

The Digital Thread: How IoT, Remote Monitoring, and Augmented Reality Impact Corporate Performance

The digital thread—a [communication framework](#) that connects traditionally siloed elements in manufacturing processes and provides an integrated view of an asset throughout the manufacturing lifecycle—is fueling new process innovations that drive critical business decisions, improve operations, and boost competitiveness.

This digital journey involves connecting assets and collecting data to generate actionable insights using three key technologies: the Internet of Things (IoT), remote monitoring (RM), and augmented reality (AR). Each contributes to a modern, digital-first organization.

Revolutionizing the Organization

Integrating these technologies into the organization is the foundation of industry 4.0 — the newest industrial revolution. The **Internet of Things (IoT)** enables machines to talk to each other in real time and analyze data, increasing efficiency and uncovering insights. **Remote monitoring (RM)** offers visibility into the network, both people and machinery, to optimize operations. **Augmented reality (AR)** enhances the real-world environment and creates an immersive and flexible experience to take manufacturing and training activities to the next level.

The interconnectivity and real-time nature of these technologies are changing the fundamental ways that businesses operate.

Data is the most [valuable asset](#) within any modern organization and the lifeblood of the digital thread. Information from sensors, machines, processors, and people can be captured, measured, and analyzed for a variety of uses, such as optimizing and automating operations, improving task efficiencies, enhancing R&D, and upgrading production. Partnered with other technologies, such as machine learning, organizations are using this data to garner insights, support decision making, and stimulate the product development process.

RM, which goes hand in hand with IoT, allows organizations to track the movement of people and machinery and to share work across diffuse environments, including collaborating and sharing files and work products. AR, an overlay of virtual objects to enhance a real-world environment, uses data from sensors and IoT devices and supports improved operations and efficiencies and product development.

The convergence of these three technologies can lead to real change in enterprises that establish a connected digital thread and a digital-first ecosystem.





[McKinsey](#) estimates that IoT alone will generate \$5.5 trillion to \$12.6 trillion in value globally by 2030. Meanwhile, 80% of companies in a [BCG study](#) expect IoT-AR solutions to become the norm in their industry.

Across industries, businesses are facing up to the risks—including workforce management challenges, the impact of not updating existing infrastructure and legacy technology, and security risks—and making the investment. In 2021, a Microsoft survey showed that [90% of organizations](#) in sectors like manufacturing and energy invested in IoT

technology, with 82% saying at least one project had reached the use stage.

Uncovering Actionable Insights

The thread of digital technologies throughout an enterprise boosts profitability by increasing efficiencies, improving margins, and providing a real-time visualization of what is happening in the business. As a result, organizations uncover actionable insights that facilitate more informed decision-making.

Examples include:

- Analyzing data for predictive maintenance of factory floor equipment to reduce downtime
- Implementing AR training for employees to reduce production errors and reduce total training time for new hires
- Connecting IoT devices to collect and store real-time data to uncover trends and reveal patterns of use that could speed up or improve product development or redesign
- Using IoT and RM, to monitor and product use or service and identify issues that are getting in the way of profits. This can be a technology issue, such as interoperability or connectivity challenges that hamper use, or a process issue, like identifying part of the supply chain that is slowing down movement of raw materials or inventory. [McKinsey](#) notes that 23% of companies are using IoT for operations management, and 16% are using it for product development.

In addition to cost savings, IoT, RM, and AR can contribute to creating revenue streams for businesses that are interested in finding new uses for their data and assets to drive profits. [IDC](#) predicts that 35% of G2000 companies will use their digital capabilities to sell data or other services by 2024.

Using their digital assets, some enterprises:

- Share equipment with clients, who rent the assets when they are not in use and only pay for time and output.
- Monetize the data collected by selling insights gathered, such as energy or equipment usage, to other companies with similar applications — or selling that data to a third party.
- Enhance services to existing clients, such as by creating a premium maintenance program using IoT and AR.

- Improve or upgrade existing products or uncover the needs for new products based on customer usage and behavior.

Creating a Digital-First Organization

Enterprises building a digital thread are still on the cutting edge of implementing these technologies. According to [Ernst & Young](#), 17% of organizations are currently investing in AR/virtual reality. One in five of these companies also plan to invest in this technology in the next two to three years.

Building a digital thread using IoT, RM, and AR to boost revenue and profits requires having or creating processes and a culture to support them. Elements that support a digital-first organization include:

- A digital-savvy workforce that can manage and operate the equipment and assets, analyze the data, and think strategically about how digital initiatives improve the business.
- An accessible infrastructure for capturing and sharing the data—along with reliable data storage and transmission—so people can easily find and access the information.
- Convergent technologies such as machine learning or artificial intelligence to analyze data and provide insights to improve business operations and product design.
- A robust cybersecurity infrastructure that ensures the network and data are secure and private while complying with all relevant regulations.

When creating a digital thread throughout an organization, it is necessary to define goals for the technologies that effectively and efficiently solve business challenges and also align with the business goals and objectives. A subsequent action is to set key performance metrics and milestones to measure program success. For most organizations, the first steps to adoption are to engage with an organization that understands a digital-first landscape (to learn what digital first means for their own organization) and then to adopt a pilot program for IoT, RM, or AR.

Challenges

While organizations are building out their digital capabilities, there is understandable concern about large investments of time and money, even in industries that are not traditionally risk averse. Here's a look at some of the primary challenges for companies to resolve before investing in new technology.

- Workforce management, as some companies struggle with having enough in-house talent to deploy advanced technologies—including installing the equipment and sensors and analyzing the data
- Legacy systems and equipment, which require rearchitecting, rebuilding, or replacement to meet the new requirements of a digital-first business model
- Cybersecurity risk, as IoT and RM in particular open new avenues for compromising data and the enterprise network

Commercial

Manufacturing is one of the biggest sectors on the leading edge of IoT, RM, and AR technologies in the commercial space. [Gartner](#) projects that the manufacturing sector will spend up to \$670 billion on the IoT by 2023.

Integrated manufacturing requires connected devices (both physical and digital) and RM for visibility along with AR for maintenance and training. These technologies eliminate blind spots, enable predictive

maintenance, highlight new opportunities, facilitate remote collaboration, and provide data analytics and insight. Once the product is off the factory floor, RM and IoT provide regular feedback from assets in the field to improve the customer experience and shape product improvement and development.

Medical Devices

Medical devices are highly complex systems that must work 24/7/365 without fail. Global regulations require that these devices and their components be traceable from the initial design through implementation in the hospital, lab, or clinic. This protects patients and ensures manufacturers can remove dangerous or defective devices from the market.

The ability to receive real-time data makes a difference. Instead of waiting for something to go wrong and the situation to become an emergency, for example, a connected device could report statistics and key performance indicators in real time so that teams could get ahead of potential breakdowns. And the market is growing. With devices like artificial joints, MRI scanners, and wearable biosensors, the Internet of Medical Things (IoMT) is worth an estimated \$158.1 billion, according to [Gartner](#).

Defense

The defense industry is generally risk averse, as the costs of failure are high. Enterprises in this sector are investing in IoT, RM, and AR to streamline efficiencies and evolving to become more like their commercial counterparts, as modern soldiers, for example, require real-time information at their fingertips.

The most important accomplishment in this space is getting information into people's hands so they can make the right decisions in a timely manner. The U.S. Army, for example, is [using AR](#) to improve soldiers' situational awareness, precisely locate their positions, and allow them to see in the dark. Investments in AR in the defense sector are projected to reach [\\$5.8 billion](#) by 2026.

A Final Word

The digital thread is leading to new process innovations that enhance operations and increase profitability for organizations across industries. And advanced technologies such as IoT, AR, and RM are key ingredients of that digital-first strategy. The journey starts with understanding the business case—how smart connected products and the analytics and operational efficiencies they enable can add value to all areas of an enterprise ready to make the investment.

Enterprises must answer some tough questions: What is the value of the IoT, RM, or AR to the organization? What will we do with the data and insights gathered? What is the cost of not adopting? Once questions like these are answered, it is time for a pilot project to test it out in a small area of the business as proof of concept.

Answers to these questions will drive investment decisions, which will shape the future for the companies that choose the digital thread. After all, these technologies are already changing people's lives for the better. The only real question is: **Will your company be part of that change?**

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