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Modelling and simulation: Setting the pace

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PE talks to an engineer who helps athletes to measure and analyse their performance in a bid to improve their training regimes and boost their medal hopes

The Rio Olympics were Team GB's most successful overseas games in history, and a small engineering company based in Leamington Spa can claim a part in the achievement.

Pace Insights, which was set up by IMechE member and chartered engineer Samir Abid, has been helping top sports teams to improve their performances through the application of technology for the past five years.

"When I came into engineering, advanced technology, simulation, mathematical modelling and things like that existed, but they weren't very good, and people were really pushing them," he says. "People were a bit dismissive about it. Over a period of time I managed to convince a few people that simulation and modelling were good things to be doing."

Abid explains that a stint working at Aston Martin helped him develop his skills. "There was a guy who went from being a bit cynical to being my best customer. Once we got the modelling and techniques up to speed – it was a case of me selling the whole concept to him in a different way, not as a threat to his job, but as using technology to enable what he was doing and leverage his expertise."

In 2009, when Abid was leading the vehicle dynamics team at Mira, he decided to take a step away from the automotive industry to do an MBA degree at Warwick Business School. "The seed for it was that a friend of mine from Formula One moved to Olympic sport and he asked me to help him with a project. We got chatting around sport and their use of technology, and the process for developing performance. We concluded that while sport was getting more technical and athletes were making marginal gains it wasn't as mature as people were making out, so there was an opportunity for a company like ours to add some value."

Abid set up Pace Insights to provide tools, processes and technology inspired by engineering and F1. "And to bring that energy, pragmatism and can-do attitude and engineering mindset that your readers take for granted and outside of an engineering environment – it's totally alien to many people in sport to think in an engineering way," he says.

The company is working with more than 30 British-based sports organisations, including UK Sports, EIS, Team Sky, GB Boxing, British Sailing, British Athletics, British Swimming, and the British Equestrian Federation.

One of the projects Pace Insights has recently completed involved combining data for an athletics team. Abid explains: "As sports have become more technical they have wanted to measure more things in training. They want to take videos from different angles at high speed, they want to look at velocity, force, accurate timing, and pressure.

"All of these pieces of equipment exist, but one of the challenges is the equipment records that data at different rates – if you try and bring all those different bits of information together it becomes a bit of a headache – particularly if you are trying to do it in Excel or some other general-purpose tool.

"It is possible, but it takes a long time. So what we've done is build a software system that pulls all their bespoke pieces from different manufacturers of data together straight away. They are able to pull all the information together in a training session and analyse using all their data in sync and logically presented.

The company also does mechanical engineering projects and electronics and instrumentation. Pace Insights recently took an inertial-measurement unit which measures acceleration, gyro, manometer, pressure, temperature, altitude, and GPS data in athletics and built its own system. The system uses an array of up to six sensors per athlete, compared to the usual one sensor. When that data is synced it builds a much richer motion profile/signature.

Abid says the company faced problems in locations where there isn't a great internet connection, but a telemetry model from motorsport helped solve that.

The company focuses primarily on training equipment rather than competition equipment, although it has the capacity to do both. Abid says: "When you go to the gym there is a bike and a rowing machine, but if your sport isn't rowing or cycling, yet you still want to exercise the cardiovascular system in a way more relevant to your sport, what are you going to do? Bespoke pieces of training equipment that you can't buy off the shelf require a lot of mechanical design."

Abid says sports is a growing sector, created by a push and a pull in the market. There's the increasing commoditisation of sensors – it is becoming cheaper to measure things – and there is also a greater will to use the technology. As the next generation of athletes comes through they are more used to technology and they expect things to be measured, they are used to infographics, and using data to make decisions.

Driven by data

"The data is going to increase, the quality and robustness of the data is going to improve, and the management of the data will improve with our help," says Abid. "At the moment sport is really good at describing what just happened. What is going to happen is they will look at much more historic data, much more in the moment data – realtime telemetry – and have much more predictive capabilities so they can constantly adapt, tune and review what they are doing.

"The types of information that people use – the metrics – there will be more of them. At the moment they are too raw – it's like F1 in the 1970s and early 1980s. We are working on instrumentation that is measuring information that has never been measured before in that sport.

"I hope it will end with us being able to extract the genetic potential of everyone in the squad so we know that by the time we get to the start line they will do their best and we can sit back and enjoy it."

Abid says there is a skills gap at all levels and his company is looking for staff, particularly those with motorsport experience.

For the time being Pace Insights will be focusing on two or three areas: predictive analytics, modelling and exploiting raw data, using that data to inform and optimise everything that sportsmen and women do.

"The lovely thing about sport is you don't really know what is going to happen. You can do all the preparation and engineering and Leicester go and win the Premier League.

"As soon as our job finishes and they get on the start line we can be fans again – that is what I really love about what we do," he concludes.

In focus - applications from retail to healthcare

Pace Insights has had requests from retailers for **operation optimisation projects**. The firm might help shops to determine how much stock they need or how customers are likely to move around the store. Samir Abid says that shoppers' buying habits tend to be quite predictable. The company has also started working in the **healthcare sector**, looking at operations optimisation, and how medical staff can use wearable technology.

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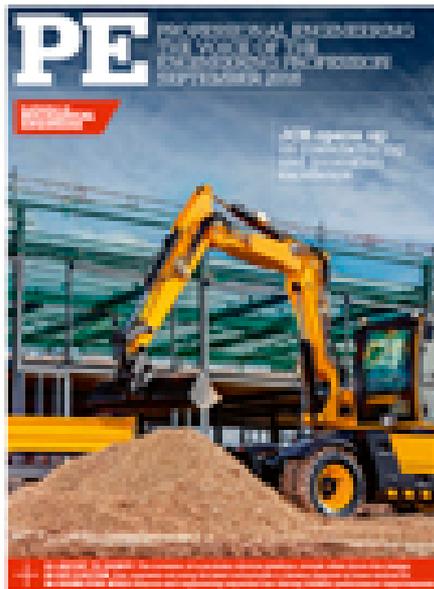
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