



How an intranet of things at BMW Group is driving digital production for its mixed drivetrain future

Christian Patron is head of innovation, digitalisation, data analytics at BMW Group. The editor of automotiveIT International, Paul Fisher, spoke to him about how BMW's culture of innovation is pushing further into creating a more agile production process.

Reading time: 06.30 mins

Paul Fisher: A job title like yours may not have existed in BMW or any other car company, 10 years ago. Can you explain a little more about what you do?

Christian Patron: Well that's not true at BMW! We've always had a head for innovation. So it's not new, but what is new that we have more innovation projects based on digital technologies.

A specific part of my job is linking pre-development and implementation of new things, which focuses more than ever on effectiveness. We're "greening the scenery" for innovations, and when we see that there is potential we try to get it on the roads as fast as possible.

So I'm responsible for all the pre-development projects in the BMW production system which includes smart logistics, analytics to 3D printing as well as robotics.



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 Tell me more about the BMW Production "Intranet of Things" that was recently mentioned in a press release?

The main reason we used the term Intranet is that we wanted a safe environment for production applications. So it's not open to everyone. It's a software platform, but a very flexible system with different layers of integration. We can integrate what's on the shop floor, including data from sensors on machinery, and from most other assets that we have in production.

There is also a layer to restore data, and a layer to connect mobile devices: tablets and smartphones. The main reason we built the Intranet of Things was to speed innovations within the plant. We can set them up and scale into the BMW production system, a modular principle we call "BAUKÄSTEN".

How far do you use external software developers for the Intranet of Things and other BMW software platforms?

 Digitalisation is always about working with others. And we do it ourselves quite a bit. We do buy standard things and adapt them to our needs and combine them with other developers. For example, we needed to connect to every kind of vehicle on the shop floor, including autonomous units. We did this in co-operation with external software partners.



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And you mentioned you work with startups. Are you using smaller companies to help build software systems for production?

We work together with startups if they're the right partner for us on given projects. But it is often great when you work with start-ups because they have a tidy and rapid solution for a very specific problem.

And how do you find the right solutions? The procurement process for startups must be a bit different Do you have a dedicated team that looks for the solutions, or do startups come to you?

Both. We have the Start Up Garage. These guys set the startup process for the whole BMW group, not only for production - and there are special processes for start ups to easily connect to us. We also go to conferences to connect and scout for interesting start ups. And once we are connected with these guys we decide if it makes sense for production and then possibly move to proof-of-concept.

What impact do innovations in production IT have on the speed of development of new cars. BMW is very clever in its marketing and customer research in discovering that there's a niche for a new BMW Series. Does production anticipate that or do management say we want to introduce a new SUV model and then you have to change production tools and process?

 The main thing is we can use analytics to enhance the ramp up quality new models



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and to test production systems very early in the virtual environment, for a new model. We can't actually speed the development of the car. We're talking about production here. So what we can do is test our assets or production technologies to virtually integrate new models and test the whole system.

I wanted to ask about digital twinning. Is this something that you're already using in BMW?

Yes, but we wouldn't describe digital twinning a stand alone process, its part of our Internet of Things platform. We mainly focus on the data we actually need. We don't put every pice of data into a digital shadow. Our key focus is always efficiency, and that's the same for the data. So when we need to store data from a physical asset we store only the essential data within our Intranet of Things platform.

When we are planning new processes, new machinery or robot lines we gain time by ensuring that everything to be transferred into the real production system has been proven in the digital world. The digital recording of our plants that may be also called kinds of digital twin. We can visualise a plant to within two millimetres of accuracy (see Reimagining the car factory at Rolls Royce, below).

Wow, two millimetres, that's amazing!

Yes, when you see the digital video it looks real, the quality is that good. So when it comes to ramp up a new model you can use that digital recording of existing structures, so a new engine can be integrated very precisely. It's now easy to make a digital recording, and make a judgement call on existing structures without having to travel over to that plant. You gain so much



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time.

I imagine that would be helpful as we move into the sort of electrification era when the same cars may have different powertrain in so you'll be able to see whether the supply of electric motors, and the battery will fit in without causing disruption.

You may have heard about our approach called system integration. We plan from the next decade on in any given plant everything from internal combustion engine (ICE), plug-in hybrid electric vehicles or purely battery electric vehicles to be built on the same line. Digitally recording is a key factor in making it possible to speed up integration and adapt our production system continuously.

There are different mega trends in our industry- electromobility and autonomous driving - and the product portfolio is ever more differentiated. But you can't have one production system for one driving mode, or autonomous or classically driven cars. So in order to be able to have efficient cost structures on one hand and to be able to deliver cars to our customers, it's hugely important to have one integrated system because it is absolutely impossible to foresee how demand will develop over a different model.

What is the human factor in the introduction of digital production systems?

Introducing smart digital solutions, is not just about cost reduction and quality control but also makes life more interesting for the workers. Its not about simply replacing human labour. Our basic thinking is how can we help humans, via technology, to be more efficient, to have a more ergonomic job.

How can we use the specific strengths of humans and machines or a different



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solution, in a way that we get the best possible result. And one thing that is sometimes discussed in the media is some kind of new wave of automation that makes the human redundant. We don't think that will happen - absolutely not. The core of our production is the process, and any use of technology is designed to help people make these processes better, more stable and more efficient.

Do car workers come from different sort of backgrounds these days, do they have different educational qualifications? Do you look for people with IT skills?

Yes, of course, but when you work in car assembly, you don't need deep IT skills. We put a lot of energy into training our staff. We believe in high quality training and we also use digital technology to train the people, including virtual or augmented reality systems. For example, there's a program which actually teaches people how to assemble the cylinder head.

Reimagining the car factory at Rolls Royce

BMW purchased Rolls Royce Motors in 1998 and has invested heavily in new models and state of the art production facilities since. It has recently been the testbed for BMW Group's digital factory recording process.

The digital recording of a factory in 3D entails significant advantages compared to the two-dimensional, manual standard approach, says BMW. It only took one weekend to measure the entire Rolls-Royce plant in Goodwood, UK, and to record it down to an accuracy of two millimetres. This was achieved with a bespoke 3D scanner and high-resolution digital cameras.

The site now has a three-dimensional likeness of its production facility for planning purposes; the need for a laborious CAD reconstruction of actual structures and manual recording on-site is



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eliminated.

Contrary to the traditional two-dimensional plans, any spatial change can now be intuitively simulated and assessed, says BMW. The digitalization provides a precise and comprehensive, up-to-date database for quick and flexible adaptations in production. (PF)

