

# How the Houston Astros are winning through advanced analytics

In the first of a two-part interview, the architect of last year's World Series champions shares how analytics, organization, and culture combine to create competitive advantage in a zero-sum industry.

**When the Houston Astros** won the seventh and deciding game of last year's World Series, it marked the end of a long and challenging road. The team not only became the champion of Major League Baseball for the first time in its 56-year history but also did so after losing a staggering 111 (out of 162) games just four short years before. And the Astros didn't simply spend their way to victory. Their Opening Day payroll ranked 18th of 30 major-league teams—and almost 50 percent (approximately \$118 million) less than the World Series runner-up, and highest-spending team, the Los Angeles Dodgers.

Winning was a process, years in the making, and resting to a large extent on advanced data analytics. Houston Astros general manager Jeff Luhnow, a McKinsey alumnus and former vice president of the St. Louis Cardinals, began undertaking a data-driven transformation of the baseball operations for the Astros from the moment he was hired in 2011. Analytic insight fueled both player selection and on-the-field decision making, such as where to position players in game situations. As with any big change effort, this was far more than a numbers game. Luhnow and his team had to build an organization and culture that embraced data, translate it into ideas that mattered for players and coaches, and break down silos that were hampering the realization of data's full potential.

In February 2018, Luhnow took a break from spring training to sit down with McKinsey's Aaron De Smet and Allen Webb and discuss his views on both how the Astros used data to move from last to first and what it will take to continue winning as more and more baseball teams join an analytics arms race that has already gone far beyond statistics and data mining and is starting to integrate artificial intelligence.

**The Quarterly:** *What were the analytics strengths and weaknesses for the Astros when you joined them in 2011?*

**Jeff Luhnow:** There really was not any focus on analytics at all. It was a traditional scouting organization. The Astros had done a nice job of scouting and developing some really good players—players like Dallas Keuchel, George Springer, and José Altuve, who were in the system when I took over. But in terms of the analytic capabilities of the organization, if I were to rank it, Houston would have been in the bottom five for sure.

**The Quarterly:** *Were the existing personnel receptive to your changes?*

**Jeff Luhnow:** No. There are hundreds of people that work in a baseball organization, including coaches, scouts, and hundreds of players that are signed at any one point in time. They did not accept it right away. For certain elements of the analytics, we had to wait and be patient. Because if you can't get the coaches and the players to buy into it, it's not going to happen.

**The Quarterly:** *How did you get the organization to buy in?*

**Jeff Luhnow:** The first part was getting the decision makers on the scouting side who are making player-acquisition decisions, either through trades or through the draft, to use the information to make the right decisions. The harder part was changing the behavior of the coaches and the players that were either on our big-league team or in the minor-league system on their way up—getting them to change their behavior and use the information to help make decisions, whether it's game-day decisions or lineups or defensive configuration or recommendations on promoting players. That was harder, and took three or four years to get to a point that we felt good about it. I was fortunate that my boss, the owner of the team, was willing to support us and, quite frankly, help us double down on the strategy. There are other teams in other sports—in football, in basketball, in soccer—that have started a strategy like this and peeled off after two or three years because they couldn't stand the heat in the kitchen.

*The Quarterly: What kinds of changes made the organization particularly uncomfortable?*

**Jeff Luhnow:** I'll give you a great example. The pitcher's on the mound; he throws a pitch. The ball gets hit to where, for the pitcher's entire career, there's been a shortstop right behind him. But all of a sudden, the shortstop's not there, because the analytics would tell us the shortstop should be on the other side of the base. So, to that pitcher, that's a massive failure—that ball should've been an out, and instead, that ball turned into a base hit and maybe a run that's going to go on his personal record.

People always remember the negatives. It's harder for a pitcher to remember the ball that got hit up the middle that, in years past, would've been a single, but this year, it just so happened the second baseman was right there, stepped on the base, and got a double play. We get a little less credit for those, though, than we get dinged on the negative ones.

It's hard to convince the pitchers that this was the right thing to do. Because it was so different. It felt wrong. The defense wasn't standing in the positions that they've been standing in since these guys were in Little League. Pitchers would therefore glare into the dugout and glare at the coaches that asked infielders to move, or glare at the infielders themselves. And over time, everybody would go back to their traditional positions. That was the first year.

The second year—this was 2013—we were a little bit more forceful about wanting to shift, and our coaches did a nice job of doing it for the first couple of months. But again, infielders started to complain: they're not used to turning double plays from that spot. The pitchers started to complain. And so we went from being the highest-shift team in the first couple months of the season to one of the middle of the pack by the end, because our coaches just lost the desire to continue to do it and push back against the players.

The next spring training, 2014, we brought all of our major-league pitchers and infielders into a room and decided to share the data with them, which is a little risky because players leave and they go to other organizations. But we figured, if we're asking them to truly change their behavior, they need to understand why this is beneficial to them and where it comes from.

There was an incredible moment where one of our younger pitchers who really wasn't quite getting it kept complaining, "Well, what about this? What about that?" One of the veteran pitchers who had come around turned to the

younger pitcher and said, “Look, this is going to help you have a better ERA [earned run average]<sup>1</sup> and have a better chance to have a better career, so you should really take this seriously.” Once you start getting players to advocate for the use of these tools, it changes the whole equation. Because then you’re no longer pushing; it’s starting to pull. Once that happens, the sky’s the limit in terms of the impact that these technologies and analytics can have on the players.

**The Quarterly:** *Amazing story. And it brings to mind one of the themes that comes up a lot in business contexts: the need to have “translators,” people who get the analytics and can bring it to the front line.*

**Jeff Luhnow:** Absolutely. We decided that in the minor leagues, we would hire an extra coach at each level. The requirements for that coach were that he had to be able to hit a fungo, throw batting practice, and program in SQL. It’s a hard universe to find where those intersect, but we were able to find enough of them—players that had played in college that maybe played one year in the minors that had a technical background and could understand analytics.

What ended up happening was, we had people at each level who were in uniform, who the players began to trust, who could sit with them at the computer after the game or before the game and show them the break charts of their pitches or their swing mechanics and really explain to them in a lot more detail why we’re asking you to raise your hand before you start swinging or why we’re asking you to change your position on the rubber or how you deliver the ball. Once we got someone in uniform to be part of the team, ride the buses with them, eat the meals with them, and stay in the motels they have in Single A, it began to build trust. They were real people, there to help them.

That was great, and that transition period worked for about two years until the point where we realized that we no longer needed that, because our hitting coaches and our pitching coaches and our managers are now fully technology enabled. They can do the translation. And they’re actually real baseball people who have had careers in coaching and playing.

The translators have essentially become the coaches themselves, and we bring them into Houston every year. We have a hitting meeting; it lasts three days where we’re talking about hitting and we present all the analytics and

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<sup>1</sup> The average number of runs that a pitcher allows over every nine innings pitched.

all the new things. Same thing on the pitching side, same thing on defense, same thing for the managers. And then our medical staff spends a whole week in Houston. Really, it's a continuing-education program, a way to sort out the pushback we get the preceding year in the field from our players. How can we tailor the program this year to make it easier on them? It's worked very well for us.

**The Quarterly:** *Is that a source of competitive advantage?*

**Jeff Luhnow:** We're in a zero-sum industry. And I know a lot of industries feel that way—where any advantage you gain has to, by definition, come at someone else's disadvantage. For us, we win a game, someone else loses. For us, the competitive arena moved to being able to implement analytics insights into the field. And again, that's the most difficult thing to do as an organization. Because, at least at the start, the players aren't going to want to do it. The coaching staff's not going to want to do it. You've got 150 people working in baseball operations, 200 players in a system, some of them have no high-school education. Some don't speak English. You're dealing with a very difficult population to implement new things that are not normal to them. And then you add on top of that the criticism of the media and other organizations and traditional baseball people who, any time they see something different, the first reaction is, "This is bad."

The program of sending the people out and eventually changing over a large part of our hitting and pitching coaches and managers, quite frankly, to be a bit more open-minded, progressive group is when our implementation started to take root. And it's going to provide us an advantage for the next five to ten years. To be able to change people's behavior on the field and how they assess new information and use new technologies is very, very difficult to do. It's been painful, and it's taken a long time, but it's going to be hard for other clubs to copy that.

**The Quarterly:** *What other organizational changes have you made?*

**Jeff Luhnow:** Traditionally, there are silos in baseball. You've got your player-development silo with all your minor-league teams and your staffing and farm director who helps manage the flow of players and coaches through that pipeline. You've got your scouting department, which is focused on the amateur world of high-school players and college players. You have your international department, which has a lot of scouting and a little bit of player development. Then you have your pro scouting department, which looks at other pro players that you might want to trade for. All of these silos are baseball

functions. But now you've got an ever-growing sports-medicine group, and a front-office group, which has some economics in there—sort of the general-management group.

Those functions have to work together seamlessly, and there was a lot of cross-functional reorganization that we really had to think through. And every year, we continue to struggle with that to a certain extent. But we've gotten to the point where we have a collaborative senior-management group, all of whom have different areas of responsibility but who work very collaboratively together. Structurally, we've changed the way we're organized at the top and how it flows all the way down to the affiliates and down to the players.

Now, there's a group that covers international player acquisition, domestic player acquisition, and pro player acquisition, so our acquisition philosophy permeates and is led by the same person for all those areas. There's a development group that not only works on the development of a 16-year-old kid in our academy in the Dominican Republic, but also works on the development of Justin Verlander or Dallas Keuchel at the big-league level, because there are similarities between what we're asking some of them to do and the technologies we're using. What we're doing shouldn't be based on level, it should be based on opportunity to improve. Then there's a sports-medicine-and-performance group, which includes not only the essential medical areas but now gets into mental-skills training and how we develop the mental skills of our athletes, the conditioning aspect of it, and strength building. There's a lot of technology around all the medical areas that are changing the game very rapidly.

**The Quarterly:** *What major changes do you see on the horizon?*

**Jeff Luhnow:** Big data combined with artificial intelligence is the next big wave in baseball, and I think we're just starting to scratch the surface. It's an area that I consider to be highly proprietary, so I don't discuss it in front of my competition. But we're making a big investment in this area. I think other clubs are as well. There's so much being captured. There's radar and video at every facility in baseball now, not just the major leagues but the minor leagues, colleges, starting to go into high schools.

We know what every person is doing on the field at all times. We know what the bat and the ball are doing on the field at all times. We now have

information we didn't dream we'd have a few years back. Developing models from all that information is going to be critical to the success of teams going forward. They can gain an edge—and an edge in terms of not only being first to use that technology but being able to implement it more quickly than the other teams. Because any edge we get, we know it's just a matter of time before the other clubs catch up.

*The Quarterly: So how can you stay ahead?*

**Jeff Luhnow:** It's speed and speed of evaluation and implementation. Those are the key success factors for us. We talk internally about being on the "bleeding edge." We know we're going to have some cuts, some nicks, some bruises—because if we're not, it's similar to base running. If you have a player on first, and he never gets thrown out at third on a single to right field, he's not being aggressive enough. If you don't ever get thrown out at third, you're leaving runs on the table. I consider it the same way in terms of how quickly we implement new technologies and try and squeeze out a competitive advantage. If we're not making some mistakes along the way, we're not being aggressive enough.

## JEFF LUHNOW

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### Vital statistics

Born in 1966 in  
Mexico City, Mexico

Married, with 3 children

### Education

Graduated with dual BSs in  
economics and engineering  
from the University of  
Pennsylvania

Earned an MBA from  
the Kellogg School  
of Management at  
Northwestern University

### Career highlights

#### Houston Astros

(2011–present)  
General manager

#### St. Louis Cardinals

(2007–11)  
Vice president of scouting  
and player development

(2005–07)

Vice president of player  
procurement

(2003–05)

Vice president of baseball  
development

#### McKinsey & Company

(1993–99)  
Consultant

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If you wait for it to be obvious, it's going to be too late. You have to be first. You have to create an advantage for yourself. If you're not looking at what's coming down the road—and technology and data are so important—somebody else is going to. Then you're going to think to yourself, “That should've been us. That should've been our company out there first. We should've figured it out.” Being a fast follower maybe works in some cases, but you've either got to be the first one in or a fast follower in order to really capture the benefits of it. Waiting can only be harmful. All you'd be doing is catching up to the leaders.

**The Quarterly:** *Do you try to combine the analytics, the head, and the heart within the organization to make better decisions?*

**Jeff Luhnow:** There's always going to be a place for experience and judgment and wisdom in baseball in terms of evaluating players. There are so many soft components to what makes players great—leadership, desire, will, ability to overcome obstacles—a lot of things that you can sort of put a science around it in the mental-skills area, but it's hard, and we are always going to rely on our coaches and our scouts and our human beings who are out with these players to give us their opinion, because their opinion really does matter. And we've proven that when you combine the information from the technology and analytics with the human opinion, you get the best possible result. Either one separately gives you suboptimal results.

The key is how do you combine them? That's much easier said than done. We give expert opinion more weight with high-school players because we don't have the analytics and the information or the track-record part of the information for high-school players that we would for a player who's been three years in the SEC [Southeastern Conference] and played two summers on the Cape.<sup>2</sup> We have a lot of data that tells us what type of player that player is going to become.

Combining those in a systematic way is important. So is communicating how we're using the information. We want to help folks understand why we actually used their recommendation, and it did nudge this player up the draft board a little, but the player didn't get nudged enough for us to want to take him over some other player. We want a lot of feedback loops going back the other way to the humans that are doing the work for us, and over time, exposing them to more and more of the process and the results.

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<sup>2</sup> The SEC is a group of 14 universities, primarily in the southern United States, and is a leader in college athletics, including baseball. The Cape refers to the Cape Cod Baseball League, a summer baseball league in Cape Cod, Massachusetts, in which top collegiate baseball players are selected to compete.

**The Quarterly:** *So the process generates high-quality results.*

**Jeff Luhn****ow:** The right answer is to continue to measure the things that really matter. What are the drivers of success for you in the future, and are those things tracking the way they should be, and is there a way to accelerate those? If you're going to make fast decisions, you need to make sure you understand what the roadblocks are going to be, what the obstacles are going to be, how you're going to overcome them. It's about having the right people and making sure that you have all the dissenting points of view presented together in order to make a decision.

That also means being able to stop doing things that were in the pipeline that are no longer valuable. That's just as important because they use up resources, and as soon as that project is no longer as valuable as one of the ones that's being proposed, you have to make that decision. Just because something has been worked on in the past doesn't mean it should in the future. Frequent communications among people making the decision, with all the right information, helps speed up the decision. And as our people see that the decision that the organization did make was actually better than the decision they would've made had they been in charge, that's when you start to build up confidence that the system, as a whole, is working. 

**Jeff Luhn****ow** is the general manager of the Houston Astros. This interview was conducted by **Aaron De Smet**, a senior partner in McKinsey's Houston office, and **Allen Webb**, editor in chief of *McKinsey Quarterly*, who is based in the Seattle office.

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