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EPISODE FIVE:
KEY TAKEAWAYS

The IoT Show delves into topics on Industrial Internet of Things (IIoT) and touches on the broader Internet of Things (IoT). We pick engaging, hot topics, and ask our speakers to advise on situations, opportunities, recommendations and gotchas so that listeners can benefit from the experiences and insights of others.

This document is not intended to be a complete representation of views of either the host or participants or a more formal white paper on topics discussed; it's more an aide memoire of comments made by show participants. To watch this episode in full, please go to this page.

In Episode 5 In the series, we look at the topics of computer generated and augmented realities and their place in the IIoT. Our host and guests were:
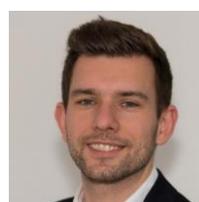
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What do we mean when we speak about VR/AR and MR…

Truth be told Virtual Reality (VR) and to a lesser extent Augmented and Mixed (AR, MR) has been around for some time. For example, we've seen virtual computer models rendered in Caves and Powerwall's for some time. These (older) 'environments' were not designed for the mass market and have limitations.

- Virtual Reality (VR) is a fully (computer) immersive environment where everything one sees is computer generated. It's blind to the world around you as it's totally immersive.

  o For example, a digitally rendered factory with digital plant and machinery models.

- Augmented Reality (AR) is essentially taking 2D and/or 3D information and displaying this onto a view of the real world. Think of Pokemon Go as a good example.

- Mixed Reality (MR) is somewhat analogous to AR but the digital data is displayed inside the (physical) environment you're in. It's an immersive experience where 2D information and 3D models and objects may be (in sight) anchored to physical objects, live views of building spaces and/or locations. What one sees is a spatially aware environment, perhaps a holographic rendering of digital objects in a real-world view. Think of Microsoft's HoloLens as a viewing device.

How are these relevant to the IIoT/IoT?

Think of how humans process information. The cognitive distance being the distance between digital and physical worlds. Reducing this cognitive distance delivers unique, experiences. Connecting the VR/AR/MR world to IIoT/IoT adds value to the cognitive experience by adding insights and information, for example from smart, connected machinery and products; perhaps information concerning machine status or process KPIs.

Connecting VR/AR/MR to IIoT/IoT takes Industrie 4.0 to the next level, allowing much greater industrial integration and collaboration, vertically and horizontally, and at the same time enhancing one's ability to achieve (and optimize) end-to-end engineering.

One of the most obvious use cases (AR/MR) is to deliver a more practical proposition of the 'Digital Twin'. For example, to overlay digital machinery in a real-world factory, or equipment onto a larger mechanical assembly. When combined or overlaid with streams of IIoT/IoT data, these solutions enable operators to better understand and act on information and evaluate situations; perhaps perform tasks more efficiently and help train on or be guided through complex procedures. They can also cut a lot of time from manufacturing service and assembly operations by combining the real with 3D and sensor (analyzed) data.

The bottom line is that these new acronyms connected to the IIoT/IoT allow us to interact in ways that were not previously possible. With machines, devices, 3d models, digital data and the environment.

What are some of use cases?

Some common uses cases might be found in areas of:

- Maintenance

  - Think of real-time digital information pinned to a piece of machinery.

    - With a live status of machinery or processes shown alongside the equipment.

  - Freeing up hands (MR) to operate or investigate complex equipment

  - Troubleshooting, or guiding with expected results (perhaps with suggested probes or tests) presented next to measured information.

- Supervisory roles

  - Perhaps OEE (efficiency indicators) available to selective viewers via headsets. The right information presented to the right (and authorized) person, when and where it's relevant.

- Training

  - One can train people more safely working in virtual or mixed environments.

  - One can train people on more complex tasks without the risks associated with 'real' equipment

- Design reviews

- - With information from the real world or other (perhaps CRM or service management) systems

- Manufacture and assembly-build, for example with a headset to

  - Helping operators through build instructions presenting real test results vs expected values.

  - Routing cables and assembling complex systems, perhaps guided by step-by-step instructions, perhaps using AI techniques to detect anomalies.

    - One could also include virtually displayed (and selectable) checklists and procedure recordings to verify and/or audit processes and procedures.

- Investigate shopfloor layouts.

- Connecting with systems, such as ERP and PLM.

  - Perhaps allowing users to access information on work orders and/or providing context sensitive visible warnings on the shop floor.

    - It could be that a piece or process may not be safe to be worked on at a particular point in time and operators (or service personnel) can be advised via visible/audible warnings.

- …and many other things that couldn't be done before.

  - Think about collaboration when you're not co-located, especially when discussing live or proposed equipment (in-situ).

  - Coupling other technologies to AR/MR delivers much more value to the concept of the Digital Twin.

    - Perhaps using AI to reason equipment or process problems, as they occur in-situ, with recommendations.

    - Providing simultaneous views (perhaps super-imposed) of real and virtual product in test situations, with key metrics and procedures in the line of sight at the same time.

    - Moves the concept of the Digital Twin from a lightweight representation to one that helps optimize not just product, but also process.

What to consider

These acronyms have different benefits, strengths and weaknesses. A degree of understandings on the different technologies is essential, and this knowledge will influence choices appropriate to differing use cases. Payback and benefits are (understandably)

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company specific, and sound understandings allows for companies to rationalize and develop more practical ROI cases.

> Having said this, AR/MR are most applicable when it comes to considerations involving the Digital Twin; VR, being totally immersive isn't really applicable (in this case).

Digital information that's disconnected from it's origin is a sign that you might need and AR strategy. For example, if you use 2D drawings in manufacturing but you have 3D models…why not use 3D and AR to help/support shop floor workers?

The technologies in this space have advanced much faster than business processes. Don't miss out on the opportunity to reduce errors, reengineer processes and focus on benefits delivered to customers.

These technologies are not just about new ways of doing things. They're about new ways of doing things that you've never done before.

How about getting going?

Of course, this does depend on how far you've gone with your digitalization strategy. Are you already using aspects of the technology and do you have (VR/AR/MR) assets already in place?

Have a defined goal and scope for projects. Decide whether you want to go it alone or look at existing solutions and partners. There are lots of solutions (and skills) out there, so look into the marketplace.

Hiring skilled people (perhaps programmers) in these domains can be problematic and one needs time to develop solutions. The biggest costs for these types of projects are in personnel and time.

Go agile. Don't use old-fashioned (long-winded) waterfall development techniques. Fail fast and improve often.

Don't be overly ambitious. Chose a use case that's practical in a reasonable time frame. Without this you might not get management buy-in, and make sure what you're doing isn't technology for technologies sake.

Start with a proof of concept. This will help guide on technologies and in fleshing out ROI (or benefits), and don't believe everything you see on YouTube. Be realistic.

Make sure you assess your maturity level. Not just for you personnel, skills, availability etc., but so too the capabilities of your equipment and its connectivity. If you don't have the digital data (f/e for 3D models) it's more difficult to get going.

Think about the quantities of data and it's flows. Think on the variety, veracity and velocity of the data flows you'll need.

Look at the repeatability of any solution. It's often much to do with the proposition at scale, and the opportunity to reduce risk and errors.

What might we learn from others?

Don't be overly ambitious. Start small, with small steps and grow.

If the opportunity is an enterprise activity, look at how you might deploy and maintain it.

How ready is the hardware you'll need? Take holographic headsets for example. These may not be at the maturity level you'll require for today, but don't let that stop your investigations; they're evolving rapidly.

Some of the use cases are not new; predictive maintenance, for example. What's different now is it's much more practical, lower cost and quicker to get going. Costs, for example, have changed dramatically since the days of Caves and Power Walls. Devices are low(er) cost, portable and can be used across locations and for different use cases.

One of the biggest challenges is in maintaining support (and evolution) of processes and business models as these technologies evolve and is employed across the business.

Keep it simple and don't get too hung up on technology. Make sure you expose (early and often) your successes to the broader organization so that others can see the benefits.

Understand that use cases may be new. Accept the fact that there will be iterations and improvements (and some failures), but agile is the key. Accept failure as a learning opportunity.

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If you're on the fence....

There's lots of advantage beyond the traditional and there are lots of smaller companies leading the way.

Your maturity level is a guide on how fast you can use/take advantage of these technologies.

It's not difficult and its quick to employ. Start with something simple and small and build a degree of comfort. Possibly in a supervisory role that's not process (or company) or company critical. Perhaps something that supports operational management and scale out to more sophisticated or connected topics.

Get acquainted with the (new) business models that are evolving with the IIoT/IoT and AR and see how they may add value (or be a threat) to your business.

Look at what's happening in the world of software and hardware in this space. There's a lot of 'free trials' that'll help you investigate and/or get started.

Try it!