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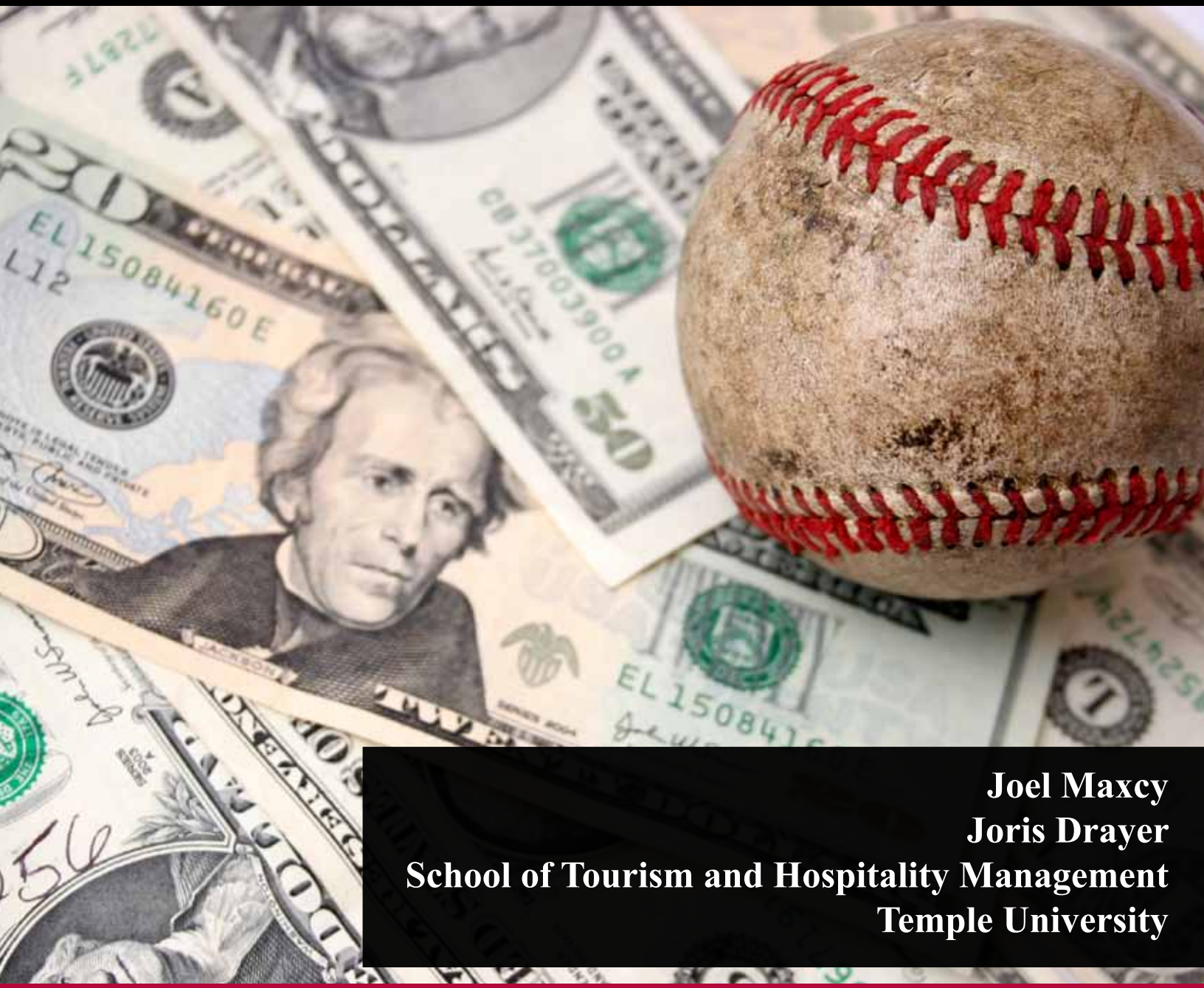
Sports Analytics:
Advancing Decision Making Through Technology and Data



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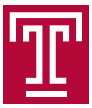

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Foreword

Sports enthusiasts are likely familiar with the growing importance of analytics in sports franchise operations. Sports teams use analytics in a wide range of activities, including game management, player development, marketing, and finance. As a result, sports are becoming a proving ground for tomorrow's business analytics technologies. This IBIT Report provides a history and the current state of analytics and big data in sports. It includes two case studies that detail specific applications, their value, and the potential benefits to other industries. Also, the report outlines lessons learned to assist readers in applying these techniques to their own organization or field.

Bruce Fadem
Editor-in-chief
March 10, 2014

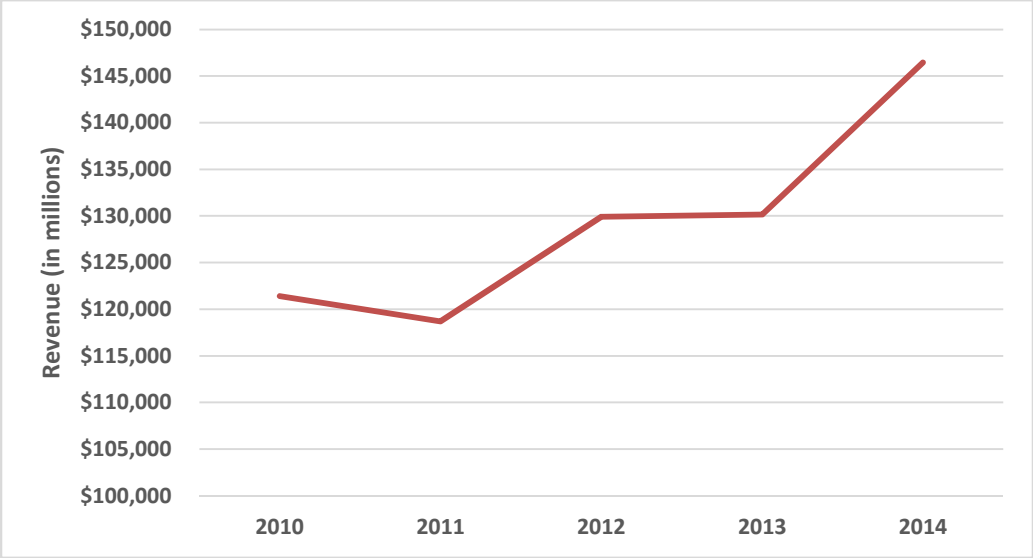
Introduction

Big data and advanced analytical techniques are rapidly being integrated into the sports industry. Sports teams are employing analytics for use in game management, player development, training and practice methods, marketing, and financial decision-making. According to a report from PricewaterhouseCoopers, annual global sports revenues are projected to reach $146 billion this year (Clark, 2011). Moreover, sports leagues and governing bodies are able to use analytics to optimize scheduling, assist with resource allocation issues, and examine the legal environment within their organizations. Meanwhile, sports-related businesses—such as media providers—use analytics more often to study relevant markets—from fantasy sports to sponsorships. The possibilities are boundless and sports may be proving ground for analytics technologies and techniques that will be useful in other industries.

The analytics revolution in sports parallels that of other domains. The incentive to use analytics now, as with other industries, has grown from the combination of abundant and increasingly available data concurrent with significant improvements in computing power and technology. While the use of statistical methods for player evaluation is nearly as old as sports, few disciplines engage, generate, and evoke as much data as sports does. For instance, sports contests create large volumes of statistics and have long been the subject of quantitative analysis. Yet, the use of highly sophisticated analysis methods is recent and has widened the scope of applications for the sports industry. Indeed, analytics is evolving toward multifaceted usages that promise to provide advantages to decision makers throughout the entire sports organization, and many of these practices have great potential for transferability beyond the sports industry.

The incentive to use analytics now has grown from the combination of abundant data and significant improvements in computing power.

The purpose of sports analytics is to help decision-makers within sports firms and organizations make better assessments. Sports teams' objectives are twofold, and they pair achievement on the field (or court, or ice) with managing financial targets. These two goals are not mutually exclusive. Analytics advances create meaningful ways to understand and prioritize data, which can then be used to improve decision-making with regard to both objectives. In fact, general managers and their player development staff who procure and develop talent and assemble their rosters use sophisticated analytical methods. New analytical technologies help coaches prepare athletes physically, devise game strategies, and manage talent within games. However, the usage of analytics is not limited to personnel decisions and game management.



(source: Clark, 2011)

Figure 1. Global Sports Market Revenues, Projected Through 2014

Sports analytics has recently crossed over into the boardroom where teams and leagues are using big data to make decisions about pricing, marketing, distribution, and resource allocation. However, the use of analytics still varies widely depending on the sport. For example, while 23% of National Hockey League (NHL) teams employ analytics professionals as staff or consultants, 97% of Major League Baseball (MLB) teams use them (see Figure 2). Consumer behavior, product markets, and financial outlays are all potential subjects of advanced statistical evaluation, too.

This report provides an overview of the opportunities for analytics in the business of sports. It also discusses the importance of technological innovations, the growing influence of big data, and the escalating competitive advantage analytics provides to sports organizations. Additionally, the report spotlights two vanguard methods—a player evaluation system and a financial practice—with the larger implications that could impact other industries beyond sports.

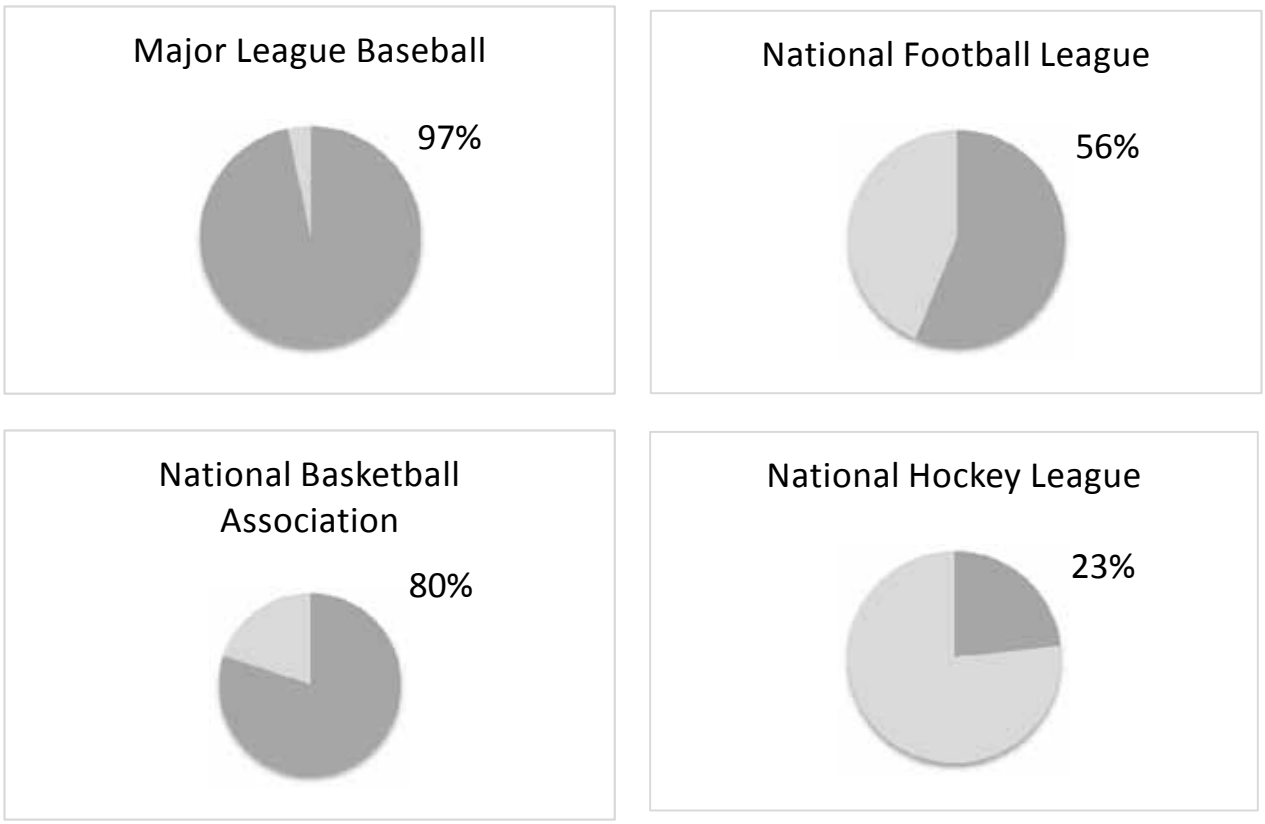


Figure 2: Percentage of Teams That Employ Analytics Professionals

The Development of Sports Analytics

In the late 1970's, people began to advance the empirical analysis of baseball and produce cutting-edge statistical evaluations of sports players' performance. Bill James pioneered this approach, which is known as Sabermetics. Baseball lends itself to quantitative empirical evaluation, because it produces readily available performance data that is ideal for analysis. James and his Sabermetric colleagues sought to develop statistics that could find objective measures of in-game activity, particularly those that directly correlated with the team's objective to win games.[1]

In the 1990s, Sabermetric analysis began to infiltrate baseball front offices. Faced with challenging economic conditions, Oakland A's General Manager Sandy Alderson adopted the use of advanced empirical analysis to evaluate talent and build the A's roster. Alderson recognized that Sabermetric analysis could be used to identify talent market inefficiencies and quickly assembled a competitive team on a very modest payroll.

Billy Beane, who succeeded Alderson, advanced the use of Sabermetrics techniques. He emphasized the analytics for identifying and developing new talent to stock the minor league feeder clubs. The A's became the MLB's most cost-effective club at the turn of the millennium. Starting in 2000, the A's were demonstrably successful with four consecutive playoff appearances, despite having one of the sport's smallest payrolls. Their story was made famous in Michael Lewis's 2004 book *Moneyball: The Art of Winning an Unfair Game.* The book and subsequent motion picture propelled the Sabermetrics analytical principles into the mainstream.

Sample Sabermetric Statistics
from Baseball Prospectus (2013)

FIP: Fielding Independent Pitching Statistics

Measures a pitcher's effectiveness based only on plays that do not involve fielders.

OPS: On-base Plus Slugging

Measures a batter's ability to get on base and hit for power. Computed as the sum of the player's on-base percentage and slugging percentage.

VORP: Value Over Replacement Player

For hitters, the number of runs contributed beyond what a replacement player at the same position would contribute

WARP (AKA WAR): Wins Above Replacement Player

The number of wins a player contributed above that of a replacement level hitter, fielder, or pitcher.

[1] Sabermertics has given rise to new measures of hitting, pitching, and fielding including OPS (on-base percentage plus slugging), DIPS (defense independent pitching statistics), and range factor, for each performance category. Sabermetric analysts have developed innovative all-inclusive statistics to determine a player's Winshares and VORP (value above replacement player).

A number of MLB clubs followed the A's example and hired general managers and other front office personnel with statistical acumen to aid general managers who wanted to employ modern statistical evaluation. Directors of baseball analytics and decision sciences are now frequently included with general managers and directors of baseball operations on team organizational charts. The most prominent example is the Boston Red Sox.

Sports data is unique in that much of it is readily available to the general public, particularly regarding athletes' performance.

In 2003, the Red Sox hired analytics devotee Theo Epstein as General Manager and Bill James as an advisor on baseball operations (Baseball Prospectus, 2005). Boston—whose championship drought had extended back to 1918—regularly employs the new analytical tools to analyze player personnel decisions, and they have since claimed three World Series titles in 2004, 2007, and 2013. Notwithstanding the success of clubs employing these new methods, the use of analytics in baseball is not yet universally embraced. A few clubs continue to rely primarily on scouting, the traditional approach of player evaluation.

Baseball was not alone in the use of advanced empirical analysis of talent as analysis methods spread throughout American sports and to world soccer. The use of advanced statistics in the National Basketball Association (NBA) corresponds with that of the MLB. In the mid-1990s, more than half of all NBA teams subscribed to Advanced Scout, data mining software used to analyze game statistics and detect interesting, non-obvious patterns in the data. Coaches use this information strategically to implement game plan substitution schemes (Bhandari et al., 1997).

Sports data is unique in that much of it is readily available to the general public, particularly regarding athletes' performance. Therefore, advanced statistical analysis began with when outside parties, such as James, became interested in the sports industry. What's more, communications networks have expanded via the Internet, enhancing the ability to collect and disseminate sports information and expediting the development of sports-specific analytics organizations.[2] Aspiring sports research gurus are bidding to develop methods and establish reputations that gain them entry to the highly visible sports world. Plus, platforms, such as the MIT Sloan Sports Analytics Conference, facilitate the convergence of representatives from industry and sports media with those from the general public and academic sectors who have research interests in this field. However, in contrast with other sectors, the sports industry has been reluctant to sponsor or fund formal academic research. Instead, the industry relies on the less expensive approach of utilizing independent and randomly scattered researchers. This approach results in a lack of uniformity in the analytical methods used across the industry.

[2] Football Outsiders, which began in 2003, for instance.

The Current State of Analytics in the Sports Industry

Sports clubs and organizations vary widely in both usage of, and enthusiasm toward, analytics (Alamar, 2013). In fact, the industry's acceptance of analytics techniques is hardly universal. Teams with disadvantages, such as a small market size, are more likely to aggressively employ analytics. The Oakland A's exemplify this situation and are the model for the use of analytics by a professional sports team. Nevertheless, no archetypal analytics system exists for professional sports clubs and organizations.

Investment in analytics personnel and technology differ considerably across the sports industry. Moreover, the approach, or lack thereof, for the integration of analytics into organizational processes remains as diverse as the sports industry as a whole. Organizations are establishing analytics procedures where they see the best opportunities to gain competitive advantages and returns on their investment, but the industry has much to learn. Sports organizations must better understand analytics procedures and methods, as well as learn how to integrate them into their missions and strategic plans. As with other industries, those organizations that fail to grasp and engage analytics effectively stand to fall behind (Alamar, 2013).

For over a decade, paralleling the MLB, the NBA has hired analytics experts to work in its front offices, while teams have invested in analytics and statistical experts as well. At the start of the 2013-14 season, 23 of the 30 NBA clubs used advanced statistics by employing basketball analytics specialists or working with expert consultants.[3] The National Hockey League (NHL) and National Football League (NFL) have also embraced advanced statistical evaluation methods, and the last year has seen a considerable increase of analytics experts hired as consultants or in the front offices of clubs in these leagues. The NFL's 2013 Super Bowl participants—Baltimore Ravens and San Francisco 49ers and perennial powerhouse New England Patriots—are among the forward-looking NFL clubs that utilize analytics.

New analytic technologies in player evaluation and game management continue to develop. For example, analytic methods in the NBA are advancing with the installation of multiple camera systems that capture game details. Similar to GPS systems, player-specific optical tracking methods are another recent development. These devices are able to measure the relative speed of players, their placement and movements on the court, and their interactions. The above developments provide teams with data well beyond what can be derived from traditional statistical analysis.

[3] Accessed November 2, 2013 from NBAStuffer.com, (2013). http://www.nbastuffer.com/component/option,com_glossary/Itemid,90/catid,44/func,view/term,NBA%20Teams%20That%20Have%20Analytics%20Department

Glossary of Analytics Terms

Data Management

The fundamental step of the analytics process that establishes the acquisition, storing, and organizing of data.

Advanced Statistical Methods

Methods that include regression analysis, model evaluation, simulation, logistical regression models, factor analysis, forecasts, and graphical models.

Data Mining

The automated application of algorithms to detect patterns in data. Data mining software can be programmed to search for and reveal hidden yet intriguing patterns within large data sets.

Data Visualization

The pictorial representation of data. The information summarized in a graphic form so the target viewers can see the data from one or more visual perspectives.

As of 2013, a number of college teams are using GPS devices for data collection, including eight NBA teams and several NFL clubs, including the Philadelphia Eagles under coach Chip Kelly, who is new to the NFL and moved up from the college ranks.

Financial incentives play an important role in the use of analytics. The NFL salary cap, which mandates a payroll limit, provides NFL teams with specific challenges. The Patriots have flourished behind an analytical cap management system that identifies inefficiency in the players' market, which in this case is undervalued veteran free agents (Jarret, 2013). Other recent developments extend to pricing, sales, and marketing.

On the business side, the move to demand-based ticket pricing is a major development. Other industries, such as airlines, have long practiced dynamic pricing models, which face similar fixed supply and time-specific consumption constraints. In 2009, MLB's San Francisco Giants along with software partner Qcue pioneered the use of dynamic pricing in sports. Many NBA teams and several NHL teams are now also dynamically pricing some of their seating inventory, but traditionally, the tickets for sports events were priced prior to the season and did not fluctuate with changes in demand. Until recently, most clubs were reluctant to charge varying prices for games—even when variance in demand could be projected—but the rise of online ticket exchanges in the early 2000s challenged that philosophy. For instance, secondary ticket market broker StubHub's sales data provided clubs with a clear indication of how much revenue they were leaving on the table by not allowing their prices to fluctuate with changing market conditions. Moreover, the emergence of more and better data, combined with computational power and speed, has facilitated dynamic pricing.

Case Studies in Sports Analytics

This section highlights two case studies representing state-of-the-art sports analytics. The first case study explores the dynamic pricing of sports event tickets, and the second one discusses a system for combining GPS technology with highly sophisticated analysis to monitor athletes under game and practice conditions. Both topics were chosen as exemplars of the application of analytics within sports and because of their implications for other industries. In 2009, the MLB's San Francisco Giants introduced dynamic pricing in sport ticket pricing, which is known as yield management in the airline industry and revenue management in the hospitality industry. This report includes a summary of the results from a forthcoming study by Drayer and Shapiro (in press) that provides the details of the Giants' experience and lists the lessons learned to extend knowledge to other firms and industries considering alternative pricing strategies.

Second, the report describes in detail how using modern technology can enhance the longstanding use of analytics for player evaluation. GPS monitoring technology has been developed specifically for sports, and the potential applications to other industries are abundant. GPS devices monitor athletes' movements in practices and games, while innovative algorithms are applied to analyze the collected data. These methods improve game management, practice efficiency, and monitor athletes' physiological responses in both situations. The technology and methods are beginning to take root in American professional sports, providing limitless possibilities to extend such systems to general workforce applications.

The San Francisco Giants and Dynamic Ticket Pricing

In 2009, the MLB's San Francisco Giants and their technology partner Qcue introduced dynamic ticket pricing (DTP), where ticket prices change daily based on market conditions. By 2011, the Giants were joined by three more teams. However, the Sports Business Journal reported that by March 2012 the number of MLB clubs using dynamic pricing jumped to 17 (King, 2012) and that many NBA and NHL teams had implemented demand-based pricing for at least some portion of their seating inventory (King, 2012).

In the classic ticket-pricing model, a fixed pricing structure based seat location is the sole determinant of price differentials. This strategy focuses on price as a function of organizational cost and sports event competition. Ticket prices are set well in advance of the season, and clubs do not adjust prices based on changes in consumer demand. Previous academic research, reviewed by Shapiro and Drayer (2012), cites numerous factors influencing ticket prices in the secondary market. Demand for sporting

events fluctuates as a result of a wide variety of quantifiable factors. Sellers in the secondary market (i.e., ticket brokers) are capitalizing on these fluctuations and the primary market's inefficient prices.

The nature of sports ticket pricing in the primary market has undergone a rapid transformation in recent years. As recently as 2010, the San Francisco Giants was the only team in professional sports to completely institute a dynamic pricing strategy. In 2010, the Giants reported a 7% increase in revenue through DTP (Sports Business Journal, 2011). Currently, the majority of teams in MLB have implemented DTP in some form. Teams in the NBA and NHL are also rapidly adopting this pricing strategy. Price setting in a demand-based environment is contingent upon understanding the variables that influence demand fluctuations. Yet research is still needed to fully understand the factors that influence prices where DTP has been implemented.

> Industries with similar dynamics, including fixed capacity and on-place, time specific consumption, could learn a great deal from the experiences of the sports industry.

A forthcoming study by Shapiro and Drayer (in press) examines the factors that cause the Giant's DTP prices to fluctuate. The study identifies the elements that the Giants expected to be important as they determined price changes. Their model weighs specific factors that influence ticket prices in the primary market when utilizing a demand-based pricing structure. Qcue also identified the sources of demand movers for the process. A total of 13 baseball games were analyzed using all seat locations throughout the stadium. The results revealed several insights for analyzing ticket demand and forecasting demand.

The final primary market model included 13 independent variables and explained 91.8% of the variance in primary market ticket price. Determinants of ticket price were found to be related to variables including: season ticket price, secondary market price, and seat location; team performance; individual players' performance; temporal variables such as the time and day of a game; and game-related variables such as if the game would be nationally televised.

The results showed the mean for dynamically-priced tickets was $43.68, 31% below the $63.77 average price for secondary market transactions. The season ticket price (see Figure 1) was the strongest determinant of primary market prices. The analysis revealed that $1 increase in per-game price for full season tickets corresponded to a 15% increase in the dynamic price. Interestingly, the secondary market price also had a strong positive influence on primary market price. A $1 increase in secondary market prices correlated with a 5% increase in the primary market price. One implication drawn

from that result is that the secondary market informed prices in the primary market. Seat location proved to be another significant ticket-related variable. Premium seats' DTP prices increased approximately $6 more, on average, compared to lower quality seats.

Additionally, the study found that various forms of team and individual on-field performance influenced DTP prices. The strongest of these was the number of All-Stars on the opposing team's roster. An additional All-Star resulted in a DTP price increase of approximately $3. Furthermore, when the opposing team had participated in the post-season during the previous year, there was a DTP price premium of $14 over games against an opponent who had not made the playoffs. Individual player performances also proved to be important. A probable appearance by the team's top pitcher, Tim Lincecum, resulted in a DTP price increase of $7.55. Moreover, the statistical performance of Lincecum and the Giants' top offensive player, Pablo Sandoval, significantly influenced primary market prices. Oddly, though, prices actually decreased as the performance of the two stars improved.

Time-related variables were found to affect price variations, too. The 7:00 PM game time starts had the highest price, an approximate $24 increase over a 1:00 PM start. DTP prices gradually increased as games drew closer. Increases of approximately $10 from one month before the game until game day were revealed. The largest percentage increases occurred between 30 days and 20 days before the scheduled game. Additionally, weekend games priced approximately $8 higher than weekday games. Last, nationally televised games yielded a DTP price of roughly $10 more than games that were not nationally televised.

Determinants of Major League Baseball Game Ticket Value Under Dynamic Pricing

Season ticket price
Secondary market price
Seat location
Player performance
All-Stars on opposing team
Opposing team's prior year performance
Day and time of game
Nationally televised

Lessons Learned: The use of big data and analytics provides a number of insights about consumer demand. Teams are able to examine the nature of both primary and secondary market transactions and determine the most appropriate price for a given game at a given time. Indeed, perhaps the most interesting finding in this research is that the Giants may use perceptions from the secondary reseller market to help set their own prices in the primary market. All professional spectator sports teams and leagues now have relationships with secondary market providers that likely include access to secondary market transaction data. NBA teams now employ a combined primary and secondary market broker (Ticketmaster) and offer both options on their ticket sales websites. Teams may also conduct their own demand studies where they examine transaction histories in both primary and secondary markets to determine what factors drive fans to purchase

tickets, with price adjustments to follow as needed. These sophisticated modeling techniques allow teams to enhance ticket revenue by increasing prices for high-demand games without a corresponding drop in attendance and decrease prices to encourage attendance for low-demand games.

The use of dynamic pricing is rapidly spreading to new areas. The range of applications now extends from live entertainment and the performing arts to highway toll roads, and there has been a corresponding shift away from traditional fixed price strategies. Many retailers are moving from the traditional fixed price and discount strategy to dynamic pricing. A report from Marketplace reveals that Internet retailing is driving the shift toward dynamic retail pricing. As web-based selling becomes increasingly prominent, the notion of when to buy, not where to buy, is imperative (Smith, 2013). Industries with similar dynamics, including fixed capacity and on-place, time specific consumption, could learn a great deal from the experiences of the sports industry. Examples include restaurants, movie theatres, and the performing arts. In fact, on Broadway and in some other locales, dynamic pricing is cautiously being implemented for shows and performance events.

Catapult Sports and GPS Monitoring

The Australian company Catapult developed the GPS system and data analysis algorithms described earlier. Founded in 2006, Catapult began with applications only for Australian Rules Football clubs. However, as of 2013, their client list includes over 300 sports organizations from all around the world (Caplan, 2013). Team-sports soccer, rugby, and hockey are well-represented, as is competitive rowing. Included in the client group are several NFL and NBA teams and numerous NCAA members from the United States. Almost all American professional teams have signed on within the past year. The system's primary function is to monitor players' movements and effort to ensure each player is optimally fit and trained without being overworked.

Catapult is not alone in offering GPS technology to sports teams, yet their analysis of the data is unique. Analysts derive three categories of benefits from their system. One is performance analysis, which is fundamental to player evaluation. Additionally, injury analysis and tactical analysis comprise their practice. Effective use of these systems allows teams to monitor the return times of injured athletes and more efficiently manage player placement and substitution patterns in games.

Catapult's method is an all-encompassing system that enables the detection of each athlete's work effort. A small monitoring device (OptimEye) is attached to the back of the player's jersey. Wireless transmissions upload every performance parameter to mobile computing devices or cloud-based software. Data analyses are developed from a set of algorithms, which interprets scientific and objective data that a monitoring system collects and records. The methods capture additional data and are able to run more sophisticated analyses, upgrading standard GPS-type systems.

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For example, speed and distance are reasonable measures of an athlete's workload and can be tracked with any GPS monitoring systems. However, basic tracking technology that com-

pares an athlete's running wind sprints with an athlete's running laps on a track may provide very similar data in terms of total distance covered and the athlete's average speed. Catapult's Inertial Movement Analysis (IMA) advances the analysis with algorithms developed to accurately measure the other movements of athletes in practice or competition. These include sudden changes in direction, vertical leaps, and sudden stops. IMA provides the ability to quantify accelerations, decelerations, changes in direction, and jumps. The technology gauges the workout's intensity and the load on the athlete's body. The technology and analytical methods provide new insights and metrics for measuring the sources of fatigue and performance decline.

IMA helps determine when athletes will fatigue and how their previous explosive movements will affect future performance. Another algorithm, labeled Repeat High Intensity Efforts (RHIE), provides the ability to identify periods where athletes are subject to high intensity efforts without adequate recovery. RHIE reporting uses a combination of inertial sensors and positional signals to detect when high intensity efforts have occurred. The technology allows the monitor to pinpoint fatigue-causing events with inertial sensors and positional signals. Practices and workouts can be designed more optimally based on this information.

New applications are currently being forged through ball and contact sports. Football and rugby have initiated tactical analysis developments including SmartBall, an integrated ball tracking system tracks each player and the movement of the ball. SmartBall accurately records relevant metrics such as time of possession, velocity of the ball at possession, velocity at disposal, and pass chains between team mates. This information tells the "story" behind every team possession, making it invaluable for tactical analysis and understanding players' movements with and without the ball. Another technology, Tackle Detection, detects, counts, and analyzes physical encounters and collisions. The Tackle Detection algorithm uses a combination of inertial sensor signals to detect when a tackle has occurred. Combined with the tracking and monitoring capabilities of the IMA and RHIE, Tackle Detection assists in providing the whole picture of an athlete's health, helping maintain his or her physiology at an optimal level.

Use in the NBA: In 2013, eight NBA clubs including the San Antonio Spurs, Dallas Mavericks, Houston Rockets, and New York Knicks invested in the Catapult GPS monitoring system. The NBA and NFL do not permit clubs to use the monitoring devices in league games, so the analysis is limited to practices and scrimmages. NBA clubs are particularly concerned with injury prevention and rehabilitation. A primary use of the system is to protect basketball players from overloading their bodies. This encompasses both detecting overuse early, as well as sufficiently decreasing the likelihood of re-injury during the rehabilitation stage.

Player Load (PL) is a statistic representing an athlete's physical output. Monitoring PL helps coaches work players just hard enough to improve performance without risking injury. The algorithm builds player profiles with data on a physiological level over an extended period. Thresholds are determined to advise whether an athlete is overworking and what recovery is needed to ensure the player is peaking physically for games. The New York Knicks, who first employed the system last season, was able to pinpoint the correct time to reactivate forty-year-old point guard Jason Kidd, who suffered from a back injury. Kidd wore the device during workouts to track his movement, force, and acceleration. He was cleared to return to competition when his levels met his benchmark readings, which had been set in the pre-season (Konrad, 2013).

> One challenge such systems could face is that employees may perceive them to be an intrusive force.

Performance analysis is also critical to basketball. The system is able to collect unique data regarding exactly how hard players are working in practice. Catapult claims that its metrics not only measure work effort, but what it costs players to produce their effort. Testing is specific to on-court basketball fitness. This enables coaches to make better use of practice time by creating drills based on each player's individual game movements. Practice methods can better meet game demands by understanding the requirements of each player, and it ensures players are peaking at the right time by monitoring their physical output on a day-to-day basis. NBA clubs also benefit from the system's tactical analysis capabilities. Video-based technologies, like Stat.com's SportVU, have become commonplace for analyzing games. Comprehensive video analysis helps aid tactical assessment for NBA teams. Nonetheless, Catapult proposes that the real strategy work is done in practice, where these cameras cannot provide the whole picture. Their methods supplement video with real-time animations that "bring to life" the coach's whiteboard. The indoor GPS system tracks players in real time and can discover defensive breakdowns and help optimize offensive spacing. IMA enables coaches to objectively assess movement and quantify external loads so as to understand accelerations, decelerations, changes of directions, and jumps with scientific data.

Lessons Learned: The use of GPS monitoring and analysis of the data gathered from these processes is in its infancy, and for professional sports in the United States applications remain limited to practices only. Nonetheless, research is rapidly advancing these methods. On their website, Catapult lists more than 80 research centers and universities as clients, as well as over 50 research studies that reveal insights about the applications of GPS in sports and training.[4]

[4] Catapult 2013. November 2, 2013. <http://www.catapultsports.com>

As with other analytic methods, the combination of technological advances, competition, and creative minds will continue to rapidly advance these systems and their uses.

The physical nature of the athlete's profession is above and beyond what is necessary in most other workforces. However, modifications of this type of monitoring, tracking, and analysis could be highly useful in other fields, too. Lost production time due to workplace injuries costs both workers and their employers millions of dollars each year nationwide. Almost certainly, a portion of these accidents is caused because workers are fatigued, or, as with sports, workers are inappropriately placed or spaced within the work area. Monitoring systems such Catapult's could be developed for use on an industry-by-industry basis. Also, optimizing job-related physical interactions could improve productivity, while potentially reducing workplace injuries. Furthermore, new applications of this technology could be developed to augment efficiency and productivity across the workforce. One workplace challenge such systems could face is that employees may perceive them to be an intrusive force, as opposed to a proactive way to protect them from harm during the workday.

The two case studies presented here are just two examples of how analytics is currently utilized in the sport industry. Additionally, as current methodologies advance, new analytic technologies and techniques could continue to be developed. Much of what is valuable to the sports industry is transferable to other fields, too. Resourceful professionals should recognize these opportunities and take advantage of them.

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About the Authors

Joel G. Maxcy is Associate Professor of Sport and Recreation Management and economist in Temple University's School of Tourism and Hospitality Management. Joel has published extensively on the impact of free agency on professional sports leagues, the influence of long-term contracts on player effort, and antitrust issues in sports.

He the author of over forty publications including twenty-seven articles in scholarly journals and books. His work has appeared in Contemporary Economic Policy, Review of Industrial Organization, Managerial and Decision Economics, Journal of Sport Economics, Journal of Sport Management, and Sport Management Review. His current research examines the labor markets of sports coaches, pricing strategies in sports and service industries, and the economics of professional cycling. He currently serves as a vice president of the International Association of Sports Economists.

Joris Drayer is Associate Professor and Director of the Sport and Recreation Management Program at Temple University. Prior to joining Temple, he worked in marketing and promotions and performed statistical analysis for the Oakland Athletics' baseball operations department. His experience in marketing and analytics led him to his two primary research areas: pricing and consumer behavior.

Joris has written two book chapters and over 30 peer-reviewed articles, many which relate to the dynamic that exists between primary and secondary ticket markets. In addition to his academic work, which includes the 2010 and 2013 Sport Marketing Association Best Paper Award, Joris has thrice been invited to speak at the industry-driven TicketSummit Conference and has provided expert commentary for the New York Times, ESPN, Bloomberg News, and the Philadelphia Business Journal. His work has appeared in the Journal of Sport Management, Sport Management Review, and Sport Marketing Quarterly among other peer-reviewed journals.

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