



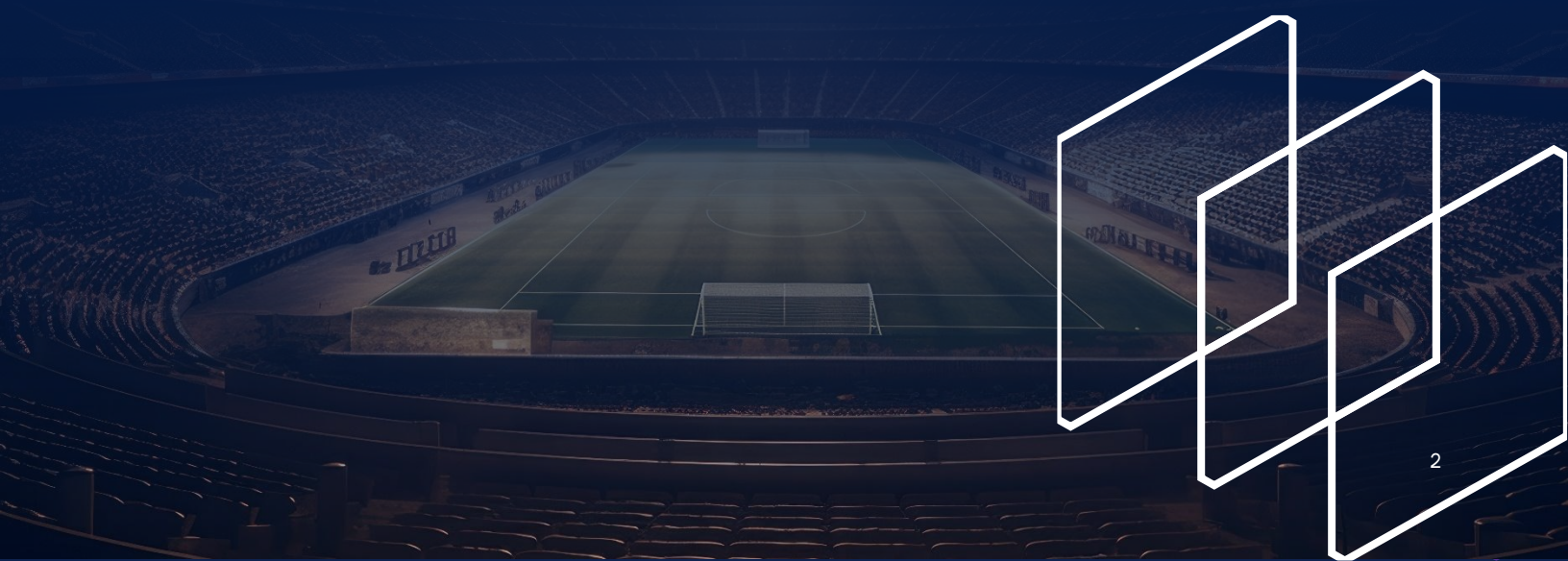
Transitioning Towards Smart and Sustainable Sports Facilities

Towards Enabling Comprehensive Digital Ecosystem
and Experience

July 2025

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Foreword

Saudi Arabia is advancing a bold vision to become a global leader in sport through the development of smart, sustainable, and commercially viable stadium infrastructure. These next-generation venues are designed for long-term relevance, combining modular construction, climate-adaptive design, and flexible event usage to anchor a year-round calendar of high-impact events.

As stadiums take on more complex, year-round functions, advanced technologies are being integrated to manage operations, reduce costs, and enhance the visitor experience. Artificial intelligence plays a pivotal role, supporting energy optimization, crowd management, facility maintenance, and fan personalization.

While the 2034 FIFA World Cup is a key milestone, the Kingdom's strategy extends further, anchored in global standards, diversified revenue models, and sustained utilization planning. This paper explores how AI-enabled, future-ready stadiums can deliver long-term economic, environmental, and experiential value, positioning Saudi Arabia at the forefront of global sports infrastructure innovation.





1

Establishing Saudi Arabia as a Global Powerhouse in Sports Through Infrastructure Transformation

KSA is strategically positioning itself as a global sports powerhouse through transformative investments in infrastructure

Saudi Arabia is executing a bold vision to become a global leader in sports by investing in next-generation sporting infrastructure that meets the highest international standards. Through the development of smart, sustainable, and multipurpose stadiums, the Kingdom aims to redefine how major sports venues are designed, built, and utilized. Rather than serving as single-use venues for flagship events, these assets are being planned as high-performance facilities capable of sustained, year-round activation across a wide range of sporting and commercial uses.

Sports Sector Economic Impact



SAR

142.5 Bn

Earmarked for the sports sector by 2030



~3x

Increase in the sports sector market value by 2030



23%

KSA's sports sector CAGR from 2025 to 2030, more than triple the projected global sports sector CAGR of 7%

Infrastructure Development



15+

State of the art multi-purpose stadiums



SAR

75 Bn+

Investments to develop and renovate facilities by 2034¹



1. Of which SAR 10 Bn to be spent on stadium renovation by 2028

Central to this vision is hosting mega international events, solidifying its position as a global sports destination

Saudi Arabia is adopting a strategic, event-led approach to sporting infrastructure development, using a pipeline of international sporting events to guide stadium planning and ensure long-term asset performance. These events are not isolated milestones, rather, are part of a long-term strategy to deliver world-class venues and ensure their sustainable year-round utilization. This approach is anchored around two strategic priorities:



Development of world-class infrastructure, including smart and sustainable stadiums



Attracting a sustained pipeline of global events that establish the Kingdom as the premier destination for international sport

Saudi Arabia is executing a coordinated calendar of international sporting events through 2034, each reinforcing its infrastructure investment and elevating its global profile—culminating in flagship tournaments like the FIFA World Cup



KSA's stadium strategy is built to support a pipeline of mega-events through 2034 and beyond, not just a single tournament. By addressing the varying needs of events like the FIFA World Cup, AFC Asian Cup, Esports Olympics, and Asian Winter Games, the Kingdom is embedding flexibility from the outset. This future-ready approach boosts long-term ROI by enabling multi-use functionality

Saudi Arabia is redefining sports excellence by developing world-class infrastructure that meets international standards

As part of its vision to become a global sports leader, Saudi Arabia is developing state-of-the-art stadiums designed to meet international standards, including those set by FIFA for the 2034 World Cup. These modern venues integrate sustainability, smart technology, and multi-functional capabilities, ensuring they serve as vibrant community hubs long after the events conclude



FIFA’s Stadium and Infrastructure Evaluation Framework¹ focuses on 5 key infrastructural elements:



Saudi Arabia is building world-class stadiums with future proof and advanced infrastructure

Non-exhaustive




Stadium Quality and Safety Standards



Ergonomic Chairs



Security Signs



Command Center



Operational Readiness & Legacy Planning



Community Space



Multi-use Stadium



Technology & Innovation Integration



IT Command Center



Digital Signage




Fan Experience & Accessibility



Accessible Infrastructure



Lounges




VIP seats



Video Screens




Environmental & Sustainability Compliance



Solar Panels



Wind energy



Electric Transport

KSA is not just meeting FIFA standards, it aims on setting a new global bar for stadium infrastructure. By embedding universal best practices in design, safety, technology, and sustainability, KSA is building venues capable of hosting any major international sporting body, from the AFC to the IOC. This future-ready approach ensures Saudi stadiums remain relevant, attractive, and competitive across global sporting calendars for decades to come

Saudi Arabia's Stadium Construction Plan: Refurbish, Build, Innovate

KSA's stadium development plan for the next decade includes 15 major venues, grouped into three categories: Refurbished legacy stadiums, projects currently under construction, and planned stadiums. Some are integrated into giga-projects like NEOM, Qiddiya, and ROSHN, positioning stadiums not just as event infrastructure but as core components of mixed-use urban districts, designed to drive year-round activity, commercial viability, and long-term urban regeneration

1. Refurbished Existing Stadiums



Revitalizing the iconic stadiums with modern upgrades, advanced technology, and enhanced fan experiences to meet international standards and host prestigious global events

2. New Stadiums Under Construction

Constructing cutting-edge sports venues designed to set new industry benchmarks, equipped with innovative features and sustainable practices to accommodate world-class competitions



3. Planned Futuristic Stadiums



Envisioning futuristic stadiums that blend advanced infrastructure with versatile functionality, creating landmark destinations that support both international sports events and community engagement

Refurbishing existing stadiums for global excellence

Saudi Arabia is transforming its existing stadiums to meet international standards, incorporating advanced technologies and modern amenities to elevate the fan experience. By upgrading infrastructure and enhancing comfort, these venues are being primed to host prestigious global events, including the FIFA World Cup



King Abdullah Sports
City Stadium



58,432



2032



King Khalid University
Stadium



45,428



2026



King Saud University
Stadium



46,319



2032



King Fahad Sports
City Stadium



70,200



2026

Jeddah

Riyadh

Abha



Capacity



Completion date

Key Focus Areas of Refurbishment



Enhanced Capacity



Modern Hospitality



Digital Systems



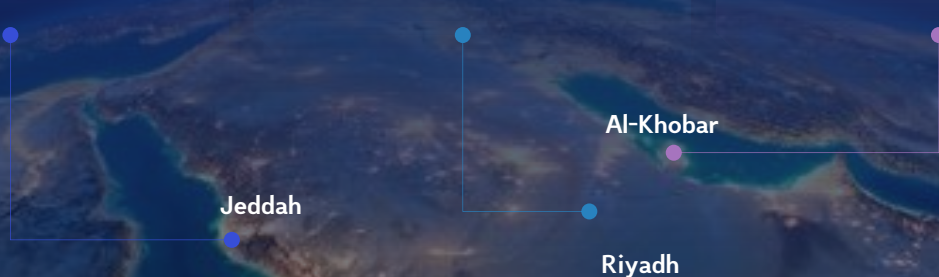
Water Efficiency



Solar Integration

Building the next generation: Key KSA stadiums currently under construction

Saudi Arabia is developing state-of-the-art stadiums designed to set new benchmarks in sports infrastructure. These modern facilities, equipped with innovative features and sustainable practices, will serve as iconic venues for hosting world-class sporting events and fostering community engagement



Capacity
 Completion date

Constructing Modern & flexible stadiums featuring

- Modular Seating
- Cutting edge cooling systems

- Advanced Broadcast set-ups
- Multi-use areas

Planned flagship stadiums positioned for global sporting and entertainment leadership

Saudi Arabia is envisioning a new era of sports with planned stadiums that combine futuristic design, multi-functional utility, and eco-friendly innovations. Strategically positioned to support their long-term vision for sports infrastructure, these stadiums will be flagship venues for international sporting competitions



From Vision to Viability

While the scope and ambition of Saudi Arabia's stadium infrastructure program are unparalleled, the success of this undertaking hinges not only on architectural delivery but also on its economic defensibility and long-term operating model. With an estimated SAR 75 Bn investment, these assets represent one of the most capital-intensive infrastructure bets in the Kingdom's modern history. The financial commitment reflects more than readiness for a tournament, it is a strategic wager on the sustained commercial utility of these venues across multiple decades.

This vision can be realized by assessing the underlying cost structures, long-term utilization plans, and risk exposures associated with mega-event infrastructure, ensuring that these venues are not only globally competitive but also financially resilient, adaptable to future demands, and embedded with mechanisms that support continuous value creation.





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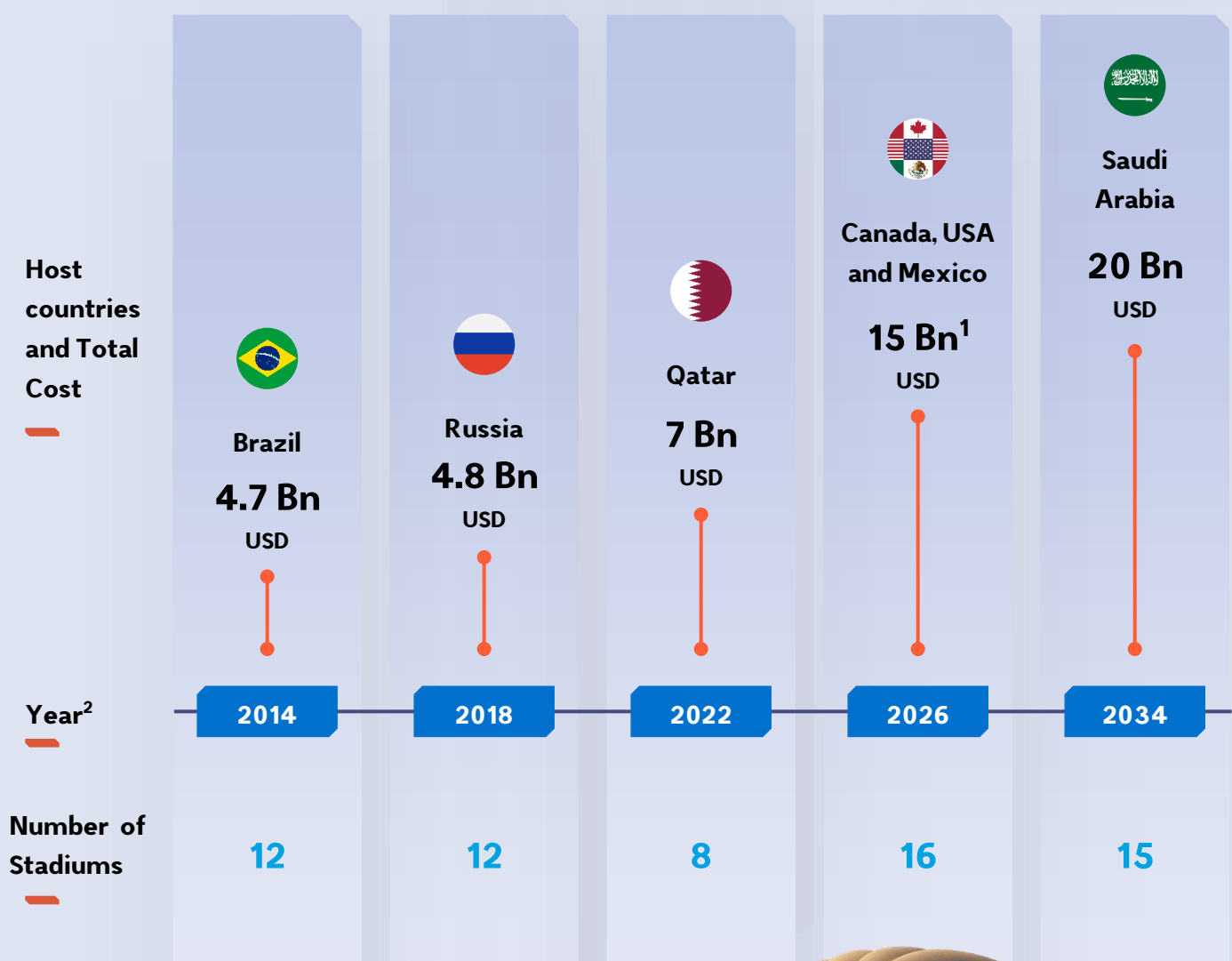
**Driving Capital Investment and
Maximizing Stadium Utilization
for Long-Term Success**

Raising the Bar: Saudi Arabia's Global Benchmark in Stadium Development

In preparation for hosting large-scale international tournaments such as the FIFA World Cup, Saudi Arabia is embarking on one of the most ambitious stadium development programs in modern history. These projects will require substantial capital commitments, not only to meet international standards, but also to deliver infrastructure that can adapt to future needs, environmental challenges, and evolving fan expectations.

Global trends have shown a steady escalation in both the scale and complexity of investments tied to FIFA events, reflecting not just rising construction costs, but heightened expectations for legacy value and long-term utility

Saudi Arabia's World Cup bid achieved the highest FIFA evaluation score in history, signaling unmatched preparedness and a new global benchmark in tournament planning & hosting



Saudi Arabia's stadium investment sets a new global ceiling, not just in scale, but in strategic intent, shifting the focus from event delivery to long-term asset performance, year-round activation, and future-proofed infrastructure



1. Joint bid from USA, Canada and Mexico, 2. Investment Data for 2030 FIFA world cup has not been published

Studying the building blocks that contribute to stadium development costs
















Stadium development typically involves four major areas of capital investment, as outlined in FIFA's guidelines, each playing a distinct role in shaping both the physical and operational quality of the venue. Stadium development typically involves four major areas of investment, each playing a distinct role in shaping both the physical and operational quality of the venue. These include construction, land and infrastructure, professional services, and other project-related costs that together form the financial backbone of any stadium project.



While these four pillars represent the foundational cost structure of any stadium project, what distinguishes Saudi Arabia's approach is how capital is being strategically directed. Beyond the basics of construction and compliance, the Kingdom is investing in advanced features that reflect both its climate realities and global sporting aspirations. These enhancements are not just add-ons, they are essential to building future-proof venues that not only meet FIFA requirements but also contribute to the broader national vision for legacy-driven infrastructure

Saudi Arabia's strategic priorities to future-proof the stadium ecosystem

As Saudi Arabia positions itself to host the 2034 FIFA World Cup, the Kingdom is not just aiming for compliance, it is pursuing excellence. With a projected stadium investment of SAR 75 Bn, Saudi Arabia is deliberately directing capital toward features that exceed minimum standards and reflect the country's climate conditions, global aspirations, and long-term urban development goals. These targeted investments are essential to ensuring that stadiums function not only as tournament venues, but also as adaptable, sustainable, and technologically advanced civic assets

Focus Area	Importance	Key Elements	
 Climate Adaptation of Stadium Infrastructure	<ul style="list-style-type: none"> Ensures player safety & comfort Complies with climate regulations 	 Geothermal, and seawater-based cooling systems	 Smart pitch irrigation
 Sustainable construction requirements	<ul style="list-style-type: none"> Aligns with FIFA sustainability goals Supports environmental stewardship 	 Solar panel integration and carbon emissions management	 On-site waste management systems
 Broadcast and media facilities	<ul style="list-style-type: none"> Enables seamless broadcasting Strengthens cybersecurity & data management 	 Dedicated broadcast compounds and media centers	 IT command centers
 Security and fan engagement infrastructure	<ul style="list-style-type: none"> Ensures safety & crowd management Complies with international security standards 	 CCTV and perimeter security	 Intrusion detection and public safety communications
 Multi-use functionality	<ul style="list-style-type: none"> Extends stadium utility post-tournament Supports diverse events & community use 	 Modular seating and convertible pitch configurations	 Built-in fan zones, retail spaces, and exhibition areas

Ensuring revenue sustainability through integrated post tournament utilization planning strategy

Saudi Arabia has already outlined detailed utilization plans for several of the new stadium facilities being built for the 2034 FIFA World Cup. These plans are designed to ensure that the significant capital investments translate into long-term economic and social value for the country. By defining clear post-tournament uses, the Kingdom aims to integrate these venues into the broader sports, cultural, and urban landscape, securing their relevance and sustainability well beyond the event itself.

Planned Utilization Post-World Cup

Stadiums



Home venues for professional football clubs



KSA National Team



Saudi Pro-League Teams

- " King Salman International Stadium
- " Prince Mohamed bin Salman Stadium
- " Prince Faisal bin Fahad Sports City Stadium
- " South Riyadh Stadium
- " King Abdullah Sports City Stadium

- " Jeddah Central Development Stadium
- " King Khalid University Stadium
- " Aramco Stadium
- " NEOM Stadium



Major Event Venues



Concerts



Exhibitions



Commercial activities

- " King Fahd Sports City Stadium
- " New Murabba Stadium
- " King Abdullah Economic City Stadium
- " Qiddiya Coast Stadium



Mixed-use facilities



Sports



Retail



Public



Leisure



Cultural spaces

- " ROSHN Stadium



Hosting university sports, community sports events, and women's football

- " King Saud University Stadium

Defining clear post-tournament utilization plans from the outset is an important risk mitigation lever. By aligning stadium functions with national sports development, major event programming, and community activation, KSA is setting the foundation for long term asset productivity and return on investment

Mitigating risk in stadium projects: what must be managed for long-term viability

Stadium projects designed for landmark events carry inherent long-term risks. For Saudi Arabia, the challenge lies not only in delivering world-class venues on time, but in ensuring their sustained utilization, commercial viability, and alignment with national priorities well beyond the events themselves. Ongoing maintenance costs, venue differentiation, utilization rates, and long-term programming will be critical to realizing the full potential and legacy value of these capital-intensive assets.



Infrastructure Risk Areas Requiring Proactive Management

Utilisation Pressure on Large Venues

Despite efforts to boost attendance with international talent, many stadiums face low utilization outside marquee Saudi Pro League matches, highlighting the need for expanded fan engagement and diversified event programming

High Cost of Upkeep and Maintenance

Saudi Arabia's hot climate significantly increases construction and operating costs for stadium environments. Maintaining comfort and safety requires high-efficiency cooling, advanced shading, and energy-intensive systems. Future-proofing stadiums will require innovation in design, smart HVAC, and renewable-powered cooling solutions.

Venue Clustering and Market Saturation

Stadium clustering in cities like Riyadh and Jeddah risks event cannibalization unless venue roles are clearly differentiated. Without a national utilization strategy, multiple stadiums may compete for the same events, diluting revenue. Purpose-built specialization and centralized scheduling can mitigate overlap

To safeguard long-term returns, a centralized utilization strategy should be adopted, that clearly defines the role of each stadium within the national network. Without this level of differentiation, venue clustering in major cities risks driving event overlap, underutilization, and revenue dilution—turning world-class assets into stranded investments.

Unlocking Long-Term Stadium Value

Once mega-events end, the challenge will no longer be infrastructure delivery, it will be legacy delivery. Stadium investments must remain active, relevant, and financially sustainable long after the event banners come down. With over billions committed to infrastructure, these venues must evolve into long-term economic and cultural assets—not seasonal monuments.

Historically, stadiums have relied on matchday-driven revenues, ticketing, sponsorship, naming rights, and concessions. While these income streams remain vital, they are no longer sufficient. To realize year-round returns and reduce underutilization risk, new layers of monetization must be unlocked. This includes hosting business expos, digital competitions, and concerts; creating immersive museums and branded retail districts; and enabling community-driven activities like pitch rentals and educational programming.

The next section explores stadiums can diversify their revenue—layering traditional models with premium, non-traditional, and future-focused channels, while leveraging technology and financing strategies to build commercially resilient, multi-use venues.





3

Sustaining Stadium Assets Through Multi-Channel Revenues

Understanding revenue constraints: Most earnings during mega events flow to event organizers

Stadium development strategy must be guided by a singular truth: infrastructure alone does not guarantee economic return. While traditional revenue streams help in recovering capital investment and support long-term operations, event specific infrastructure made for tournaments like FIFA World Cup limit these opportunities. Revenue from streams such as ticketing and F&B are usually taken by FIFA and other similar bodies, with the stadiums only recovering rental and event related costs.

Revenue sources for stadiums during events such as FIFA World Cup



Broadcasting Rights



Sponsorships



Ticketing



F&B Sales



Parking



Merchandising



Rental Income



Revenue received by FIFA

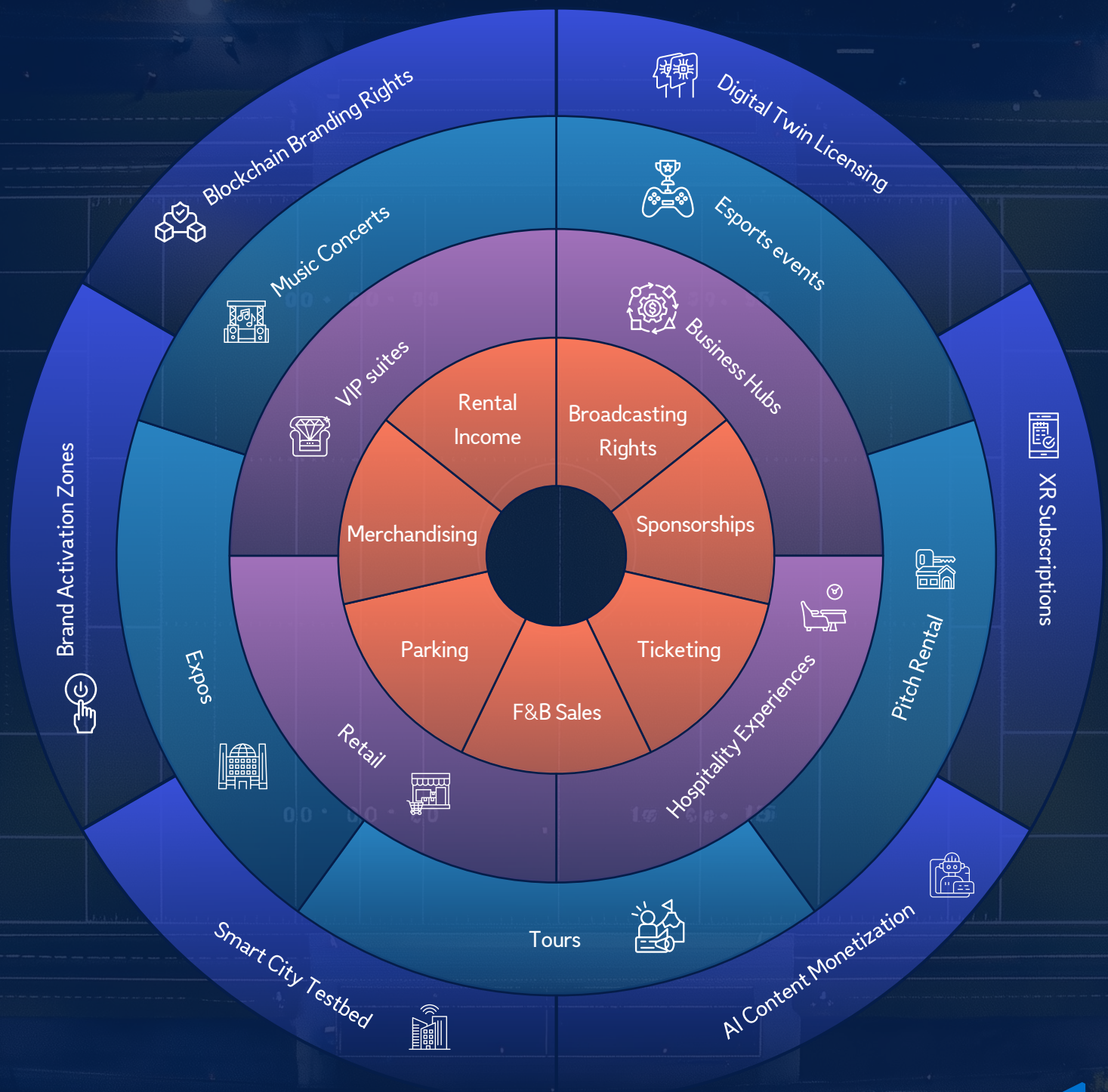


Revenue received by stadiums

Major event infrastructure often carries significant financial exposure, as revenue generated during the tournament typically accrues to sporting federations, making long-term post-event utilization the primary pathway for investment recovery

A multi-faceted revenue model must be developed post events to ensure financial viability and sustainability

As recuperating financial investment during major events is not feasible, it is imperative to focus on innovating traditional revenue streams while incorporating non-traditional and innovative revenue streams like digital twin licensing and hosting music concerts. By creating a diversified revenue model, stadiums can ensure long term financial sustainability through sustained stadium utilization.



Reimagining traditional revenue streams for long term returns

While major events limit access to traditional revenue streams, these streams become far more valuable once stadiums shift to regular operations. These legacy revenue models can serve as a bedrock of post event financial sustainability; however, they need to be reimagined through premium offerings, recurring event calendars and innovative experiences

Ticketing



Primary source of revenue across event types. Additional features like premium seats, exclusive ticket sections, can be introduced

Sponsorships



Sponsorship deals with companies to advertise across spaces like pitches, concourses, public areas, exterior spaces helps generate additional revenue

F&B Sales



Introducing pre and most match dining experiences, food halls and premium hospitality packages

Parking & Mobility



Paid Parking, VIP access lanes, charging infrastructure and other mobility services generate consistent additional income

Naming Rights



High value, long term revenue streams that span over 10-20 years and helps increase stadiums visibility through co-branding

Merchandising



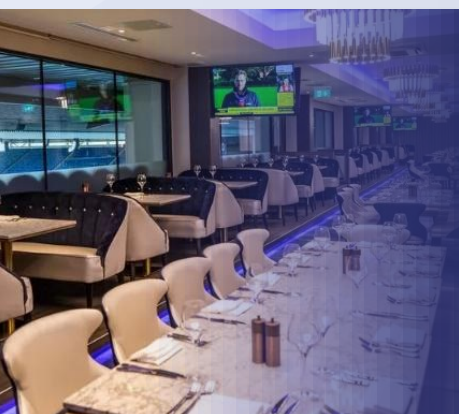
On site retail stores selling exclusive merchandise, not limited to specific events

A sample of revenue streams and relevant models

Traditional revenue streams form the financial foundation for most stadiums, they are often event-dependent and limited in scalability. To ensure long term profitability and year-round utilization, stadiums must go beyond the conventional

Unlocking high-margin value through premium seating experiences

Premium seating is one of the highest-yield assets in any modern stadium. By designing for exclusivity from the outset—through sky lounges, executive suites, and field-level access—stadiums can capture outsized while elevating its position as a global venue for elite sports and entertainment experiences.



Sky Lounges



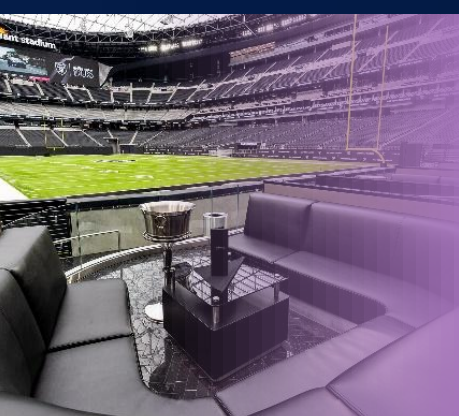
- › Panoramic views ideal for corporate gatherings and premium experiences
- › Customizable interiors to cater to brand activations and private events
- › Seamless access from VIP entrances, valet zones, and private lifts



Executive Suites



- › Exclusive tiered boxes designed for VIP clients
- › Tailored interiors to suit private hosting and personalized events
- › Direct entry via private corridors, offering enhanced privacy and comfort



Field Level Seating

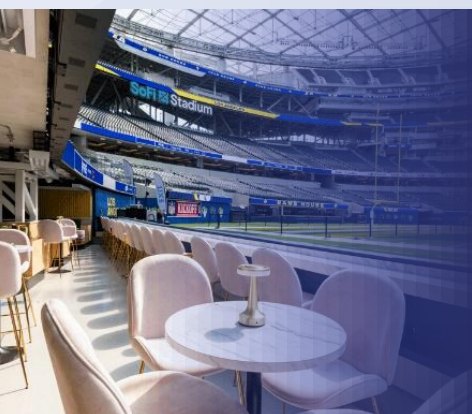


- › Premium pitch-side seating offering immersive, close-up views of the action
- › Personalized service with dedicated staff and in-seat dining options
- › Direct access to exclusive lounges and private corridors for added convenience

The most commercially successful venues derive most of their income from VIP experiences, lounges, and hospitality tiers. Across major markets, hospitality lounges, private suites, and executive boxes account for up to 40–50% of total stadium revenue, despite representing only 5–10% of seat capacity. Premium hospitality must be embedded at the core of stadium design, not as an afterthought.

Transforming stadiums into prestige-driven, all-day destinations

The premium experience doesn't end at the seat. By integrating hospitality lounges, business hubs, personal concierge services, and curated dining, stadiums can become immersive destinations that attract corporate partners, VIPs, and high-value audiences—driving loyalty, reputation, and year-round monetization.



Business Hubs and Meeting Pods



- › Co-located spaces for pre-event corporate engagements
- › Integration with conferencing, hospitality, and matchday experience



Personal Concierge Services



- › Bespoke ticketing, pre-ordered merchandise, personal guides, and transport bookings
- › AI-powered loyalty programs for elite fan clusters



VIP Lounges and Dining



- › Chef-curated dining, private bars, cigar rooms, and pre-event networking spaces
- › F&B designed by global chefs or partner restaurants to ensure exclusivity



Case in Point :
Sofi Stadium,
California, USA



SAR 563 Mn

Revenue generated from
premium seat licenses



250 luxury suites

Climate-controlled cabanas & executive-level
lounges catered by Michelin-star chefs

Expanding the Revenue Universe Beyond Traditional Revenue Streams

While premium suites and lounges capture top-tier value, stadiums must also broaden their commercial reach. From esports and expos to music and media, activating these new formats will allow stadiums to tap into diverse audiences, attract year-round events, and build new economic linkages.

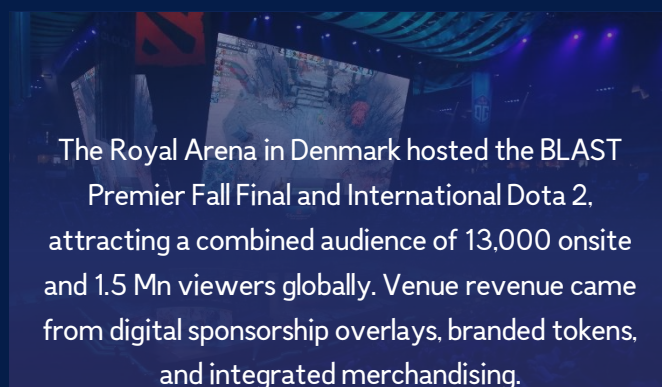
What can be done?

Case Study



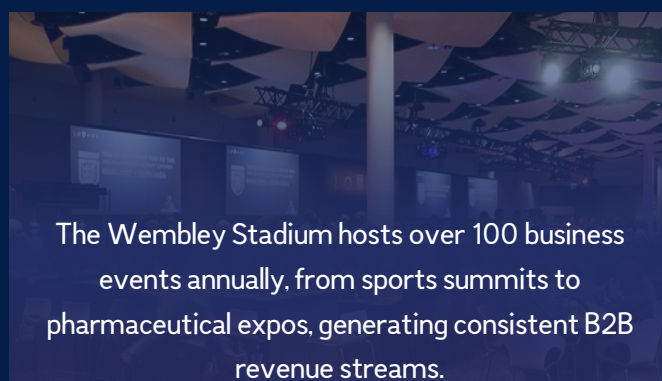
Esports and Digital Competitions

- Hosting international gaming tournaments and hybrid VR experiences
- Stadium-as-studio configurations with high-speed connectivity and immersive backdrops
- Co-branded AR activations and digital collectibles sold onsite and online



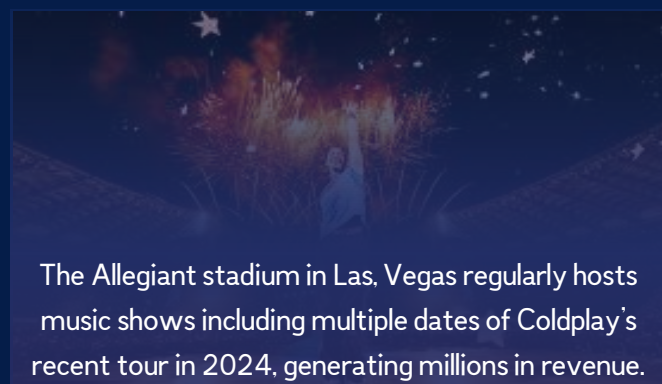
Corporate Expos and Global Summits

- Conversion of stadium floors into modular expo halls
- Integrated branding zones, networking terraces, and plenary stages
- Partnership with tourism boards to align with MICE strategy



Music Concerts

- Hosting globally renowned artists and large-scale music events to diversify audience profiles
- Multi-day residencies and festival-style programming to maximize stadium utilization
- Integrated hospitality packages bundling premium seating with exclusive backstage access



Embedding everyday relevance through community, culture, and commerce

Long-term success lies not just in headline events, but in making stadiums relevant every day. By integrating civic uses, immersive storytelling, and destination retail, it is possible to create stadiums that are constantly utilized in, not just visited occasionally –delivering both financial returns and cultural impact well beyond sports.

What can be done?

Case Study



Community Integration and Rentals

- Affordable pitch rentals for local leagues, corporate sports, or school events
- Hosting large-scale festivals, cultural programming, and public screenings
- Dynamic pricing based on demand, time of year, or event profile



The Johan Cruyff Arena in Amsterdam hosts annual 14K charity runs, local tournaments, and youth camps – positioning itself as a civic asset while generating revenue.



Stadium Tours and Immersive Museums

- Augmented tours, virtual avatars, interactive exhibits
- Branded content (e.g., behind-the-scenes access, historical moments, metaverse integration)
- Monetized through ticketing, retail, and digital subscriptions

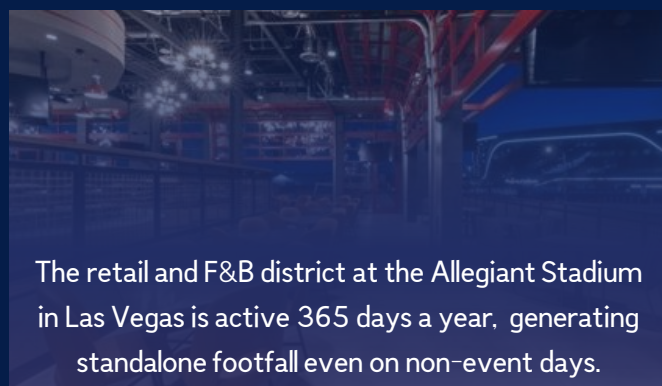


The FC Barcelona Museum, brings over 1.6 Mn annual visitors, generating more revenue than some matchdays. The museum has integrated technology such as VR storytelling to increase visitor spend



Retail Activation and Dining Districts

- Year-round destination retail embedded within stadium footprints
- Licensing of F&B spaces to global and local brands with tiered rental models
- Launchpads for limited-edition merchandise, digital twin tokens, and fan loyalty programs



The retail and F&B district at the Allegiant Stadium in Las Vegas is active 365 days a year, generating standalone footfall even on non-event days.

Deepening the Revenue Play: Digitally Enabled and Experimental Models

Building on non-traditional revenue streams, stadiums can further expand their commercial footprint by tapping into digitally enabled and experimental models. These emerging concepts can allow stadiums to turn into monetizable platforms for innovation, content, and next-generation experiences.

Revenue Streams



Monetized Digital Twin Licensing

- Stadiums create hyper-realistic digital twins for use in gaming, virtual tourism, metaverse events, and simulation training
- These environments can be licensed to developers, brands, or e-sports leagues

Licensing fees, in-metaverse purchases, virtual event rentals



AR Venue Subscriptions for Remote Fans

- Fans subscribe to immersive mixed-reality experiences that allow them to <enter> the stadium through AR glasses
- Different tiers could include live AR commentary or avatar meet-and-greets

Monthly subscription packages and premium digital experience tiers



AI-Generated Content Monetization

- AI generates customized content (match highlights, player cams, fan POVs) in real time, personalized for each fan
- Stadiums can sell or license these streams to fans, brands, or content platforms

On-demand microtransactions, branded AI-content partnerships



Stadium-as-a-Testbed for Smart City Prototypes

- With their density, connectivity, and diverse usage, stadiums can serve as live testbeds for companies piloting urban technologies like autonomous mobility, energy systems, behavioral AI, or public robotics

Paid innovation sandbox programs, urban tech partnerships



Personal Brand Activation Zones

- Fans lease micro-spaces within stadiums to display their personal brands, NFTs, fan art, or community content during non-match days, transforming concourses into fan-generated digital galleries or micro-retail pods

Micro-leasing, creator monetization, peer-to-peer stadium commerce



Financing for sustainability: public-private partnership (PPP) models

To ensure long-term commercial viability, structured PPP models can be adopted that allow the government to share financial, operational, and utilization risk with experienced private sector players.

Model			
	 Public Ownership, Private Build	 Design, Build, Finance, Maintain (DBFM)	 Build-Operate-Transfer (BOT)
Description	Government avoids upfront capex but takes on utilization and operations; private sector exits post-construction.	Government pays concession fee, private partner responsible for long-term upkeep and efficiency; revenue depends on meeting stadium service KPIs.	Government finances construction and leases to private sector, private operator drives events, bookings, and partnerships to recoup investment
Cost impact on government			
Operational Complexity			
Partner Revenue Potential			
Case Studies	 <p>Levi's Stadium (San Francisco), developed by Turner & Devcon for the Santa Clara Stadium Authority</p>	 <p>Kyoto Arena (Japan), governed by Kyoto prefecture, is delivered and maintained by ITOCHU Corporation</p>	 <p>London Olympic Stadium, owned by London city, operated by West Ham United with fixed fee and a profit-share model</p>

To safeguard long-term financial sustainability, PPP models can be proactively explored to balance operational complexity with risk-sharing efficiency. By selectively adopting DBFM or BOT models, countries can attract experienced global operators, reduce public sector cost burdens, and ensure that stadium upkeep and utilization remain commercially viable.

Powering the Vision Forward

Through premium suites, multi-use programming, immersive retail, stadiums are being reimagined as more than sports venues. They are evolving into year-round engines of economic, cultural, and digital activity. Yet, the success of this transformation hinges not just on what these stadiums contain, but on how intelligently they operate. As revenue models diversify and audience expectations rise, the stadiums of tomorrow must be as smart as they are spectacular.

To achieve this, stadiums must embed intelligence across their lifecycle—activating technologies that not only reduce cost but also elevate every touchpoint of the fan journey. From real-time crowd management to predictive maintenance, personalized fan experiences to autonomous operations, artificial intelligence will be the silent orchestrator behind world-class performance. The next section explores how AI and advanced technologies will form the nervous system of the next-generation stadium infrastructure—driving efficiency, security, and profitability at scale.



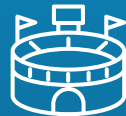


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**Enhancing Operational Efficiency
and Fan Experience through AI
Technologies**

Technology will help stadiums unlock value at each stage of the event lifecycle

As stadiums transition from single-purpose sports venues to integrated, multi-use public infrastructure, the use of technology will be essential to enhancing both operational performance, and visitor satisfaction across lifecycle of events. Technologies such as AI will be central to powering the stadiums of the future, while other emerging technologies such as digital twins and IoT will play a key role in enabling the AI infrastructure



Pre-Event

Before the event begins, technology can help stadiums optimize operations, and maximize early revenue through predictive planning,



Event Planning & Scheduling

During Event

Technology can power real-time decision-making, enabling seamless crowd control, dynamic service delivery, and personalized fan engagement at scale



Venue Operations and Crowd Management



Ticketing & Access Control



Fan Engagement & Experience



Merchandising and Retail

Post-Event

Technology can streamline recovery operations and minimize waste by triggering tailored follow-ups, maintenance routines



Post Event Turnaround



























Facility Management

Stadiums of the future will be powered by AI systems embedded at every stage of their lifecycle

AI is set to become a transformative enabler for stadiums across the event value chain, redefining how venues are operated, and experienced. The use of AI will allow stadiums to operate with greater precision, resilience, and profitability, making them smarter, greener, and more commercially viable over the long term.

Across the event lifecycle, AI can be used to help stadiums deliver unmatched performance and fan experience

	Stage	Use case	
Pre-event	 Event Planning & Scheduling	 Smart scheduling	 Event plan and blueprint generation
	 Venue Operations and Crowd Management	 Autonomous environmental control	 Adaptive stadium zoning and real-time crowd flow optimization
During Event	 Ticketing & Access Control	 Contactless entry and predictive gate allocation	 Identity verification and entrance monitoring
	 Fan Engagement & Experience	 Personalised immersive experiences	 Synchronized crowd engagement
	 Merchandising and Retail	 Personalized Retail & F&B Recommendations	 Autonomous checkout
Post-Event	 Post Event Turnaround	 Autonomous Post-Event Cleaning & Reset  Centralized Operations Dashboards with AI Insights	 Real time Waste Management and Recycling Optimization  Predictive Maintenance with AI and IoT
	 Facility Management	 Idle Period Asset Optimization	 AI-Driven Recommissioning and Micro-testing



Tech Spotlight

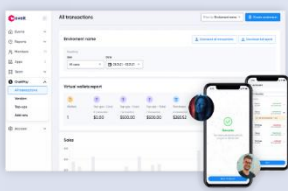
AI-Driven Fan ID systems integrate identity, preferences, and movement data to personalize fan experiences and streamline crowd and venue operations in real time

Leveraging AI to optimize event planning and access control

Use Case

Impact

Smart scheduling



AI is used to analyze historical ticket sales, local calendars, weather data, public transport information, and fan interest to predict demand and pick optimal event dates



- Avoids scheduling conflicts
- Boosts attendance
- Ensures events occur at times likely to attract large audiences

Event plan and blueprint generation



AI can generate detailed event plans and operational blueprints by analyzing historical event data and simulating expected demand to identify optimal configurations for staffing



- Streamlines event management
- Enhances safety and overall fan experience

Autonomous Environmental Control



Stadiums can autonomously adjust lighting, ventilation, and temperature for comfort and energy efficiency using AI, using real-time data on crowd density, movement, and climate



- Reduces energy waste through usage-based operations
- Maintains comfort by aligning systems with real-time demand

Adaptive Stadium Zoning and Real-Time Crowd Flow Optimization



AI can enable dynamic spatial rezoning, adjusting walkways, seating layouts, and staff deployment using real-time insights on crowd density, movement patterns, and event dynamics



- Reduces congestion and improves fan flow
- Activates underused spaces for a more responsive venue

How AI elevates in-stadium experiences and optimizes real-time crowd management

Use Case	Impact
<div><div>Contactless entry and predictive gate allocation</div><div><p>AI can use facial recognition and biometric data for contactless entry, predicting crowd flows and dynamically assigning gates to reduce wait time</p></div></div>	<ul style="list-style-type: none">• Reduces wait times• Minimizes congestion• Enhances security• Streamlines entry processes
<div><div>Identity verification and entrance monitoring</div><div><p>AI with biometric and contactless technologies, can automate identity verification, flag individuals & detect unauthorized entry in real-time, reducing the need for large security teams</p></div></div>	<ul style="list-style-type: none">• Improves crowd control• Minimizes disruptions (e.g., pitch invasions, controversial displays)
<div><div>Personalized Immersive Experiences</div><div><p>AI can learn fan preferences through historical behavior, seat location, live match events, and emotional cues in real-time, enabling the delivery of hyper-personalized AR content</p></div></div>	<ul style="list-style-type: none">• Delivers personalized, engaging in-stadium experiences• Strengthens fan connection• Encourages repeat attendance
<div><div>Synchronized Crowd Engagement</div><div><p>Using real time inputs including crowd noise, motion patterns, and mobile activity, AI can trigger synchronized lighting, sound, and visual effects across the stadium</p></div></div>	<ul style="list-style-type: none">• Engages fans as active participants• Enhances the overall matchday experience

Using AI to personalize stadium retail and accelerate turnaround between events

	Use Case	Impact
During Event	Personalized Retail & F&B Recommendations  <p>Using AI and Big Data enabled apps, stadiums can deliver personalized promotions based on fan preferences, purchase history, seat location, and event context such as goals or milestones</p>	<ul style="list-style-type: none"> Boosts fan engagement with targeted offers Increases spending through personalized promotions
	Autonomous checkout  <p>Stadiums can use AI-powered autonomous checkout systems with facial recognition or biometric authentication for fast, contactless purchases</p>	<ul style="list-style-type: none"> Reduced congestion during peak times Shortens wait times Improves crowd flow
Post Event	Autonomous Post-Event Cleaning & Maintenance  <p>AI-coordinated drones with computer vision can be used to perform rapid post-event cleaning and repair by accessing high-traffic and hard-to-reach areas and detecting damage</p>	<ul style="list-style-type: none"> Accelerates turnaround time between events Keeps venues event-ready with minimal downtime
	Real time Waste Management and Recycling Optimization  <p>Stadiums can enhance waste management and recycling efficiency through real time data from smart bins and IOT sensors to predict bin fill levels and optimizing collection routes</p>	<ul style="list-style-type: none"> Reduces operational costs Reduces waste buildup Supports sustainability goals

Optimizing maintenance and operations with AI-powered infrastructure intelligence

Use Case

Impact

Centralized Operations Dashboards with AI Insights



AI-powered dashboards can integrate data from maintenance, security, energy, and crowd systems to provide real-time insights and automated alerts



- Streamlines decision-making processes
- Enhances resource allocation and improves overall operational efficiency

Predictive Maintenance with AI and IoT

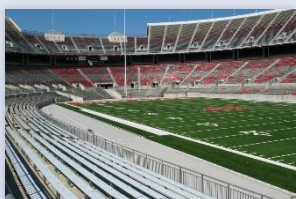


AI can analyze data from IoT-enabled sensors in stadium systems (like HVAC and lighting) to detect anomalies, predict failures, and schedule preventive maintenance



- Minimizes downtime and extends asset lifespan

Idle Period Asset Optimization

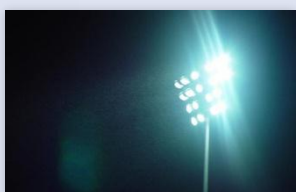


Idle infrastructure (e.g., escalators, lighting systems, HVAC zones) can be monitored using AI, and be automatically shut down or scaled back to conserve energy and reduce wear



- Lowers operational costs by optimizing usage
- Reduces unnecessary equipment operation, extending asset lifespan

AI-Driven Recommissioning and Micro-testing



Before reactivating for major events, AI systems can run autonomous micro-tests across all operational infrastructure, lighting, acoustic checks, HVAC stress tests, and more



- Ensures full functionality before venue reopening
- Reduces need for manual inspections
- Enables fast venue recommissioning

Tech Spotlight:

Utilizing AI driven Fan ID to enhance fan experience and operational efficiency

With a proven track record in major tournaments, Fan IDs are transforming the fan experience by streamlining access, enhancing safety, enabling personalized engagement, and simplifying event-day logistics



Interactive Engagement

Fans unlock AR games and AI-driven personalized experiences using their Fan ID, enhancing event interaction



Fan Verification

Biometric Fan IDs allow quick and accurate identity checks, ensuring seamless stadium access and entry only for legitimate fans



Smart Pre-Orders

Fan IDs facilitate instant food and merchandise purchases, with AI predicting fan preferences for faster service



Crowd Flow Optimization

AI analyzes Fan ID check-ins in real time to manage congestion and streamline fan movement within the venue



Loyalty Programs

Fan IDs track purchases and attendance, enabling personalized offers and rewards



Ticket Fraud Prevention

By linking tickets to unique Fan IDs, events can prevent ticket scalping, duplicate entries, and fraud

Hayya Card in FIFA World Cup Qatar 2022



- Qatar launched the **Hayya Card** during the **FIFA World Cup 2022** as a mandatory fan identification system to streamline entry into the country, provide access to stadiums and public transport, and enhance visitor experience
- It served as a **unified digital pass** offering visa-free entry, event access, accommodation support, and cultural benefits, reflecting Qatar's efforts to deliver a seamless and memorable tournament experience

Technology Use Cases



Access Control

Fan ID tech enabled faster stadium entry by replacing barcode scanning with RFID, reducing congestion



Fan Verification

RFID-based Fan IDs allowed security teams to quickly and reliably verify ticket holders across the venue



Crowd Monitoring

Real-time data from RFID helped monitor crowd movement and allocate resources strategically


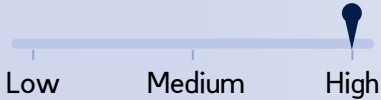










Enhanced Fan Engagement

Offered information on events, venues, and tourist attractions, fan zones contributing to a more informed and engaging fan journey

Technology such as IoT, and digital twin will be key enablers to AI powered stadiums

IoT, biometric technologies, and 5G will play a key role in forming the foundational infrastructure that will allow AI to function at scale across stadium operations enable real-time monitoring, predictive infrastructure management, and seamless fan connectivity

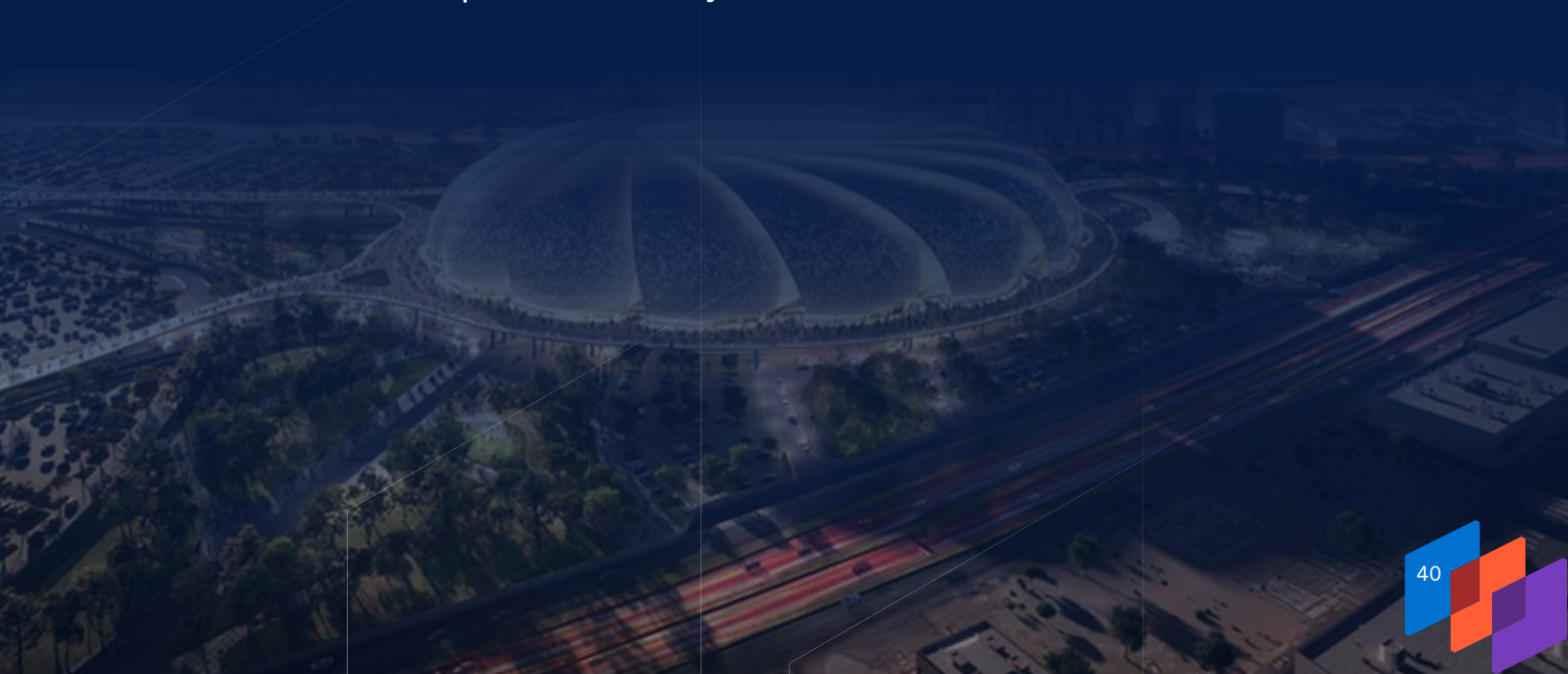
Technology	Importance	Criticality
 IoT (Internet of Things) Sensors	Will act as the primary data source for AI by continuously capturing real-time information on foot traffic, temperature, equipment usage, air quality, and waste levels	
 Biometric and Contactless Access Technologies	Will feed AI systems with identity, location, and behavior data that helps automate and personalize access control, loyalty tracking, and service delivery	
 5G and Edge Computing	Provide the high-speed, low-latency infrastructure required for AI to process and act on data in real time, especially during live events with high demand	
 Digital Twin	Serves as a virtual environment for AI to simulate operational scenarios before they are deployed in the real stadium	
 Blockchain	Will ensure trust, transparency, and traceability for AI-powered systems—especially in ticketing, identity management, smart contracts, and micropayments	

Conclusion

KSA's stadium development program has laid a solid foundation for a new global standard in sports infrastructure, one centered on flexibility, technology integration, sustained utilization and long-term public value. The next chapter is operationalizing this vision: transforming capital-intensive infrastructure into intelligent, adaptive ecosystems that deliver sustained performance beyond flagship events.

Artificial intelligence will be a critical catalyst in this evolution. From optimizing scheduling and gate allocation to enhancing energy efficiency, retail operations, fan engagement, and visitor experiences, AI can shift stadiums from static assets to dynamic, data-driven multi-use assets. To unlock this potential, AI must be embedded not as an add-on, but as a core layer of stadium operations—integrated into facility design, management protocols, and commercial strategies from the outset.

Unlocking a sustainable future for stadiums requires a fundamental shift in operating models—embedding AI-driven intelligence throughout the entire stadium lifecycle. This entails strengthening data infrastructure, ensuring seamless system integration, and fostering innovation partnerships that extend well beyond individual events. The goal is no longer just to host world-class tournaments, but to reimagine stadiums as adaptive, high-performing civic platforms that deliver enduring economic, social, and operational value year-round.



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