Systems Analysis of Social Spaces of Shopping Malls from Customers’ Point of View

Olena Berezko
Department of Design and Fundamentals of Architecture, Institute of Architecture, Lviv Polytechnic National University, 12 Bandera street, Lviv, Ukraine, 79013
olenavberezko@lpnu.ua

Abstract. The paper provides a systems analysis of the shopping mall’s social space functioning with the “black box” approach. According to this model, the main purpose of social space is to meet all customers’ needs. In addition, external architectural and non-architectural factors are determined, and the means of influence are identified: architectural organization means. Thus, based on previous research, we built a detailed model of the "black box" of the social space system. In which, to meet all the needs of customers, and by the levels of design psychology needs, we formed five principles of building a shopping mall’s social space: the principle of ergonomics, the principle of organicity, the principle of social openness, the principle of harmony, and the principle of flexibility and polyfunctionality. The research results can be used in the design of new and reconstruction of existing malls and further research on this topic.

1. Introduction
The shopping mall has become a common building type and an integral part of the modern city [1-3]. The initial need of visitors to this type of building is mainly to purchase goods and visits to catering and entertainment establishments. Thus, malls are no longer primarily about shopping. They also serve such purposes as social interaction, excursions, and works, and even official meetings [4-6]. This trend is observed worldwide [7]. Therefore, the question arises, what factors attract visitors (customers) to one or another mall, creating a competitive advantage [8].

Much of the satisfaction of the mall’s customers’ needs occurs through rented premises. However, recent studies show that it is the combination of various tenants and the mall’s attractive internal environment that are the main factors that determine the attraction of visitors [9]. Therefore, creating a high-quality and comfortable mall’s social space is no less important than the variety of goods and services available at its rented premises.

To create a quality social space, it is necessary to determine all the customer's needs and pay attention not only to physical but also psychological and social ones. In addition to specific dimensions, planning decisions, and functional content of the social space, several quality criteria provide convenience, psychological comfort and promote socialization and communication in this space. Such a task plan is quite extensive. Therefore, some methods and principles of system analysis will help in its solution.
2. The "black box" model of the mall's social space system

In previous studies, we discovered that a mall's social space is not just its element but a coherent subsystem [10]. This allows us to consider the functioning of the communication space of the mall by methods of system analysis.

The main method in the study of one of the system's aspects is the "black box" method [11] (Figure 1). The "black box" model of the social space system will allow displaying the connection of the social space with the environment. The principle of this model construction is that the system itself, i.e., the social space, is depicted as a box. The arrow on the left shows the "inputs" – that is, the problems or tasks that the system should actually work with. On the right, the arrow also indicates the "outputs" – the result achieved during the system's operation. The arrows above and below indicate the impact of the environment on the system's operation [12].

As noted above, this method is used to study the system from one side of its functioning. All "inputs" and "outputs" are formed from the task assigned to the system.

The mall as a commercial building generates financial profit. The mall owners are interested in the profits from renting the premises, and in turn, the tenants are interested in stable high profits from sales [13]. However, we will consider the mall system in terms of other tasks, namely satisfying visitors' needs, because the object of study is the social space designed specifically for visitors and their comfort. In addition, during the implementation of this task, i.e., meeting all the needs of visitors, financial gain is solved indirectly.

Thus, the "input" in the "black box" model of the mall system will be the needs of visitors (Figure 2). At the top, the arrows show the architectural and non-architectural factors that affect the system – the system resources. Below are the arrows indicating the means of the system's architectural organization – the system's features. Satisfaction of visitors' needs is defined as an "output" in the model.
One study result should be an expanded "black box" model scheme (Figure 3). The functioning of the social space system of the mall is reflected in the established principles. Each of the principles is formed according to the specific needs of customers. The diagram also shows the influence of factors on each of the principles and indicates the means of architectural organization, which can ensure their implementation.

Based on the created "black box" model, the general structure of further research was formed, namely:

- determining the customers' needs;
- studying of architectural and non-architectural factors of influence;
• analysis of the means of architectural organization.

In previous studies, we analyzed the architectural and non-architectural factors influencing the architectural and planning organization of malls' social spaces [14]. Among the architectural factors, we analyzed: urban planning location, terrain and site configuration, parametric factor (size of the mall), contextual factor, design features of mall’s social spaces, and mall’s visual perception.

Among the non-architectural factors, we analyzed: economic factor, the factor of real estate market organization, marketing factor, natural-climatic and environmental factor, and socio-psychological factor.

The means to create the overall composition of the interior were also analyzed. The following are considered: planning layout, tectonic expression of internal space, rhythmic organization of spatial structures, and scale [15]. The tools of space construction at the second stage of perception are analyzed: color, light, finishing materials, furniture, natural elements, navigation and communication means [16].

Thus, to build a detailed scheme of the "black box" model and form the principles of building a social space of the mall, it remains to determine the needs of visitors.

3. Determining the needs of customers in the social space of the mall

One of the most popular trends in modern design is "Design Psychology" [17]. This trend is the communication between people and the connection of people with their artificial or natural space. In fact, the study, formulation, and recognition of the original, authentic experience of a given space changes the view of architecture, planning, and interior design and gives it a higher purpose. According to the principles of design psychology, the architect's task is not only to create a functional and aesthetic place but also a place that is psychologically and socially valuable.

Similar to Maslow's pyramid of needs, proponents of this trend developed the Pyramid of Design Psychology. In Maslow's pyramid, self-realization is considered to be the highest level, the need for which arises after meeting all previous needs: physical needs, security needs, social needs, the need for respect. The pyramid of design psychology also consists of five levels [18] (Figure 4).

![Figure 4. Maslow’s pyramid and "Design Psychology" pyramid](image-url)
The lowest first level is the shelter. At this level, the only thing required of space is to provide the basic functional needs of a human being. For example, accommodation, food, trade. When it comes to the communication space of the mall, at this level, you need to meet the need of visitors to buy goods, the need for food, and the need for protection from adverse weather conditions.

The next second level is the level of satisfaction of psychological needs. The space at this level, in addition to meeting physical needs, should be psychologically comfortable. We are talking about psychologically comfortable space, color, lighting. The concept of psychological comfort also includes a sense of security.

The third level of the pyramid is the level of satisfaction of social needs – a space in which conditions for social activity and communication are created.

The fourth level is the level of satisfaction of aesthetic needs. Only on the fourth level, after the satisfaction of psychological and social needs, the satisfaction of aesthetic needs is made.

The highest fifth level of the pyramid, similar to Maslow's pyramid, is space as self-realization.

It is important to consider the practical application of the design psychology theory. Often, modern architects and designers focus solely on business models, i.e., on the first and fourth levels of the pyramid. For example, the main task during design is the distribution of functions and appearance of the structure, and during construction, the strength of structures. Jumping immediately to the fourth level of the pyramid, thus ignoring the middle levels (psychological and social), might be tempting for many practitioners.

What needs to be done with space, particularly with the social space of the mall, to meet all the levels of needs according to the pyramid of "Design Psychology"? In response to this question, we will form five principles for building a social space of the mall. Each of the principles will meet a certain level of needs of the design psychology hierarchy.

Thus, to meet all the needs of visitors, five principles of building a social space were formed: the principle of ergonomics, the principle of organicity, the principle of social openness, the principle of harmony, and the principle of flexibility and polyfunctionality.

As mentioned above, each of the established principles depends on the influence of certain factors. Also, implementing each of the established principles can be ensured by certain means of architectural organization.

4. An expanded "black box" model diagram of the mall's social space functioning from the customers' point of view

Having all the components, we built an expanded "black box" model diagram of the mall’s social space functioning in terms of the customers’ needs (Figure 5).

The principles of ergonomics are the basis for creating a social space that would satisfy the first basic level of customers' needs. Adherence to this principle depends on several factors: design features of construction, the size of the mall, urban planning location, terrain and site configuration, and the contextual factor.
Figure 5. Expanded "black box" model of the social space system

The principle of ergonomics in the social space of the mall is formed by the following means: scale, navigation features, architectural and planning scheme, volume-spatial solution, tectonic expression, and subject content.

The principle of organicity meets the customers’ needs for psychological comfort, i.e., the next second level of needs. The principle of organicity is expressed in the similarity of the social space's interior to the natural environment. This principle is influenced by the following factors: design features of construction, socio-psychological factors, environmental, and natural and climatic factors.

The principle of organicity in the social space of the mall is formed by the following means: scale, volume-spatial solution, color and light solution, subject filling, finishing materials.
Social needs are an important component of building a social space, which is often neglected when designing a mall. To meet the third level – social needs, it is necessary to adhere to the principle of social openness. The implementation of this principle is influenced by parametric, economic, socio-psychological, natural and climatic factors, urban planning location, terrain and site configuration.

The principle of social openness in the social space of the mall is formed by the following means: scale, architectural and planning layout, volume-spatial solution, functional content, subject content.

Fourth, the aesthetic level of needs can be met using the principle of harmony. The main factors influencing this principle are: environmental factor, terrain and site configuration, natural and climatic factor, economic factor, and visual perception.

The principle of harmony in the social space of the mall is formed by the following means: volume-spatial solution, color and light solution, rhythmic organization, tectonic solution, and finishing material.

The most advanced level of the pyramid of "Design Psychology" is space as self-realization. The principle of "flexibility" and polyfunctionality has been introduced to meet visitors' needs in self-realization.

The implementation of this principle is influenced by economic and marketing factors and design features of construction.

The principle of "flexibility" and polyfunctionality in the social space of the mall is formed by the following means: architectural and planning layout, tectonic solution, subject content, and functional filling.

5. Conclusions

Using the system analysis approach, we built a "black box" model of the mall’s social space system in terms of customers’ needs. Based on this model, the main purpose of the social space of the mall is to meet the needs of customers. We determined external influence factors: both architectural and non-architectural, as well as the means of influence, which are the means of architectural organization. This model formed a clear understanding of the further research structure.

According to the theory of design psychology, there are five levels of needs in the architectural space. Based on these needs, five principles of building the social space of the mall are formed: 1) the principle of ergonomics; 2) the principle of organicity; 3) the principle of social openness; 4) the principle of harmony; 5) the principle of flexibility and polyfunctionality.

Based on the identified needs and principles and following our previous research, we created a detailed scheme of the "black box" model of the social space system functioning in terms of customers’ needs. This scheme can be used as a basis for further theoretical research on this topic.

Following all five principles of architectural and planning organization of social spaces allows meeting all the customers’ needs. All these principles must be built on a certain hierarchy according to the levels of needs. Ignoring the first basic principles makes the success and comfort of the mall’s social space impossible, even if more advanced hierarchically-wise principles are observed.

Adherence to these principles can take a shopping mall to a new level – from a commercial building to a true analog of a modern city center, which will lead to a transformation of its social space into a full-fledged public space.
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