Strategic Roster Management via Nobel-Winning Economic Modeling

Technology Transfer to Sports

Steady technology transfer from other industries to sport has occurred for many years now. On the field, advanced scientific research and computer-aided design tools have created increasingly better equipment using advanced materials and sophisticated designs. Inside stadiums, the fan experience has benefitted – from massive screen televisions, to convenience apps that allow fans to order refreshments from their seats. Soon implementations of virtual and augmented reality will enhance the in-stadium and at-home experiences. Off the field, software has revolutionized preparation and training for athletes. **Figure 1** lists examples of technology transfer to sports.

Since the inception of the Big Data era, voluminous data has been collected around athletes and sporting events. The potential benefits are numerous – importantly and significantly – for both commercial and on-the-field success. Biometric data is collected via wearables (body temperature, heart rate, blood pressure, respiratory rate, etc.). Individual performance data (traditional measures, like batting average in baseball, and newer like, shot trajectory in basketball) are also gathered. Beyond individual data, team data is collected and analyzed, like how player(s) perform and situational performance data. The data is used to improve performance of the team, with the ultimate goal being more wins and thereby, sustainable competitive advantage. However, analysis and use of the data trails far behind the collection. **The central question is "Now that we have all this information, how can we best use it for <u>sustainable competitive advantage</u>?"**

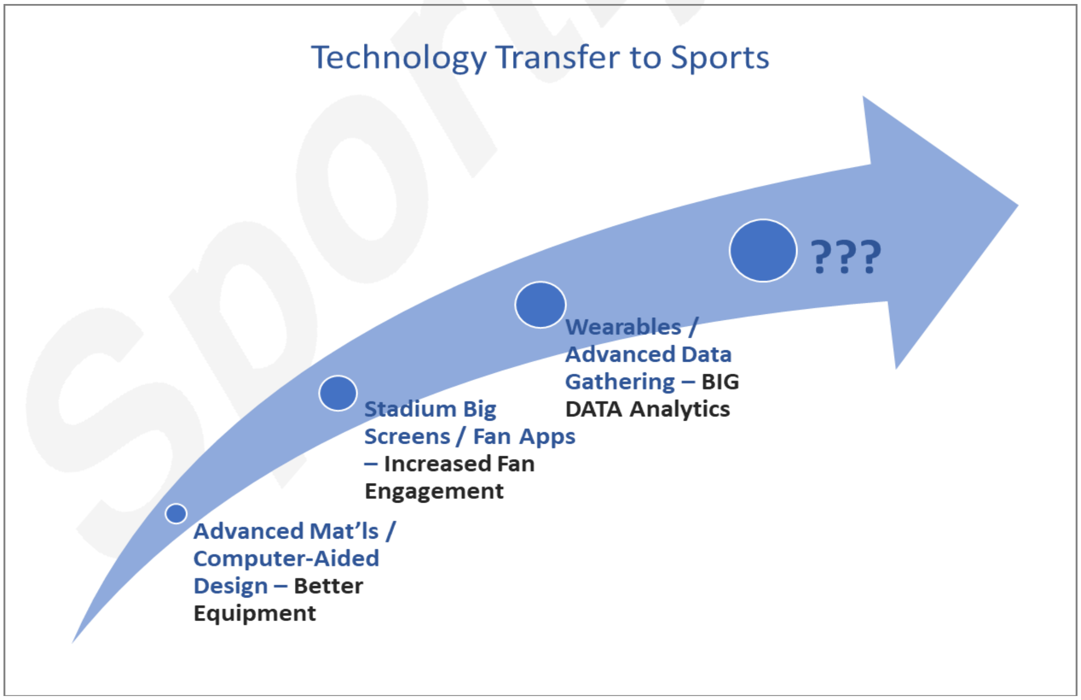

Figure 1: Examples of technology transfer to sports.

Possibilities

Today's dominant strategy uses data to increase fan engagement and revenues. Gather fan data via social media opt-in – then offer promotions like "meet the team," merchandise giveaways, and discounts to increase engagement. Viral loops reinforce and grow the subscriber base. Targeted advertising increases sales of tickets and merchandise.

There are numerous such implementations, each using proven marketing techniques and leveraging social media platforms like Instagram, Twitter and Facebook. These programs have been implemented or are being implemented across most, if not all, major college and professional sports organizations. Positive results have proven the value of the approach. While further value may be derived as these programs grow, the greatest benefits arise in the early part of the implementation cycle. Going forward the upside will be limited as the saturation point is reached. Eventually, there will be a liability associated with NOT fully employing these programs.

A more strategic (and breakthrough) way to take advantage of advances in technology and vast data available to teams is to build a better team via improved decision making. But isn't this already happening? Certainly, Big Data and advanced technologies are already used to identify and develop better athletes. However, the predominant approaches focus on each athlete / prospect individually. They do not account for the varying requirements of building a team: roster limits, salary cap considerations – both for the current year and future years, long-term talent development, effects of age and injuries, opportunistic acquisitions, etc. Conceptually, an approach taking full advantage of available data, combined with best analytical approaches from other industries could account for all these factors. **This is where Nobel Prize-winning economics enters. Successful implementation would result in a sustainable competitive advantage on the field.**

Best Use of Big Data and New Technologies – Economic Modeling

Economic modeling encompasses using vast data, the newest technologies, and the most sophisticated mathematical and statistical techniques applied on the solid foundations of economics. Its value has been proven in numerous industries.

One familiar example is dynamic pricing of airline (and other travel) tickets – whereby airline seats are priced according to availability and demand. Without dynamic pricing, airlines struggled to fill seats, planes flew half full, and profits were hard to generate.

Another example is online advertising auctions. Here, the advertising slots are offered by publishers, and advertisers bid to place ads on a given site at a given time or for a given duration. Market dynamics, matching supply and demand, dictate the price of each ad on each site. Advertisers with varying budgets get access to advertising distribution while, at the same time, helping publishers maximize the uptake of their advertising inventories. Both sides benefit.

A third example is the supply – demand models applied in DRAM markets. With real-time markets as the backdrop, DRAM manufacturers are subject to price and quantity risk on a daily basis. High quality data is readily available to determine forward supply and demand curves. Add to this the pace of technological improvement on cost and function, and DRAM manufacturers rely on forward looking economic models for short, medium, and long-term decisions like price modifications, end-of-life considerations, and greenfield fab investment.

These are but a few examples; there are many more. **Most importantly, economic modeling is absolutely and undoubtedly applicable to sports organizations.** Better yet, given so many successful applications in other industries, economic modeling is readily transferrable to sports teams.

Modeling Energy Markets

Applying economic modeling is a no-brainer, so is there an obvious example on which to draw? One compelling application is energy market modeling, specifically worldwide crude oil markets. Economic models have been employed in oil markets for decades. These models start with crude supply in the ground and end with demanded finished products like gasoline and chemicals.

Oil companies have limited resources – they can drill only a limited number of test wells. Their objective is to maximize ROI, treating each well as a depletable resource. Each well, once proved and in production, has a finite output. In economic models, wells are represented with production profile curves, characterizing output over production lifespan.

While the method's underpinnings are complex, the process itself is fairly straightforward. First, based on geology, testing and computer simulations, an estimate of each potential well's lifetime output over its production lifespan taking in uncertainty properly. A probable production quantity (supply profile) is determined over the life of the well. **Figure 2** shows three typical production profiles. Well 1 is a "grand slam" – it ramps production quickly and stays high for the life of the well. Well 2 is a "flash in the pan" – it has a few good years and then drops off quickly. Well 3 is a "comeback kid" – seeing its highest production in later years perhaps by a technological breakthrough, like fracking or enhanced oil recovery using capture carbon dioxide.

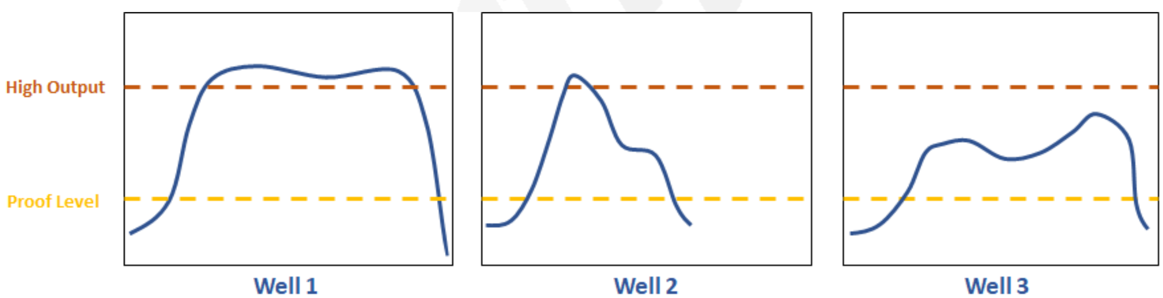

Figure 2: Typical oil well production profiles.

Next, estimates of market demand are used for operational objectives. Well production profiles are combined to form a composite production profile that meets market demand (see **Figure 3**). Combining the production profiles with the market demand and competitors supply profile, well(s) are brought into production to meet market demand that replace wells going out of production, AND simultaneously maximizing ROI. This process is ongoing and continuous to achieve corporate objectives. The approach is robust and flexible so as to incorporate smooth interplay between short-, medium-, and long-term objectives. It can also account for sudden disruptions in supply and rapidly-changing market conditions.

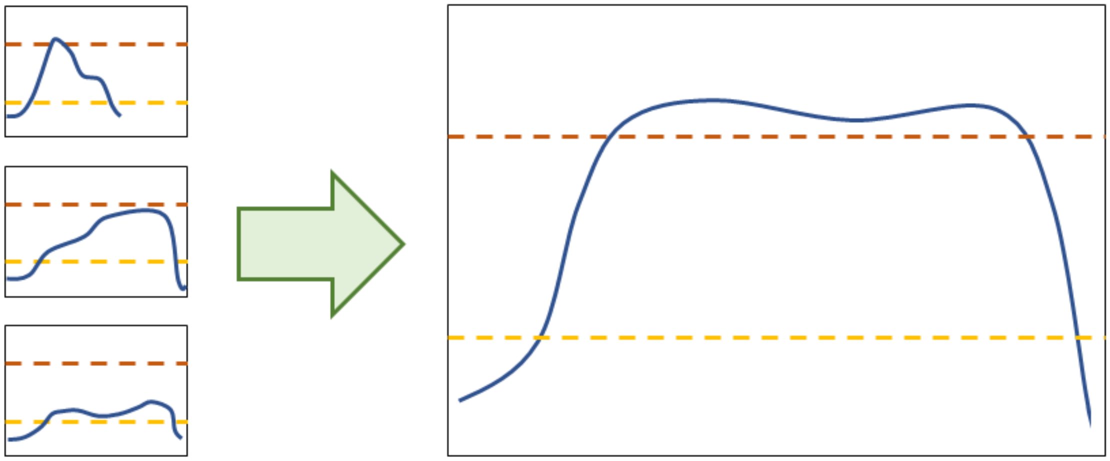

Figure 3: Combined well production profiles.

Application to Sports Organizations

Energy market modeling is readily applicable to the development and management of rosters for sports teams ("roster science"). Like oil companies, sports organizations have limited resources to spend, due to salary caps, roster restrictions, scouting, and player development resources. While an oil company's primary objective is to maximize ROI, sports teams seek to maximize both individual player performance and franchise success. A critical analog is that, like an oil well, each player is a depletable resource. Some players demonstrate and maintain high performance levels for many seasons before declining precipitously, while others reach a peak midway through their careers and decline slowly from there. Still others (many others) demonstrate an adequate performance for only a few seasons. These player production profiles are similar to the production profiles in Figure 1. Each player has a finite total performance over his / her career. Most players in the development pipeline – high schools, colleges, minor leagues, farm clubs, academies – never demonstrate or develop an adequate level of performance. These are analogous to test wells that never "prove out."

Like players and oil wells, the process for franchises is similar to that of oil companies. Sports organizations have a roster of current players and a pool of prospects from which to choose. For players currently on the roster, performance by season is collected to form a portion of a career production profile. During team planning cycles, players' performance profiles are revised using updated information and data. In the simplest case, a performance profile might be updated using just that individual's game statistics.

However, given the voluminous amounts of data currently available, better, more accurate performance profiles can be created which combine individual and team performance information, along with biometric data. State-of-the-art predictive analytics create forward-looking stochastic player performance curves. These hold the promise of offering deeper insights and being more useful to the organization. As the pace of technology accelerates, the situation will only improve. The process for prospects is similar, except that there is less data available with which to characterize them. These are analogous to an oil company's test wells. As prospects prove out in testing, there will be correspondingly more confidence in the characterization of their career performance profiles.

Finally, once player performance profiles are compiled, they are assembled to create a roster meeting different objective criteria. Criteria can be for overall roster makeup and/or for units or position groups. While useful to build a roster for the upcoming season, this approach's real benefit lies in its use to assemble a roster of enduring excellence over a long time period. **Figure 4** shows how combining player profiles over many seasons can result in maintaining high performance over a long time horizon.

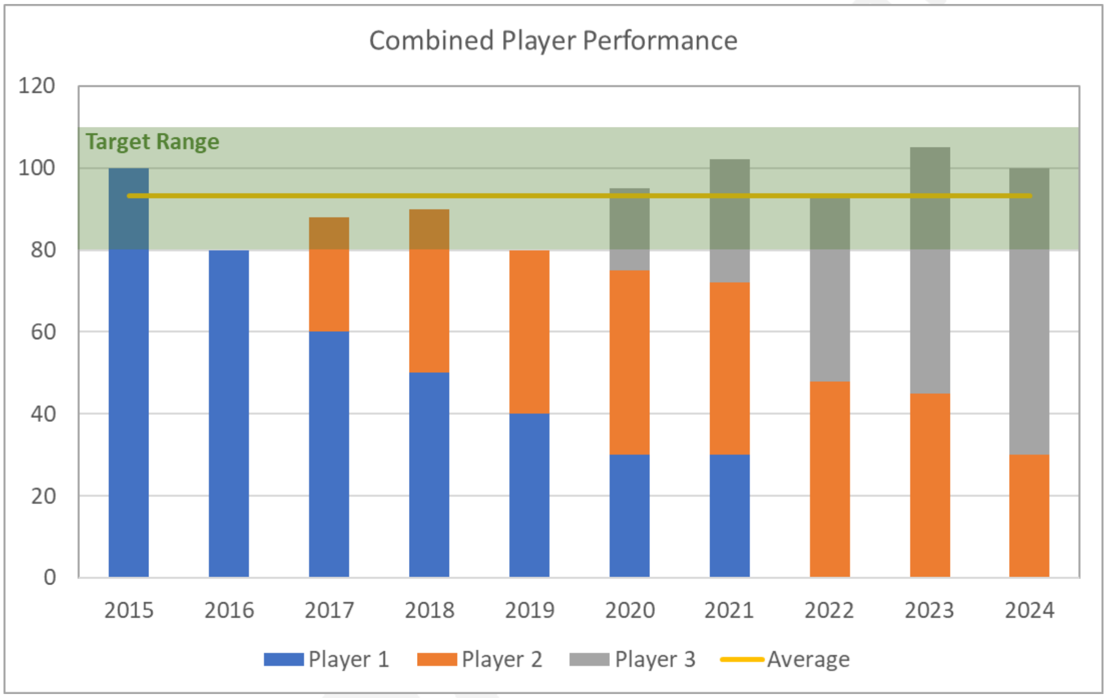

Figure 4: Combined player performance over a span of seasons.

This example may apply to a position group on a roster, e.g., running back on a football team. While Player 1's performance is declining rapidly, he remains a contributor and earns a spot on the roster. To supplement Player 1's performance, Player 2 is added and begins to contribute. However, while solid, Player 2 has a low ceiling. Player 3 is added to the roster and begins to contribute immediately with output that rapidly matches, then eclipses, that of Player 2. Average total production is relatively even with in the target range. This example tends toward the trivial, but when multiple position groups, salary cap and roster requirements, and available player pools are added to mix, complexity rises rapidly to the point beyond which pencil-and-paper approaches are effective.

Looking Ahead

So, while teams are already thinking along these lines, they very likely are still falling short of taking full advantage of the capabilities available. They assess their rosters to determine strengths and weaknesses and gauge the ways they might improve, fill gaps and address upcoming needs going forward. They are also taking advantage of better ways to evaluate their players and prospects than they did just a few years ago, thanks to advances in analytics and information technology. Sports organizations that have accelerated analytics implementation are beginning to realize positive results. Yet, the approaches of many sports organizations suffer from ad hoc or piecemeal execution and, more importantly, lack of scientific rigor. Simply stated, sports organizations are not taking advantage of the best available technologies. This limits the ultimate success that can be achieved.

In order to derive maximum benefit and truly master roster science, teams must implement more advanced, structured, and sophisticated techniques, like economic modeling. **Figure 6** revisits examples of technology transfer discussed previously and reveals the next significant item in that succession. Specifically, application of time-tested economic modeling described here holds great promise. Combined with continued improvements in predictive analytics and analytical decision making, the approach can simultaneously optimize short-, medium-, and long-term roster strength subject to constraints like budget and salary cap. In addition, compared to current approaches, the method reduces downside risks. **Early adopters have the opportunity to get ahead of the competition and achieve sustainable success on the field of play.**

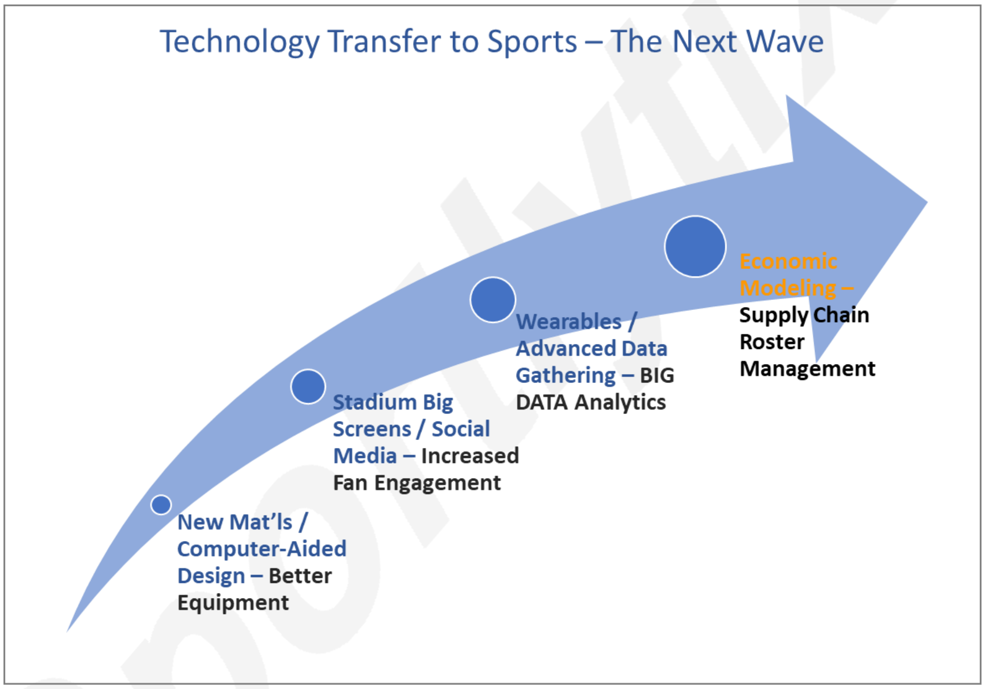

Figure 6: The next wave of technology transfer to sports.

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