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Formal Constituent Elements of a Dynamic Model of Object Formation

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Abstract: This article investigates the patterns for constructing a formal model of the formation of design objects. A clear structure of the model has been identified, which includes: the form-generating method of style; methodologies for pre-project analysis and research within the design process; form-generating principles in design; form-generating techniques in design; universal approaches to the formation of design objects; the method of experimental modeling; and special methods for form generation based on ethnocultural traditions. The study presents global examples of models of the process of object formation, perspectives for their improvement, and practical application.

Keywords: design, form generation, model of design object formation, universal design methods, universal design principles, design process, pre-project analysis, ethnocultural tradition, ethnocultural artistic tradition

Introduction

A relevant issue in contemporary design culture is the search for sources of form generation for new design objects. At the same time, the effectiveness of implementing new conceptual ideas based on defined sources depends on the quality of the form generation model, or creative method, used by the designer in their work. Despite the personal creative method, the designer strives to create as many form variations as possible. In such project situations, it is quite convenient to visualize the entire process of object formation as a holistic system or specific model. This model should encompass both the quantitative and qualitative composition of elements, clearly demonstrating their structural connections and interdependence, as well as creating an indirect informational environment and groundwork for revealing heuristic ideas. The mentioned model should have a dynamic character of development, as it must adapt and adjust flexibly according to the specific tasks of the design process.

Purpose of work

The Purpose of this research is to create a formal universal model of object formation that could be used in the design development of modern objects' forms. The study proposes to utilize the author's individual project experience in combination with disparate thematic information blocks into a cohesive structural model of the object formation process. The constructed model will be examined in the context of its application in designing contemporary design forms based on ethno-artistic traditions. To achieve this goal, the following tasks must be completed:

- Define the philosophical and general scientific principles of form creation;
- Formulate the style-forming method;
- Outline the tasks of pre-project analysis and research methodology within the design process;

- Identify the form-creating principles in design (theoretical foundations);
- Formulate form-creating techniques in design;
- Consider universal approaches to the formation of design objects;
- Determine the role and tasks of the experimental modeling method;
- Establish special methods for form creation based on ethnocultural traditions;
- Identify examples of the application of form-creating methods in design as creative models of style or school.

Presentation of Research Material

The process of shaping design objects occurs within two main components: the theory and practice of design object formation.

The practice of design object formation takes place through the following stages: identifying the idea or concept of the object's creation, which originates in the sociocultural and material environment and is defined by the project client (the project discipline's curriculum); issuing the technical assignment, which is formulated by the project client (the lead instructor of the project discipline) and provided to the designer in written form; determining the meaning of the object and defining the artistic-conceptual approach according to the object's primary purpose; conducting pre-project research; defining the strategy and tactics for project work; compositional shaping (the sketch proposal stage); project-graphic modeling; 3D modeling and prototyping; project critique and evaluation; and the development of project documentation.

The theory of design object formation includes the basic categories, principles, and methods of project activity: the project image, function, ergonomics, aesthetics, morphology (structure, material, construction), and technology.

The method of style, which unifies the theory and practice of design object formation, provides the object's form with an original and unique appearance, meeting the demands of modernity, fashion, novelty, and contemporary sociocultural values.

The practical and theoretical components of the design object formation process create a holistic model. Constructing such a model as a schematic intersection of the basic theoretical categories of project activity and the stages of object design allows for the observation of the patterns of their internal interaction and interdependence. The prerequisites for the emergence of new formative concepts, ideas, and forms of objects arise from phenomena in the sociocultural environment such as changes in the worldview and philosophical perception of the environment by humans, the moral obsolescence of design object forms, and changes in technology and the material and technical base.

Based on years of experience in project creativity and the educational process, the author of this study aims to use the developed model in the design of contemporary objects, applying forms derived from researched artifacts of ethno-artistic traditions. In the future, the term "object" will refer to design products in the fields of architecture and restoration, object and graphic design.

We will consider the possibility of developing a theoretical concept of such a model of form creation. The proposed model may be based on a combination of existing general scientific methods of scientific knowledge and project activity techniques, as well as newly developed methods and approaches to the interpretation of ethnocultural traditions in contemporary design practice and the information field (Badiu A., 2009; Norman D., 2013; Yurchenko I.A, 2009a). The proposed model may include: philosophical and general scientific principles of form creation; the style-forming method; the methodology of pre-project analysis and research; form-creating principles in design (theoretical settings); form-creating techniques; universal approaches to design object formation; the experimental method of modeling; and special methods for form creation based on ethnocultural traditions.

Philosophical and general scientific principles of form creation determine the conceptual direction of design searches, their orientation toward the system of contemporary and traditional aesthetic values, and their role and place in the overall system of scientific knowledge and the creation of material culture. When determining the conceptual foundations of form creation, the following are of fundamental importance:

1. the influence of philosophical understanding of the essence and purpose of the object, and current aesthetic and ethical norms on the development of a specific form-creating concept (Yurchenko I.A., 2013a);
2. philosophical concepts in contemporary fields of architecture, fashion design, object and graphic design, and art that influence the cultural environment of human life (Karamischeva N.V., 2016);
3. the conscious use of general scientific methods and approaches to knowledge (such as deduction, induction, modeling, extrapolation, etc.), which allow the designer to consciously organize both pre-project research methodology and design form creation methodology (Yurchenko I.A, 2009a);
4. the methodology for finding the contemporary context, which involves the embodiment of ethnocultural forms in contemporary design products by determining the logic of functional or thematic-semantic connections between carriers of ethnocultural traditions and the forms being designed (Yurchenko I.A., 2013b).

The style-forming method of design takes its origins from the concepts of "form creation" and "method" and refers to a systematized set of principles, rules, techniques, and steps that need to be taken to create an ordered formal spatial structure or material form of an object based on point, linear, planar, and volumetric elements. The main task of the form-creating method is to establish a connection between the object's internal structure and its external appearance. Form-creating methods can set different tasks to achieve either a narrowly specialized goal *(the method of combinatorial form creation* in a specific field) or a broader goal – creating a concept for a specific style-forming direction. In the latter case, the form-creating method acquires the characteristics of a certain style. The form-creating method demonstrates the form creation concept of both an individual artist or designer and an entire school or direction. As the form-creating method of style evolves and improves, it develops its own original visually expressive artistic language. The presence of different style-based form-creating methods provides the human living environment with unique artistic and design images.

In the practice of visual arts and design, the form-creating method of style represents a unique and original vision of the development of an entire cultural environment in which humans exist, within specific temporal boundaries. Typically, the form-creating method of style encompasses all levels of culture and human activity, including those related to transforming the material environment surrounding them.

The methodology of pre-project analysis and research considers the patterns of object design and its functioning within the system of human life (John W. Creswell, and J. David Creswell., 2018; Neil Leonard, Gavin Ambrose, 2011). The components of this methodology include:

1. The methodology for applying general scientific methods of cognition, such as analysis, synthesis, abstraction, deduction, and induction, among others;
2. The methodology for studying the specifics of the design object and the possibility of incorporating ethnocultural traditions into its form, considering the strict ergonomic requirements for the object's functionality, consumer needs, and the task of meaning formation, conditions of mass or individual use, the marketing foundation of the design development, and the degree of closeness of the object to the consumer (Yurchenko I.A, 2009b);
3. The methodology of observation and verbal description of the design object;
4. The methodology of visual-morphological analysis of carriers of ethnocultural tradition, identifying its characteristic features based on analogs and prototypes (Yurchenko I.A, 2011: 166);
5. The methodology for developing a design strategy.

The process of conducting pre-project research can be either universal or applied. The universality of such a process involves determining the utilitarian purpose of the object, its consumer or target audience, and the specifics of fulfilling the technical requirements. The applied nature of the research lies in embodying predefined characteristics of ethnocultural artistic traditions in the form of objects.

Form-creating principles in design (theoretical foundations). *Form-creating principles* are theoretical positions that serve as the foundational basis of the form-creating process. In the field of design activity, they are formulated based on an understanding of the patterns of their historical formation and development. As a result of the form-creating process, these principles transform into compositional properties and qualities of the spatial structure, which become visible during the perception of design objects. The main form-creating

principles include *the principle of integrity, the principle of appropriateness, the principle of harmony, and the principle of order.*

The principle of integrity. The essence of the principle of integrity is revealed through the concept of coherence and compositional completeness of the elements of the spatial structure. In the process of visual perception of the spatial structure, this principle manifests as the impression that nothing can be added or removed from the structure.

The principle of appropriateness. This principle is revealed through understanding the creation of such a form of spatial structure that is both maximally simple and understandable. The form creation of design objects is based on a predefined idea regarding the object's purpose and compositional intent. The elements of the spatial structure of design objects must be in a justifiably appropriate relationship.

The principle of harmony. This principle is revealed through the concepts of mutual agreement, complementarity, and the plastic unity of the form creation and the color-tone solution of the compositional elements of the spatial structure. The main characteristic of harmony is the aesthetic quality of the design object's form.

The principle of order. The essence of this principle is that every spatial structure must have its own order of construction. In the process of perceiving the spatial structure, the logic of construction, development, and the relationship between compositional elements must be clearly readable. The principle of order is expressed through the concepts of *static and dynamic, symmetry and asymmetry, proportionality, subordination, balance, rhythm, and scale.*

The principle of expressiveness. The essence of this principle is to maximally reflect the sociocultural or utilitarian-functional content of works of art and design in a visually perceptible form through artistic-imagery and visual-descriptive means, as well as through the techniques and methods of the form-creating process. The modern trend in the development of expressiveness is characterized by the system of borrowings and mutual influence of various techniques and methods from the fields of literature, art, and design. This mutual influence enriches each field while also being characterized by the presence of common techniques for achieving artistic-imagery expressiveness. Typical theoretical artistic-imagery techniques for achieving the principle of expressiveness in art and design include *metaphor, metonymy, hyperbole, comparison, allegory, personification, irony, pathos, and sarcasm.* The use of these theoretical artistic-imagery techniques in combination with the successful selection of plot lines and visual means, such as contrast, nuance, meter, rhythm, proportioning, accentuation, and achieving compositional properties of symmetry and asymmetry, static and dynamic, gives spatial structures unique artistic images.

Form-creating techniques in design. *A form-creating technique* is an operation for creating and/or transforming the configuration of a design object. Theoretical and practical form-creating techniques are distinguished.

Theoretical form-creating techniques. Theoretical techniques include compositional means of form creation, namely meter, rhythm, identity, contrast, nuance, proportioning, scale, and symmetry.

Practical form-creating techniques. Practical techniques include operations for manual, technical creation or plastic transformation of the configuration of point, linear, planar, volumetric elements, or an entire spatial structure formed on their basis, through cutting, augmentation, transformation, etc.

Universal approaches to the formation of design objects present the principles and methods of form creation, namely:

1. Universal principles and categories of design activity that have an applied nature (Bella Martin, Bruce Hanington, 2012; William Lidwell, Kritina Holden, Jill Butler, 2010);
2. The "traditional-innovative approach," which involves spatial contrast in the search for forms of objects with visually expressed elements that meaningfully express the concepts of "tradition" and "innovation";
3. The formal-geometric approach to form creation, which is based on the visual-morphological properties of basic elements such as points, lines, planes, volumes, geometric figures, combined with techniques and methods of form creation (Yurchenko I.A, 2015);
4. The use of a compositional approach with the application of parameters and properties of the volumetric-spatial structure and means of composition (Yurchenko I.A, 2011: 197);
5. The amorphous approach to free decorating techniques of the product, based on the use of techniques for applying graphic images and building structures based on ethnocultural traditions;

6. The approach in the use of the Gestalt method, which is built on the specifics of the visual perception of the material environment by humans, taking into account the specifics of sequentially distinguishing the "figure" from the "background," as well as on the factors of visual grouping of elements such as "symmetry," "proximity," "similarity," "common connection," "closure," "good continuation," "common fate" (Yurchenko I.A, 2011: 48-61);
7. The artistic-imagery approach, which involves the creative reinterpretation of ethnocultural motifs in the context of metonymy, metaphor, allegory, synonymy, etc.;
8. The approach to the use of "secondary raw materials," which involves the reuse of forms, elements, or images that have gone out of use, aesthetically rethought in a modern context and interpreted by contemporary form-creating means;

The method of experimental modeling. The method of experimental modeling can be fairly attributed to scientific cognition methods, but within this model, it plays one of the leading roles, as it is the basis for searching for design form variants (Yurchenko I.A., 2013b; Udris-Borodavko N., 2023).

Special methods for form creation based on ethnocultural traditions. The methods of this group are based on the use of the characteristic properties of ethnomotifs as the leading theme in combination with formal form-creating methods and techniques (Yurchenko I.A., 2014). The following special methods are recommended to be included:

1. The ornamental method, based on the use of ornament as the basis of form creation, the philosophical understanding of ornament and its aesthetics, principles of ornament construction, and ornament decoration of other works;
2. The method of style and ornament transformation in a historical context;
3. The method of form creation for ensembles of modern design forms based on ethnocultural traditions, preserving plastic or cultural-meaning connections between material forms;
4. The method of interpreting the grapheme of a specific ethnornamental motif;
5. The method of interpreting several ornamental motifs;
6. The method of interpreting the visual and technological properties of decorative techniques by modern means;
7. The technique of hyperbolizing the form of an ethnornamental motif, elements, or other visual signs of decorative techniques according to the design concept or experimental idea;
8. Methods of interpreting traditional techniques for creating decorative and applied arts products;
9. The method of interpreting oral folk art, poetry, prose, folklore through visual means of artistic language typography or three-dimensional modeling;
10. Heuristic methods aimed at finding connections between ethnodesign and the concepts of other contemporary design trends based on extrapolation and experimental modeling methods.

The proposed interpretations of ethnocultural traditions in contemporary design are based on the dialectical synthesis of the above-defined elements of the model. However, it should be noted that during the testing stages of this model in the design process, mechanical and eclectic combinations of elements, dominance of one over the other, or the formation of functional subgroups within the design tasks are possible. Nevertheless, the functioning of the entire model will be subject to the character of the created original concept, in our case, ethnocultural.

Form-Giving Methods of Styles in Design as Creative Models

The characteristic feature of the functioning of form-giving methods of style is the presence of universal components in their structure, as well as elements that differentiate them from one another. The history and practice of form-giving encompass a vast array of form-giving methods of styles. Throughout the development of design, they have evolved into distinct schools with their own programs, sets of laws, rules, and requirements. Below are examples of such schools with unique and original form-giving methods of style. Typically,

the theoretical concept of a form-giving method of style is based on the selection or exaggeration of elements within the categories of the spatial structure of *figure, size, position, and order:*

- The form-giving method of the "point-line-plane-volume" style, based on the category of *figure*, is applied in the design departments of the Kharkiv State Academy of Design and Arts, the National Forestry University of Ukraine in Lviv, and the Lviv Polytechnic National University.
- The popular method of combinatorial form-giving, based on the category of *size*, uses the concept of a module and the rule of obtaining various compositions from the same type of element through different spatial arrangements.
- The form-giving *method* of the German school Burg Giebichenstein Hochschule für Kunst und Design Halle – University of Art and Design, Halle, is built on the category of position, specifically the concept of *direction*. The essence of this method lies in organizing spatial structures based on the visual properties of geometric figures in their directional perception within the image plane. The tasks begin with a circle, a figure devoid of a clearly defined spatial direction. Subsequent tasks are based on the vertical, a figure with upward and downward directions. Then come tasks involving the square, a figure with neutral spatial direction. The following tasks involve organizing compositions with a triangle, a figure with a clearly defined spatial direction. The methodology concludes with compositions that combine the circle, vertical, square, and triangle.
- The classical theory of composition in most Ukrainian universities, which follows the traditions of post-Soviet schools, is based on the category of *order*. In this concept of form-giving method, composition begins with mastering fundamental properties and tools such as integrity, symmetry-asymmetry, static-dynamic balance, unity of character, subordination, proportioning, rhythm, contrast, and others.

There are also modern concepts of form-giving methods built on theoretical principles from specific sciences or historical styles. Every artist and designer aims to develop and refine their own form-giving method that best reflects their worldview. However, this is not always immediately achievable. Typically, a personal form-giving method evolves and refines over years.

Conclusions

As a result of the research and the construction of the formal model concept of form-giving, the following conclusions can be made:

- It has been determined that the philosophical and scientific foundations of form-giving within the model structure provide valuable guidelines for design strategy.
- The form-giving method of style has been identified as an important factor in the form-giving process, which gives the formal structure of the model and artistic language its original form, subordinating structural elements of the model and ensuring the unity of artistic language.
- The tasks of pre-project analysis and research in the design process have been outlined, allowing for the determination of not only general design requirements but also the character of ethnographic traditions.
- The principles of form-giving in design have been identified and named as a set of theoretical guidelines for the form-giving process and for assessing the quality of the final design product.
- Form-giving techniques in design have been formulated, and their function and place within the project task execution system have been defined.
- Universal approaches to form-giving of design objects have been considered as a set of standard design project requirements.
- The place and task of the experimental modeling method have been identified as a crucial stage in the search for formal compositions and final forms.
- The names of special form-giving methods based on ethnocultural traditions have been identified and formulated.
- The application of form-giving methods of styles within the design schools system has been examined, establishing their influence on the character and style of the final design forms.

The application of the developed form-giving model allows its principles to be expanded and applied in modern design, both in project activities and in the professional training of young designers. The research results suggest the following prospects in design activity:

1. The ability to observe the patterns of form-giving model development throughout its historical periods and predict the emergence of new trends, tastes, and forms within the existing context, anticipating novelty through new technologies.
2. The possibility to observe the functioning features of the form-giving matrix components as individual mini-sources of the form-giving process.
3. The existence of the presented model provides a comprehensive understanding of the interconnections between the components of the form-giving process and their mechanisms of mutual influence, which in turn should provoke the heuristic emergence of new design-form concepts.
4. The use of domestic ethnocultural traditions and the proposed form-giving model enables full-fledged searches for innovative design forms with distinctive visual identities.
5. The development of heuristic thinking is encouraged, with a clear representation of cause-and-effect relationships between the system components.
6. The nature of the functioning of categorical concepts and their combination into coherent systems becomes clear.
7. The model allows for the generalization of personal pedagogical experience.
8. The study of past development patterns enables the projection of the present and the creation of design forecasts for the future.
9. Designers gain the freedom to search for new personal design concepts by utilizing the structure and dynamics of interconnections within the model.
10. The establishment of visual connections creates communication between users based on a common terminological-practical scientific language.

It is believed that this form-giving model concept has prospects for development both in design practice and in professional design education.

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Podstawowe elementy składowe dynamicznego modelu we wzornictwie przemysłowym

Streszczenie: W artykule przeanalizowano prawidłowości konstruowania podstawowego modelu tworzenia obiektów wzornictwa. Ujawniona została przejrzysta struktura modelu, która obejmuje: podstawową metodę stylu; metody analiz i badań przedprojektowych w systemie procesu projektowania; zasady kształtowania w projektowaniu; techniki kształtujące w projektowaniu; uniwersalne podejścia do tworzenia obiektów projektowanych; metoda modelowania eksperymentalnego; specjalne metody tworzenia form w oparciu o tradycje etniczno-kulturowe. W opracowaniu przedstawiono światowe przykłady modeli procesu formowania rzeczy, perspektywy ich doskonalenia i praktycznego wykorzystania.

Słowa kluczowe: projektowanie, formowanie, model kształtowania obiektów projektowych, metody projektowania uniwersalnego, zasady projektowania uniwersalnego, proces projektowania, analiza przedprojektowa, tradycja etno-kulturowa, tradycja etno-artystyczna