions, it reproduces a rhizomatic model of organisation in which there is no core, and space develops as a network of interconnected elements. In summary, marginalised art clusters can be defined as specific urban formations in which the following elements converge: the materiality of the

industrial ruin, a rhizomatic structure of spatial development, and underground artistic practices. This combination constitutes their aesthetic potential as spaces of becoming, where neglect does not function as a sign of degradation but as a condition for the emergence of new forms of artistic and spatial identity.

CONCLUSIONS

The conducted study demonstrates that marginalised art clusters in post-industrial cities result from the spontaneous appropriation of abandoned spaces and are formed as rhizomatic structures lacking centralised governance or a unified compositional core. It has been established that the abandonment of industrial sites functions not as a deficit but as a productive condition for the emergence of new forms of spatial and social organisation, in which the materiality of ruin, artistic practices, and sensory experience interact in processes of poetic and aesthetic interpretation of the environment.

The study shows that underground art clusters function as open, decentralised systems in which street art, graffiti, sticker art, and temporary installations act as mechanisms of reterritorialization of space. They create a multi-layered, polyphonic visual structure that shapes the aesthetic logic of rhizomatic organisation and stimulates alternative modes of social and artistic interaction. The findings confirm that marginality and abandonment are key factors contributing to the emergence of new forms of spatial identity and

aesthetic experience. The space of art clusters exists in a state of continuous transformation, combining processes of deterritorialisation and reterritorialization, which allows them to be understood as spaces of becoming. The scientific novelty of the research lies in the conceptualisation of marginalised art clusters as rhizomatic, processual formations in which abandonment becomes a condition for creative development and the formation of alternative urban scenarios. Prospects for further research include the study of the long-term transformation of marginalised art clusters and the analysis of how processes of institutionalisation influence their rhizomatic structure, aesthetic qualities, and social functions.

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None.

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Ризоматичні структури та маргінальна естетика в арт-кластерах

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Анотація. У статті досліджено феномен маргіналізованих арт-кластерів як специфічних урбаністичних утворень, що формуються у напівзанедбаних або трансформованих індустріальних просторах поза межами інституційного планування. Метою дослідження була концептуалізація таких арт-кластерів як ризоматичних структур у сенсі Gilles Deleuze та Félix Guattari, а також осмислення їхньої естетичної значущості через призму просторового та чуттєвого досвіду Gaston Bachelard. Методологічну основу становили міждисциплінарний підхід, що поєднує урбаністичний аналіз, філософію простору, культурологію та дослідження мистецьких практик, зокрема стріт-арту та тимчасових інтервенцій. Для аналізу було використано концепти ризоми, детеріоріалізації та поетики простору, що дозволяють інтерпретувати арт-кластери як нелінійні мережеві утворення та оцінити їх естетичний потенціал. Результати дослідження свідчили, що маргіналізовані арт-кластери не є результатом цілеспрямованого проектування, а виникають як динамічні, ризоматичні структури, що формуються через множинні творчі практики, спонтанні взаємодії та художні інтервенції у напівзанедбаних просторах. Стріт-арт, перформативні акції та тимчасові інсталяції відіграють роль семіотичних маркерів, які перетворюють занедбані середовища на естетично значущі простори, що набувають поетичного та чуттєвого виміру. Наукова новизна полягала у поєднанні концепту ризоми із аналізом маргінальних арт-кластерів як естетичних утворень у постіндустріальних просторах, що дозволило розглядати їх не лише як соціальні чи культурні феномени, а як форми переживання та становлення міського середовища. Практичне значення дослідження полягає у можливості застосування отриманих результатів для переосмислення підходів до ревіталізації занедбаних територій та розвитку неінституційних мистецьких практик

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