University of Louisville

Harnessing predictive analytics to help athletes avoid injur

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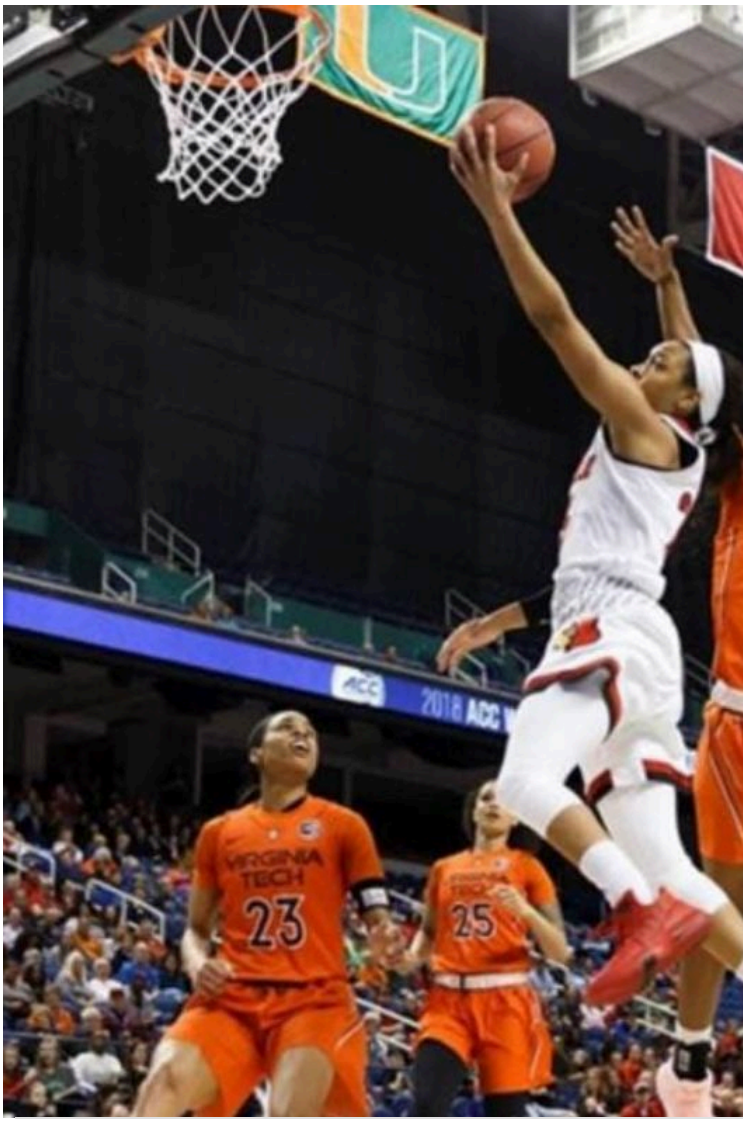

Business Challenge Transformation Results Business challeng

College athletes could be the professional sports stars of tl
but injuries can affect performance in key games, or even p
premature end to promising careers. The University of Loui

IBM® Analytics solutions to monitor training and avoid injur
athletes stay safe and reach their full potential.

Business Challenge

The women's basketball team at the University of Louisville uses wearabl
track athletes' movements and vital signs during training—and saw an opp
this data to avoid injuries too.

Transformation

Working with IBM and PMsquare, the University built a solution that inclu
Modeler and Cognos Analytics, that automatically captures and models d
wearables and other sources, and visualizes it in intuitive dashboards for
athletes.

Results

95% player availability
achieved for basketball practices and games

20% time saving
for the sports performance team by automating data collection processes

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Business challenge story

Getting ready for game day

In the United States, university sports are big business. College football a
aren't just the training grounds for the next generation of NFL and NBA st
major sporting events in their own right. According to recent statistics ,
million people attended at least one college sports event in 2017, and the
basketball championship game attracted a TV viewership of 23 million.

For many student athletes, success at the college level could put a career professional leagues within their grasp—but injury could snatch that drea second. If their team has a big game and the world is watching, they want field, not the bench. And from a university's perspective, a successful spo a major source of both prestige and revenue, so avoiding injury is a top pri coaching program.

The University of Louisville sport performance department is committed t finest collegiate performance program to minimize the risk of injury, maxi development, and optimize team success. The program's motto is: "build preparing champions for sport and life", and by taking a holistic approach performance, the department is doing just that. Utilizing an assessment-b and wearable technology, the University of Louisville sport performance p become a leader in the world of collegiate high performance.

Teena Murray, Director of Sport Performance at the University of Louisville Louisville, we wanted to break old patterns of thinking. Instead of a tradit and conditioning approach, we're looking at athletes in a more holistic wa they are competing and training, but how they are eating and sleeping, an mental and physical health affects their performance."

The success or failure of this approach depends on one thing: data. To help coaches make informed decisions about how to help each athlete reach peak condition in time for game day, it's critical to collect and analyze as much relevant, accurate data as possible.

To this end, Louisville has adopted a variety of technologies to help track every aspect of its athletes' performance. For example, it uses wearable devices from Catapult and Polar to track players' movements and monitor their heart-rate during training and on game days. Subjective information is important, too: players fill out daily surveys about their mood, sleep quality, fatigue and stress levels.

However, getting the data is only half the battle: the other half is finding ways to turn that data into actionable insight. In Louisville's case, the Performance Analytics team saw both challenges and opportunities in this area.

Paul Jones, Performance Analytics Coordinator at the University of Louisville, comments: "Getting the data from the wearable devices and uploading it into our athlete management platform was a complex, manual process, which took more than an hour per day per team. That's time that the coaching and analytics teams just don't have, because there's a relentless schedule of practice sessions for each of our teams every day. We needed to find a way to turn that manual process into an automated data pipeline."

He adds: "We also saw an opportunity to do more than just look at our athletes' current condition—we wanted to harness predictive analytics to look at player injuries and try to predict them ahead of time. If we could find an accurate way to model injuries, it would be a literal game-changer for the university, and potentially for the whole world of athletics."

> "The SPSS model showed that injuries are not just about what happens in training on the day—they are related to the stress and fatigue that build up over time. This really backs up our philosophy of

looking at our athletes' experience as a whole, instead of focusing on individual practice sessions."

Paul Jones
Performance Analytics Coordinator
University of Louisville

Transformation story

Putting together a strong team

Louisville decided to team up with data engineering and data science experts from PMsquare, an IBM Gold Business Partner that specializes in business analytics solutions.

"This was an exciting project for us to partner on with the University of Louisville," says Dustin Adkison, Managing Partner of PMsquare. "In most industries, it can be hard to truly visualize the impact of your efforts, but with this project, we knew we were doing more than just helping a basketball team win more games. We were helping athletes stay healthy, and that changes lives."

Paul Jones adds: "The PMsquare team not only provided technical expertise, they also helped us develop our theories about injury prevention and find ways to make the data actionable. In particular, Erik Hoggard and Eric Dolley deserve a lot of credit for the dedication and innovative ideas they brought to the project."

The PMsquare team helped to define the project around three focus areas: automation (to streamline the data collection process), investigation (to find ways to model data and predict injuries), and visualization (to help coaches understand the results and put them into practice).

The first step was to find a Cardinals team to act as a proof of concept for the new approach. Paul Jones explains: "Basketball is our most popular sport at Louisville, and Coach Jeff Walz and our women's basketball staff are fully committed to any tools that will help us with managing player health, wellness and performance over the course of the lengthy college season—so that team was the perfect candidate. We already had a rich history of using technology with the team, and we knew that if we could create a winning framework for women's basketball, other sports would follow suit."

Erik Hoggard from PMsquare tackled the data collection challenge by building an automation layer based on Python scripts, which is affectionately known as the "Louisville Scraper". Instead of manually collecting data from the Catapult and Polar wearable devices, and then going through a long process of uploading and downloading data from various web services, the Scraper acts as an intelligent process automation tool, minimizing the need for human input.

Next, PMsquare brought in data scientists to investigate the causes of injuries. By building a predictive model in IBM SPSS® Modeler, the team confirmed what its coaches

had long suspected. Most injuries aren't sudden freak accidents; they result from a longer-term aggregation of fatigue, stress and other factors. And as a result, they can be avoided.

"Our SPSS model showed that injuries are not just about what happens in training on the day—they are related to the stress and fatigue that build up over time," explains Paul Jones. "In our case, the period of 27 days before the injury occurred seemed to be the best predictor of whether a player would get hurt. This really backs up our philosophy of looking at our athletes' experience as a whole, instead of focusing on individual practice sessions."

The project also raised some interesting insights about when injuries happen: Thursdays and Fridays were the days with the highest incidence.

"We need to do some further investigation, but it's possible that there's a weekly cycle at work here," says Teena Murray. "Most players only have one non-practice day per week. So, it's possible that by the end of each week, they're becoming fatigued and the risk of injury increases."

The investigation phase of the project was eye-opening for Louisville's analysts—but to make a real difference to the way teams practice, they needed a way to bring the results to life, and convince the players and coaches. Eric Dolley from PMsquare used IBM Cognos® Analytics to build a set of intuitive dashboards that highlight the most critical insights at a glance.

"Coaches' time is very valuable, so the information we deliver has to be something they can grasp within 10 seconds," says Paul Jones. "The Cognos dashboards that get the key points across instantly, so there's no need to interpret tables of figures to understand how fatigued an athlete is, or how likely they are to get injured."

> “Since adopting the IBM solution, our women’s basketball team lost only five days to injury all season—that’s a 95 percent availability rate for practices and games.”

Paul Jones
Performance Analytics Coordinator
University of Louisville

Results story

A net benefit for players and coaches

Louisville has dramatically simplified the process of turning data into insight. Instead of analysts spending 80 minutes per day on data collection and consolidation, the Louisville Scraper captures information from wearable devices almost instantly. This amounts to around a 20 percent reduction in workload, which gives the Performance Analytics team more time to spend on new analyses and interacting with players and coaches.

More importantly, results from the predictive model have already had an impact on the way practices are structured—which in turn seems to be having a positive effect on the number of injuries.

“Since adopting the IBM solution, our women’s basketball team lost only five days to injury all season—that’s a 95 percent availability rate for practices and games,” comments Paul Jones. “Injury rates actually improved over the course of the season. That’s a big advantage, because you want your strongest team on the court when competition for the postseason heats up.”

In terms of predicting injuries, the SPSS model achieved a 92 percent accuracy rating, with no false negatives. As the Louisville team continues to refine its data management practices and gathers more data about injuries, the hope is that this accuracy level could be improved even further.

Paul Jones concludes: “With PMsquare and IBM, we’ve really gained confidence in the power of our data to help our coaches make better decisions, and help our players understand how their training behavior affects their performance. A lot of the findings have validated things that we were already doing, but we’ve been able to take them to a deeper level of insight. The results speak for themselves, and many other teams on our campus are excited to follow the basketball team’s lead.”

University of Louisville

The University of Louisville is a state-supported research university located in Kentucky's largest metropolitan area. The University has three campuses, nearly 7,000 faculty and staff, and a student body of over 22,000. Its student athletes, the Louisville Cardinals, comprise 13 women's and 10 men's teams across various popular sports, and all 23 teams participate in the Atlantic Coast Conference.

Solution components

- Cognos Analytics
- Watson Studio & Modeler

Take the next step

PMsquare is an IBM Gold Business Partner with extensive experience in business analytics and performance management solutions. The company's software expertise is supported by owners and managers with extensive business backgrounds in financial services and information technology. This hands-on business experience means PMsquare can understand clients' organizational needs, now and into the future.

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