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The stadium as a platform
A new model for integrating venue technology into sports business

The ancient Greeks built the world's first known stadium at Olympia in the 8th century BC. It consisted of a simple track surrounded by mud-formed seats and a single stone stand for judges to observe the games dedicated to Zeus. The largest surviving ancient Greek stadium, the Panathenaic Stadium, today holds 45,000 in its all-marble seats surrounding a narrow track. By the time the first purpose-built stadiums for today's most popular sports were constructed, little had changed—the first stadiums were simple ballfields with grandstands (now made from wood) on the side.

Much has changed in the years since, such as expansion of seating capacity, the rise and fall of multi-purpose "concrete donuts," and new stadium construction moving to relatively cheap land in the American suburbs. But most sports venues still offer the same basic design, an analog experience with the game as the single focus of attention.
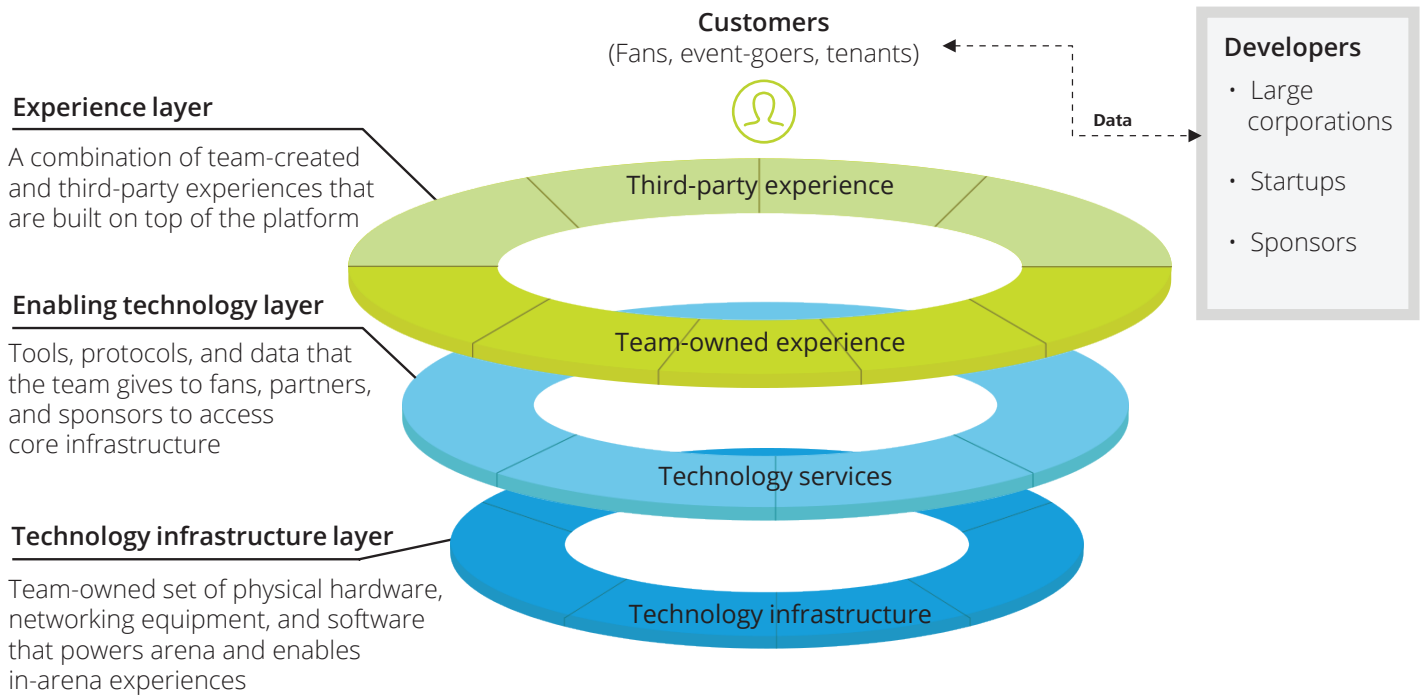
Today a new dominant model is emerging. Geographically, new venues are moving back to the city, anchoring larger mixed-use real estate developments and creating "arena districts" that reshape commercial activity in the neighborhood. Meanwhile, fans are playing an increasingly important role in shaping and directing the experience—interacting with teams and players in new ways on the field, in the concourses, and outside the stadium.

Concurrent to these trends in stadium construction, over the past fifty years, transformative advances in consumer technology have occurred. Increases in computing power and the shift to mobile and cloud computing as the dominant paradigm have fundamentally reshaped commerce. Today's smartphone owner carries a device with processing power that would have required a computer the size of a stadium fifty years ago.

These trends are increasingly converging. With bits and atoms coming together, the sports industry is moving toward a new model in which the stadium is a technological and commercial platform. This change subverts the traditional way of thinking about the stadium experience. It is no longer enough to only consider the role of sightlines, seat width, and the price of beer. Teams need to engage their fans and event-goers to encourage them to shape their own experience. While the platform concept requires an organizational and operational mindset shift for teams and stadium operators, teams that embrace it in stadium design, construction, and operation will be on the vanguard of offering their fans the best experience in the stadium of the future.

Three layers of the stadium technology "stack"

The concept of the stadium as a platform comprises three "layers" of infrastructure, resources, and activities that work together to enable stadium operators and teams to create new experiences for all visitors, regardless of the event.

Customers
(Fans, event-goers, tenants)

Developers
- Large corporations
- Startups
- Sponsors

Data

Experience layer

A combination of team-created and third-party experiences that are built on top of the platform

Third-party experience

Team-owned experience

Enabling technology layer

Tools, protocols, and data that the team gives to fans, partners, and sponsors to access core infrastructure

Technology services

Technology infrastructure layer

Team-owned set of physical hardware, networking equipment, and software that powers arena and enables in-arena experiences

Technology infrastructure

Technology infrastructure

The modern stadium is a technological marvel, with thousands of access points and hundreds of miles of networking cable installed in a large and complex building footprint. The technology infrastructure layer comprises the full set of physical hardware, networking equipment, and operational software that serves as the venue's foundation. This is the layer that requires significant investment–often tens of millions of dollars–by the stadium owner and team to install and maintain. Included in this layer are elements like:

- Wi-Fi access points and distributed antenna systems to provide fans connectivity on their mobile devices
- Networked hardware / beacon technology to enable location-based service to fans and stadium operations staff
- Connected, immersive display hardware that can turn all parts of the arena into interactive screens
- Venue-wide enterprise resource planning systems to integrate in-stadium functions like operations / facilities, retail point of sale, customer service, ticketing, and social media
- Data ingestion, processing, output, and visualization systems that can integrate stadium and game data, package it into fan-friendly formats, and display across a range of devices
- Purpose-built handheld equipment for stadium operations staff
- Systems integration solutions that enable stadium technology to integrate with its surrounding environment, including broadcast systems, nearby retail / dining, and municipal transit systems
- Retail point of sale equipment and other commerce engine infrastructure that can handle a wide range of transactions, payment types, and processing systems

### PRECURSOR: Avaya Stadium (San Jose Earthquakes)

The San Jose Earthquakes, together with stadium sponsor Avaya, created a "fan engagement wall," a permanently-installed digital, interactive screen that displays fans' social media posts and statistics throughout the game.

The team and stadium have also adopted a social media analytics tool that allows them to understand fan sentiment about the team, the game, the stadium experience, and display content relevant to what is happening on the field.

Fans' social media posts are captured and analyzed using social listening technologies and social media analytics platforms to get a more accurate and real-time gauge on the fan experience and identify any operational issues quickly for resolution by venue employees.

Future applications

- How can teams engage with their fans' social media without massive new technology implementation through use of existing infrastructure?
- What do fans want to see? Highlights, commentary, player comments or opinions and / or, takes as action unfolds on the field
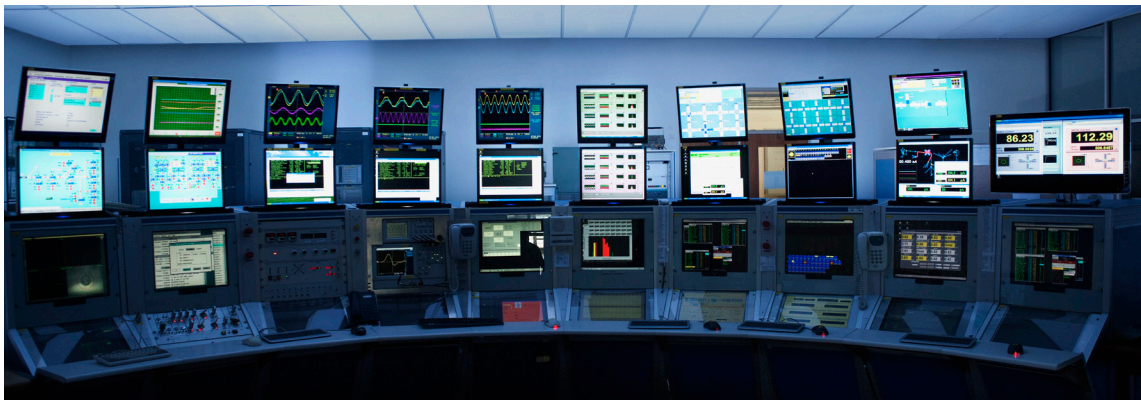
Enabling technologies

While a strong technology foundation is critical to providing the fan service that is expected in modern stadiums, the potential for transformative value creation lies in opening up the stadium to allow fans and other partners to build on top of the technology and sport infrastructure of the stadium. Moving up the stack, enabling technologies include the tools, protocols, and data that teams and venues provide to fans, partners, and sponsors to access the core infrastructure. Included in this layer are elements like:

- Application programming interfaces (APIs) that allow developers to build apps and other solutions using stadium information, such as game / event schedules, seating maps, amenity locations, and ticket prices
- Identity management tools to give each fan a unified credential for use in every transaction and touchpoint including arena entry as well as the purchase of tickets, concessions, and merchandise
- Audio and video feeds that capture fan-created content for integration into social media, in-stadium promotions, and game broadcasts
- Social listening / analytics solutions that give teams and venues the immediate "voice of the fan" regarding the stadium experience and any operational problems that may arise, for immediate resolution

PRECURSOR: Amazon Echo

The Echo, a wireless speaker and voice command device, is a hub that allows users to access Alexa, Amazon's virtual assistant that responds to commands including placing Amazon orders, maintaining wish lists, searching for information, and streaming music.

The Echo's ecosystem is connected to Amazon's media services (like Prime Music), hardware (Kindle), and e-commerce storefront for a seamless user experience.

Open sourced Amazon "skills" give users and developers an open API to program new actions and settings for the Echo to incorporate, ranging from home temperature control to controlling lights to health and hospital integration (e.g., asking Alexa "My child has a 101 degree fever, should I be concerned?).

Future applications
- Build out additional hardware compatibility to create a truly connected home, store, or venue; all devices connected through a unified cloud
- Provide in-store to customers via virtual assistants that "live" on shop floors and can answer questions and provide services

PRECURSOR: Disney World

Guests are provided RFID enabled "MagicBands" containing all Disney information from hotel room keys to park admission to fastpasses MagicBands are linked to customer credit cards so that they may use bands to purchase concessions, souvenirs, and photos throughout the park.

Guests receive custom tailored offers based on a linked Disney Experience Profile containing past purchase information as well as user selected preferences.

Future applications
- Big data accumulates through the use of the band providing numerous opportunities for vendors to further increase the level of personalization utilized for in-stadium offers and promotions
- Mobile integration offers possibility to reduce overhead and allow customers to access information outside of the park from the comfort of their own devices

PRECURSOR: US Bank Stadium (Minnesota Vikings)

The stadium's app will provide traffic conditions and parking alerts that direct fans to the least congested stadium entrances as well as up-to-the-minute statuses on the least crowded bathrooms and concessions.

Specific kiosks will allow users to utilize their phones for entry and then receive turn-by-turn directions to their seat.

Push notifications will deliver in-game deals and promotions.
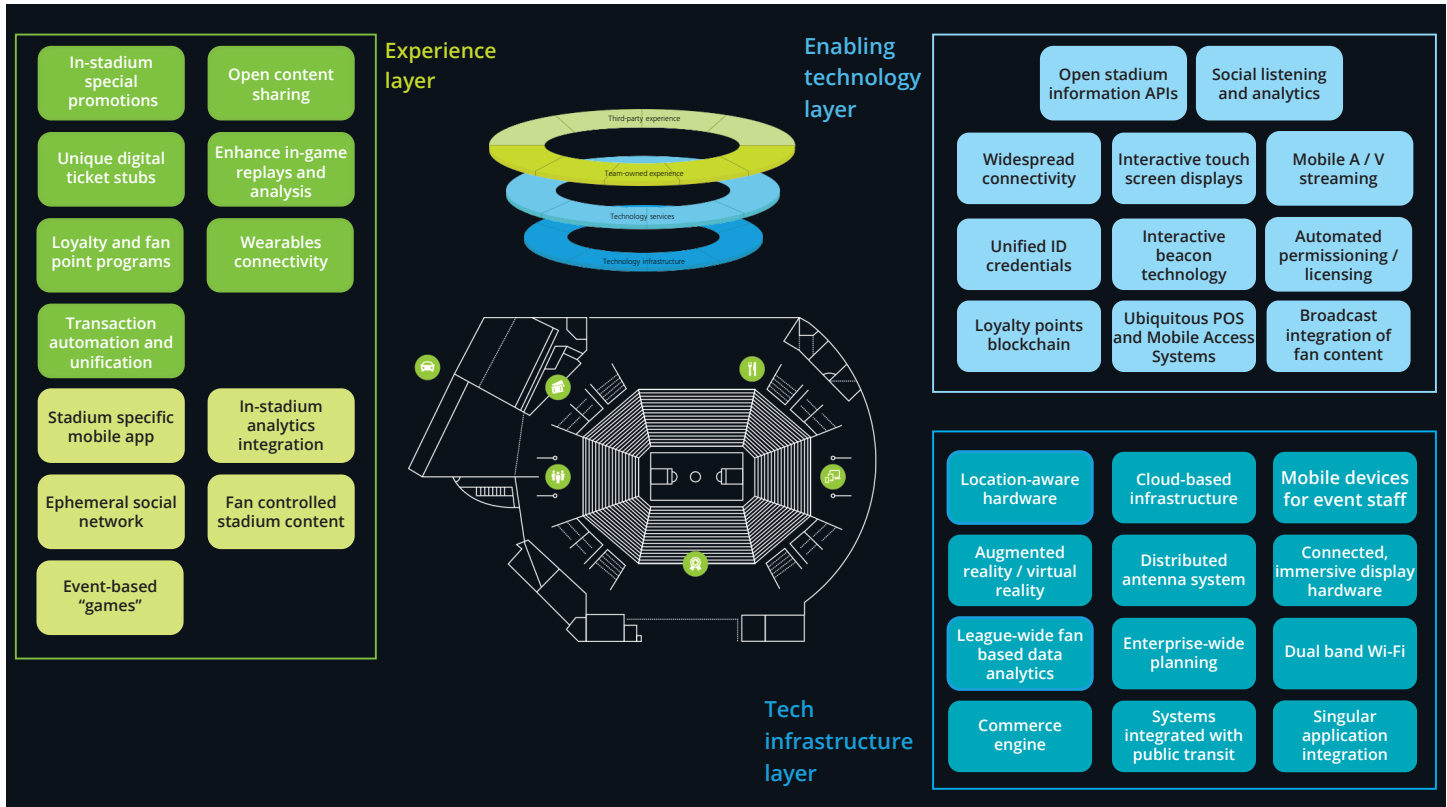
Future applications
- How can additional API's (Google Maps, Uber, social media feeds) be integrated into apps to create a more seamless mobile experience?
- Mobile apps open several revenue streams including paid targeted marketing and team-directed ecommerce
- There is opportunity for league-wide apps to leverage common protocols and increase application and stadium adoption

Experience layer
The top layer of the stack is where fans live: the fan experience layer comprises all of the devices, apps, activities, and commercial transactions that fans bring to the stadium and use before, during, and after the game. Venues and teams—particularly their marketing and fan engagement groups—continuously seek to develop and improve in this domain. Teams have recently created a host of new touchpoints to improve the fan experience on mobile devices. These include elements like:
- Team and stadium mobile apps that give fans critical information about the venue and the game such as the location of seats, concessions, and other stadium amenities
- Mobile commerce and payment solutions for food and beverage ordering / delivery and in-stadium retail
- Mobile ticketing that allows fans to scan their phone for entry and creates "virtual ticket stubs" or a digital journal of their attendance history
- Fan loyalty and rewards programs that offer repeat visitors special offers and unique access
- Integration with social media to make it simple for fans to share content with one another in the arena and with friends at home

Experience layer

In-stadium special promotions	Open content sharing
Unique digital ticket stubs	Enhance in-game replays and analysis
Loyalty and fan point programs	Wearables connectivity
Transaction automation and unification	
Stadium specific mobile app	In-stadium analytics integration
Ephemeral social network	Fan controlled stadium content
Event-based "games"	

Enabling technology layer

Open stadium information APIs	Social listening and analytics	
Widespread connectivity	Interactive touch screen displays	Mobile A / V streaming
Unified ID credentials	Interactive beacon technology	Automated permissioning / licensing
Loyalty points blockchain	Ubiquitous POS and Mobile Access Systems	Broadcast integration of fan content

Tech infrastructure layer

Location-aware hardware	Cloud-based infrastructure	Mobile devices for event staff
Augmented reality / virtual reality	Distributed antenna system	Connected, immersive display hardware
League-wide fan based data analytics	Enterprise-wide planning	Dual band Wi-Fi
Commerce engine	Systems integrated with public transit	Singular application integration

The transformative potential of a stadium platform, however, rests in opening up the stadium and its hardware / software infrastructure to developers, sponsors, and users to build upon. The result is a set of third-party experiences that complement what the team can deliver. While a team is focused on delivering the best possible game experience to its fans, it can't be all things to all people. Giving developers access to stadium infrastructure allows the team to benefit from the creativity of many. Examples of third-party experiences could include:

- Recreating the stadium in virtual reality to expand the in-game fan experience beyond the walls of the venue
- Visualizing player and game data over the field through augmented reality displays
- Creating a "game within the game" system where fans bet virtual currency (or, using bitcoin / blockchain, real currency) on in-game events, or use stadium-provided technology for other micro-transactions

- Democratizing in-stadium content by giving control over stadium elements (in-game signage, music, video messages) to the fans
- Including ephemeral social networks that strengthen the temporary connections between fans in the stadium based on their shared in-game experience
- Putting advanced analytics in the stands by integrating in-game data into the fan experience through data visualization

Building a platform to bring the latest advances in consumer technology into the stadium can sound incredibly appealing, especially as a way for the stadium to compete with fans' watching the game at home. After all, these technologies can be used just as easily outside of the stadium. Stadium operators, however, need to be conscious of what it takes to build a platform and the changes in operating mindset and organizational behavior it entails.

Creating and building on the stadium platform

The fundamental economic changes of "software eating the world"—especially exponential decreases in production costs and distribution costs driven by the Internet—have increased the strategic value of platforms in every industry, including sports and entertainment. For every attempt to create and scale a new platform, though, there may be even more competing definitions on just what a platform *is*. In thinking of how stadium technology will change the fan experience, we use a possibly apocryphal definition attributed to Bill Gates—a commercial platform exists when the economic value of everybody that uses it exceeds the value of the company that creates it.[1]

Transforming the stadium into a platform means "opening up" the stadium to third parties, including developers, sponsors, and advertisers. This transformation carries with it significant changes for the stadium business model. For example, the economics of a platform are very different from solely selling a stadium experience, an event surrounded by adjacent businesses like concessions and retail, for the price of a ticket. In this new model, the stadium owner is not just the operator of the venue, but also the architect and manager of the platform. While this shift carries risks, there is also significant opportunity to create new sources of value for fans and partners alike.

Building a platform: Lessons from Apple

One of the foremost examples of a company adopting a platform strategy is Apple's evolution from selling Macintosh® computers to architecting a platform around iOS mobile devices (the iPhone® mobile device, iPad® device, and Apple Watch® wearable device). Apple has created a common "infrastructure" layer consisting of Apple-made devices and the iOS operating system. On top of this layer, Apple's App Store® online store gives users access to millions of apps that essentially individualize the iPhone experience and functionality for every user.

The iOS / App Store platform is supported and grown by the tools and resources that Apple gives to developers to support and encourage building apps for the iPhone and iPad. While the iOS / App Store model may seem necessarily connected today, the first iPhone notably included only Apple-made apps, allegedly at the direction of Steve Jobs, who instructed early mobile developers to build Web apps. Apple changed course by 2008, allowing third-party apps, releasing the first iPhone Software Development Kit, and creating the App Store, laying the groundwork for what would become a $6 billion business in net revenue to Apple by 2015.

The network effect generated by growth in the number of Apple users on iOS devices has made the App Store a very desirable and profitable channel for software developers to sell their apps. At the same time, the presence of more and desirable apps in the App Store increases the attractiveness of the iOS ecosystem to phone users, reinforcing the value of the platform and encouraging iPhone purchases.

Apple made a critical, strategic choice in establishing a "walled garden" approach to the App Store: apps must comply with strict guidelines for content, design, and pricing, and are subject to Apple approval before appearing in the store. This rigorous governance process has a limiting effect on the quantity of apps available on the Apple platform and has also resulted in increased security and fewer iOS malware incidents relative to other computing operating systems. This approach allows Apple to maintain a unified user experience across iOS devices, consistent with the company's overarching product design approach.

[1] http://blog.semilshah.com/2015/09/17/transcript-chamath-at-strictlyvcs-insider-series/

There are three primary components to architecting and maintaining the stadium platform:

Development ecosystem

While we mean "platform" to refer to the entirety of the stadium business model, at its core is a technology ecosystem, the collection of hardware, software, and tools that allow people to access and build on top of the stadium's core infrastructure and systems. Stadiums can foster development of new experiences by creating tools like APIs, libraries, and software development kits (SDKs) and providing support to developers.

Business / value drivers

The primary economic force that differentiates platforms from standalone products is *network effects.* In a platform environment, the benefit to users of using a particular platform increases with the number of other users on the platform. The strongest example is Facebook, where the value of the social network increases for each user as more of the user's real-world friends join. These benefits are commonly called *same-side* or *user network effects*. Additionally, there are strong *cross-side network effects* at play. As the number of users on a platform increases, it becomes increasingly attractive for developers to build applications for the platform or for companies to advertise on the platform. Inversely, the more applications written for a platform, the more attractive it will be to users. Apple's App Store for iOS devices is an example.

Rules and governance

Opening up a platform for third-party development can be risky, as it requires allowing other entities to access core infrastructure and manipulate information in order to build new experiences for guests. This necessarily loosens the venue's control over how fans engage with it. The experience can no longer be fully controlled through proprietary software and team-created applications. Therefore, it is the stadium operator's responsibility as the architect of the platform to create rules on which data and systems can be used when, how, and for what purpose. This requires not only guidelines and policies for developers, but also establishing the commercial guidelines of how transactions are managed in the stadium and how revenue is shared between the team / stadium and its partners. In addition, the stadium operator must define and clearly communicate how misuse of the infrastructure will be addressed and consistently enforce these rules.

Implications for teams and stadium operators

1. **Teams that are building new venues have a blank slate to work with and are thus best positioned to think about creating the stadium platform from the ground up.** From day one of planning for the design and construction of a new stadium, think about the technology infrastructure required to create the experiences you want fans to have–including what is possible today, what could be possible by the time the stadium opens, and the future of the experience throughout the stadium's life.

2. **Existing stadiums can build platform design into technology refresh cycles to address fan needs that have emerged since the stadium's opening.** The competition between new stadiums to be the best, most technically advanced venue means that each opening sets a new target for subsequent stadiums to surpass. As a result, the "honeymoon period" of a new stadium is compressing, and fans' preferences and expectations are changing rapidly. Even if an operating stadium cannot design its infrastructure from scratch or overhaul its existing infrastructure, teams can still use the platform concept to build technology into meeting their fans' changing needs. Any system refresh or technical upgrade within the stadium (e.g., installing beacons, introducing mobile ticketing / payments) should be considered through the lens of how the new components will integrate with other parts of the stadium and can be opened up to outside development. Additionally, advances in cloud infrastructure and mobile technology have made it possible to upgrade stadium technology without substantial on-premise investment. In this way, current stadiums that stay the same physically can use technology upgrades to offer a new experience digitally that meets fans' new needs and competes with newer venues.

For some stadiums, the size or footprint of the stadium, or the importance of history and tradition to the fan experience—Wrigley Field and Fenway Park, to name two—may make widespread installation of new hardware undesirable. For these venues, making the most of cloud and mobile technology (i.e., not installing intrusive hardware) may be a more desirable course.

3. **Embrace and encourage development by partners.** Due to network effects, the value of a platform–to its users and its owner–increases exponentially with the number of users and developers on it. Stadiums, teams, and leagues have already seen success in encouraging fans to use their devices at the stadium, meaning there is a readily-available potential user base for a stadium platform. Developers, however, are in more scarce supply; therefore, concerted efforts need to be made to attract and encourage them to build new applications on top of the stadium platform. Creating development tools and seeding them widely to developers is the first step to creating a valuable platform and tapping into the potential of others to create new, unique third-party experiences.

4. **Define how you want your platform to operate.** The most crucial component to establishing a successful commercial platform is establishing at the outset the vision for what the platform will be and the rules under which it will operate. Establishing clear guidelines to developers and users regarding data access and usage (especially as it relates to fans' personal information) and implementing a process to manage the platform is critical to encouraging development and ensuring that the platform operates in line with the stadium's business goals.

5. **Create a data monetization strategy.** The interaction between fans' devices and stadium operational and commercial systems generates a treasure trove of data for smart stadium organizations to mine. Some of this data can be used to make stadium operations more efficient, e.g., understanding fan flow through the stadium can ensure that guest service representatives or other facility staff are exactly where they are most needed throughout the game. Other data, if it is properly captured, stored, and analyzed, will give the team incredible insight into fans' behaviors and preferences that could be of great value to the team, as well as its partners and sponsors. To maximize the potential of the data generated by the stadium platform, consider possibilities for translating fan data into actionable insight, and pursue the highest-opportunity uses in a strategic fashion. And remember, if stadium owners and operators do not have a clear vision for how they are going to monetize the data generated in their stadium, someone else will.

It's not just for teams

The stadium as a platform extends beyond the final buzzer and the season schedule. As stadium development and construction costs increase, they are used for more and more events to keep the stadium and its surrounding district active throughout the year, playing host to concerts, expositions, conferences, and other events. Building flexibility and agility into the stadium infrastructure opens the potential for attendees of all types to build and integrate technology and software into the stadium to create new experiences.

Concerts offer the most compelling example. The long decline in album sales and their replacement first by the iTunes Store and later streaming and other digital media services have made concerts and tours a vital part of the music industry. Meanwhile, the world's biggest acts, like Kanye West, Beyoncé, and Taylor Swift, have become franchises in their own right, largely thanks to their (and their management's) savvy in using digital and social media and being on the forefront of technology changes. These acts demand a new kind of venue to connect with fans: not just the physical stage, lighting, and AV system, but a digital stage that connects their concert—goers to the full multimedia experience. As venues compete to book concerts to keep turnstiles turning year-round, stadiums that can cater to the changing wants and needs of attendees will attract performers, offer the best and most personalized experience to fans, and create and capture the most value.

Conclusion

Re-imagining the modern stadium as a technology and business platform has significant implications for the sports and entertainment industry. Stadiums are more connected than ever before and so are the fans that walk through the turnstile. This hyper-connectivity can be the foundation for creating new transactions, growing new businesses, and unlocking new revenue streams.

Adopting a platform mentality when it comes to technology means designing a stadium's infrastructure to allow fans and partners to create new applications using data generated through stadium systems. Adopting a platform mentality in business means thinking about how value can be created through new experiences in the stadium–whether directly from the team or from others–and capturing that value in a commercially beneficial way for the team.

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