Reliability driver – Japanese computer company Fujitsu is taking the smart factory concept to a new level by piloting AR headset technologies at its factory in Augsburg, Germany.

Smart digitization – bridging digital islands

21,000 devices in up to 250 configurations. Every day.
Fujitsu is the only IT company in Germany that not only develops
the latest computer hardware, but also produces at competitive costs.
To achieve this, the company is pushing the maximum end-to-end
digitization of all processes forward. The latest activity as part
of Fujitsu's Smart Factory concept is a co-innovation project
with T-Systems: employee-supported "picking" of all components
in the immediate run-up to production using audio-visual
headset technologies.

COPY —— Thomas van Zütphen

Just in sequence. When industrial production shifts from "stockpile" production to customer-specific manufacturing, manual assembly (picking) of all product components plays a key role. In this product removal, the "picking," every single move is an economic value contribution. And everything a picker does – how alert, quick, and focused they are from the beginning to the end of their shift – has an impact on unit labor costs. An incorrect or missing component? Today, every mistake made by a picker is detected at Fujitsu during assembly at the latest or in the functional test before delivery to the customer. But this costs time and disrupts the processes.

The company has managed to reduce the waiting time of its fitters from ten to three minutes in production if a missing or incorrect component needs to be rapidly replenished. But Frank Blaimberger wants to "reduce the number of such cases even further." The Bavarian is Head of IT Services and Tools at Fujitsu. Together with T-Systems Innovation Management, he is testing an augmented reality headset and system for suppling IoT data and micro services from the cloud until April.

Every second counts for Markus Stutzmüller. In real life, the Senior IT Consultant at Fujitsu is Blaimberger's closest collaborator – especially in factory operations. These days he is testing the IOT001 Head Mounted Display, HMD for short, under live conditions. The "headgear" he'll be wearing for the next few hours is black, comfortable, and sturdy as well as dust- and waterproof.

According to Frank Blaimberger, these real-world production experiences are "much more meaningful and important for the technical feasibility of projects like 'HMD' than use cases under isolated laboratory conditions." Especially for Fujitsu, since the so-called picking in the Augsburg factory is performed not by their own employees, but rather by an external service provider. They use employees depending on the order situation. In return, the Japanese client equips them with all the infrastructures, processes, and technologies they need in a hall on the Fujitsu campus, constantly seeking ways to improve working conditions. "Ideally, this enables us to visualize the direct interaction of the processes 'I'll do better' and 'I'll save money' for our service provider and ourselves," says Blaimberger. "By

The headset monitor visualizes the camera settings in a way that mimics a laptop screen viewed from 31 inches away.

Markus Stutzmüller, Senior Consultant IT, tests the Head Mounted Display, an innovation developed by a Fujitsu team in Japan.

"Affordability is partly measured by its ability to help us adhere to our schedules."

FRANK BLAIMBERGER,
Head of IT Services and Tools, Fujitsu

avoiding tedious activities and supporting people with technology, we can add more value to the pickers' work."

Simply adjust the 8-million-pixel camera, make eye contact with the 0.4-inch monitor, and off you go. In Fujitsu's so-called "supermarket," Stutzmüller and his camera start by looking almost simultaneously at the barcode of a special transport container. Here, all the components for the production are brought together according to the order and then transferred to a logistics train all the way to the end of the picking line. Just in sequence. Each of the electric trains carries and distributes up to 100 containers per hour to different production halls, depending on whether the supermarket employees have filled them with components for workstations, servers, thin clients or computers. And exactly at this moment Stutzmüller scans the barcode.

PRODUCED, TESTED, DELIVERED

Behind this is a sophisticated logistics concept that supplies the picking of the components in the factory with exactly the components that are needed by the pickers on a given day and transfered to the next step of production. Just in sequence. From the external warehouses on the campus in Augsburg, the temporary storage facility at customs in Rotterdam, or the Group's own distribution center in Worms – the Fujitsu principle behind all of them is: The customer places an order and has the guarantee that his product will be available in just a few days. – Produced, tested, delivered.

In the background, material availabilities, capacity, and resource planning are checked for 'collision orders,' among other things, to ensure that delivery dates can be met. "To accomplish this," says Frank Blaimberger, "every customer order is essentially broken down into the component level." This means: Are all components available? – And is every configuration buildable?

Whether a batch size of 1 or 500 packs – from the package insert to the CPU, the pickers must merge the order and components. In the past, pickers had to use pen and paper to keep track of everything – and to date, tablets, smartphones, and scanners – but today, Markus Stutzmüller has both hands free at all times. At the same time, he receives all the information he needs via voice commands and projections on his small monitor for every next "pick". What does the component look like? Where along the line can it be taken from the shelf? Each step is controlled, executed, and ticked off in a single interaction between the component, headset, shelf, and order, unlike the previous "pick-to-scan" method. Pure IoT culture, so to speak. And in the middle of it all, so-called AR overlays – and Markus
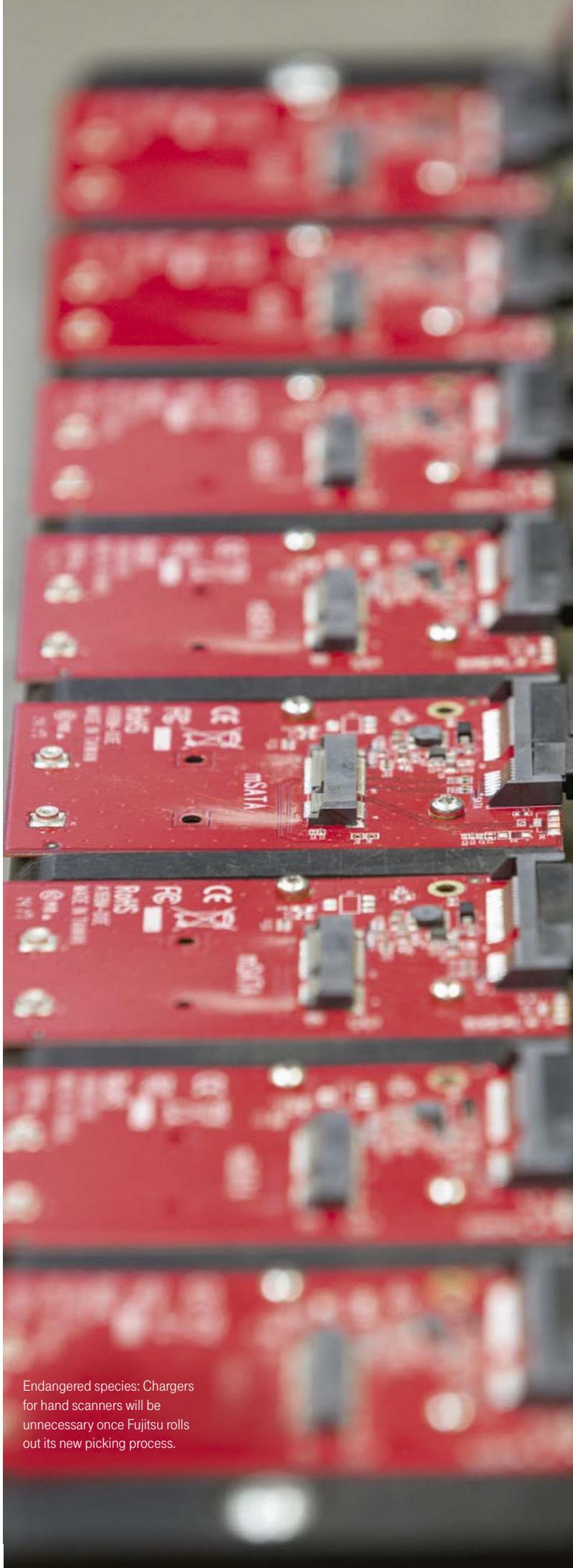
Endangered species: Chargers for hand scanners will be unnecessary once Fujitsu rolls out its new picking process.
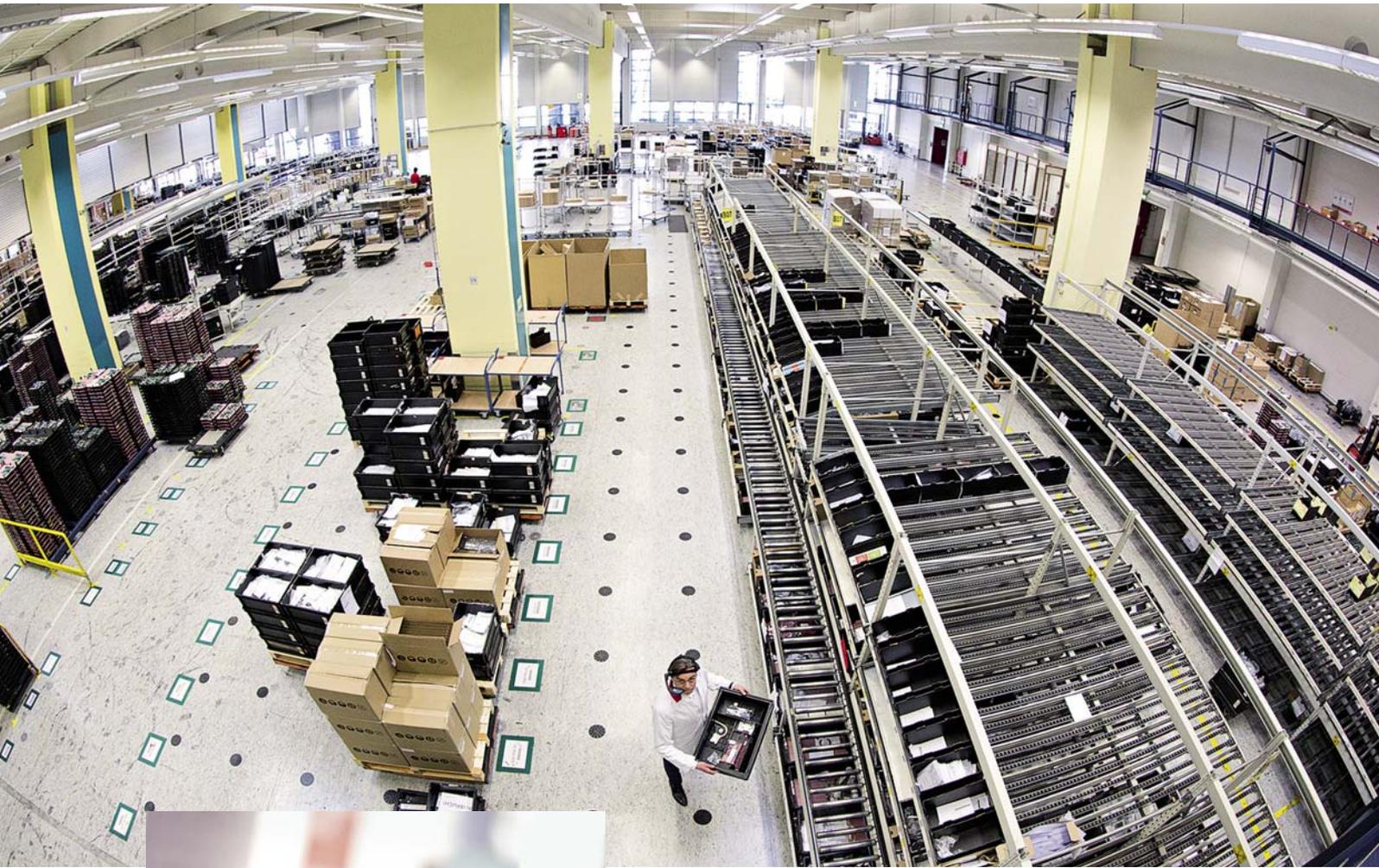
Frank Blaimberger, Head of IT Services and Tools at Fujitsu in Augsburg, employs T-Systems' sophisticated micro-services to support the use of the HMD for picking.

Stutzmüller. Because all augmented reality-based information converges at his workstation.

"Of course, the criterion 'price' always resonates in the pursuit of every process optimization," admits Frank Blaimberger. "But 'affordable' is measured in the first step not just on the basis of the cost of an action, but also its value contribution in adhering to schedules and the quality of our processes. The fact that pickers like Markus Stutzmüller can now process orders faster and more reliably at Fujitsu has a lot to do with the HMD's small monitor. The small diagonal screen measuring 1.02 cm displays document formats – whether PDF, Excel or JPEG – and real-time images from the HMD camera as if Stutzmüller's eyes were viewing a 15-inch screen from a distance of 81 centimeters. This is based on a simple concept from the Fujitsu colleagues in Japan who developed the headset. "We did not want to add information to the real field of vision of a pair of glasses that people might need to wear in other AR applications, because this would require the user to be constantly re-focusing their eyes between near and far," explains Frank Blaimberger.

Rather, Fujitsu wanted to offer employees the guidance of each individual pick by providing information on a separate display – the HMD monitor. This also has an-

other advantage that Markus Stutzmüller is experiencing first-hand: His field of vision and perspective are in no way restricted. The fact that he can accept and handle more orders with the HMD in the same working time also has to do with the fact that he automatically receives all the needed information after each step, including via so-called "voice-based operations". – Just in sequence. Colleagues without a headset must always request each new piece of information on the display of their tablet by pressing a button or manually "checking off".

EMPLOYEE ADOPTION

Markus Stutzmüller's HMD, however, is connected to a so-called "edge cloud server" using mobile communications to receive all the information needed to make work easier. The server initiates all necessary processes in a context-sensitive and individualized manner, depending on the order, that is, for each work step and required micro-service, such as object recognition from the image of the camera (see interview). The same applies to multimedia information, for example, using symbols if an employee does not master the intended system language. For example, if the system unmistakably signals "RED!", Stutzmüller knows to remove a component that is not suitable for the order from the shelf of his picking line – perhaps because its live sensor does not match the data of the AR displays provided by the system.

According to Frank Blaimberger, in addition to the sophisticated preparation and provision of such micro-services, "using the HMD also involves radio technology, processing, the power supply, occupational safety, and ergonomics as important components. Only when everything fits together and optics and wearing comfort are optimal at the end of the day do we achieve the necessary acceptance of the employee to use the device and to do so gladly."

Thus, possible application scenarios of the HMD are by no means limited to logistics. Frank Blaimberger can imagine even more application examples "wherever guided work content makes sense and hands-free work speeds up processes" – for example, for training employees in production. "If the challenges for our employees increase, we naturally want to support and train them accordingly." And there it is again: Just in sequence.

> ## "Every co-innovation requires trust, courage and motivation."
>
> **DR. STEPHAN VERCLAS,**
> Head of the Innovation Center, T-Systems

PROTECTING A SELLING POINT

"When introducing new processes, a guided instruction that is supported by HMD offers great advantages. This allows us to implement the concept of "training-on-the-job," to educate employees or to familiarize them with new things. The resulting fact that they are able to be immediately productive in the first hour of work is a win-win situation for employees as well as for the company." Once the area of picking logistics has completed this transition, all of the digitally isolated islands that still remain will also be bridged so that Fujitsu can complete its journey as a smart factory. But Frank Blaimberger also has another motivation that lies somewhere between unique and solitaire – to preserve the unique selling point "Made in Germany," or in other words: at the Augsburg production site in Germany, "activities that make us measurably better than others are of vital importance. In this sense, the project we are implementing as part of a co-innovation partnership with T-Systems fits perfectly into the context of Industry 4.0 and the concept of a smart factory. We want to get there. And we have a clear picture of how the journey will go."

Focused, fast, attentive: every action – and every mistake – made by pickers affects Fujitsu's unit wage costs.
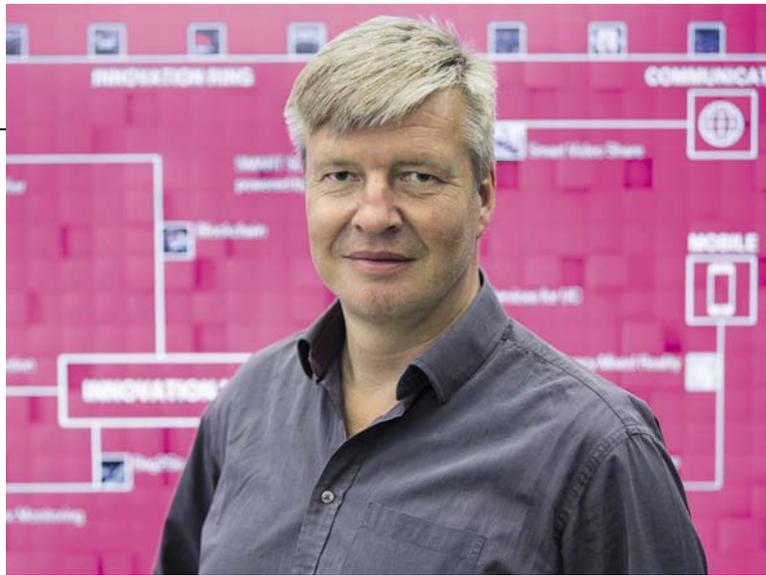
a.droste@t-systems.com (Andreas Droste)
fujitsu.com
www.t-systems.com/manufacturing/smart-factory
www.t-systems.com/manufacturing/smart-logistics
www.fujitsu.com/de/products/computing/pc/vr
www.t-systems.com/video/fujitsu

Just keep thinking

Dr. Stephan Verclas, Director of T-Systems' Innovation Center,
on the joint co-innovation partnership with Fujitsu.

COPY —— Thomas van Zütphen

Dr. Verclas: What is behind the idea of co-innovation?
Nothing other than a strategy for implementing new ideas in collaboration with our customers and partners from business and research. "Collaboration" in this sense also means including our innovation network within the Deutsche Telekom Group as well as the operating units of T-Systems. We take our customers' requirements and develop the most economical solutions with innovative technologies.
The "Head Mounted Display" project in the logistics department at Fujitsu is a great example for this. Our customers, in this case Fujitsu, are at the heart of every digitization process: Will future applications and services run on-site on a device or will they use the cloud, for example, as the infrastructure for service management? Can I map services as microservices, use them multiple times, and then, if applicable, develop additional added value by establishing a systemic link with Smart Analytics? At this point, customers do not want a long-term project with an uncertain end, but short, clear sub-projects (sprints) that help adjust the project focus and minimize failure risks.

And you are starting today?
Correct. 'Co-innovation,' as we understand it, requires trust, courage, and motivation. After all, the creative process does not just end by putting together technologies for which one or the other partner has the better competence and expertise, and then the product is finished. It is simply about thinking ahead, maintaining balance from the first step onward, and keeping the actual and much more valuable development goal in mind: to be able to offer shared solutions to shared customers in the future. Point-by-point cooperation leads to a continuous process that starts with joint development and production, and concludes with consulting, sales, and integration. To accomplish this, we first see who can bring added value to the co-innovation. With HMD, for example, Fujitsu is delivering today the device, the use case, and the process flow that needs to be supported. We designed the solution, developed the application, and integrated the first micro-services, like "Pick-to-Voice". Additional micro services, for example, from the 5G environment and edge cloud computing can be supplemented by other partners during the project or later on.

What is the next step?
We are testing a software solution with Fujitsu from our subsidiary Multimedia Solutions (MMS), which can visualize machine data and thus create a virtual image of an analog factory. An entire plant or, depending on the target group, individual and real manufacturing processes can be visualized. This so-called 'digital twin' becomes the basis of a dashboard where every customer receives a needs-based presentation, for example, using algorithms for predictive maintenance. Essentially, an avatar of the factory provides concrete recommendations for necessary process steps up to the integration of suppliers. We want to use this project to show how additional assets from a pure software product can become a real solution.

✉ s.verclas@t-systems.com (Stephan Verclas)
▭ www.t-systems.com/innovation-center