

Summary

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MUSEUMS IN THE 21ST CENTURY: INNOVATIVE FORMS OF EXHIBITIONS FOR CHILDREN

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Keywords: exhibition, multisensory, interactive museum, human-centred design

In the past few decades, we experienced significant development of construction and renovation of various museums worldwide. In spite of the potential for great popularity of these cultural institutions, the traditional museum presentation in showcases is no longer enough to attract a wider audience. The attractiveness can be enhanced through appropriate architectural solutions and also by introduction of innovative forms of exhibits that offer a unique symbiosis of education and entertainment which make modern museums unique. Modern techniques applied in exhibitions, as can already be seen especially in western countries, could contribute to greater popularity and prosperity of Slovak museums and galleries and increase the number of their visitors.

The forms of exhibitions are continuously evolving and the traditional model of a museum, characterized by simple showcasing of exhibits, which can be experienced primarily by sight, has been enhanced with many other presentation techniques, which increase the attractiveness of the museum space for a larger spectrum of visitors. Thanks to the ever-increasing opportunities for touching and interacting with exhibits, museums open up to a wider audience in order to capture the interest and welcome all visitors, regardless of their age, education, abilities, or health restrictions. It is important for the society to offer this cultural space to all segments of the population, thereby attracting more visitors to these institutions. Exhibits are therefore presented using modern means that help a variety of users to fully experience the exhibitions. Various forms of interactive exhibitions are presented, in particular multisensory and interactive exhibitions and hands-on by innovative methods in particular. At present, museums, galleries, but also partial or temporary exhibitions tend to focus more and more on attracting the interest of children. A distinctive feature of children's museums and exhibitions is that, unlike in traditional museums, visitors are allowed, even encouraged, to touch exhibits, perceive exhibitions not only visually, but through multiple senses, and be actively involved in the handling of exhibits, often with support of information technology.

The multisensory architecture simplifies the stay and orientation in space in general, together with the understanding of a particular museum exhibition for all its users, and plays an especially important role for children and people with visual or hearing impairment. Interactive exhibits provide visitors with direct experience that supports the learning process. Multisensory and interactive architecture is in line with the principles of universal and human-centered design, allowing as many people as possible to fully enjoy the environment. When designing the interior and exterior of children's museums, the emphasis is put on the safety of the space, appropriateness of the target age group, and taking into account the development needs of all children and also those of adults.

Children have different needs, expectations and areas of interest, compared to adults, as well as specific ways of perceiving museum exhibitions, so it is necessary to design exhibitions for them accordingly. The reasons for these

differences are briefly explained in the theoretical section. So, the architecture of children's exhibitions differs from traditional museums, mainly in the interior design and the character of the exhibits. Children's museums are thus partly outside of the definition of a museum. Indeed, many institutions that are designated as children's museums do not meet some of the basic criteria for a museum in general. Generally, one of the main goals of traditional museums is to ensure the safety of the exhibited artifacts and to highlight their museological importance. However, the main objectives of modern exhibitions for children can be described as a strong positive experience of the museum's visitors and their education.

The analyzed case studies of the visited exhibitions, mainly for children, in Austria, present a variety of solutions utilized by this type of institution. Particular attention is paid to the educational potential, the atmosphere of the exhibitions, and the ways of creating and adjusting the exhibition space for all visitors, including people with special needs are explored. The aforementioned attributes were chosen for the great importance they have in the role of children's museums, whose purpose is to educate and "shape" their visitors, offer memorable experiences through the creation of unique atmosphere and their modern goal is also to support the inclusion of children with health limitations. These examples are intended to serve as inspirational architectural and design options for the presentation of exhibitions, as these museums primarily highlight the positive elements and introduce the options for adapting some of the exhibition segments to better accommodate the needs of people with disabilities. Four museum exhibitions in Vienna dedicated to children were selected for the comparison. This location was chosen due to its inspiring nature, high quality of local exhibitions and museums for children visitors, as well as due to its geographical and cultural proximity to the Slovak environment.

Based on the acquired information, the paper also suggests potential areas for further research concerning mainly the possibility to divide the museum space for children into sections, as well as suitable routing of exhibitions in order to achieve a playful, inclusive and educational architectural space.

ENVIRONMENTAL CONTEXTUALIZATION IN DEFINING ECO-AESTHETICS OF INTERIOR COMPONENTS

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Keywords: environmental contextualization, sustainable design, interior, eco-aesthetics

The paper analyses a concept of interior architectural design called Design for formal and physical minimalism DfFPM derived from environmental contextualization. It is to accomplish the sustainable design strategy of resources' effectiveness and to identify the attributes of eco-aesthetics of indoor environment. The analysis is based on the comparative case studies of interiors of commercial spaces completed recently. It is intended to juxtapose primary and complementary functions of components, their forms, methods of completion, as well as selected sustainable design strategies to comply with. The main purpose of the paper is to present restraints in the quantitative selection of materials for interior components, as a stimulating factor to define the features of ecological aesthetics, and thus to confirm the potential of Design for formal and physical minimalism in shaping of sustainable indoor environment.

The recognition of the environmental context in the formation of interiors and their components is confirmed by: 1) consideration of multidimensional impacts of interior components, understood as spatial and functional structures shaping the indoor environment on natural surrounding with emphasis on every phase of their life cycle; 2) respect for the interconnectedness and interdependency of indoor and natural environments; and 3) prevision of the consequences of relationship between designed and natural environments to minimize the negative results of this coexistence, and to create interiors of high environmental performance.

The possible implications of environmental contextualization in the design methodology for interior components, being mostly promising in terms of sustainable interior architectural design, combine the following: 1) shaping of the components of interior spaces as environmentally oriented function components; 2) adjustments in the existing behavioural model, as well as stimulation of pro-environmental schemes among the occupants of indoor environment with interior components as specific design tools to achieve it; and 3) development of criteria defining the eco-aesthetics of man-made environment and interior architectural design methods. The questions proposed regarding the latter involve: 1) accomplishment of the biophilic concept in the environmental integration of interior components and natural surrounding; 2) development of interior architectural design to comply with the adaptive reuse concept, in its physical and semantic perspectives; and 3) inclusion of restraints in formal solutions and physical aspects of designed components, as incentives for the innovative design methods and outlining of eco-aesthetics.

The question of control over the quantity of resources, and its influence on the development of an environmentally-related aesthetic category, are enclosed in the concept of interior architectural Design for Formal and Physical Minimalism, discussed in this paper. This design scheme, realized through the restricted usage of resources, presents the design strategies for sustainable interior components in defining of eco-aesthetic features. Design strategies comprise dematerialization and deconstruction, both directly related to the requirement of effective management of resources, as well as the model of multi-functionality of interior components. The latter refers to the question of optimization in the use of inner space and reduction of used building materials and products. The eco-aesthetic features assigned to interior components comprise: essence of usefulness and final appearance; intended lack of precision in workmanship; honest materiality; structural honesty; formal integration of structure and finishing; rawness; roughness. Design techniques and tools applied by designers offer the observers a strong experience of artefacts' materiality, tangibility, texture and weight. These multi-sensual experiences endorse the pro-environmental statement enclosed in the components of indoor environment and stimulate changes in behavioural models of end-users'. The aesthetic occurrence of environmentally sustainable interiors and their components is defined by their experiential perception based on the users' engagement in denoting of objects' forms, structures and physical properties. Thus, the multi-dimensional, emotional, sensorial, as well as intellectual effects on the occupants of interior spaces reveal the inclusiveness of eco-aesthetics.

BRATISLAVA, (UN)PLANNED CITY: NOTES ON THE STUDY AND INTERPRETATION OF THE HISTORY OF CITY PLANNING AND CONSTRUCTION

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Keywords: town planning, architecture, construction, Bratislava, urban structure, (un)planned

In Slovakia, after 1989, there were dramatic changes in the field of town-planning, which were conditioned by the change in social conditions, but also by the change of paradigm in the field of planning and regulation of construction in the city. Practically in the whole of Czechoslovakia, this meant a rejection of modernist urban practice. In Bratislava, this phenomenon manifested itself extremely intensively. Within a few years, the planning institutions that have been developed for decades disappeared. This development, reflecting deep doubts about the meaningfulness of planning in the context of a market economy, coincided with increasing construction investment and growing demands for decision-making processes related to new construction. This was no longer the result of the planned economy, but a manifestation of the free market. Bratislava once again faced the situation as many times in the past, when private investors demanded quick decisions and clear construction guidelines, which, however, they did not receive from the city council and the city planning department. Bratislava expanded, rebuilt and densified more or less ad hoc. In the most

critical period of the first decade of the new millennium, this trend even brought the Slovak capital the adjective of an unintentional or unplanned city.

In parallel with the growing criticism of the events of that time, there were also growing efforts to take a holistic view of the issue of city planning and construction. At the same time, glimpses into the past indicated that the first precondition for dealing with this situation would be an analysis of the history of modern planning and construction in Bratislava. At the same time, it was clear that there was an opportunity for a more ambitious task than a standard history.

The study analyses the starting points, methodological tools and results of research carried out by a team of architects and historians of architecture since 2014 under the guidance of the author of this text. It describes the current situation in the field of urban research, with an emphasis on examining the morphology of urban structure. It draws attention to the line of current research, which understands the city as an open work with the potential of a number of development possibilities, which at the same time cannot be perfectly guided or coordinated. This trend is followed by the presented research of Bratislava, which aims to approach the history of modern planning in Bratislava, to reveal and describe the relationship between planning and construction, to define architectural and urban concepts and paradigms relevant to Bratislava's urban structure, to examine selected examples of their application in the material structure of the city and on their basis to reveal the laws of its development. The phenomenon of an unplanned city served as a research premise.

The study describes the methodological approach of this research, which is a hybrid combination of methods of architectural, urban and architectural-historical qualitative research and presentation tools of architecture and urbanism. To better understand the relationship between planned and implemented city construction and the mechanism of its functioning, objective knowledge about the history of planning and construction was confronted with the visualization of planned and implemented interventions in the city structure. At the same time, this method has made it possible to identify, abstract and visualize key features of urban tissue and its transformation over the last hundred and more years. At the same time, non-chronological retrospective examination of the development of the form of development helped to identify the factors of stability and instability of the urban structure. It was literally about the visualising of invisible history, about connecting of local phenomena across history, about clarifying of their relations as well as the connection with city-wide tendencies so that their correlation is obvious and understandable. It turned out that the combination of historiography and engineering disciplines such as architecture and urbanism and their digital imaging tools, allows the discovery of otherwise unobservable patterns and opens up opportunities for a new comprehensive understanding of the history of urban planning and construction.

In the process of investigating the planning and construction of Bratislava, which included the identification of major urban documents from the first city regulatory plan of 1774, through the first modern city regulation and expansion plans of 1906 and 1917, several general city plans and a number of partial regulation plans from interwar period, almost a dozen master plans from the second half of the 20th century to the current city plan, their analysis, evaluation and comparison with the real urban structure of the city, several urban situations were identified within the city structure of Bratislava, which are characteristic of this city and which were determined by modern planning. These situations include some tensions arising from the confrontation of the organic development of urban structure and modern planning and from the relationship between traditional historic urban spaces and elements of modern urbanism.

The basic characteristics and naming of individual types of situations are based on urban morphology, but it also includes a phenomenological view, how these parts of the urban structure appear from the perspective of today's observer. The intention to combine the view of urban morphology with the phenomenological view was most in line with the approach of the Catalan architect and urban planner Ignasi de Solà-Morales. Solà-Morales defined five cultural categories in 1996, which should be the basis for understanding the new relationships between architecture and the contemporary city: Mutations, Flows, Habitations,

Containers, Terrain Vague. In the presented research, this method was used to explain and characterize the urban situations that arose under the influence of modern architecture and urbanism in the last century in Bratislava, despite the fact that Bratislava cannot be considered a large city at that time. In the background of this intention was the same belief that "only by according equal attention to the values of memory and absence and the values of innovation will we be able to maintain confidence in a complex and plural urban life".

The presented typology of urban situations in Bratislava consists of the following 12 basic types: 1. From linear street to complex urban space, 2. From periphery to the new city centre, 3. From the unique to a generic, 4. Embankment as a problem, 5. Fragments of concepts, 6. City-shaping modernity, 7. The ambiguous ring, 8. The crossroad is not a square, 9. A traveling object, 10. From factory yards to downtown, 11. From sports to commerce, 12. The phenomenon of mass housing. Each of the mentioned urban situations is assigned a separate narrative in this interpretation, which reflects its research from a historical and spatial point of view. The typology of Bratislava's urban situations served as a representative object in the research of Bratislava's urban tissue, but at the same time it characterized this tissue by its structure. Through it, it was possible to identify and clarify specific phenomena and processes, including the mechanism of their functioning, which had a major impact on the development of urban structure of Bratislava. It was, for example, a mechanism for procurement, preparation, approval and application of regulatory, respectively zoning plan of the city, the application of the phenomenon of expropriation and remediation, the process of ordering, preparation and application of partial regulatory studies and the role of individual actors in this process.

VIRTUAL REALITY AND ITS APPLICATIONS IN TRANSPORT DESIGN

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Keywords: virtual reality, mixed reality, transport, motorbike, design, simulator, configurator

This article focuses on the use of virtual and mixed reality in transport design. The advancement in virtual reality hardware and software also enables more extensive use of this technology in the design process. The possibility to visualize new designs in real scale is especially useful with larger objects, such as cars and motorbikes, in case of which the preparation of a physical model would require a significant amount of resources and work hours.

Another advantage of virtual reality is the wide range of options for data configuration. 3D data of a new car exterior can be visualized through VR software in various colors and materials. Models can be placed and viewed in a studio or any outdoor environment. It is also possible to change individual shapes and elements in real time (e.g. lights, bumpers, etc.) and thus review design variants in a faster and more efficient manner. We can come across similar configurators on the websites of car manufacturers, where a customer can give exact specifications, based on which the configurator generates a rendering of the new car's exterior and interior.

A car interior must be shaped to accommodate ergonomic requirements of a human body and, what is more, it also comprises user interface for human-machine interaction. When testing car interior designs in virtual reality, an ergonomically adjustable construction – a simulator is used. Modular simulators offer various levels of complexity. They include seats, a steering wheel, pedals, various parts of a dashboard, etc. All these elements are adjustable according to the manufacturer's car model portfolios. The primary feature of the simulator is its synchronization with virtual data. The person sitting inside the simulator can experience the new design in virtual reality and they are able to interact with it through the physical simulator. In this mixed reality scenario, virtual steering wheel lines up with its physical counterpart to provide haptic feedback. The technology that combines the physical simulator with 3D digital data is applied in the author's doctoral thesis to visualize new motorcycle designs. A variable

motorcycle simulator was constructed for the purpose of simulating ergonomics of various types of motorcycles.

The first section of the article contains an overview on virtual reality technology. It classifies virtual and mixed reality in the reality – virtuality continuum and provides examples of other interactions between the real world and virtual data. HTC and Oculus are companies that brought VR headsets to consumer market and introduced virtual reality to the general public. The combination of a HTC Vive headset with a HTC Tracker is used in the doctoral thesis to create mixed reality. The increase in the sales of VR hardware, such as VR headsets, goes hand in hand with software development. Gaming engines like Unreal Engine and Unity, originally developed for creating computer games, are now used in automotive industry. This software combines quality visualizations with the ability to program material configurators, door animations, interior mood light changes and many other features.

The section on “VR in Transport Design” presents practical and also conceptual examples of virtual reality application in development process. Virtual reality has mainly been used as a visualization tool for models in the development or for final presentations. However, VR tools are becoming more suited for creative work, like capturing initial ideas or creating multiple variations of a design. In this field, sketching by hand using paper and pen or a graphic tablet is still prevalent. VR modelling software (e.g. Gravity Sketch) provides the option to sketch in virtual reality. The user is able to capture an idea of a design directly in 3D space.

“Research by Design” summarizes the results from the process of motorcycle design using VR tools. First, a variable construction was built to simulate different ergonomic types of motorcycles. The simulator was then synchronized with the digital data of an electric sports bike and visualized in Unreal Engine software, in which a configurator for changing body and wheel colors was programmed. In the subsequent experiment, the simulator was incorporated into VR modelling software Gravity Sketch. The sketching a motorcycle in real scale and with the aid of a physical simulator allowed for testing and “sitting” on a new design motorcycle from the perspective of a rider.