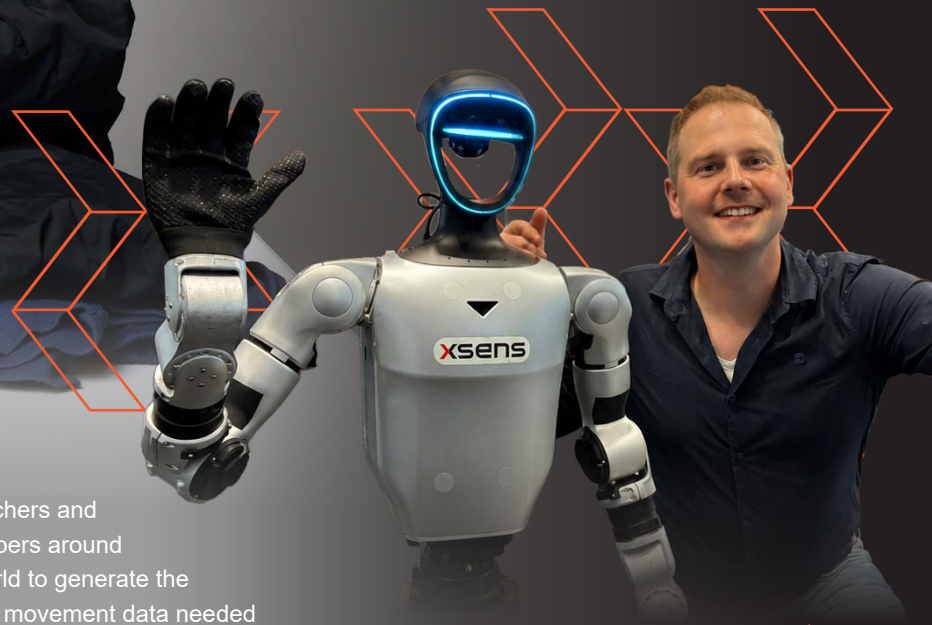


LESSONS FROM THE FRONTLINE OF AI ROBOTICS

WHAT MANUFACTURERS CAN LEARN FROM XSENS

xsens



As manufacturers begin exploring AI-powered robotics, many are asking the same questions: Where should we start? What challenges should we expect? And how can we prepare for technologies such as humanoid robots?

For Xsens, these questions are not theoretical. Its motion capture technology has been used by robotics

researchers and developers around the world to generate the human movement data needed to train intelligent robots. Working alongside companies developing the next generation of AI-powered robotics has given Xsens a unique perspective on how the technology is evolving and what manufacturers can do today to prepare.

We spoke with Dennis Kloppenburg, Innovation, Growth & Business Manager at Xsens Technologies, about the lessons his team has learned from working at the intersection of AI, robotics and human movement.

What has been the biggest lesson you've learned about developing intelligent robots?

Everything you see on television now is a lot of marketing. Robots fighting, running marathons, being deployed into factories. The reality is that there is no real large-scale deployment with a sustainable ROI. Deployment is happening in very few instances, with a lot of human monitoring and control behind it.

At the beginning, I always thought the difficult part was building the humanoid or the computation. It isn't. In China, they can build the hardware part of robotics almost instantly nowadays. The most difficult part is collecting all the data to train a robot and then applying it properly by retargeting it to the robot. That's the biggest thing I didn't know before but know now: having good data, and enough variation in it, to train a policy that actually works and keeps working if, for example, the lighting or environment changes.

This is what our systems help companies with every day. Our suits are in the collection pipeline behind published datasets like RoboMIND. Xsens is one of the capture devices with native support in NVIDIA's Isaac Teleop,

the tooling their GR00T ecosystem uses to gather demonstrations, and we're used by many of the large OEM robot and Physical AI companies.

You can train a robot in a lab to some extent. But out in the field is where a policy stands or breaks. So that's where you should start collecting data: where you want the robot to be deployed.

What are the biggest misconceptions manufacturers have about AI-powered robotics or humanoid robots?

The biggest misconception is around buying from a large OEM. What they offer isn't wrong. They'll help you train, they'll start the data collection in your factory, on your processes, and on everything you do. That works.

But eventually that data goes to them. And the data is potentially worth more than the help. That's the choice manufacturers need to think through: to what extent do you want to do the data collection yourself, rather than have an OEM do it for you?

This is where you see two camps forming. On one side are companies helping with data collection that are agnostic to the robot platform. That's where we sit.

On the other are the big OEMs, who offer this as a service, or intend to once the pipelines become more reliable.

From your experience, what separates successful robotics projects from those that struggle?

The successful companies/projects are the ones that think about where the robot is going to be deployed and what that means for their data collection. They validate early against the real deployment and adjust what they collect based on what they learn.



The people/projects who value digitising their workspace and their processes, and who care about keeping their data clean. Labelling, annotating, storage. They think about it up front, design a workflow that works for them from the beginning, and stick with it. Strict on data cleanliness, strict on variation. Those are the ones getting better results.

The others just start collecting. Large amounts of rough data, bad data, and some good data.

It's a balance between quantity, variation, quality and the right context: what the worker is handling and the state of the environment around them. Large amounts of bad data mean a lot of people collecting for little return. High quality alone isn't enough either. You need all four, in the right mixture.

If you could give manufacturers one piece of advice before they begin investing in robotics, what would it be?

Think about what your goals are with humanoid robotics, or with Physical AI in general. And don't expect an ROI from the first robots you buy, especially not now. Expect to learn from them.

That first one gives you an understanding of your own processes, your data, and what the technology can actually do.

You need to collect the data and build the pipelines. Digitise your processes, instrument your workplaces, make adjustments, and buy the right technology. Every month, new things come out, and no manufacturer is going to keep up with that on their own.

So the first thing to do is start caring about your data and digitising the place where you want to deploy. And work with good technology partners, because this field is developing fast.

Looking ahead, what should manufacturers start doing today to prepare for the next generation of robotics?

Start digitising your workspaces and work processes. Many companies are already doing this today as part of ergonomic assessments, using similar technologies. That work is also the beginning of the dataset you'll eventually need for training humanoid robots.

From there, expand what you capture and how. Head-mounted cameras, IMUs, and recording what the worker is actually doing and what they're handling.

The same effort then gives you something you can train on later.

Do that, and when humanoids are available at scale and the pipelines are robust enough for training and deployment, you're ready. You've already done the crucial part, and you have a head start on everyone else. Those will be the companies that deploy first. ■

KEY TAKEAWAY

While humanoid robots continue to capture the headlines, Dennis believes the real challenge lies elsewhere. Success will depend not only on advances in robotics hardware, but also on the quality of the data used to train intelligent systems. Manufacturers that begin digitising their processes, collecting high-quality operational data, and building the right digital foundations today will be better positioned to adopt AI-powered robotics as the technology matures.

For manufacturers, the message is clear: don't wait for humanoid robots to become mainstream before taking action. Start learning, start building your data capabilities and start preparing your organisation. Those investments will not only support future robotics applications, but also strengthen the broader digital transformation of manufacturing.

