

Research on City Commercial Complex Design Based on Externality Theory

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Abstract: Based on the cross study of externality theory of economics and city complex theory, with the city commercial complex as the research object, from the perspective of "externalities", we examine the due effects of commercial complex on urban space, function, environment, public culture and social economic activities. It is proposed to integrate commercial complex into urban planning and design system, focusing not only on land allocation and social economy, but also on user behavior and spatial landscape. By using "anti-commercial design thinking" and "public design thinking", a new design mode of externally optimized city commercial complex is established to eliminate negative externalities, increase positive externalities and play an important role in improving urban external quality.

Keywords: City Commercial Complex; Design; Externality Theory; Anti commercial design thinking; Public design thinking

1. Introduction

The impact on urban ontology and disturbance by the development and construction of urban commercial complex cannot be ignored. It is not just an aggregate of architectural space, but a kind of special configuration of city public and social resources in the combination. It should not just pursuit business profits, but also emphasize the social value of products. Cognizing commercial complex externalities, reconstructing the symbiotic relationship of internal and external value interests between the complex urban system's each link, will lead to grow together with the city and accompany the updating of the city.

2. The connotation cognition of economic externality theory

Externality, also known as external effect or external economy, is an important concept in economic research. This concept began in 1890, the founder of new classical economics Marshall's book "Principles of Economics", first mentioned the concept of external economic externality concept began derivatives and study^[1]. Marshall only mentioned the external economy instead of making mention of external diseconomy. Later economist Henry Sidgwick and Arthur s. Pigou extended the concept of externality to the "negative externality"^[2]. In 1960, Ronald Coase put forward the concept of "transaction costs", and studied the "transaction costs" in the real world of external solution in his classical paper "Problem of Social Cost"^[3].

Taken together, the "externalities" concept can be understood as when the activity by economic subject made an impact to other subject that has no direct relation with the activities. The impact is out of a market transaction or price system, and do not need to pay compensation. Of course, the effect is positive and negative. The so-called "negative externality" refers to the negative economic impact of a certain economic subject on other economic subjects, causing some kind of damage. The so-called positive externality refers to the positive economic impact of the activity of a certain economic subject on other economic subjects^[2]. For cities, positive externalities bring vitality to the city and negative externalities add to the burden of cities. The externality theory research mainly gathered in the city urbanization, urban rail transit, sustainable development, ecological compensation, industrial concentration, economic growth and urban planning and so on.

3. External design of urban commercial complex

During the development of the city, the externality is widespread. Different nature of the building, facilities and places the city functions such as body gradually appear. They will be different degree of urban environment, the residents of externalities, both the positive externality and the negative externalities, which influences the whole city and urban residents at every aspect of life.

In the book "The Design of Outer Space", Ashihara Yoshinobu points out, "Outer space is a purposeful external environment created by human beings, which is more meaningful than nature^[4]." Here, we can understand the externalities of urban commercial complex as its external function, space and environment of city and public culture, the impact of social and economic activities, function and meaning. It is mainly reflected in external public service and external ecological compensatory, external function should be modified and outer space connectivity and so on four aspects. The design can construct positive externalities and weaken negative externalities.

3.1 External public service of urban commercial complex

Design of public service is becoming a hot topic of research in China and abroad in recent years. In 2013, with the support of the European commission, the British design association, the Danish design center, Design Will, Finland Aalto university jointly launched a report entitled "Design for the Public Interest", in the report it presented on improving the public sector to accept design ideas, and led to the series of mainstream implementation method research^[5]. The essence of urban commercial complex is rational allocation of resources and integration of urban functions, with typical characteristics of externality. It involves the public interest of the public culture, public employment and protection and guidance that should embody the comprehensive character and social responsibility. Intervention of the public service design can make the developers rethink the real working method from the perspective of the public when making related decisions. By using the "public thinking," it can create healthy circulation of city supporting service platform will be the inevitable trend of future development.

Firstly, by using the public economic service concept, the urban commercial complex serves the local economy as the city's backup energy. According to the international shopping central council (ICSC) analysis on government data, in "How does Shopping Center Affect the U.S. Economy?" it is pointed out that shopping center has a positive "delayed effect", which can provide a large number of employment opportunities. It can drive the gross national product of the United States and become an important economic source for the community. In fact, it is even more important that the shopping center and the entire commercial complex are developing into the city's backup energy, and becoming the center of the supporting charity (FIG. 1). In August 2017, after the Harvey hurricane attacked Texas and Louisiana, Fayette Mall in Lexington, Kentucky raised more than \$130,000 in disaster relief in collaboration with local organizations. In Puerto Rico, after Maria hurricane attacked island there is no clean water and electricity in most areas, so Taubman Centres Inc., the owner of the of San Juan shopping center, launched a year-long community service projects to support reconstruction^[6]. While making contributions to the society, these shopping centers will gradually gain recognition from the society and increase their popularity, thus gaining good graces among the public.

Secondly, by using the thinking of public cultural services, treated as the carrier of public cultural activities the urban commercial complex services the development of the city function and mechanism, public policy formulation and implementation, public welfare and other aspects of the design theory and activity, involving education, social security, health care, public administration, environmental protection, and many other fields. Today, the commercial complex is more oriented towards thematization, which combines with social infrastructure such as medical treatment, education, art and culture, and forms a variety of themed business models. Lewis Mumford says, "The city creates art, and itself is art, the city creates drama and is itself a great theatre of social activities." The goods act as "props", service as a "stage", the environment as a "set", make the customer in the retail, catering, entertainment as one of the shopping center business activities enjoy the wonderful experience. Thematic orientation can not only avoid the homogenization of the commercial complex, but also provide the public with specialized services. K11 art and culture theme shopping center is very popular. K11 commercial layout and spatial form take the "arts and humanities, natural" design concept, the architecture and art appreciation, experience of humanities, the natural sightseeing together (FIG. 2). By occasionally holding in arts and culture it has attracted a group of fixed art lovers involved^[7].

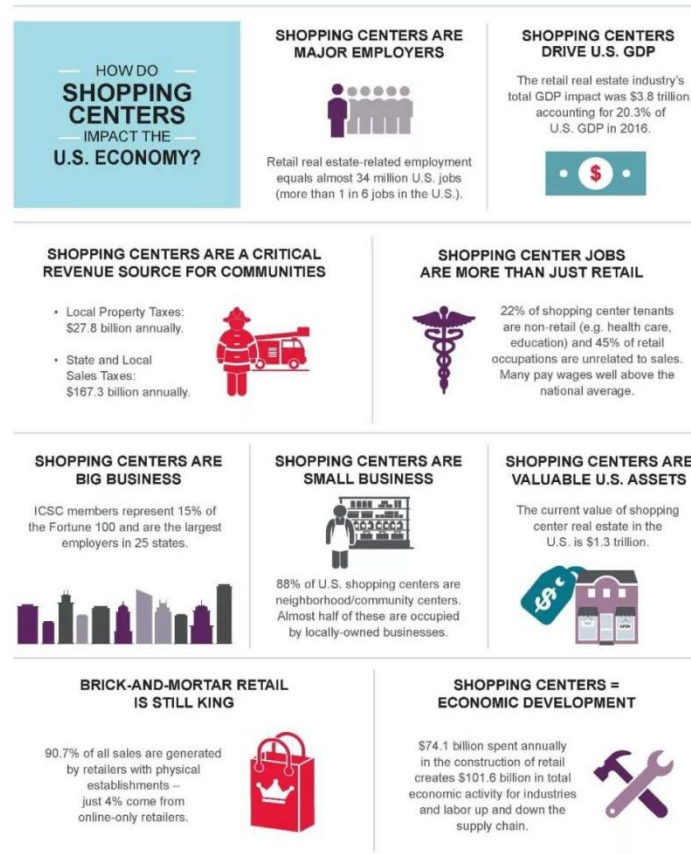


Figure 1: How do shopping centers impact the U.S. economy? [6]

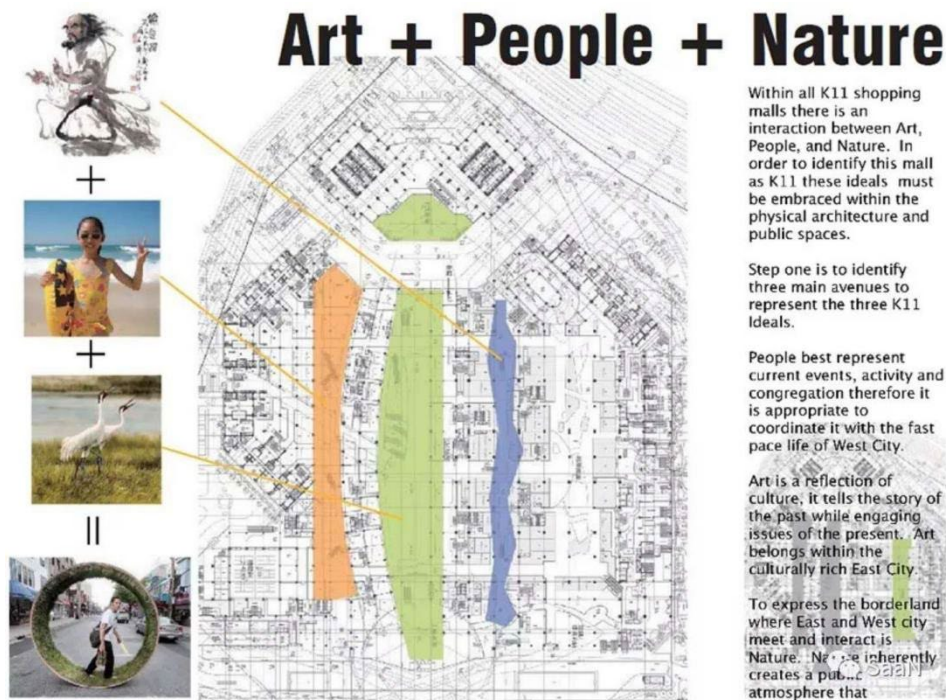


Figure 2: Design concept of K11 shopping malls [7]

Thirdly, using public science and technology innovation thinking, the city commercial complex is used as a platform to display innovative technology and culture, and then serve the people. Hang lung group chairman, Chi-Tsong Chan said, "The development of science and technology can overturn the

original business model, but don't think that can replace a human brain, science and technology is only a tool, the only constant is human nature." In London downtown business district there is a street called "Bird Street" (Fig.3,4), every step of you can be used to generate electricity that can also be used to exchange for the store discounts. Cooperation merchants can get traffic information from the "new west end" intelligent laid floor tile. It is "the first intelligent road in the world" and provides the most innovative shopping experience for visitors to shopping. As pedestrians move around the floor, the electromagnetic sensors on the corner of the floor can accurately convert each step to 5W. The energy will be used to provide street lamp power and to allow the Bluetooth speakers to play birdsong in the background. In addition, there are public benches can "clean air" at bird street. The pink and mint on street buildings can absorb the nitrogen oxides in air, bacteria, dust and other harmful substances of water-based paint. For the operation of shopping center and city business circle it also has great reference significance^[8].

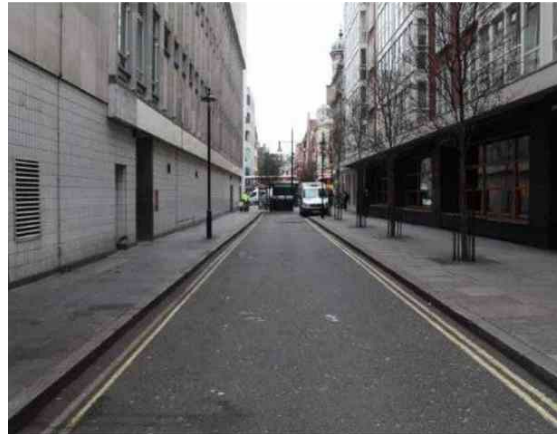


Figure 3: Bird street before renovation^[8]



Figure 4: Bird street after renovation^[8]

3.2 The external ecological compensation of urban commercial complex

If environmental pollution is a negative externality, ecological compensation is a typical positive externality. "Who develops, who protects, who destroys, who recovers, who benefits, who compensates, who pollutes, who pays" is the basic principle of ecological compensation. The development and construction of urban commercial complex is based on a certain natural resource endowment and ecological environment, and has great influence on the natural ecological environment of the city. The excessive development of land and the rigid intervention of the environment will not only cause irreversible adverse effects on the urban ecosystem, but also indirectly affect the construction and operation of the project itself.

Future urban commercial complex development and design should be able to compensate and repair the ecological environment, such as light environment, thermal environment and biological environment. In the "city of the future" series of scene in U.S history channel. The plant become a power generator drawing natural energy from the sun for the city. With plant growth, city become a

complex that city and the forest covered, urban planning and the law of the jungle come into one piece. There is Namba Parks in Osaka, and the Singapore Mapletree city phase 2, the two present the scene in the history channel of the United States. Singapore Mapletree city phase 2 was completed in 2016(Fig 5,6). Through effective asset value engineering, the existing assets value has achieved great success, an industrial area mainly composed with port and warehouse were changed into "urban wilderness" in commercial complex projects. Inspired by adjacent nature reserves, the project designed a large "forest ecosystem" with 70 percent of the site covered with greenery. The trees in different sizes and growth stages are arranged in a more casual form, forming a true forest form. A variety of plants, fruit trees and shrubs have enhanced the forest as a habitat for butterflies, dragonflies, birds and other wildlife, maximizing biodiversity. The "ecological pool" with the filtering function provides a healthy ecological environment for all kinds of aquatic plants and fish. The green area is not just on the edge of the building. These plants extend to the surface of the building, replacing the original hard surface with green plants and being able to receive sunlight from a 45-degree Angle. In some forests, typical shade plants are selected to be planted in the area to ensure long-term forest growth^[9].



Figure 5: Overall plan^[9]



Figure 6: Outdoor perspective^[9]

Another famous case is the Namba Park in Osaka, Japan, covering an area of 3.37ha, with a building size of 234,400 m² it looks like an aerial garden, hence the name(Fig 7,8). According to the survey, the huge roof garden is close to the natural ecological environment, with 14 species of birds and 93 species of insects. The public accumulation effect caused by the roof garden can probably bring Namba Park turnover of 9.2 billion yen (about 740 million RMB) a year, about 200 million yen (RMB 16 million) in operating profit^[10]. Early in the design of urban commercial complex, ecological energy saving investment, the openness to the society, will be rewarded, and the return is not only from the society, from the consumers, but also from nature.



Figure 7: Aerial view^[10]



Figure 8: Aerial view^[10]

3.3 The external function compliance of urban commercial complex

Although traditional complex design demonstrated research from different angles while in the planning stages, it never get rid of the thinking mode of "one dimensional", that is the "complex" simple definition for the "function of combination", ignoring the complex network relation between each function groups space and ontology of the city. The inevitable result of doing so is coming to the status quo of anxiety in the reality today. Focusing on spatial expression and form design has not been able to solve the difficult situation faced by urban complex. Thinking of urban complex multidimensional space externality between functional groups, using the "backward thinking", setting up a new design pattern inward, exploring strong associations between outer city ontology, can achieve the healthy growth and sustainable development in today's diverse, rapidly changing era.

The first "reverse thinking" is based on the urban planning and design. It integrates urban public space into the multi-functional group of urban commercial complex and form a complex functional space network complex. This complexity is based on the variability of the internal and external space of the building complex, showing the dynamic change of functions between functional Spaces. In 2014, the Boko Master plan was completed by ZAHA HADID architectural firm(Fig 9,10). The whole complex shows the ZAHA HADID style, "no rigid form, no straight line, no symmetry, no repetition, no space division based on standard function. Architecture is different from every angle, form is circular, flow, space is not divided. It flows seamlessly from one room to another. Is it formalism? It isn't. The parameterized fluid architecture designed by Zaha Hadid follows the complex performance of functional complexity, and the whole complex is defined as the "new urban center". Hadid follows the region of the modernist tradition by having the leading edge of residential space, galleries, offices, five-star hotel, the art of Belgrade in urgent need of the conference center, retail space, department stores, underground parking garage, and many other functions organically integrated together. The organic produce in a coherent complex network systems and procedures, functions between the composite circulation. The curved walls of the building are surrounded by a series of new squares and gardens, and in Hadid's view, "It is absolutely necessary to invest in these public places that are connected to the city. They are an important part of the rich urban life and urban landscape, combining the cities together to connect the city structure"^[11].



Figure 9: The general plan^[11]



Figure 10: Aerial view^[11]

The second "reverse thinking" is to start from the urban planning and design, introducing the urban public activity function synthesis, redefining the function of profit and non-profit relationship, establishing adaptive dynamic change between them, and then reconstruct people, goods, scene, consumption patterns, allocation of resources and so on each link. In the design of the large commercial building complex, experiential and public openness cause the attention of people more and more, the non-profit space and "non-effect gathering" place of commercial value and the concentration of people in the space design take more and more proportion. In May 2016, Taroko Park Kaohsiung, one of the most interesting shopping centers in Asia, was developed by the Taroko group, a leading sports and leisure leader in Taiwan (Fig11,12). This is Taiwan's first free admission theme park, no need to buy tickets to enter. The traffic exceeded 100,000 the first weekend after opening, making it the most popular new landmark in Taiwan. The project covers an area of 8.7 hectares and is connected by two shopping centers to an outdoor fairyland. Inside, there have not only the romantic euro air street view with all sorts of food restaurant, and F1 racing track, dream merry-go-round, Ferris wheel, and English pub style top end bowling alley, nearly 20 kinds of amusement facilities. The patterns in this theme park, and sports, leisure, retail experience in new mode, gather shopping, dining, sports, family, entertainment, literary creation, leisure, vacation, etc. Various elements ^[12].



Figure 11: Aerial view of the model^[12]



Figure 12: Outdoor renderings^[12]

Another project, Guangzhou Grandview Mall, also illustrates the importance of "non-profit space". From the opening to the present it has experienced three positioning adjustments, and positioned as the "Asian experience capital" at the beginning of the opening (Fig.13). In 2008, it was adjusted to "family fashion experience center". The positioning was adjusted again in 2013. The positioning of "family fashion super-experience center" was put forward, and the catering, animation and children's business state were increased by reducing the retail ratio. It is also the largest indoor aquarium in Asia. Last year, the sales volume of Grandview Mall was 6.4 billion yuan, which was the top spot of the shopping center in Guangzhou, and the increase of the experience business has played an important role in driving the passenger flow^[13].



Figure 13: Indoor picture^[13]

3.4 Outer space connectivity of urban commercial complex

Urban commercial complex has the outer space connectivity. Good commercial complex acts as "endless Mobius Band" joined from two dimensions, including space connection, connected environment, and the crowd connector. It brings positive externalities for city. Under the concept of "openness-sharing-coordination", it promotes outward communication, industrial coordination and resource sharing, and forms a strategic network community with urban ontology; Under the concept of "innovation -- green" a city complex with high quality and sustainable development is formed.

First of all, urban commercial complex has vertical external connectivity. Large commercial complex, since most are sections for high-density built up area and function characteristics of the vertical stack, building has distinct vertical, outer space focuses on the urban scale and vertical characterization. Secondly, the urban commercial complex has the horizontal external connectivity. As the external environment extends to the urban public space, the inner space is more capable of communicating and relaxing the living space of people in the high-density urban environment. Through the asymmetric and free layout of the high atrium and sunken plaza, more public areas are created. In the book "The Outer Space Design", Ashihara Yoshinobu tells us that "Due to the outer space is not unlimited extension of the nature, but no roof of the building", "so planning layout is the most important"^[4], so the current urban commercial complex should be vertical and horizontal two dimensions of external connectivity of the integration of three-dimensional. The Yongjia World Trade Center is located at Oujiang River in Wenzhou, China. It is located in a special economic zone, from the deep water port and inland waterways to the sea, strengthening trade activities. UNStudio won the

design competition and presented a green new world trade center in the sky (Fig.14,15). Vertically, the 500,000-square-meter complex consists of five tall buildings ranging from 287 meters to 146 meters. Horizontally, including an open green space and a winding network of waterways. The whole complex embodies the outer space connectivity of two dimensions, reconstructing trade and commerce, and realizing the triple effective connection of space, environment and crowd. Their design inspiration is: "the concept of precious items on the tray drives the main design concept, here, the continuous platform landscape occupies the entire site, and serves as a green plain like a tray^[14]."

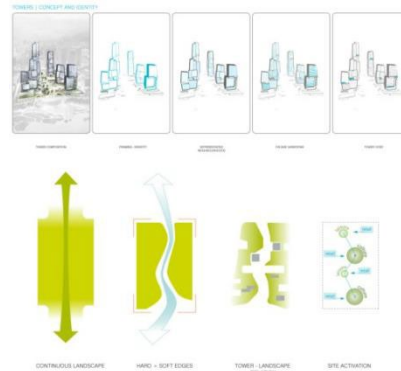


Figure 14: Analysis diagram^[14]



Figure 15: Rendering^[14]

4. Summary

The development of urban commercial complex has not been able to carry out the design method from inside to outside only. And of course, the design method is not to be carried out in the opposite direction. Survey from the perspective of "externalities" city urban commercial complex development and construction's external effect to the surrounding urban space, function, environment and public cultural, social and economic activity, thus to understand the externality of urban commercial complex correctly. It is of great significance for the development and construction of urban commercial complex to analysis integrally from the inside to outside, from the outside to inside, to establish systematic evaluation and design method.

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