

Coupling Research Based on City Brand Effects of Large Sports Events and Urban Development

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Abstract

Higher driving force is gradually reflected in the process of urban development by city brand value, which is transformed into the motive force of supporting urban development in process of holding large events. Therefore, how to use the city brand effect has become an important measure to explore the relationship between large sports events and urban development. For this purpose, the mechanism of producing brand effect by host cities undertaking large sports events is analyzed and reference values of relevant parameters with variables of city brand effect are summarized in this research. The coupling model of city brand development and sports events is designed and the corresponding evaluation methods are proposed in this research to provide theoretical reference for sustainable development of large sports events held by the city.

Keywords: City Brand, Large Scale Sport Events, Coupling Research.

1. RESEARCH BACKGROUND

1.1 Literature review

With the rapid development of China’s economy, a city's comprehensive competitiveness has increased, where the ability of the city to undertake large sports events is also increasing (Liu and Liu, 2013). At the same time, during the period of its undertaking large sports events, its international influence and visibility are also increased and objectively reflected in the city brand value, which can also attract external investment which stimulates and promotes the host city, forming the corresponding financial support (Zhang, 2013). Inner relationship between sports events and urban development can be determined based on analysis of physics coupling through evaluation on inner relationship with regard to matching degree, synergy degree and other aspects between large sports events and urban development and on indicators to further solve difficulties and problems encountered during urban development and support & promote the host city through city brand effects (Xu and Liu, 2013). Meanwhile, adverse impacts on the host city can be analyzed through assessment on coupling relationship among financial burden, city transportation, venue construction, perfection of service system and other rigid indicators. Comprehensive assessment on positive and negative effects of city brand effect on large sports events can also provide a reliable theoretical basis for urban development.

1.2 Purpose

Internal relationship between large sports events and urban development is used in this research to analyze coupling degree in the physics, while coordinated development functions produced from coupling degree relations are assessed through positive effects of brand values. Coupling degree refers to development support which may exist in earlier, medium and later periods of the sports event, obtained from a sports event during the period when a host city undertakes a sport event. How to evaluate coupling relationship between of large sports events and urban development is the core content of this research (Huang, 2013). Design of the coupling model based on city brand effects of large sports events and urban development is capable of evaluating supports for large sport events obtained from urban development effectively and analyzing expression forms of city brand effects and a lasting impetus produced in the later period with effect (Du, 2010). However, differences between cities, spatial differences between cities with areas for sports events and border areas of cities and maintenance & other problems from construction at beginning of the sport events and after construction will also affect evaluation methods and standards of the coupling model. To this end, supplementary evaluation indicators are designed in this research to further analyze coupling degree between urban development and large sports events.
2. BRAND EFFECTS FROM THE HOST CITY UNDERTAKING LARGE SPORTS EVENTS

City brand is a unique geographical environment and man-made natural environment which is designed through analysis, abstraction and integration in the process of city construction, where historical culture deposits, industry advantages and other elements constitute the corresponding brand elements. Commercial value attributes can be analyzed for understanding city brand effect: If a city is regarded as a commodity, then the brand value and effect are expressed as consumer demand and motivation (Gong and Luo, 2010). The core interest passed down to the consumer is the reasonable operation of the target market, so the city brand is a cultural image of the city and is also able to bring the core concept experience to the public. At the same time, city brand is accompanied by attraction, cohesion and radiation force, the final performance of which forms core competitiveness of urban development, further forming the brand value of intangible assets to promote continuous development and progress of the city.

2.1 City brand effect support for the right of undertaking

In the undertaking stage of large sports events, the city brand effect is an important indicator to obtain the undertaking rights. It can be found from selection of a host city for Olympic Games that brand value of a city is a key consideration for the choice (Zhu, 2010). Own popularity, image, culture and other advantages of a city are the necessary factors for its standing out among many cities. Therefore, it is clear that the city brand value plays a supporting role in undertaking major sports events. During the competition undertaking stage, the effect from undertaking large sports events for the host city is often an important form of promoting the city brand, where the economic benefit is particularly obvious. Most of the host cities’ GDP in that year show steady growth, more than 27% higher than the last three years on year-on-year basis, so the economic benefits cannot be neglected, which are ultimately reflected in driving force for future development of these cities.

2.2 Driving force for urban development during undertaking period

Whether the city brand effect can produce a positive impetus to urban development depends on the reasonable publicity during the period of undertaking large sports events by taking full use of time and space dimensions. International reputation and influence out of the city brand will also be driving forces of urban development (Lu, 2014). Whether the driving forces are effective in the long term depends on the coupling relationship between large sports events and urban development. Strong coupling effect results in relatively longer maintenance time of positive effect from city brand value, but it can weaken or disappear gradually in the later period (Wu and Zhang, 2012), which is closely related to the future maintenance of the host city. At the same time, it also lies in the fact that sufficient propaganda preparation is not achieved by taking effective use of the time during which large sports events are held, which prepares for city brand value but development advantages for positive effects fail to be formed. This kind of situation is the specific expression of low coupling degree for which it is necessary to further explore the related variables which influence the coupling relationship, and further to clarify the part and direction which should be perfected in the city brand effect.

3. VARIABLES OF CITY BRAND EFFECT

Rigid and soft indexes of city brand image which are the fundamental driving force to support the urban development must be considered comprehensively based on scale, flow, type, time of sports events and other variables during the period when large sports events are undertaken, as shown in Figure 1.

![Figure 1. The Role of Hard or Software Metrics for City Brand Effects](image-url)
3.1 City culture, as a soft index

City culture, which is national culture integrity owned by residents living in this city for a long time and an expression of important culture confidence, can be regarded as an important soft index in forming city brand. Importance of culture confidence was once aging stressed by General Secretary Xi Jinping in the 19th National People’s Congress of China (Zhang, 2014). The city culture confidence comes from external expression of each resident in this city, while these residents serve urban development and harmonious operation of the city with its evaluation indexes involved in humanity, attainment, society, harmony, idea, image etc. From the perspective of urban development, if the cultural confidence fails to produce benign outcome, even if a large sports event is held by the city, the approval of people in the world cannot be obtained which causes defection of intangible assets, becoming an adverse factor for backward development (Zhang, 2016). Therefore, a substantial role of culture confidence in city brand image is bringing good culture expression in the host city and further obtaining unanimous good reputation of the people around the world, publicizing good reputation of brand value for exchanging for more positive feedback information on economical benefits. It can be inferred that city culture, as the soft index is not an objective index directly affecting urban development, that it plays a substantial rule of indirect coupling.

3.2 City construction, as a rigid index

Rigid indexes refer to infrastructure conditions of the host city, including expression ways and ability to undertake of brand values with regard to sports venues, transportation facilities, catering service system and other aspects. At the same time, the funds for infrastructure construction will be payment for values of undertaking sports events, which includes both the direct economic benefits during the undertaking period and the indirect economic effects in the later period. Objective performance of economic benefits is also the basic condition for the local cities to develop and grow continuously (Huang and Luo, 2012). Taking the 2022 Beijing-Zhangjiakou Winter Olympic Games as an example, the infrastructure of winter sports will be strongly developed by Beijing and Zhangjiakou for hosting the Winter Olympics. For example, Beijing will build high-speed railways and highways linking Beijing, Yanqing and Zhangjiakou. In addition to the original stadiums (Water Cube, National Indoor Stadium, Wukesong Stadium, Capital Gymnasium), a new venue- National Speed Skating Gymnasium will be also required on the south side of the Tennis Center in Beijing Olympic Forest Park. It can be learnt from merely traffic and construction of stadiums that large sports events are a necessary driving force with regard to basic infrastructure facilities.

4. COUPLING MODEL OF CITY BRANDING DEVELOPMENT AND SPORTS EVENTS

4.1 Theoretical framework of coupling effect

Coupling in physics is a measure method and measurement standard for the degree of association between modules. Force of the coupling degree depends on the fitness and complexity of the interface between modules, and the overflow value of data volume after the module called, so as to evaluate the coupling degree. Culture index and infrastructure link large sports events and urban development; therefore, analysis on their inner coupling degree is used for judging stimulating factors for urban development during the period of its undertaking sports events. With relevant factors obtained, analysis on coupling degree and cohesion degree can reflect leading force of city brand (Tian and Xu, 2012). With weak points of the force can be regarded as the perfect direction, development measures to be planned and implemented during the period when the city undertakes large sports events can be made clear through evaluation on conditions and basis of progressive development with coupling degree parameters.

4.2 Design of the coupling model of sports events and urban development

The coupling model of large sports events and urban development is designed based on coupling relation defined in physics; the equation for coupling degree is as follows:

\[ S_n = \frac{(r_1 \cdot r_2) / \Pi(r_1 + r_2)(R_1 + R_2)}{1/2} \]

In this equation, the object of evaluation is the coupling relationship between urban development and large sports events, and it is considered as the coupling function with \( n = 2 \), where \( R_1 \) is the rigid index of the host city; \( R_2 \) is the soft index of the host city; \( r_1 \) and \( r_2 \) are supports of rigid and soft indexes obtained during the period
when the city undertakes a large sports event; $S_n$ is the coupling index value for the large sport event and successive development of the host city. The two systems support and coordinate each other, and the degree of coordination and matching is the comprehensive index feedback to evaluate the coupling level and self-consistency. Brand effect of integrated development is expressed by corresponding coupling degree when $S_n$ value is high; while declining $S_n$ value means positive impacts on coupling effect, which means that corresponding supports from large sports events are not obtained by urban development and positive effects of its city brand effects are not exerted.

4.3 Evaluation methods and standards for coupling degree

When measuring the coupling effect between large sports events and brand effects generated from urban development, evaluation on relative time and space relations can be weakened easily by only using coupling model. For example, as for comparison of years of the city undertakes large sport events and other years, its value of coupling degree is subject to certain spatial constraints, which comes from the geographical location of the host city, i.e. the core areas hosting the sport events and internal relationship between the core areas and the urban fringe areas. Therefore, the coupling degree index is simultaneously subject to fluctuation and interference of space and time. For this purpose, a complementary evaluation standard is designed in the paper for the coupling model, so as to verify accurate judgment on the coupling degree between urban development and large sports events. The calculation formula of the coupling degree between space and time is as follows:

$$K = ((C \times aU_1 + bU_2)^{1/2}$$

Where, $K$ is the assessed value of spatial coupling degree; $C$ is the coupling degree index for the initial assessment; $aU_1 + bU_2$ is the development demand of time dimension; $a$ and $b$ are coefficient before and after launching of the sport event, which can be regarded as undetermined coefficients. In the actual evaluation on coupling degree index, the situation of $K \in [0, 1]$ will be the final goal of urban development. The situation of $U_1 > U_2$ represents supports of large sports events for urban development and the final effect after brand values obtained. Otherwise the coupling degree cannot meet the expectation, the matching degree between sports events and urban development will be low, and the brand value will be lagging behind. The evaluation index of coupling degree between urban development and large sports events is shown in Table 2.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Coupling value</th>
<th>Degree imbalance</th>
<th>Coupling value</th>
<th>Coordination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>0.0-0.099</td>
<td>Extreme disorder</td>
<td>0.5-0.599</td>
<td>Reluctant to reconcile</td>
</tr>
<tr>
<td>Level 2</td>
<td>0.1-0.199</td>
<td>Serious disorder</td>
<td>0.6-0.699</td>
<td>Primary coordination</td>
</tr>
<tr>
<td>Level 3</td>
<td>0.2-0.299</td>
<td>Moderate imbalance</td>
<td>0.7-0.799</td>
<td>Intermediate coordination</td>
</tr>
<tr>
<td>Level 4</td>
<td>0.3-0.399</td>
<td>Mild maladjustment</td>
<td>0.8-0.899</td>
<td>Good coordination</td>
</tr>
<tr>
<td>Level 5</td>
<td>0.4-0.499</td>
<td>Close to a disorder</td>
<td>0.9-1.0</td>
<td>Quality co-ordination</td>
</tr>
</tbody>
</table>

5. EMPIRICAL RESEARCH ON COUPLING DEGREE BASED ON CITY BRAND EFFECTS

Based on the application analysis of the above coupling model, how to use the model to deduce deficiencies of urban development in the realistic dimension is the original intention of designing the coupling model. In the process of application, whether the relevant indicators of the variables are matched and whether there is misunderstanding and deviation in the process of measuring coupling degree are first things needing to be made clear. If data information collected is relatively sufficient and reliable, model calculation and analysis can be carried out. The actual results of the five coupling relations are assumed in the research, and development measures that the host city should take are further analyzed.

First of all, $K \in [0, 0.3]$ represents relatively low coupling degree between large sports events and urban development. At this time, the city fails to form a city brand image, and there are no rigid and soft indexes in brand value; therefore, problem of low coupling degree can be solved only by economic support, policy support, cultural propaganda and efforts from other parties (Sun, 2011). Only by vigorously promoting urban development and improving the level of urban development can the coordinated development of sports events and urban development be promoted and proper brand value of the city be exerted.
Secondly, $K \in [0.3, 0.5]$ represents a turning point of urban development at this stage with the corresponding hardware infrastructure basically reflecting the supporting role, but soft indexes are insufficient and there are relatively large contrasts with regard to positive effect of cultural value. In order to further promote the benign development of the city, it is necessary to break through the constraints of sports events and to improve the corresponding maintenance work in the late stage. At the same time, culture propaganda during the period of the sports events should be maintained to keep effectiveness of urban spiritual civilization construction.

Later on, $K \in [0.5, 0.8]$ represents a relatively long run-in period for sports events and urban development. Although there is a good coupling relationship in this stage, no optimal state and result is shown (Song, 2011). Therefore, the host city needs to continue to increase policy guidance and media propaganda support from the respective of culture soft power, to ensure long-term support functions of city brand values after undertaking of the sports events, promoting benign development advantages of sports events and urban development.

Finally, $K \in [0.8, 1]$ represents high coupling level between sports events and urban development. The two systems support each other and show the final result of steady development. At the same time, it will complement each other, showing the maximum utilization of city brand value, and conversion rate of economic benefits.

In addition, $K=0$ or $K=1$ represents minimum or maximum coupling degree between sports events and urban development. This situation is the ideal state which does not refer to the actual reference elements, and it will not appear in the actual effect, so it is not used as the brand value analysis of urban development.

6. CONCLUSION

In calculation, in measuring the coupling relationship between large sports events and urban development, the utilization rate and the transformation rate of urban brand value should be taken as objective evaluation indicators. Consequently, proportion weights of related variables are designed in the theoretical framework of coupling effect. Finally, the internal relationship and interaction mechanism of related variables are obtained by the coupling model. With the coupling target $K=1$ as the original driving force, integrity and coordination between large sports events and urban development are continuously promoted in the process of the city using city brand advantages to further promote rapid development of the host city.

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