



Kalpa Publications in Computing

Volume 22, 2025, Pages 1150–1163

Proceedings of The Sixth International Conference on Civil and Building Engineering Informatics



# Design Strategies for Enhancing Spatial Vitality through the Integration of Sports Venues and Commercial Spaces

Xuefei Yuan<sup>1,2\*</sup>, Benchen Fu<sup>3,4†</sup>, Shan Man<sup>1</sup>, and Yuanyuan Wei<sup>1</sup>

<sup>1</sup> Jiaxing University, Jiaxing, China

<sup>2</sup> Shanghai Cuiyunyuan Architectural Design Consulting Co., Ltd. Shanghai, China.

<sup>3</sup> Shenzhen University, Shenzhen, China.

<sup>4</sup> Shenzhen Key Laboratory of Architecture for Health & Well-being (in preparation), Shenzhen, China.

277312039@QQ.com, benchen\_fu@126.com, 408059530@QQ.com,

00007652@zjxu.edu.cn

## Abstract

With the evolving functional attributes of sports venues in China and the promotion of national fitness strategies, sports venues are increasingly transitioning into comprehensive entertainment and leisure facilities. However, due to spatial constraints and other factors, many of these facilities suffer from suboptimal operational effectiveness and limited spatial vitality. This study employs literature review, case data collection, comparative analysis, and inductive analysis to propose a design strategy for the integration of sports venues and commercial spaces, emphasizing the "optimized horizontal space utilization, vertical compound utilization, and scene content creation." Through specific case discussion, the study emphasizes the need for these three strategies to work in synergy and highlights the importance of continuous optimization across the entire building lifecycle—from decision-making, strategic planning stages to design, construction, operation, maintenance, and feedback optimization. These findings provide a valuable reference for the organic integration of sports venues and commercial spaces in China and beyond, fostering new vitality in sports venues and promoting healthier urban environments.

---

\* Corresponding Author

† This authors contributed equally to this work as the first author

# 1 Introduction

Over several decades, sports architecture in China has evolved from serving primarily as landmark structures for major sporting events to becoming facilities that prioritize public access and enhance urban quality of life (Mo & Chen, 2020). This transformation is driven by government policies aimed at increasing public participation in sports activities and expanding the availability of sports venues (Zhang, Xie, Liu, & Mancini, 2021). With the growing number of people engaged in physical activities, the functional demands for sports architecture have diversified, shifting from a "sports+" model to a "+sports" approach. In this shift, the roles of sports venues and commercial spaces have been redefined, with many sports venues increasingly transforming into multi-functional leisure and entertainment complexes.

However, due to traditional sports venues' limited consideration of commercial integration and the lack of commercial operation experience in post-event scenarios, significant spatial resources remain underutilized, often resulting in suboptimal facility performance and, in some cases, even partial abandonment. This can negatively impact the surrounding urban environment (Turner & Rosentraub, 2016). Although previous research has highlighted the importance of post-event operations and the integration of commercial spaces (Ma & Zhuang, 2004), there has been little in-depth, systematic research specifically focusing on design strategies aimed at enhancing spatial vitality to boost both venue utility and regional urban vibrancy.

With the advancement of the "Healthy China" and National Fitness strategies, sports consumption has become an increasingly important part of the broader consumer market (National Development and Reform Commission (NDRC), Ministry of Commerce (MOFCOM), & Ministry of Culture and Tourism (MCT), 2024). Recent statistics indicate that China's sports consumption market is currently valued at approximately RMB 1.5 trillion, with projections to grow to RMB 2.8 trillion by 2025 (Xinhuanet Client, 2023). In light of this, there is an urgent need to explore effective methods for integrating sports venues with commercial spaces, thereby upgrading both sports facilities and their surrounding urban consumption environments. One of the critical factors for successful sports-commercial integration is spatial vitality. Active and vibrant spaces not only foster greater sports participation but also attract more consumers, enhancing commercial atmosphere and economic returns, and thereby invigorating the entire area. This study aims to provide insights into enhancing spatial vitality through a comparative analysis of representative cases domestically and abroad, synthesizing models to outline design strategies that support the integration of sports and commercial spaces from three dimensions: optimized horizontal space utilization, vertical compound utilization, and scene content creation.

## 2 METHOD

This study employs a mixed-methods approach, integrating literature review, case data collection, comparative analysis, and inductive synthesis to comprehensively examine the integration of sports and commercial spaces.

### 2.1 Data Collection

This study conducts a thorough review of literature to collect data on sports venues built or planned globally and domestically since 1990, resulting in a dataset of approximately 100 cases. These cases include information on location, urban context, construction date, building area, seating capacity, overall layout, floor plans, and where available, data on revenue composition and business configurations, forming the foundational research dataset. No limitations were placed on venue size,

ensuring a comprehensive basis for subsequent model synthesis. From this dataset, around 30 prominent and influential sports venues with notable integration of commercial spaces were selected as key cases for in-depth analysis, focusing on spatial characteristics, factors influencing spatial vitality, and primary design strategies to establish a robust research sample database.

## 2.2 Comparative Analysis

Based on the research sample database, 30 completed sports venues with successful post-event operations were examined in detail. Key factors for comparison included site context, overall layout, floor plans, spatial characteristics, commercial functions, spatial vitality, and integration features with commercial spaces. This comparative analysis identifies the critical spatial factors that enhance the fusion of sports and commercial spaces, contributing to improved spatial vitality.

## 2.3 Inductive Analysis






Following the comprehensive comparative analysis of the sample database, design strategies for enhancing the integration of sports venues and commercial spaces with a focus on spatial vitality are synthesized. First, sports venues with ample available land should prioritize efficient use of horizontal space. Second, those with limited land should focus on maximizing vertical compound space utilization. Third, beyond spatial optimization in both dimensions, attention should be given to content-driven scene creation. These three elements – horizontal space, vertical compound use, and content creation – are interdependent, collectively shaping a vibrant public activity space.

# 3 RESULTS

Sports venues are generally developed on two primary types of land use scales in varying spatial and geographic contexts: compact sites and expansive sites (Wei, Liu, & Luo, 2020). Integration of sports venues with commercial spaces should be tailored to the specific land scale, maximizing the use of multi-dimensional site space and interior architectural space. This approach aims to create a dynamic sports complex characterized by "optimized horizontal space utilization, vertical compound utilization, and scene content creation," establishing vibrant spaces that serve both the city and its citizens. The main design strategies for integrating sports venues and commercial spaces with the goal of enhancing spatial vitality include the following three components:

## 3.1 Optimal Horizontal Space Utilization of Site Planning for Commercial Integration

Sports venues located on expansive urban sites often feature large transitional areas between the venue and surrounding city spaces, creating a spatial buffer from city streets. For such venues, integration with commercial spaces should emphasize effective site planning to make full use of the horizontal dimensions. This can involve incorporating a variety of sports facilities, natural ecological environments, or even outdoor theme parks, commercial complexes, or shopping streets within the site. Examples of this approach include the "sports venue + multi-sport facility" model, the "sports venue + ecological environment" model, the "sports venue + theme park" model, and the "sports venue + commercial complex or shopping street" model (Yuan, Pan, & Fu, 2023). These configurations extend the range of facilities accessible to the public, creating diverse, engaging areas for city-wide sports, leisure, and entertainment, thus establishing a rich urban sports and recreation district (Table 1).

Project	Real/Rendering image	Model analysis	Strategy description
Kai Tak Sports Park, Hong Kong		Sports Venue + Multi-Sport Facilities Model	<ol style="list-style-type: none"> <li>1. Analysis of the sports and consumer characteristics of surrounding demographics.</li> <li>2. Optimized overall layout to maximize site utilization with rational zoning.</li> <li>3. Strategic placement of sports facilities and additional functional areas.</li> </ol>
Quzhou Sports Park, China		Sports Venue + Ecological Environment Model	<ol style="list-style-type: none"> <li>1. Analysis of natural environmental features.</li> <li>2. Analysis of sports and consumer characteristics of nearby populations.</li> <li>3. Maximized use of topography, landscape, and water features for sports facilities.</li> </ol>
Tokyo Dome City, Japan		Sports Venue + Theme Park Model	<ol style="list-style-type: none"> <li>1. Analysis of sports and consumer characteristics of surrounding demographics.</li> <li>2. Planning of entertainment theme and functional zoning.</li> <li>3. Strategic configuration of theme park zones to optimize site use.</li> </ol>
Sport Society, Dubai		Sports venue + Commercial Complex Model	<ol style="list-style-type: none"> <li>1. Analysis of sports and consumer characteristics.</li> <li>2. Design of the sports venue and commercial complex combination.</li> <li>3. Enhance synergy between the complex and sports venue, driving regional consumption upgrades.</li> </ol>
L.A. Live, Los Angeles, USA		Sports Venue + Shopping District Model	<ol style="list-style-type: none"> <li>1. Planning and design of the overall combination of shopping district and sports venue.</li> <li>2. Strategic configuration of functions to enhance synergy between the district and sports venue, driving regional consumption upgrades.</li> </ol>

**Table 1:** Optimal horizontal space utilization of site planning for commercial integration

### 1. Diverse Sports Facilities Tailored to User Demographics

Sports venues on expansive urban sites often have large land areas, yet historically these spaces have lacked efficient, intensive land use. In China, large sports centers are common; however, many experience underutilization or even vacancy after events. To maximize these sites, a variety of sports facilities and functional spaces should be planned to meet the activity preferences and consumption characteristics of diverse surrounding user groups. Integrating additional outdoor sports areas, plazas, and leisure spaces can help boost operational revenue, creating a multi-use, dynamic urban sports district (Shi & Li, 2020).

For example, Hong Kong's Kai Tak Sports Park features multiple sports fields, urban leisure areas, park facilities, retail outlets, and dining options around its main stadium, providing high-quality facilities for professional athletes, amateur enthusiasts, and the public. This design establishes the venue as a world-class activity hub for the city. Similarly, Shanghai's Xujiahui Sports Park utilizes outdoor spaces between the main stadium and city streets, introducing lush aerobic parks and diverse sports areas connected by a running track, greatly fulfilling the fitness and recreational needs of city residents.

### 2. Integrating Natural Environments to Create Ecological Parks

With a growing emphasis on preserving natural environments, the overall layout of sports venues should integrate with surrounding ecological elements, reducing the potential negative impact of large-scale sports architecture on urban spaces (Fan, Liu, & Yang, 2022). Integrating sports venues with commercial spaces should also take full advantage of natural features, such as terrain, landscape corridors, water bodies, and wetlands. Thoughtful placement of outdoor sports facilities alongside vibrant commercial spaces allows people to engage in both recreational and sports activities within natural surroundings, fulfilling their desire to connect with nature. For instance, Qucheng Sports Park in Quzhou, China, spans a generous site where multiple sports venues blend with natural landscapes. Between the sports facilities and the city streets, artistic landscapes resembling volcanic formations and mirrored lakes have been created. This sports-focused ecological park offers various facilities, such as tracks, badminton and basketball courts, climbing walls, cycling paths, roller skating areas, and jogging tracks, alongside retail and dining spaces, forming a vibrant urban space that merges sports, fitness, commerce, and natural ecology.

### 3. Introducing Theme Parks to Energize Urban Spaces

The integration of theme parks within sports venues provides a dynamic “sports + entertainment” theme that attracts a broader audience, particularly youth and families, and encourages active participation. This approach not only enhances event attendance but also creates a social hub for activities that cater to younger audiences. Tokyo Dome City exemplifies this model with a theme park, Korakuen Hall, LaQua spa facilities, restaurants, and hotels surrounding the main stadium, transforming the area into a vibrant urban center that combines sports, recreation, and leisure, attracting 35 million visitors annually. By creating a comprehensive space that combines sports, entertainment, and theme park attractions, sports venues transcend their traditional roles, becoming interactive and entertainment-rich urban landmarks. This design draws a wider audience, turning the venue into a multifunctional destination for viewing, participating, and socializing, thereby activating urban vitality. In addition to sports and entertainment, the area also serves as a community gathering space, enhancing regional cohesion and promoting the development of multiple industries within the area.

### 4. Integrating Commercial Complexes to Foster a Community Environment

Introducing commercial complexes or shopping districts around sports venues is another effective approach to boosting regional vibrancy. In this model, the sports venue is either integrated within or

closely connected to a commercial complex or shopping district, creating a symbiotic relationship that functions as a multi-use community hub. Such integration not only establishes the sports venue and commercial area as iconic urban spaces that strengthen the city's brand but also drives local economic growth. For example, Dubai's Sport Society integrates sports facilities with a commercial complex, creating a multifunctional area that combines sports, retail, and wellness, with sports as its defining feature. This blend cultivates a unique atmosphere and sense of belonging for the community, energizing the area and fostering a vibrant ambiance that encourages physical activity among all age groups. Similarly, L.A. Live in Los Angeles surrounds the Crypto.com Arena (formerly the Staples Center) with a dense network of shopping, dining, hotels, apartments, museums, and office spaces. This combination transforms the area into a significant urban gathering point, where visitors attending major events at the arena also patronize nearby businesses, boosting foot traffic in the surrounding shopping district and significantly enhancing its vitality, serving as a catalyst for regional economic development.

### 3.2 Utilization Vertical Compound Utilization for Commercial Integration

For sports venues on compact sites within dense urban areas, spatial constraints limit horizontal openness but provide closer integration with the city. In such cases, integrating commercial spaces should prioritize an efficient, compact arrangement of vertical spaces to create a multi-level, interactive commercial interface, enhancing vertical engagement and spatial entertainment value. Effective use of underground space can expand the venue's functional areas and attract foot traffic; multi-level utilization of above-ground spaces optimizes spatial efficiency, reducing potential wastage; strategically designed VIP areas improve service quality; and innovative use of rooftop spaces adds new elements to both the venue and urban environment (Table 2).






#### 1. Effective Utilization of Underground Space

In contemporary sports venue design, the effective use of underground space has become a key element for enhancing both overall venue utilization and foot traffic, especially in venues that connect directly with metro systems. Underground spaces not only provide additional functional areas but also create unique consumer experiences, drawing in more visitors. For example, at the Mercedes-Benz Arena in Shanghai, the B2 level features an open ice rink, while the B1 level hosts a distinctive underground food court and music theater, successfully attracting metro passengers and increasing the venue's vibrancy and commercial value. Similarly, at the Barclays Center in New York, the basketball court and training facilities are located underground, allowing the building height to blend into the urban landscape while creating a captivating street-level entrance that enhances the urban vitality of the venue through a dramatic visitor experience.

#### 2. Multi-Level Utilization of Above-Ground Space

The multi-level utilization of above-ground space is a key strategy to enhance the vibrancy of sports venues. This approach not only optimizes physical space usage but also diversifies spatial functions, reducing the occurrence of "large but empty" spaces. Sports venues can assign functions based on specific height levels, such as parking on platforms at 4 meters, restaurants and training gyms at 6 meters, basketball and soccer courts as well as large recreational areas at 9 meters, and badminton courts and cinemas at 12 meters. Additional facilities like cinemas, children's play areas, and fitness centers can be incorporated based on spatial characteristics, enhancing the venue's ability to serve a diverse public.

Function distribution across vertical space should also align with the venue's thematic features to create an attractive, multi-layered environment. For instance, at the Mercedes-Benz Arena in Shanghai, different levels host music clubs, VIP suites, and restaurants, allowing 24/7 operation and

Project	Real/Rendering image	Model analysis	Strategy description
Mercedes-Benz Arena, Shanghai		Underground + Above-Ground + VIP Area + Rooftop Commercial Integration	<ol style="list-style-type: none"> <li>1. Strategic planning of functions and revenue models.</li> <li>2. Maximal use of underground space.</li> <li>3. Multi-level integration to create a comprehensive center.</li> </ol>
Barclays Center, New York, USA		Underground + Above-Ground + VIP Area Commercial Integration	<ol style="list-style-type: none"> <li>1. Analysis of spatial interaction between the venue and city streets.</li> <li>2. Creation of an attractive street-corner entrance.</li> <li>3. Effective integration of commercial functions across multiple levels.</li> </ol>
Crypto.com Arena, Los Angeles, USA		Above-Ground + VIP Area + Rooftop Commercial Integration	<ol style="list-style-type: none"> <li>1. renovation focus—enhancing club seating and suite features.</li> <li>2. Evaluation of available space on each level.</li> <li>3. Creative utilization of all levels.</li> <li>4. Unique suite and VIP areas within lower seating areas and rooftop.</li> </ol>
O2 Arena, London, UK		Above-Ground + VIP Area + Rooftop Commercial Integration	<ol style="list-style-type: none"> <li>1. Key areas renovation to enhance VIP offerings within the existing sports-commercial complex.</li> <li>2. Replacement of select suites with expanded member experience space.</li> <li>3. Addition of retractable cantilevered walkway.</li> </ol>
Shenzhen Bay Sports Center, China		Above-Ground + Rooftop Commercial Integration	<ol style="list-style-type: none"> <li>1. Integration of commercial spaces with maximum utilization of scenic value.</li> <li>2. “Sea Gate” viewing area.</li> <li>3. Inclusion of aerial commercial spaces for high-end receptions, client appreciation events, and brand launches.</li> </ol>

**Table 2:** Vertical compound utilization for commercial integration

establishing the venue as a key cultural and entertainment landmark in Shanghai. The Suzhou Industrial Park Sports Center includes parking, restaurants, cinemas, and training gyms on the sub-2nd floor, commercial and sports stores on the 2nd floor, dining areas on the 3rd floor, and retail outlets on the 4th floor. London's O2 Arena incorporates retail, dining, leisure, and sports spaces in the surrounding area, with additional interactive sports spaces like soccer training areas, indoor trampolines, bowling, and mini-golf, creating a versatile sports and commercial complex that attracts a wide range of visitors.

### 3. Strategic Layout of VIP Areas

The strategic layout of VIP areas is crucial for enhancing the audience experience and service level within sports venues. Well-placed VIP suites provide a more comfortable and exclusive viewing experience that appeals to high-end consumers and generates significant revenue. In some venues, VIP area income has even exceeded naming rights revenue.

For instance, the Mercedes-Benz Arena in Shanghai has suites on the third and fourth floors, with capacities of 12, 21, and 30 seats, respectively. VIP suite holders enjoy access to various events and brand-exclusive experiences. At the Barclays Center in New York, luxury suites are positioned within 25 rows of the court, offering premium dining and optimal views. The venue also provides exclusive clubs, music bars, and experiential activities, adding unique value for guests while generating additional revenue. Similarly, the Crypto.com Arena in Los Angeles (formerly the Staples Center) includes 2,500 club seats, most of which are in the lower tier, and 172 suites between the upper and lower tiers, including 56 premium suites, 62 standard suites, and 54 value suites. Two tunnel suites allow close interaction with players, contributing to over \$300 million in long-term lease revenue. The O2 Arena in London recently upgraded its VIP area by replacing 12 suites with The Residence, a new club experience featuring a retractable walkway that allows VIP guests to enjoy elevated views of the arena.

### 4. Innovative Utilization of Rooftop Space

Innovative rooftop spaces provide unique vantage points and introduce new functions to sports venues, amplifying urban vitality. At the Mercedes-Benz Arena in Shanghai, the rooftop features clubs, cinemas, bars, and viewing platforms, creating a distinctive experience and enriching the venue's recreational offerings, with panoramic views of the Huangpu River skyline. Shenzhen Bay Sports Center's "Sea Gate" rooftop offers an elevated vantage point over the bay and serves as a venue for award ceremonies, high-end gatherings, client appreciation events, and brand launches, enhancing both the spectator experience and commercial value. Crypto.com Arena in Los Angeles recently added three rooftop suites, allowing members to gather on terraces overlooking the downtown skyline during events (Xie & Kang, 2011). Atlanta's Mercedes-Benz Stadium includes the Maybach Terrace and Delta SKY360 Terrace on its rooftop, offering spectators a view of the cityscape while enjoying events, blending sports entertainment with iconic urban vistas.

## 3.3 Engaging, Sustainable Scene Content Creation

The vibrancy of sports venues integrated with commercial spaces largely stems from the continuous refreshment of underperforming spaces and the creation of diverse, event-driven scenes. Research indicates that revenue for most sports venues is positively correlated with both time spent on-site and visitor spending (Thibaut, Eakins, Vos, & Scheerder, 2017). Varied functions and rich scene settings increase visitors' dwell time, thereby enhancing profitability and addressing operational challenges faced by many sports venues in China. Beyond maximizing horizontal and vertical spatial utilization, sports venues should prioritize the strategic arrangement of diverse functional spaces to create engaging, dynamic content, making the venue a lively, attractive destination for the public (Table 3).



1. Continuous Renewal of Commercial Functions

Updating commercial functions is critical to improving the operational efficiency and market competitiveness of sports venues. Regularly refreshing underperforming spaces serves to create a richer, more diverse functional environment and user experience, aligning with evolving public demands and social trends to mitigate issues of low utilization and poor revenue performance. This, in turn, extends the life cycle of the venue. Key factors guiding functional updates should include: (1) Changing Social Needs – updates should align with evolving societal interests, such as increasing demand for healthy lifestyles, cultural and artistic experiences, and senior-friendly recreational spaces (Chen, Chen, Li, He, & Shi, 2021); (2) User Demographics – understanding the age and occupation of local residents can help tailor facilities, such as more leisure spaces for senior communities or educational and recreational facilities for young families; (3) Technological Advancements – new technologies enable venues to incorporate innovative elements, such as virtual reality zones and interactive exhibits, attracting younger visitors and tech enthusiasts; and (4) Local Cultural

Project	Real/Rendering image	Model analysis	Strategy description
Xujiahui Sports Park, China		Continuous Update of Commercial Functions	<ol style="list-style-type: none"> <li>1. Analysis of changing social demands.</li> <li>2. Assessment of demographic and occupational attributes of local users.</li> <li>3. Update and add dynamic functional areas.</li> <li>4. Maximize use of indoor and outdoor spaces for updates and renovations to introduce lively functions.</li> </ol>
HuaXi LIVE·Wukesong, China		Continuous Update of Commercial Functions + Multi-Stimulus Event Scene Creation	<ol style="list-style-type: none"> <li>1. Analysis of changing social demands.</li> <li>2. Assessment of demographic and occupational attributes of local users.</li> <li>3. Create various interactive functions and “event scenes” across indoor and outdoor spaces.</li> <li>4. Host diverse events to attract different user groups.</li> </ol>
Xili Sports Complex, Shenzhen, China		Multi-Stimulus Event Scene Creation	<ol style="list-style-type: none"> <li>1. Optimize use of multi-level spaces, arranging various open activity areas.</li> <li>2. Connect venues and public spaces with an elevated running track.</li> <li>3. Host a variety of “event scenes” to engage different user demographics.</li> </ol>

**Table 3:** Engaging, sustainable scene content creation

Characteristics – updates should also consider regional heritage and culture, with dedicated exhibition and experience zones in culturally rich areas.

For example, in 2022, Xujiahui Sports Park in Shanghai underwent an upgrade of both indoor and outdoor functions, adding versatile sports areas to meet the needs of a wide user base. These include the "Wantihui" multi-purpose hall with badminton, table tennis, tennis, soccer, and basketball courts. The swimming facility added a play pool and sun courtyard, while the outdoor area was enhanced with expanded greenery. Sixteen soccer and basketball courts were added to the "Sports Park" on the south side, while the "Aerobic Park" on the north provides a relaxing space for residents. A flexible, scenic jogging track connects the facilities, creating a unique running experience. At Xujiahui, visitors can now enjoy a wide variety of activities, establishing the venue as a vibrant sports and cultural hub in downtown Shanghai.

## 2. Creating Multi-Stimulus Event Scenes

Creating “event scenes” within sports venues is a key strategy for attracting public participation and enhancing venue vitality (Lu, Du, & Guo, 2023). Event scenes encompass more than major sporting events or large concerts; they include a variety of activities and gatherings that provide a multidimensional sense of enjoyment for visitors (Desbordes & Chadwick, 2007). These scenes increase the use frequency and operational capacity of the entire venue and its commercial spaces. Key considerations for event scene creation include:

**Diverse and Innovative Activities** – regular events such as amateur sports tournaments, community art exhibitions, fitness classes, and public lectures, as well as contemporary events like e-sports tournaments, billiard competitions, and night walking festivals.

**Enhanced Interactive Experiences** – offering zones for product demonstrations, sports tryouts, VR experiences, and other engaging activities to attract individuals with diverse interests and showcase the broader value of sports and related industries.

For example, HuaXi LIVE·Wukesong in Beijing exemplifies successful event scene creation with a wide array of updated functions. Outdoor areas include the Hi-Park basketball park, HI-ICE ice rink, HuaXi LIVE Adventure Park, and HI-FUN amusement park, providing spaces for all age groups. Inside, the venue offers the Huiyuan Small Theater, M-Space, executive clubs, bars, VIP suites, and dining options, regularly hosting theater performances, fashion shows, fan meetups, and commercial exhibitions. Iconic events such as HI-Art Festival, Beer Carnival, and HI-Water Festival, along with the integration of Times Art Museum and commercial streets, create an immersive “event scene” encompassing entertainment, sports, lifestyle, education, and art, ensuring stable revenue and elevating regional vitality (Lanxionsports, 2022). Similarly, Shenzhen's Xili Sports Complex integrates a cultural and sports center, theater, multi-sport gymnasium, swimming pool, and a rooftop jogging track connecting buildings. Each structure offers open rooftop spaces, while a green stepped roof forms an outdoor theater or cinema, creating a multi-dimensional event space that merges with the urban environment. No clear boundary remains between the venue and the city, fostering community engagement.

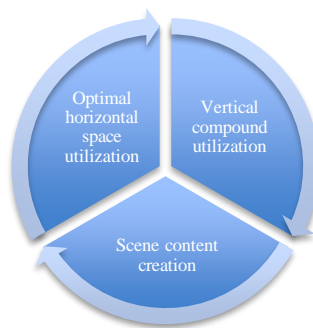
## 4 DISCUSSION

For citations it is recommended that you use the bibliography mechanisms of Microsoft Word or other tools able to process docx documents. In Microsoft Word, commands for inserting citations are located at the *Document Elements* tab of the ribbon control in the section *References*. Clicking the *Manage* button opens a toolbox, which allows you to add referenced publications and to insert them at the position of the cursor by double-clicking on them. If you use Microsoft Word for Mac, open the

main toolbox and select the *Citation* tab instead. From there you can add and insert referenced publications as in other versions of Word.

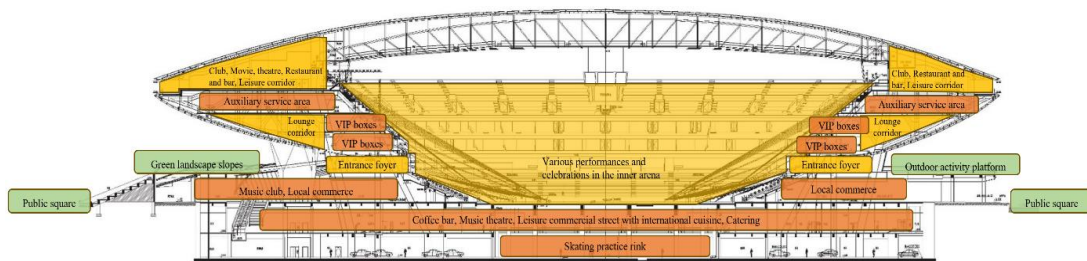
#### 4.1 Synergistic Integration of "Optimal Horizontal Space Utilization, Vertical Compound Utilization, and Scene Content Creation"

Based on the preceding results, enhancing spatial vitality relies on the synergistic interaction of "optimal horizontal space utilization, vertical compound utilization, and scene content creation." Designs focused on a single dimension often fall short of fully activating the venue's potential. In contrast, the complementary integration of multi-dimensional spaces and content fosters a cohesive, attractive environment that offers users diverse activity options and experiences, leading to sustained spatial value. This synergy not only improves overall venue efficiency but also fuels industry growth and urban vitality in surrounding areas, providing a continuous source of dynamism (Bradbury, 2022)(Figure 1).



**Figure 1:** The need for a coordinated role of the three parties

As exemplified by the design of the Mercedes-Benz Arena in Shanghai, the synergy among the three components is essential for enhancing the spatial vitality of sports venues (Figure 2).



**Figure 2:** Multidimensional integration of the Mercedes-Benz Arena with commercial spaces, Shanghai.

Firstly, the arena emphasizes the efficient use of vertical space. The B2 level houses an ice rink, utilized for skating training and public activities. The B1 level connects to the metro, featuring an international gourmet food street, retail spaces, and a music theater. The first floor includes a music club, while the third and fourth floors accommodate 82 VIP suites and various restaurants. The sixth floor features clubs, cinemas, restaurants, bars, and a scenic leisure walkway. These spaces collectively create a vibrant urban complex that integrates performing arts, sports, commerce, and culture, providing diverse leisure experiences for a wide range of visitors.

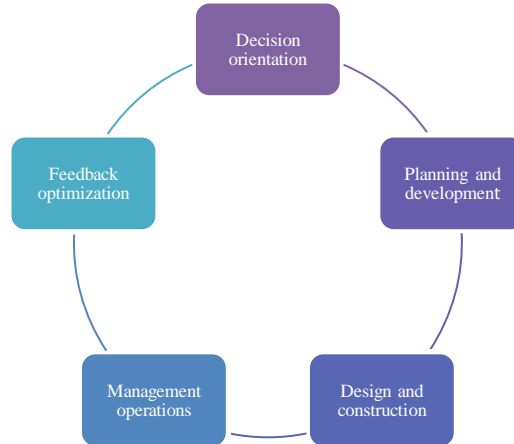
Secondly, despite its limited site area, the arena maximizes horizontal space. The first floor and underground levels are extended to accommodate a variety of functions, while the second-floor

outdoor platform is seamlessly connected to the landscaped green slopes, forming plazas, green spaces, and activity platforms. These outdoor areas host various community activities, enhancing the venue's accessibility and appeal.

Finally, scene content creation is a key driver of the arena's spatial vitality. The 18,000-seat main arena can be reconfigured to host diverse events, such as concerts, music performances, and celebratory gatherings. The venue also features a music club, cinema, ice rink, international gourmet food street, Hans Christian Andersen Children's Park, NBA interactive exhibit, and nearly 20,000 square meters of commercial retail and cultural entertainment spaces. These facilities offer opportunities for artistic exchange, academic research, leisure, tourism, and more. Externally, the venue interacts dynamically with the city by hosting activities like summer camping and riverside running, establishing itself as a trendy and youthful urban hub that attracts and engages the public.

## 4.2 Comprehensive Optimization Across the Full Lifecycle is Essential for Sustaining Spatial Vitality

Sustaining spatial vitality of sports venues is not solely a consideration during the architectural design phase but requires a coordinated effort throughout the entire lifecycle of the building. Achieving the synergistic effect of "optimal horizontal space utilization, vertical compound utilization, and scene content creation" demands a holistic approach. From the decision-making and strategic planning stages to design, construction, operation, maintenance, and feedback optimization, the sustained spatial vitality of sports venues requires close collaboration and continuous refinement among multiple stakeholders, including governments, developers, design teams, construction firms, operations management companies, and end-users. Only through this comprehensive, lifecycle-wide coordination can truly attractive and dynamic urban sports spaces be created (Figure 3).



**Figure 3:** Framework for enhancing spatial vitality through multi-stage collaboration across the venue lifecycle

The Mercedes-Benz Arena in Shanghai exemplifies this holistic approach, with its vibrant spatial vitality stemming not only from its design phase but also from meticulous attention across the entire building lifecycle. During the planning and construction stages, the arena was conceptualized as the performance venue for Expo 2010 Shanghai. With a forward-looking vision, both the government and developers aimed to integrate functions such as performing arts, sports, and entertainment to ensure that the venue would continue to bring vitality to the city even after the Expo concluded. In the

operational phase, the arena collaborated with internationally renowned management companies to optimize its operations across five key areas: naming rights, VIP suites, food and beverage, merchandising, and integrated development. Management models, functional configurations, and event programming have been continuously updated to meet the diverse needs of its user groups. Notably, revenue from naming rights, sponsorships, and VIP suite rentals now accounts for 80% of the venue's total income, providing a robust foundation for its sustainable vitality and long-term operation.

## 5 CONCLUSIONS

As the functional value of sports architecture in China shifts and national fitness initiatives advance, many venues are transitioning from a “sports+” model to a “+sports” model, emphasizing widespread public fitness, entertainment, and recreation. The integration of sports venues with commercial spaces has become a vital means of stimulating urban vitality. “Optimal horizontal space utilization, vertical compound utilization, and scene content creation” constitute the essential design strategies for enhancing spatial vitality in sports-commercial integration. This tripartite synergy is critical, and as sports venue functions evolve, new innovative strategies will likely emerge, further advancing the organic integration and development of sports and commercial spaces. On the other hand, the spatial vitality of sports venues is a dynamic and evolving process. It necessitates continuous optimization and adjustments at every stage of the venue's lifecycle—ranging from government decision-making, planning, and development to design, construction, operational management, and feedback optimization—with collaboration among all stakeholders.

## References

- Bradbury, C. J. (2022). The impact of sports stadiums on localized commercial activity: Evidence from a Business Improvement District. *Journal of Regional Science*, 1, 194-217.
- Chen, Y., Chen, L., Li, J., He, Y., & Shi, X. (2021). Main Performance, Strategies of American Sports Stadiums Promoting Urban Renewal and Their Enlightenment on China. *Journal of Shanghai University of Sport*, 45(2), 78-89.
- Desbordes, M., & Chadwick, S. (2007). *Marketing and Football*. Routledge.
- Fan, Z., Liu, Z., & Yang, S. (2022). Interaction & Symbiosis: The Design Strategy of “Interaction” between Architecture and Landscape of the Exterior Space of Sports Park Based on the Spirit of Place. *New Architecture*, (02), 76-81.
- Lanxionsports. (2022, 4 9). *Exclusive Dialogue with Huaxi Zhao Yan, Behind the Scenes of Wukesong, a Model Student of Venue Operations*. Retrieved from lanxionsports website: <http://www.lanxionsports.com/posts/view/id/22551.html>
- Lu, S., Du, X., & Guo, Q. (2023). The Development of Major Sports Events Venue Construction and Post-Match Utilization Mode in China. *Contemporary Architecture*, (09), 32-35.
- Ma, J., & Zhuang, W. (2004). Analysis of the comprehensive utilization of space under fixed seats in large sports buildings in China. *Architectural Journal*, 05, 70-72.
- Mo, L., & Chen, B. (2020). Principle and practice for everyday life dissolving “the grand” in the Qingpu Sports and Cultural Activity Center in Shanghai. *Time + Architecture*, 06, 132-139.
- National Development and Reform Commission (NDRC), Ministry of Commerce (MOFCOM), & Ministry of Culture and Tourism (MCT). (2024, 6 13). *Circular of the National Development*

- and Reform Commission and Other Departments Issuing Measures on Creating New Scenes of Consumption and Cultivating New Growth Points of Consumption*. Retrieved from Ministry of Culture and Tourism website: [https://www.mct.gov.cn/preview/whhlyqyzcxxfw/yshjxf/202407/t20240708\\_953949.html](https://www.mct.gov.cn/preview/whhlyqyzcxxfw/yshjxf/202407/t20240708_953949.html)
- Shi, J., & Li, B. (2020). Sports Building Design Strategies Based on the Concept of Post-Competition Operation-Taking Jingjiang Sports Center as an Example. *Architecture & Culture*, (04),266-269.
- Thibaut, E., Eakins, J., Vos, S., & Scheerder, J. (2017). Time and money expenditure in sports participation: The role of income in consuming the most practiced sports activities in Flanders. *Sport Management Review*, 20,455-467.
- Turner, R., & Rosentraub, M. (2016). Tourism, sports and the centrality of cities. *Journal of Urban Affairs*, 24(5), 487-492.
- Wei, Z., Liu, D., & Luo, P. (2020). A Study on strategy of space utilization of large-scale sport/performance centers based on locational and environmental analysis. *Journal of World Architecture*, 09, 110-113.
- Xie, S., & Kang, X. (2011). Spring cocoon—Interpretation of the design of Shenzhen Bay Sports Center. *Architectural Journal*, (09), 79-80.
- Xinhuanet Client. (2023, 3 29). *Cultivate new business forms, create new scenarios, explore new modes Stimulate new vitality of sports consumption*. Retrieved from Xinhua net website: <https://app.xinhuanet.com/news/article.html?articleId=40ac606f2ee2bce3bd3ded7687ac9554>
- Yuan, X., Pan, H., & Fu, B. (2023). Models and analysis of stadium and commercial space integration: a case study from China. *Building Research and Information*, 51(8), 914-936.
- Zhang, L., Xie, Q., Liu, N., & Mancini, M. (2021). Sustainability in Beijing 2022: A Chinese Framework for Cross-Scale Design Intervention. *Architectural Journal*, (Z1), 7-13.