
Redesigning Urban Sculptures in Zhengzhou City Based on Interactive Perspectives: A Systematic Literature Review

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Abstract

Purpose: This paper attempts to explore the current situation of public participation in urban sculpture in Zhengzhou City and its influencing factors through a literature review. Through an in-depth analysis of the definition of urban sculpture and the theoretical framework of interactivity, the current status of urban sculpture design in Zhengzhou City, the challenges it faces, and the potential future development opportunities are explored in depth from the perspective of interactivity.

Methodology: Mixed-methods research combines qualitative and quantitative research methods to provide a comprehensive understanding of the research problem. Considering that this study aims to explore the complex relationship between urban sculpture and public interaction, a mixed-methods study is considered most appropriate. It allow the researcher to explore the research question from multiple perspectives and provides a more comprehensive insight. Qualitative research can provide insights into public feelings and perceptions, while quantitative research can provide quantifiable data to support or refute these views.

Conclusion and recommendation: Zhengzhou city sculpture status quo, from the perspective of environmental psychology and social behavior, to promote the development of urban sculpture is the inevitable choice and direction. From the planning and design, process engineering and maintenance management, etc., to establish and improve the rules and regulations, to promote Zhengzhou urban sculpture art toward a higher level of development.

Keywords: Urban Sculpture, Interaction, Public Engagement

1. Introduction

In today's society, the construction of urban environmental sculpture has made great progress. Whether it is a square, park or street community, a variety of rich content, diverse forms and unique style of environmental sculpture can be seen everywhere. Many of these works have established a good interactive relationship with the public and the environment. These sculptures are based on the premise of sharing and communication, directly facing the audience, arousing their emotional resonance and stimulating their interest to participate. Undoubtedly, this has played an undeniable role in enhancing the taste of the city, enriching the connotation of the city, beautifying the urban space and shaping the cultural image of the city.

This paper explores the key factors of environmental sculpture and audience interaction from the perspective of interaction. This paper attempts to analyse the complex interactive relationship between individuals, sculptures and the environment, and reveals the spiritual needs of the audience interacting with environmental sculptures. At the same time, this paper analyses the interactive status of environmental sculpture in Zhengzhou urban area in depth.

Finally, from a theoretical point of view, this paper provides insights for the planning, design, construction and management of environmental sculpture in Zhengzhou city, as well as other related

departments or organisations. This paper aims to promote the friendly interaction and coordinated development of environmental sculpture in Zhengzhou City through in-depth research and theoretical exploration, and further enhance the artistic and cultural taste of the city.

2. Interaction and the concept of urban sculpture

2.1 The concept of interaction

The word "interaction", in sociology, means connection and interaction. It is a classic sociological and psychological concept in which two parties interact with each other in a way that brings about an effect or change in each other. There are also interpretations that "interaction" is a behavior or behavioral trend between two parties, which requires the existence of a certain spatial and temporal relationship between the two parties and the existence of conditions and states of interaction between the two parties. As the most interactive animal on earth, human beings, in general, each individual person gives appropriate behavioral feedback to the information of others. The combination of "mutual" and "movement" means a process of mutual action or change.

Interactivity is a necessary attribute of urban sculpture, only to achieve the organic combination of the environment, sculpture and the public, sculpture can produce positive information communication in the urban environment, so the classification analysis of the sculpture environment and public participation in the interest of the survey, is a prerequisite for the construction of a successful urban sculpture. Through the interaction of the public to the sculpture works will be connected to the artist and the public, so as to achieve two-way communication, so that the sculpture is not only a unilateral expression of the artist's narrative, but also be able to get the feedback of the public, the public has also become a link in the re-creation of the art, so as to achieve the sublimation of the work of art again. (Pinchuk, A. ,2021)

2.2 The concept of urban sculpture

Urban sculpture mainly refers to sculpture works located in urban space, which is based on sculpture and introduces the concept of urban environment and publicity, and if it is in the urban public space environment, it is also called "public sculpture" or "environmental sculpture". It has become the most popular art form in urban public art because of its shared and open characteristics. Urban sculpture is a human-centered, environmental object, the use of sculpture art means, combined with sister arts and industrial technology, through the planning and implementation of the project, to create and beautify the living space of the design of art.

Urban sculpture is different from the traditional, closed shelf sculpture, it is a form of sculpture based on the environment, and the environment co-prosperity, symbiosis, become an organic whole. On the one hand, urban sculpture should satisfy the spatial modelling beauty of sculpture, on the other hand, it should also adapt to the aesthetic interaction needs of the regional public, lead the public value through artistic intervention, and use sculpture as a medium to construct or reflect on the relationship between people and the environment. Urban sculpture has a multidisciplinary intersectionality, involving aesthetics, architectural art, urban planning, environmental psychology, sociology, environmental ecology and other disciplines, and to a certain extent, it is also closely linked with engineering technology. It is the integration of art, science and living environment, and its creation process is actually a design process that synthesizes various factors. In this paper, urban sculpture is

explored in the scope of the plastic arts in a broad sense, with a broad generalization, including public art, urban sculpture and related modelling, emphasizing the concept of integration.

3.Current status of research on urban sculpture

Urban sculpture, as an important part of public art, has a long history. From ancient monuments and statues to modern abstract and interactive installations, urban sculpture has been an important symbol of urban culture and history (Smith, 1998). In modern cities, sculpture is not only a tool for decorating and beautifying urban spaces, but also an important medium for conveying urban culture, history and identity (Johnson, 2002). With the acceleration of urbanization and the public's increasing concern about the right to use public space, the issue of public space and public participation has received more and more attention, and how to design and plan these sculptures and how to ensure their interactive experience with the public has gradually become an important issue in the field of urban planning and design (White, 2015).

3.1 Emerging trends of interactive design in urban sculpture

In recent years, with the development of technology and social changes, interactive design has become an emerging trend in urban sculpture design (Brown, 2017). Interactive design is not only the integration of technological elements into the sculpture, but also a design concept that emphasizes the interaction and participation of the sculpture with the audience (Liu & Smith, 2019). This design concept emphasizes that a sculpture is no longer a static object to be viewed, but a dynamic system that can create interaction and dialogue with the viewer (Chen, 2020). This interaction can be physical interaction between the viewer and the sculpture, such as touching and moving, or digital interaction, such as interacting with the sculpture through a mobile device.

3.2 Public Participation and Interaction Design

Public participation, as a more comprehensive concept, is a decision-making process in which non-elected officials, professionals, or members of a group are involved in shaping the outcome of urban planning. Interaction design is considered a core value of modern design because it provides the public with more direct opportunities to participate and experience. However, how to effectively realize interaction remains a controversial issue. Some scholars argue that a wide range of interactive experiences are more likely to satisfy the public, while others argue that excessive interaction does not necessarily lead to better design outcomes. Since the 1960s, public participation has been recognized as a core value of democracy because it provides citizens with more power, which has been referred to as the "ladder of participation" (Arnstein, 1969). However, the effectiveness of public participation has been a controversial issue. Although some scholars argue that broad participation is more likely to lead to social consensus (Fung, 2006). However, it has also been argued that public participation does not really reflect public opinion and therefore has limited practical contribution to urban planning (Irvin & Stansbury, 2004).

3.3. Emotional and Interactive Design

Emotion in design has attracted increasing research interest in recent years. Recent research has emphasized the importance of interaction design in managing emotion. If the public is allowed to interact with the design and derive emotional satisfaction from it, their emotional connection to the design will be strengthened. In this way, the public is less likely to be frustrated or angered by flaws in the design, leading to a smoother design process. Recent research has emphasized the importance of public participation in managing emotions in planning. When non-participants are allowed to voice their opinions and gain specific power from those in authority, their dangerous anger associated with a sense of injustice is quelled. In this way, angry "have nots" do not become "offended and angry" and therefore, the planning process can be a "healthy and successful" one (Lyles & White, 2018).

3.4 Integration of Interaction Design and Technology

Advances in technology provide new possibilities for interactive design. Modern interactive urban sculptures may include sensors, LED lights, sound devices, and other devices that sense and respond to viewer behavior (Brown, 2017). For example, the sculpture may change color or make sounds based on the viewer's movement. This integration of technology not only increases the ornamental value of the sculpture, but also enables the sculpture to interact with the audience on a deeper level. More inspiration may be gained if we refer to other cases of combining public art with new technology or science and technology, such as assembling artificial intelligence systems in sculptures to transform input information into images, sounds and languages, enabling intelligent sculptures to engage in dialogues with the public (R. Wang & V. Sirivesmas. 2022). An approach combining different participatory environments has also been proposed, using interactive touch tables and additional screens, as well as Virtual Reality (VR) and Augmented Reality (AR) devices and synchronizing them in real time, with a very low latency, in which the public can be involved during the design of the sculpture and in the design of the work's environment (Postert, P.; Wolf, A.E.M.; Schiewe, J.2022).

3.5 Interaction between the public, sculpture and environment

Theoretical and academic exploration of the interactive design of urban sculpture also includes the environmental factors of sculpture, the interaction between public environmental art sculpture and the environment, especially how to make the sculpture more easily accepted by the public and integrated with the environment. Combined with the analysis of the characteristics of the spatial environment, it provides a new perspective for public environmental art sculpture. However, the article has fewer typical cases, and more actual cases may be needed to support the theoretical analysis (Wang, Y. 2022).

3.6 The Current Status of Urban Sculpture and Interaction Design in China

In China, although there have been some participatory planning practices in recent years, real public participation is still a missing component (Wu, 2015). Especially in cultural planning and urban sculpture planning, the voice and needs of the public are often ignored (Yang, 2018). Shanghai, a central city in China, has developed an urban sculpture planning management system that includes a "public participation" component. However, this participation is often superficial and lacks real public engagement and feedback (Li, 2019), but rather a dynamic system that generates interactions and dialogues with the audience (Chen, 2020), in a study on the importance of public participation in urban planning. In Shanghai, China, there is also a study focusing on the acceptance of public art, especially when planning projects are dominated by elites and there is no participation and involvement of

residents. The study found that public participation was not the only determinant of public art acceptance; other factors, especially location, were also important. This study reveals the role of public participation in the acceptance of urban sculpture, as well as other influencing factors, but as Shanghai is a global cosmopolitan city, its study focuses on the Shanghai context and may not be applicable to other cultural or urban contexts, and it is also largely based on a questionnaire survey, which may be subject to bias or misinterpretation (Zheng, J., & Zheng, X. 2022).

4. Inspiration from excellent cases of urban sculpture

4.1 Excellent Cases of Urban Sculpture in China

Located in a prominent place in Chengdu, the "Panda" sculpture shows a lovely giant panda sitting on the ground with a naive and realistic posture. The overall shape of the sculpture is full of children's interest and makes people feel close to it. The artist has successfully captured the characteristics of the panda through the modelling and detailing of the sculpture, allowing people in the city to feel close to this rare animal in nature. The "Panda" sculpture is highly interactive with the public. First of all, as a public artwork with a cute image, it attracts a large number of citizens and tourists to come and see it and take pictures. People can appreciate the details of the sculpture up close, interact with it and feel the charm of art. Second, the theme of the sculpture, the giant panda, is closely related to Chinese culture and environmental protection. It not only arouses people's concern and love for pandas, but also makes them think about the importance of environmental protection. Therefore, the sculpture is not only a work of art, but also a medium that encourages the public to think and act. In addition, interactive facilities such as seating and photo areas are usually set up around the sculpture to create more opportunities for people to participate. People can rest, gather and take photographs around the sculpture, increasing the interactivity and sense of participation between the sculpture and the public. The famous interactive sculpture "Smile - Connection" at the Shanghai World Expo was designed by Xiang Xinrong. The design concept of this sculpture is to show the power of smiling and connecting people. If you look at it at different times, you can feel the vitality of the sculpture in its relationship with the environment under different colour temperatures, different weather, different angles and different light and shadow. Standing by the pool from east to west, following the pool horizontally in the centre, the lines run back and forth, forming the shape of the Expo Museum logo, which is the most unique place of "her". It is not only a work of art, but also a medium to convey positive energy and create a deep emotional interaction with the public.

4.2 Excellent cases of urban sculpture in other countries

Fifth Street, New York, the United States of America, Japanese-American sculptor Isamu Noguchi's work "low-limit art" as an example, the work of a new visual image, a bright red cube, in the old neighbourhood injected new vitality at the same time, but also breaks the traditional sculpture form of the fixed impression of people. It is an innovative and challenging design that breathes new life into the old neighbourhood by adding unexpected elements to the existing environment. Isamu Noguchi's quest for perfection is reflected in his public sculptures around the world, such as the courtyard he designed for the UNESCO headquarters in Paris and the giant fountain he created for Hart Plaza in Detroit.

Anish Kapoor is an Indian-British sculptor known for his large-scale public artworks. Often using pure and simple geometric forms with a strong visual and emotional impact, Kapoor's work often explores

the relationship between the material and the immaterial, between presence and emptiness. "Cloud Gate was commissioned specifically for the opening of Millennium Park in Chicago. It was completed in 2004 and quickly became one of Chicago's iconic attractions. The work was Kapoor's first outdoor public artwork and is the largest stainless steel sculpture ever created in the United States. "Since its installation, Cloud Gate has quickly become one of Chicago's most popular and iconic pieces of public art. "Cloud Gate's surface is finely polished to a perfect mirror finish. This allows viewers to see their own reflection and that of the surrounding cityscape, providing an innovative and interactive visual experience. Unique shape: Cloud Gate's oval shape is inspired by liquid mercury. The shape has no obvious beginning or end, giving a sense of continuity and infinity. Interactive: Cloud Gate encourages visitors to get up close and personal. People can walk underneath, touch the surface and view it from different angles, allowing each person to experience the work from their own unique perspective. "Cloud Gate reflects the skyscrapers and vibrant city life of downtown Chicago. It attracts visitors from all over the world and has become a popular photo opportunity. More than a work of art, it is an important part of Chicago's urban culture and public space.

The world's largest spherical building, the MSG Sphere in Las Vegas, USA, is an innovation in the art of urban architecture, a spectacular architectural project that demonstrates amazing engineering and modern design thinking. Not only does the Sphere break away from the linear framework of traditional architecture, but its unique spherical structure sheds new light on the use of space and the aesthetics of design for urban sculpture. The MSG Sphere has become a landmark in Las Vegas with its innovative design, new visual experience and efficient use of space. Its unique spherical structure eliminates the right angles and planes common in traditional architecture, using curved surfaces and three-dimensional spatial structures to increase spatial fluidity and expandability, and provide more diversified possibilities for spatial use. Billed as the world's largest spherical structure, it is designed to provide audiences with an unprecedented immersive entertainment experience.

At the same time, the spherical building is attractive for its innovative use of materials and technology. For example, the outer shell of the building is made of advanced multi-layered materials to enhance the building's seismic capacity and durability, while the interior is made of new environmentally friendly materials and energy-saving technologies to realise the building's environmental friendliness and sustainability. What's more, the spherical building is also a cultural symbol of Las Vegas, representing the city's openness, innovation and inclusiveness. The venue's design allows the audience to interact with the show and participate in the performance through mobile apps and other means. The spherical design represents globalisation and diversity, symbolising that Las Vegas welcomes visitors from all over the world, in keeping with the city's image as a world-renowned tourism and entertainment destination. Overall, the world's largest spherical building is not only an architectural innovation, but also a reinterpretation and reshaping of modern urban space. With innovative design, new materials and technologies, and meaningful symbols, it combines architecture and urban culture, bringing new energy and meaning to the city of Las Vegas.

All of the above cases illustrate the innovative nature of urban sculpture from different perspectives. On the one hand, sculptures can use novel design and materials to break the traditional sense of space and visual sense and inspire new vitality; on the other hand, they can also use traditional materials to give new meaning and value to the space, so that it can display the modern atmosphere without forgetting the heritage of history and culture. This duality makes environmental sculpture not only an important tool for urban beautification, but also a carrier of history, culture, technology and other diversified information.

5. Conclusion

Although there have been some interactive design practices in China in recent years, and interactive design has brought new life to urban sculpture, it has also brought a series of challenges. For example, how to ensure the sustainability and long-term maintenance of interactive design, how to balance the relationship between artistic creation and public participation, and how to avoid the technology being too complex and difficult to use (Wu, 2015)[11]. Especially in cultural planning and urban sculpture planning, the voice and needs of the public are often neglected. Zhengzhou, as a new first-tier city in China, has gradually developed an "interactive" component in its management system for urban sculpture planning. However, this interaction is often superficial and lacks real public experience and feedback.

The research will focus on the role of interaction design in the planning and design of urban sculptures, and how to ensure that these sculptures truly meet the public's experiential needs. We will also explore how interaction-based design affects the acceptance of urban sculptures and how the sustainability of urban sculptures can be achieved through effective design for interactivity. We strongly encourage authors to use this document for the preparation of the camera-ready. Please follow the instructions closely in order to make the volume look as uniform as possible.

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