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THE EFFICIENCY FACTOR OF ZONING OF ORGANIZATIONS AND SPACES

Summary. *The article discusses effective methods of space zoning and organization aimed at enhancing functionality and comfort in residential and working spaces. It explores key planning principles, as well as the use of furniture, lighting, and decorative elements to create distinct zones that serve different purposes. Special attention is given to adaptive solutions that optimize space utilization, enhance ergonomics, and improve the visual appeal of interiors. Practical recommendations and contemporary technologies are offered to facilitate the rational allocation of space while preserving aesthetics and facilitating free movement. The article is intended for designers, architects, and anyone seeking to create harmonious and efficient environments.*

Key words: *zoning, interior, exterior, comfortable environment, practicality, environmental friendliness.*

The modern world faces a number of social and economic challenges, which directly affect the need for optimal use of living and working spaces. Urbanization is leading to an increase in population density in cities, which in turn leads to a decrease in available housing and working areas. Under these conditions, proper zoning is becoming a key tool to improve the functionality of premises, allowing for the creation of comfortable and multifunctional spaces, even in rooms with limited space.

Additionally, the modern pace of life requires optimized spaces to increase productivity and convenience. Proper zoning minimizes noise and visual distractions, creating clear functional boundaries that are essential for residential apartments, offices, schools, cafes, and other public spaces.

Technological advancements and the development of new materials have opened up additional possibilities for space transformation and adaptation to various needs. This calls for updated knowledge and skills in interior design and architecture, making the study of efficient zoning techniques a crucial and sought-after field in modern education and professional settings.

Understanding the principles of zoning and spatial organization is essential for addressing pressing issues related to housing and working in limited spaces, improving living standards and work efficiency, as well as incorporating innovative approaches into design and construction processes.

The aim of studying the topic of effective zoning and space organization is to develop knowledge and skills in the rational use of available space in order to create functional, comfortable, and aesthetically appealing rooms. The goal is to learn how to:

- correctly divide the space into zones depending on their purpose;
- take into account ergonomic, psychological and aesthetic aspects when planning;
- use modern methods and materials for optimal transformation of the interior;
- improve the quality of life and productivity through thoughtful organization of space;
- adapt living and working spaces to a variety of needs and conditions.

Research methods for this topic include literature analysis to understand the theoretical foundations and current approaches, observation of real-world examples of space management in order to identify successful strategies, comparative analysis of different zoning techniques to determine their strengths

and weaknesses, experimental modeling of layouts to test hypotheses and find the best options, as well as surveys and user feedback to assess the functionality and comfort of organized spaces.

Additionally, computer modeling and visualization techniques are actively used, allowing for the creation of accurate plans and 3D models, which contribute to a better understanding and evaluation of the space. This integrated approach ensures a thorough exploration of the topic and the development of practical recommendations.

The topic of organization and zoning of space has been well researched and has a strong theoretical basis. Numerous scientific works have been published on methods of efficient space use, principles of ergonomics, and psychology of environment perception. Modern research also focuses on innovative technologies, such as digital modeling and smart space management systems [1, p. 9].

Despite the abundance of theoretical knowledge, however, practical aspects are sometimes less developed due to the individualized and context-dependent nature of solutions. This is particularly true for the integration of new technologies into existing architectural and interior designs.

The study of the organization and zoning of space has its roots in ancient times, when people started consciously shaping their environment for convenience and safety. In ancient times, these concepts were already evident in urban planning and architecture. For example, the layout of cities and buildings in Ancient Greece and Rome reflected these principles.

In the Middle Ages, space organization was largely determined by functional and religious considerations, which can be seen in the layouts of monasteries, castles, and cities. With the development of science and technology over time, there was a growing need for a better understanding of how space affects humans.

During the modern era, especially in the XVIII–XIX centuries, urban planning, architecture, and engineering led to the systematic development of zoning principles and forms. Ideas about the rational use of land in cities were developed and sanitary and hygiene standards were considered.

The XX century saw the emergence of ergonomics and architectural theories, leading to a deeper scientific study of space's influence on comfort, productivity, and behavior. Post-war concepts such as open spaces, flexible zoning, and adaptive environments were introduced [2].

The current stage of development is characterized by the introduction of digital technologies, intelligent systems, and environmental approaches, significantly expanding the possibilities for effective organization and management of space.

Therefore, the history of research on this issue reflects a transition from empirical knowledge to more systematic scientific concepts, taking into account not only functional aspects, but also psychological, social, and technological factors.

The basic concepts that cover the topic of space zoning and organization include spatial organization, which refers to the distribution and arrangement of elements within a space in order to achieve functional and aesthetic harmony.

Zoning involves dividing space into functional areas based on the tasks and characteristics of use. These functional areas can include residential, work, or recreational spaces. Lines or elements define the boundaries between these zones, which help to structure the overall space [3, p. 12].

Multifunctionality is an important concept that allows one area to serve multiple purposes. Ergonomics focuses on creating a rational and comfortable environment for human interaction, while psychology of space studies how humans perceive different spatial conditions.

Green spaces and recreational areas provide opportunities for relaxation and connection with nature, enhancing the overall experience of the space.

Urban planning deals with the integrated design of cities, taking into account zoning. The integration and connection of different zones ensures a comfortable transition between them, facilitated by transport and communication networks. These concepts form the basis for the effective management and organization of urban space in architecture and design.

Modern technologies for zoning and spatial organization include digital modeling and Building Information Modeling (BIM), which allow for the creation of accurate 3D models of buildings and territories for virtual zoning and analysis of functional areas during the design process. This increases efficiency and reduces errors, making the process more efficient. Smart sensor systems and the Internet of Things (IoT) are also used to monitor and dynamically adjust various space parameters, such as lighting, climate, noise, and human density. This ensures that zones can be used adaptively in real-time (see Figure 1).

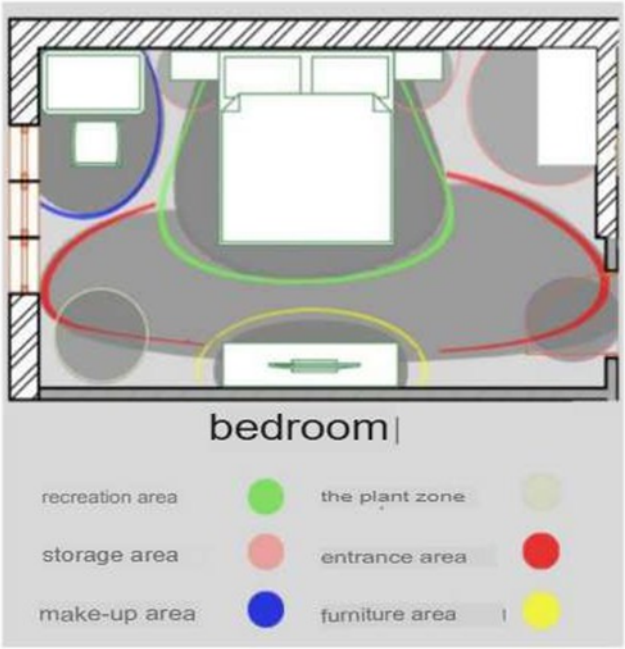

Fig. 1. The zoning scheme of the territory on the example of a bedroom

Virtual and augmented reality (VR/AR) tools help visualize and test different space organization options prior to implementation, improving understanding and decision-making processes.

Geographic information systems (GIS) analyze urban areas to determine the optimal distribution of different zones, considering demographics, infrastructure, and environmental factors. Big data analytics and artificial intelligence techniques identify user needs and preferences, optimizing zoning for increased operational comfort and efficiency. These technologies make zoning more precise, flexible, and tailored to the actual needs of people.

Problems in the organization and zoning of space are due to limited infrastructure and resources. This makes it difficult to implement modern technologies and flexible solutions. The diverse needs of different user groups are often not taken into account, leading to conflicts and inefficient use of space. Lack of up-to-date data and poor system integration limit the ability to accurately forecast and adapt management.

Legal and regulatory frameworks often do not keep up with technological advancements, slowing down the adoption of new approaches. Technical difficulties integrating different systems hinder the creation of a unified managed platform. Errors in modeling and forecasting lead to inefficient zoning, resulting in additional adjustment costs. These challenges require comprehensive solutions and ongoing improvement of space management methods.

Ways to solve the challenges of space planning and zoning include the implementation of modern technologies such as the Internet of Things (IoT), Building Information Modeling (BIM) and Geographic Information Systems (GIS). These technologies increase the accuracy of planning and adaptability to users' needs. It is essential to regularly collect and analyze current data on users' requirements and behavior in order to make well-informed decisions and make timely adjustments.

It is also essential to implement a flexible and modular design that allows for quick changes and redevelopment of the space based on changes in tasks. Equally important is the training and involvement of all stakeholders, including users, specialists, and management bodies, in order to account for different

interests and minimize conflicts. Optimizing financing through the attraction of investments and government support fosters innovation, particularly in municipal projects (see Fig. 2).

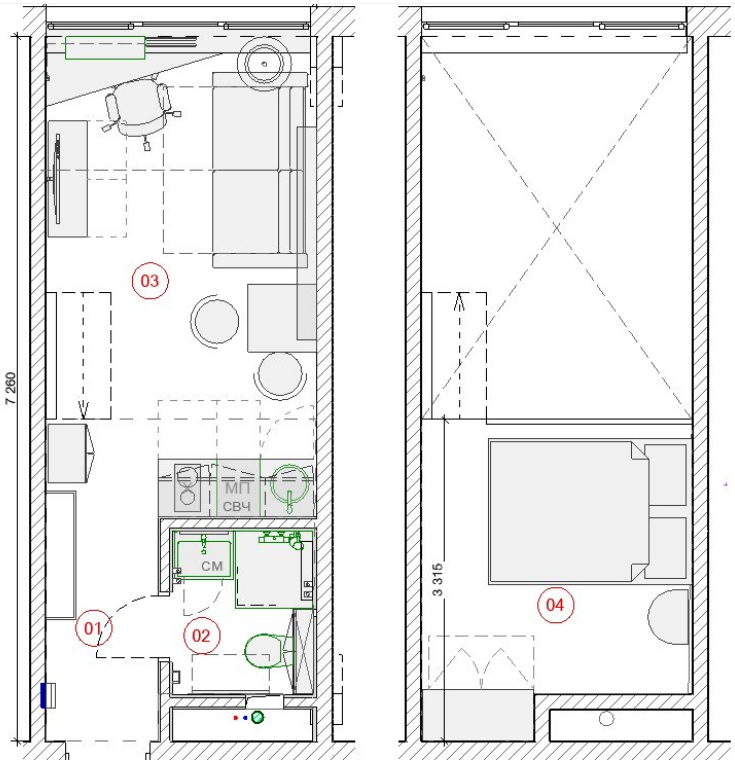

Fig. 2. Example of zoning of a small apartment [4]

The improvement of the regulatory framework, taking into account modern technologies, provides legal support for changes. To create a unified management system, it is necessary to integrate heterogeneous technological and software solutions through the development of compatible standards and platforms.

Conducting pilot projects and regular audits allows for the identification and elimination of errors, reducing risks and additional costs. This integrated approach ensures an efficient, adaptive, and rational use of resources, improving the quality of life and the economic efficiency of projects.

Effective zoning and space organization play a crucial role in creating a comfortable, functional, and productive environment in residential, public, and workspaces. Rational distribution of zones maximizes the use of available space, improves ergonomics, and enhances the quality of life and work for users. A well-

organized space simplifies traffic routes, reduces conflicts between different areas, and optimizes resource utilization.

Modern approaches to zoning take into account the individual needs of users and analyze their behavior and functional requirements, making the design more adaptable and flexible. Innovative technologies such as digital modeling, automation, and control systems improve planning accuracy and simplify the process of making changes. The introduction of modular and transformable elements allows the space to be adapted to changing conditions and demands, while compliance with regulatory requirements and environmental standards ensures the safety and sustainability of development.

Organizing the space requires considering the diversity of interests among all participants in the process, including designers, users, administrators, and investors. An integrated and systematic approach is necessary to ensure that everyone's needs are met.

Thus, effective zoning and space organization is not just a planning technique, but a comprehensive tool for creating a harmonious environment that enhances the quality of life, promotes economic efficiency, and promotes sustainable development in societies. Investments in well-designed and managed spaces pay off through increased convenience, reduced costs, and adaptability to future changes.

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