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Digital

Internet of Things (IoT) in Sports

Bringing IoT to Sports Analytics, Player Safety, and Fan Engagement

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Executive Summary

Executive Summary

An increasingly digital world is forcing the sports industry to adapt, and IoT can bridge the gap between the physical world and the digital space
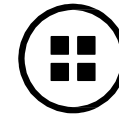
Today's IoT Presence

IoT plays a role in sports today through **player development**, **player safety**, and **fan engagement**. Coaches, players, and fans are able to shape game strategy, analyze potential injuries, and customize experience **by analyzing data collected via multiple devices**.

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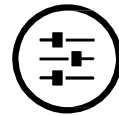
Potential Opportunities

IoT brings endless opportunities for sports organizations to **increase their efficiency and offerings, and create** a **personalized, one-of-a-kind setting for fans.**

THE INTERNET OF THINGS (IOT) is changing the way in which teams operate, athletes train, and fans engage

Current Limitations

Currently, many sports organizations implement IoT in a **disconnected** and **segregated** fashion. Rather than looking at it as IoT, organizations often view these technologies independently and **fail to identify the benefits of combining these components**.

Successful IoT Implementation

In order to capitalize on all of the benefits, sports organizations should consider these **guiding principles in order to maximize the power and benefits of IoT**: harnessing the power of data, thinking in an agile manner, and looking at the entire fan experience from end-to-end.
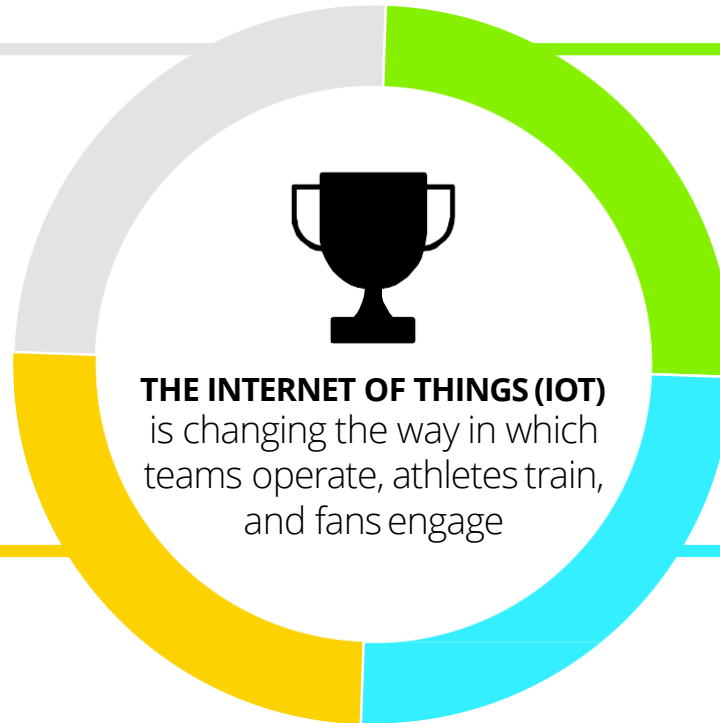
Today's IoT Presence

Current Role in Sports

Many organizations are utilizing IoT to improve their operations, better serve their players, and enhance the fan experience

Player Development

Combining **advanced analytics** with **sensors** and **game video**, coaches can easily process vast amounts of data to obtain metrics on **player efficiency**, **player performance**, and **opponent weaknesses** to better develop in-game strategy.

Player Safety

IoT is shaping the way that sports physicians, physical therapists, and team doctors are **reducing injuries and helping players heal faster**. Embedded devices such as smart insoles and built-in chips give teams an abundance of data that helps keep players healthy and fit.
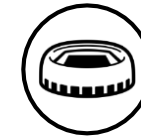
Fan Engagement

The stadium of the future is here, allowing **fans to engage with their favorite teams and athletes like never before**. Many organizations are investing billions of dollars on new stadiums—the game itself is only a small part of the main attraction.
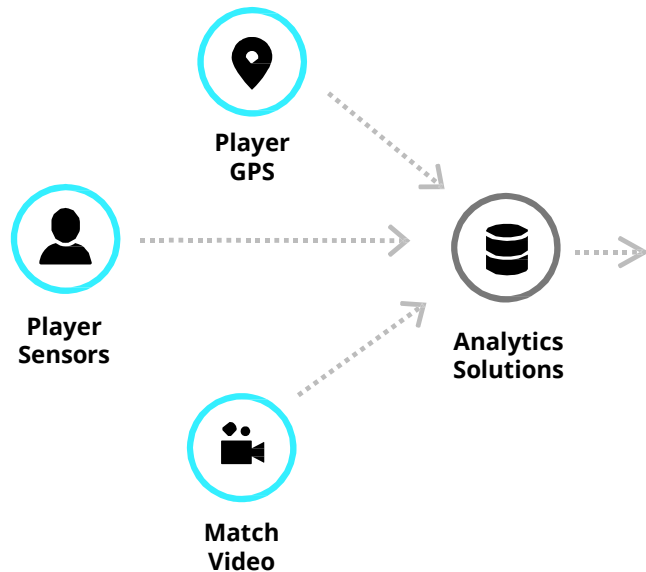
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Player Development

IoT is revolutionizing the way coaches facilitate training, manage players, and address key situations in each game

What it is

Combining multiple data sources with advanced analytics allows coaches to easily process vast amounts of data and act in real-time[1]

Player GPS

Player Sensors

Match Video

Analytics Solutions

Understand effort exerted by players and maximize efficiency

Establish necessary recovery times following matches and injuries

Identify patterns in performance

Predict and prevent potential injuries

Aid in the selection of players to draft or trade

How it works

OBJECTIVE

Partnered with SAP to develop SAP Match Insights in order to help managers in training and preparing for matches

SOLUTION

Processed millions of data points to perform analytics on, and established specific metrics for each match.[2] Utilized video match data and sensors worn by players, among other sources

IMPACT

Increased visibility into each player's performance metrics and generated insights on individual ability to make informed decisions about specific players' training and team in-game strategy; In addition, the team discovered detailed information about opposing team tactics, such as penalty kick strategy[2]

[1] Deloitte - Deloitte's sports industry starting lineup 2016
[2] Gartner - How to Approach Professional Sports Organizations at an Early Stage of Digital Adoption in the Industry

Player Safety

IoT is shaping the way sports physicians, physical therapists, and doctors reduce injuries and help players heal faster

What it is

Embedded sensors offer real-time tracking that provides a holistic view of the athlete, allowing organizations to make the best decision for their longevity and health[1]

Gain insight into when to rest a player, cut practice, and address muscle imbalances

Track historical data starting from the beginning of a player's career *(as tracking becomes more prevalent)*

Develop pre-set parameters to determine "danger zones" stemming from player input and data from wearables

How it works

OBJECTIVE

Partnered with Catapult to generate data-driven insights, specifically focusing on real-time performance tracking and injury prevention

SOLUTION

Catapult Sports embedded sensors in the lining of compression shorts worn during practices. The sensors included GPS, accelerometer (starts and stops), gyroscope (bends and twists), magnometer (direction), and microprocessor (transmit data) technologies

IMPACT

Helped inform real-time decisions during the Golden State Warriors' championship season by using data to detect diminished load capacity, thus driving decisions on when to rest players.[1] Maximized player performance by preventing injuries ahead of time

[1] CBS Sports - Warriors wearable weapon? Devices to monitor players while on the court
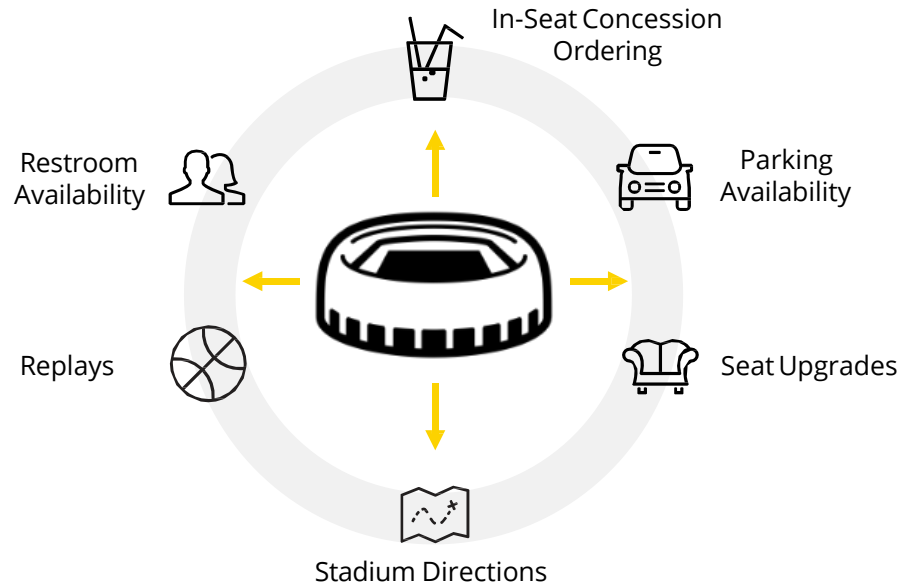
Fan Engagement

IoT is being used in smart stadiums, improving digital engagement and ultimately the in-arena experience

What it is

Organizations are placing stadiums at the center of the fan experience in order to get fans off the couch and into the venue

SMART STADIUMS

In-Seat Concession Ordering

Parking Availability

Seat Upgrades

Stadium Directions

Replays

Restroom Availability

How it works

OBJECTIVE

Developed a stadium designed to engage fans from all corners of the venue

SOLUTION

Incorporated 90,000 square feet of LED video displays, 360-degree HD video halo board, 2,000 TV screens, 1,800+ wireless access points, 4,000+ miles of fiber, and a mobile app with live coverage, stats, and concession/merchandise purchasing capabilities

IMPACT

Optimized stadium operations (e.g., traffic management), increased physical security capabilities, and reduced expenses with increased efficiencies

The Guardian - Stadiums of the future: a revolution for the fan experience in sport
Curbed - Introducing the stadium of the future, where technology is king
Mercedes-Benz Stadium

Current Limitations

The Game is Changing

Although many organizations are investing in technology, they need to adapt their way of thinking quickly in order to avoid key challenges and the risk of getting left behind in the future
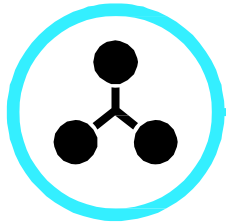
Disconnected Stadiums

Older stadiums are starting to show their age and fall behind in terms of infrastructure and technology. Stadiums must be viewed as a platform that functions together in terms of a team's operations, players, and fans.

Evolving Fans

As the prices of tickets rise and the at-home experience improves, many teams are seeing their game attendance steadily decline.

Organizations must recognize that fans are evolving and engaging with teams in new ways, both from within the stadium and from the outside.

Stand Alone Data

Teams are gathering data on their players and fans from multiple sources, but these data sources are often not being integrated and managed in the most effective ways to provide insightful analysis on business decisions.

Teams must recognize that the game is changing and they need to answer the challenges that it is bringing. Fully leveraging IoT would greatly help respond to these challenges.

IoT is not being fully leveraged

Currently, many teams are implementing IoT capabilities into their stadiums and organizations, but the solutions are often independent and do not work together, preventing organizations from realizing the full potential of IoT

Unused Current Assets

Although stadium assets have the option for built-in connectivity, a lack of infrastructure leaves these functions dormant. Organizations lose the potential for predictive maintenance, and run the risk of costly equipment failure or unneeded maintenance.[1,3]

Siloed Fan Experiences

For many, the fan experience is still needlessly manual and impersonal – spread out across multiple platforms that don't talk to each other. Rather than adding value, mobile devices often serve to distract and detract from the communal experience of fandom.[2]

Limited Wearable Application

Although wearable gadgets are becoming more prevalent in sports, the use of these wearables is currently limited. League regulations, comfort, visibility, and low quality data hinder their potential.[4]

Self-Contained OT and IT Systems

Despite operational technology (OT) becoming increasingly connected, these systems are often self-contained. The gap between IT and OT systems leaves significant opportunities for efficiencies on the table.[1]

Teams and organizations need to recognize the prevalence and real power that IoT can have when it is integrated and considered on a comprehensive, holistic level.

[1] Deloitte – Predictive Maintenance and the Smart Factory
[2] Deloitte – The Stadium as a platform
[3] Intel + GE – Digital Industrial Transformation
[4] SI - Sports tech in 2017: What's next after wrist-worn wearables and fitness trackers?

**Potential
Opportunities**

The Effect of IoT

IoT has transformed industries as it enables breakthrough results by bridging the physical and digital world in innovative ways, and drives value by integrating data sources and connecting with fans through many technologies

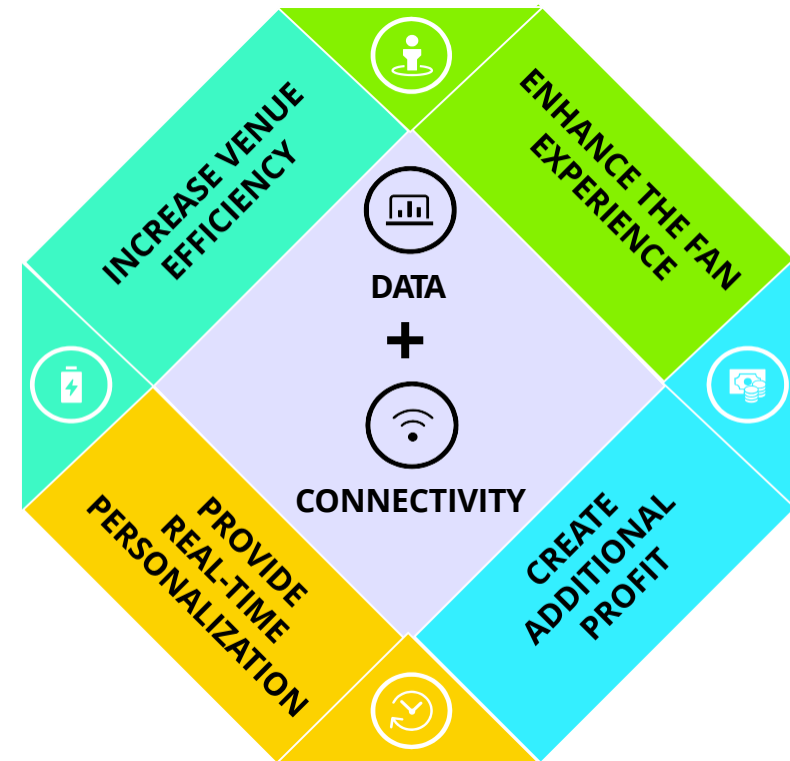## IOT IS TRANSFORMING INDUSTRIES...

AIRLINE INDUSTRY[1]

Airlines are using IoT to transform the curb-to-gate-to-destination experience for travelers. IoT allows for **personalized airport navigation, tailored offers and notifications**, **increased asset utilization, and customized in-flight experiences.**

RETAIL INDUSTRY[2]

Retailers are using IoT to close the digital divide between consumer expectations and retailer ability to deliver. IoT allows for **improved in-store experience through unique customization based on data gathered on their shopping patterns.**

...AND IT COULD TRANSFORM SPORTS

INCREASE VENUE EFFICIENCY

ENHANCE THE FAN EXPERIENCE

DATA
+
CONNECTIVITY

PROVIDE REAL-TIME PERSONALIZATION

CREATE ADDITIONAL PROFIT

[1] Deloitte – Traveling at the speed of knowledge: Exploring operation and profit benefits of deploying the Internet of Things
[2] Deloitte – Closing the digital divide: IoT in retail's transformative potential

Combining Data and Connectivity

Integrating the data gathered by different IoT sources and improving the connectivity of systems can increase venue efficiency, enhance fan experience, create additional revenue streams, and provide real-time personalization

INTEGRATE DATA

IoT can provide teams with **immense amounts of raw data** about their fans, players, and stadium. When these data sources are integrated and used together, teams can make effective insight-driven decisions.

CONNECT WITH FANS

IoT can give teams the ability to **connect with fans through many mediums**, including reward programs, digital and mobile technology, identification and interaction technology, and more. Teams can leverage these, as well as connected visual/display hardware, venue-wide ERPs, and point-of-sale (POS) systems to create a holistic IoT strategy.

INCREASE VENUE EFFICIENCY

ENHANCE THE FAN EXPERIENCE

DATA

+

CONNECTIVITY

PROVIDE REAL-TIME PERSONALIZATION

CREATE ADDITIONAL PROFIT

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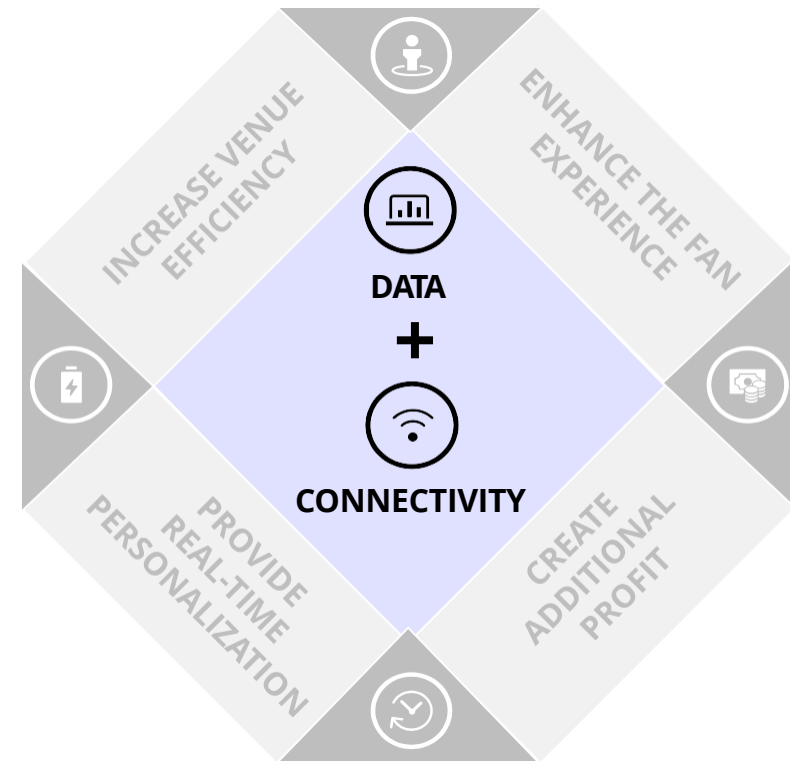
Increase Venue Efficiency

Organizations can leverage IoT to drive venue efficiency through a number of initiatives such as traffic management, building performance, and stadium security in order to improve the game-day experience

TRAFFIC MANAGEMENT

Help fans enter and exit the venue, find parking, and navigate to various parts of the stadium by using mobile apps, cameras, and sensors
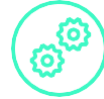
BUILDING PERFORMANCE

Monitor all building systems from a centralized area to track metrics such as energy costs and optimize building performance

ENERGY USAGE

Optimize energy usage and modify lighting conditions based on time of day and occupancy levels

STADIUM SECURITY

Observe crowd behaviors and restrict access to certain areas using surveillance cameras and facial recognition[1]

TEMPERATURE MANAGEMENT

Adjust building temperature based on set requirements, including traffic count, machine usage (e.g. kitchens), and outside temperature[1]

RESTROOM MAINTENANCE

Trigger maintenance notification at peak times and when visit counts exceed a given threshold

[1] Intel - Smart Stadiums Take the Lead in Profitability, Fan Experience and Security

Enhance the Fan Experience

While the field of play may still be the main focus for majority of fans, several enhancements such as real-time statistics, social media integration, and mobile apps are changing the way fans enjoy the sport

ENABLING TECHNOLOGIES...   ...AND THEIR MANY USES

Smartphones

Sensors

Related Technology
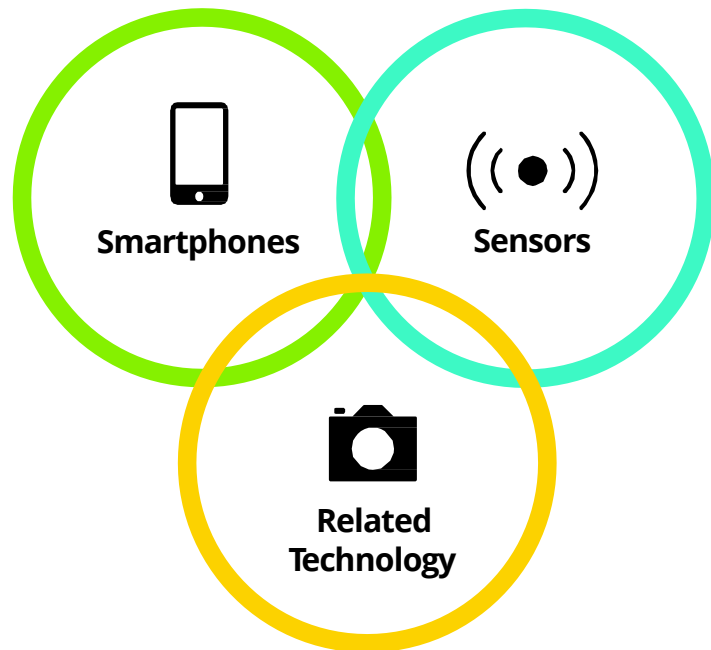
Social media integration for quick postings[1]

Thousands of Wi-Fi access points to keep fans connected

Selfies captured through connected cameras for simplified sharing[2]

Smart eyewear that displays real-time statistics[2]

Fingerprint, smartphone, or retina access for seamless entry[1]

Faster store check-out with beacons that sense items customer carries out[2]

[1] Wired - The Highest-Tech stadium in sports is pretty much a giant Tesla
[2] Deloitte - Sports Tech Innovation in the Start-up Nation

Create Additional Profit

IoT allows organizations to capitalize on the smart technologies and drive revenue in new and innovative ways

New Revenue

- Stadiums are being transformed into **entertainment and dining attractions that are used year-round**

- Increased digital signage and video screens offers more assets for potential **ad sales and sponsorship rights**

- Organizations can package and sell **data** gathered through sensors and beacons **to partners** for analysis

Decreased Expenses

- As part of the **green initiative**, stadiums are beginning to install high-tech solar panels, wind turbines, plumbing systems, and recycling programs to **save on water and energy expenses**

- **Building management systems monitor** the **health** of all machines in a stadium, optimizing usage and minimizing excess costs

Increased Revenue

- Smart stadiums can make the **purchase of tickets, food, and merchandise easier**, faster, and more personalized **through mobile apps**

- Stadiums are offering **customized games packages** with different ticket and amenity options, such as pre-game field access, stadium tours, and other unique pre- and post-game experiences

Provide Real-Time Personalization

IoT key enablers such as Wi-Fi, networked hardware/beacons, connected visual/display hardware, and venue-wide ERPs can lead to detailed data analysis, allowing teams to tailor their offering to each fan's specific needs in real-time

IOT TECHNOLOGY IS THE VEHICLE TO MAKE THIS FRAMEWORK A REALITY

Stadium and team mobile app features include **real-time traffic and parking information**, step-by-step directions to various stadium locations, concession and restroom wait times, real-time **game stats and videos**, in-seat purchases, and more

Loyalty programs can reward fans for attending games and making in-stadium purchases. Buying behavior can be tracked to **provide fans with coupons and discounts** on their most frequent purchases, and seat upgrades and other rewards can be given out to the most loyal fans

SOCIAL MEDIA

DIGITAL STADIUMS

STADIUM APPS

FAN LOYALTY PROGRAMS
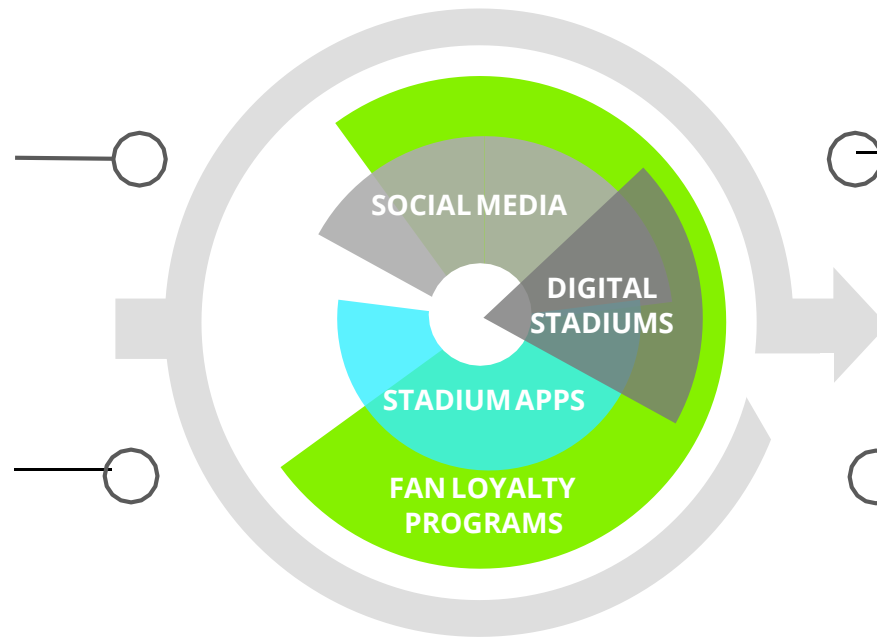
Social media platforms capture fan reactions to game events, provide live in-game video, and allow teams to interact with fans at home. Social media also plays a big role in fantasy sports, giving users the ability to **access real-time statistics**

Digital signage can be used to project relevant social media posts, inform fans of stadium happenings, and request feedback on amenities and experience. Stadiums can also integrate **virtual and augmented experiences** into their digital signage

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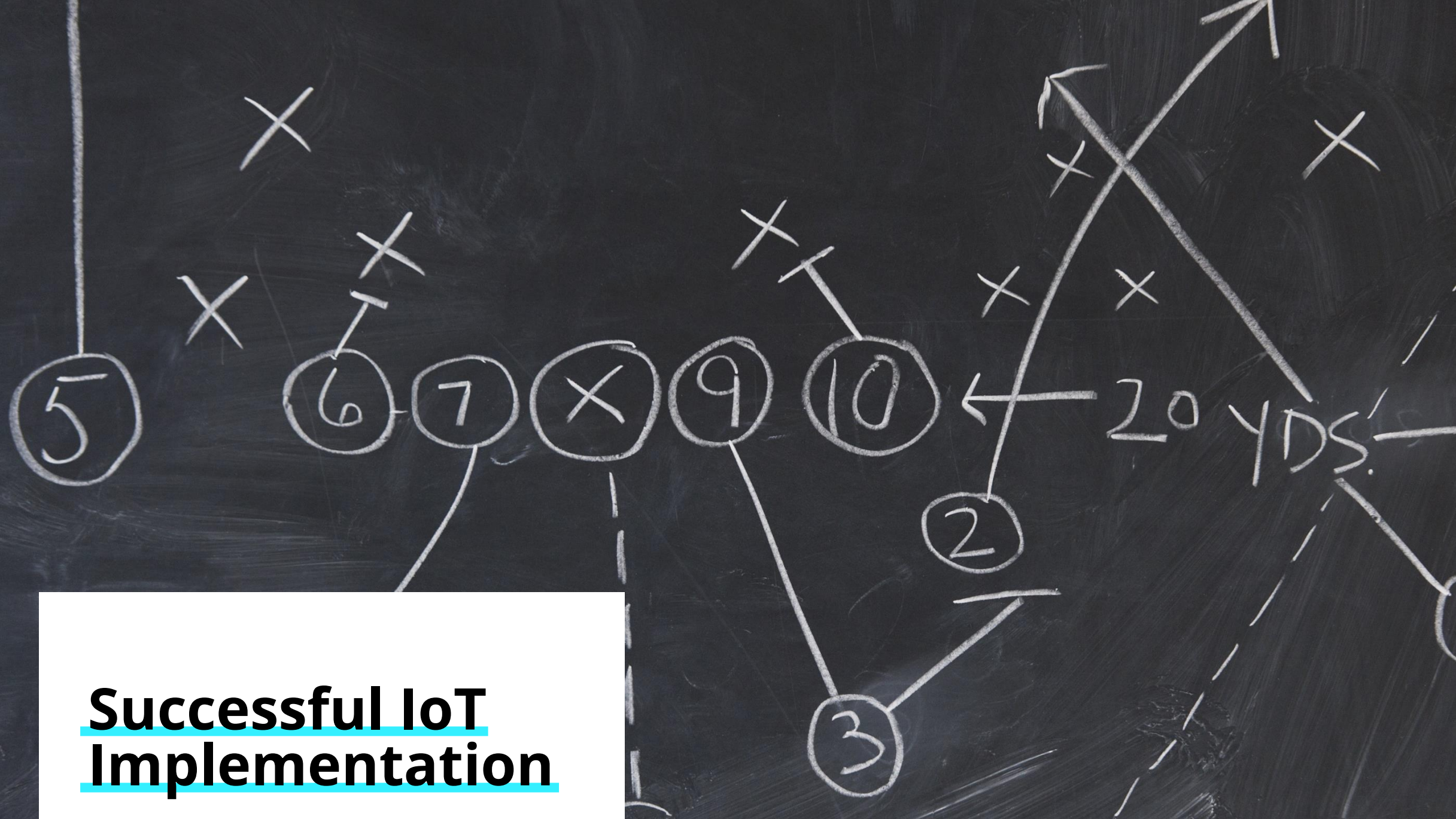
Successful IoT Implementation

IoT Guiding Principles

A successful and effective IoT-driven sports organization relies on several key principles that must be considered in order to maximize the power and benefits of IoT

THINK BIG, START SMALL, SCALE FAST

In order to implement an effective IoT strategy within an organization, teams should focus on laying the foundation from a **technology, organizational structure, culture, and business process perspective on a holistic scale**. Then expand by starting small and scaling fast.

HARNESS THE POWER OF DATA

IoT produces mass amounts of data that organizations and teams can leverage to make **better operational decisions, customize the experience for fans, construct state-of-the-art stadiums, and develop players**. The data gathered from IoT sources can be a game changer for teams when used properly.
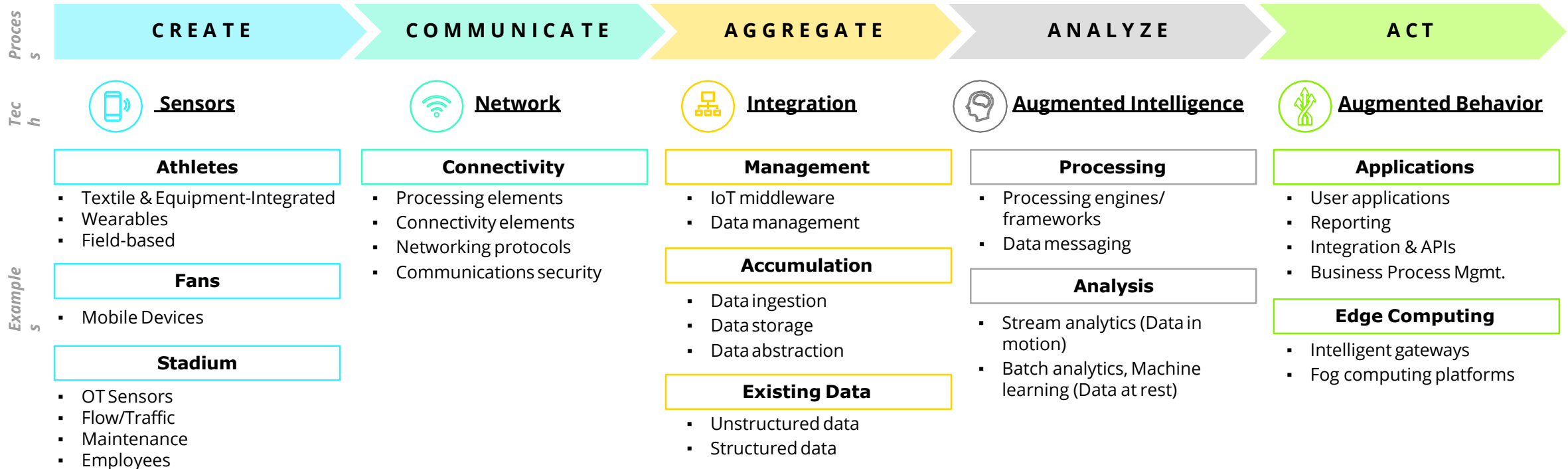
IMPROVE THE ENTIRE FAN EXPERIENCE

IoT allows teams to customize the experience for each fan from the moment they consider purchasing tickets through to the final whistle, and beyond. With ticket prices rises and sales declining, **teams should use IoT to create a unique and unforgettable experience for fans, both inside the stadium and at home.**

Harness the Power of Data

Create a data management strategy to make more effective and insight-driven decisions and transform the experience for fans and players

Proces s	CREATE	COMMUNICATE	AGGREGATE	ANALYZE	ACT

Tech

Sensors	Network	Integration	Augmented Intelligence	Augmented Behavior

Examples

Athletes
- Textile & Equipment-Integrated
- Wearables
- Field-based

Fans
- Mobile Devices

Stadium
- OT Sensors
- Flow/Traffic
- Maintenance
- Employees

Connectivity
- Processing elements
- Connectivity elements
- Networking protocols
- Communications security

Management
- IoT middleware
- Data management

Accumulation
- Data ingestion
- Data storage
- Data abstraction

Existing Data
- Unstructured data
- Structured data

Processing
- Processing engines/ frameworks
- Data messaging

Analysis
- Stream analytics (Data in motion)
- Batch analytics, Machine learning (Data at rest)

Applications
- User applications
- Reporting
- Integration & APIs
- Business Process Mgmt.

Edge Computing
- Intelligent gateways
- Fog computing platforms

Standards, Security & Services

- IAM/ Risk assessment
- Endpoint threat protection
- Device safety

- Network security
- Privacy and data protection in communication

- Cloud app and storage security
- Operations security
- Resilience and secure recovery

- Security information and event management for analytics and reporting
- Intrusion prevention and detection

- Risk identification and management
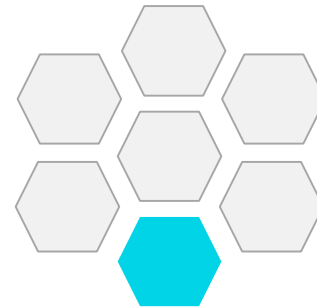- Incident response and containment

Think Big, Start Small, Scale Fast

Start with a comprehensive strategy and choose technologies for fast wins, with little to no disruption to the organization
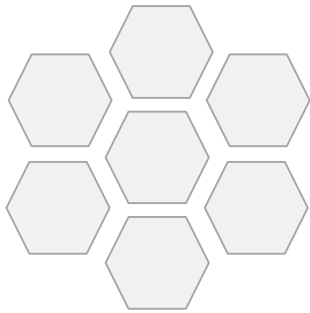
Think Big

Develop a **comprehensive IoT strategy** that focuses on data collection, organizational efficiency, fan experience, and team performance on a macro level

Start Small

Choose technologies that **integrate with existing technologies and can easily scale** and aggregate stadium data in order to be prepared for future larger data outputs
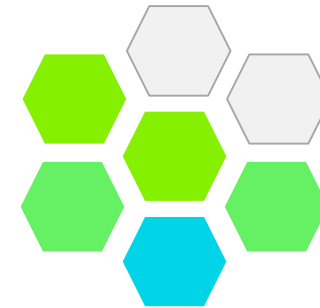
Scale Fast

Integrate the **technology, people, and process aspects of an organization** to grow the IoT ecosystem quickly and effectively with little to no disruption

Improve The Entire Fan Experience

Focus on enhancing and customizing the fan experience, from the moment a fan looks up tickets to a game through the final whistle and the drive home

IoT can be used to engage fans at all time, allowing teams to capture useful data every step of the way.
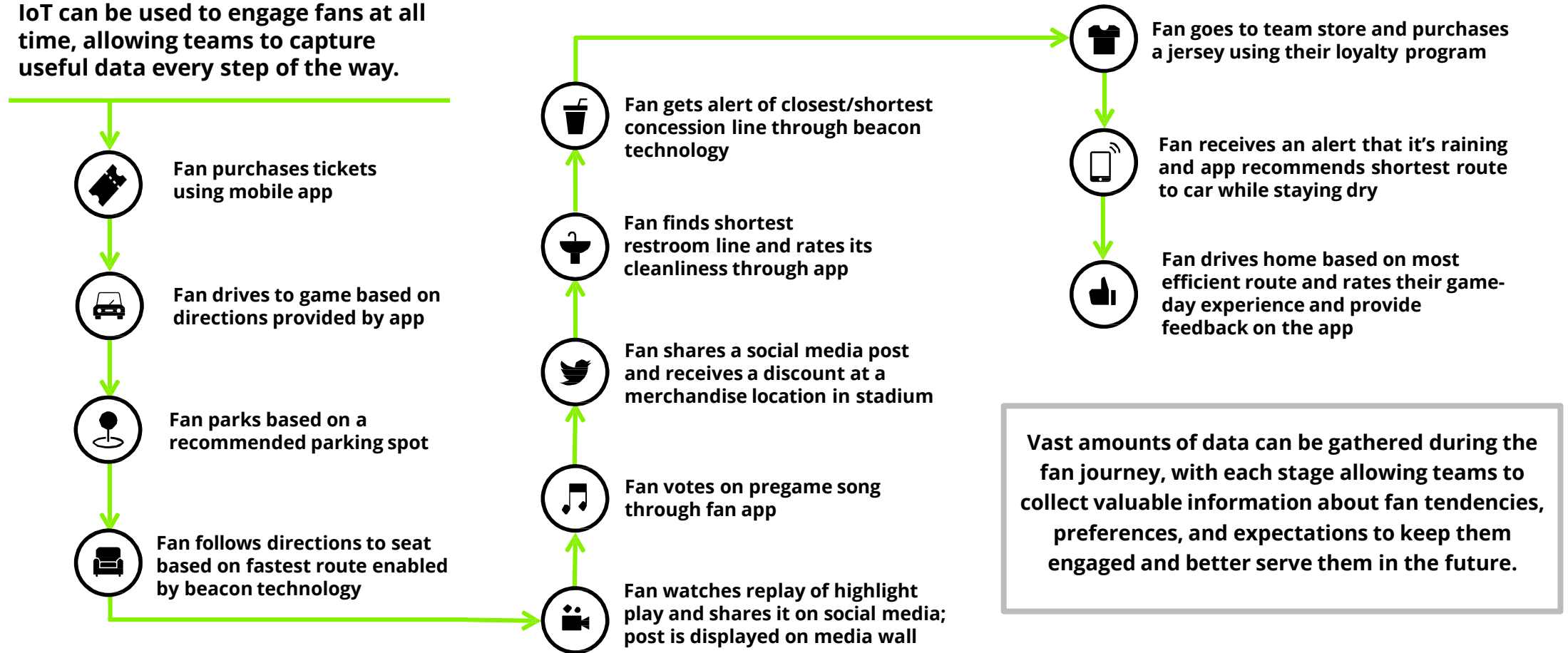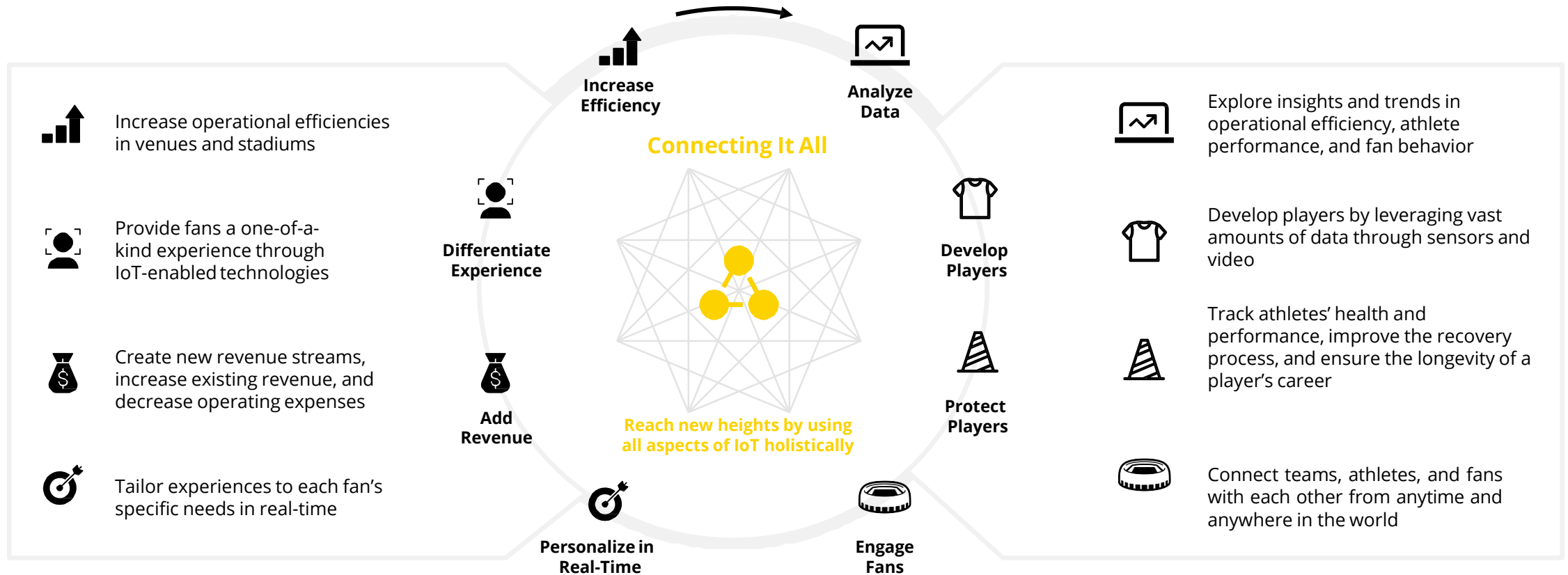
Fan purchases tickets using mobile app

Fan drives to game based on directions provided by app

Fan parks based on a recommended parking spot

Fan follows directions to seat based on fastest route enabled by beacon technology

Fan gets alert of closest/shortest concession line through beacon technology

Fan finds shortest restroom line and rates its cleanliness through app

Fan shares a social media post and receives a discount at a merchandise location in stadium

Fan votes on pregame song through fan app

Fan watches replay of highlight play and shares it on social media; post is displayed on media wall

Fan goes to team store and purchases a jersey using their loyalty program

Fan receives an alert that it's raining and app recommends shortest route to car while staying dry

Fan drives home based on most efficient route and rates their game-day experience and provide feedback on the app

Vast amounts of data can be gathered during the fan journey, with each stage allowing teams to collect valuable information about fan tendencies, preferences, and expectations to keep them engaged and better serve them in the future.

Putting It All Together

Sports organizations stand to benefit immensely by executing a comprehensive IoT strategy and integrated framework as technologies scale and humans become more inter-connected through different mediums of technology

Increase operational efficiencies in venues and stadiums

Provide fans a one-of-a-kind experience through IoT-enabled technologies

Create new revenue streams, increase existing revenue, and decrease operating expenses

Tailor experiences to each fan's specific needs in real-time

Increase Efficiency

Analyze Data

Differentiate Experience

Connecting It All

Develop Players

Protect Players

Add Revenue

Reach new heights by using all aspects of IoT holistically

Personalize in Real-Time

Engage Fans

Explore insights and trends in operational efficiency, athlete performance, and fan behavior

Develop players by leveraging vast amounts of data through sensors and video

Track athletes' health and performance, improve the recovery process, and ensure the longevity of a player's career

Connect teams, athletes, and fans with each other from anytime and anywhere in the world

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Thank you.

Pete Giorgio

Principal, US Sports Consulting Leader

Deloitte Consulting LLP
Contact: pgiorgio@deloitte.com

Stella Lee

Senior Consultant

Deloitte Consulting LLP
Contact: stellee@deloitte.com

Kenneth Marzin

Senior Manager

Deloitte Consulting LLP
Contact: kmarzin@deloitte.com

Megan Vonderhaar

Consultant

Deloitte Consulting LLP
Contact: mvonderhaar@deloitte.com

Appendix: Use Cases

Use Case Example: Fan Loyalty Programs

ISSUE

Current fan loyalty programs often fall victim to latency issues. They simply provide benefits too late for the fan to engage or act upon potential promotions. For instance, if a customer exceeds a certain threshold of concession purchases, the current model may reward them with a credit towards their next merchandise purchase. This can be perceived as lesser value since the reward is not immediately redeemable.

POTENTIAL SOLUTION

Fan loyalty programs enabled by IoT can remove the latency factor, creating a real-time offering that is significantly more personalized and valuable to the fan. If specific milestones and accomplishments provided immediate value, fans would be more inclined to strive for those benchmarks.

IMPACT

Integrating IoT can create value for the fan, who can immediately reap the benefits of their loyalty. The team may also see an increase in sales due to increased fan incentive to purchase. IoT also introduces opportunities to leverage other emerging technologies with respect to loyalty programs. Blockchain enabled cryptocurrencies, for example, can be incorporated to create a "game within a game," bringing an added element of entertainment to the fan experience.

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Use Case Example: Stadium Apps

ISSUE

Sports organizations often struggle to collect valuable data on fan behavior. This can lead to a less personalized fan experience and can leave the organization guessing on a specific fan's preferences or perception of value. This is especially troublesome for the more casual fan, who may be less likely to attend an additional event if they do not feel engaged by the team or the game.

POTENTIAL SOLUTION

Mobile apps provided by an organization's ERP system can enable a range of IoT capabilities in order to take a more holistic approach regarding fan engagement. If a fan chooses to opt in, the mobile app becomes a direct interaction between the provider and the fan, allowing for significant data collection.

IMPACT

The data collected from mobile apps can be utilized to provide the fan with a customized experience. For instance, the app could recommend the most effective route to the stadium. Upon arrival, the fan would be pointed to an open parking spot thanks to real-time traffic data. Once in the stadium, the fan could receive push notifications with seat upgrade offers, discounts based on their location, or recommendations on the shortest concession lines—all contributing to a much improved game day experience.

Use Case Example: Player Sensors

ISSUE

With an increased focus on providing the fan with valuable insights, it is imperative that teams utilize big data, which can be used to derive such insights. The data necessary to formulate these insights, however, can be obscure or hard to obtain, such as in-game or player-specific data.

POTENTIAL SOLUTION

IoT sensors can be leveraged to obtain the data necessary to run meaningful analytics. By leveraging IoT technology, organizations and teams can introduce real-time in-game insights to their fan base. Placing sensors on player equipment, such as cleats, pads, and helmets, could provide new data that was once not available.

IMPACT

With an abundance of data from sensors, organizations and teams can generate the insights that the modern fan craves. The MLB, for example, could consider adding a sensor to a player's bat to provide fans with information about bat speed, exit velocity of the baseball, distanced traveled on a fly ball, or other unique statistics that could increase fan engagement.

Use Case Example: Digital Stadium Elements

ISSUE

New stadiums are further increasing their digital assets, but they in many cases, they are failing to leverage the full potential of these assets to further engage the fan.

POTENTIAL SOLUTION

Fan engagement apps and other IoT technologies can be integrated into stadium visualization hardware and ERP to significantly increase pregame, in-game, and postgame fan interaction. These innovations could allow for activities such as fan polls that are posted to stadium screens in real-time, or stadium-specific voting such as whether to open a retractable dome or not.

IMPACT

Digital stadium elements allow for fan opinions to be displayed on a large scale and increase the fan's perception of engagement. Polls could be posted on visualization hardware and via social media channels, allowing the fan to feel that they have a say in real stadium outcomes. Additionally, beacons integrated with mobile applications could be leveraged to request for fan feedback on stadium amenities such as restrooms, concessions, or other areas visited by the fan.

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