

PRODUCT DEVELOPMENT AND THE CENTRALITY OF THE DIGITAL TWIN

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This knowledge brief looks at product development in the era of IoT and how Best-in-Class firms maximize their success through the innovative use of tools to create digital twins that bridge the gap between physical and digital.



In light of the pressing need for rapid product development and deployment, more and more manufacturers need to overcome the complexity of the development process. When developing very complex products, manufacturers need a way to understand their products better, and they achieve this through the “digital twin,” a virtual representation of the product as an integrated system of data, models, and analysis tools applied over the entire product development lifecycle.

Today’s smart, connected products have changed the rules for product development. The Internet of Things (IoT) is happening, and the products you develop are more innovative, more data centric, and involve more software than ever. At the same time, the product development process itself is based on continuous engineering and connected operations enabled by the digital thread and the digital twin. This knowledge brief looks at the centrality of the digital twin in modern product development and how Best-in-Class firms maximize product development through the use of tools and processes to create digital twins, which are used throughout all stages of the product lifecycle.

Enter the Digital Twin

Quite simply, a digital twin is a virtual model of a product, process, physical asset, or service. One can think of a digital twin as a bridge between the physical and digital world. Via the IoT platform, this pairing of the physical and virtual brings operational/performance data (physical) into the digital twin simulation model (virtual). This provides data on how a product is performing compared to its design intent, and closes the loop from the operations group back to the design group.

Digital Thread

A communication framework that connects traditionally siloed elements in product development processes and provides an integrated view of a product asset throughout the development lifecycle. In addition to technology, the establishment of a digital thread requires business processes and software tools that help weave data-driven decision management into the product development culture.

Without this closed loop, product simulation models used in design lack any knowledge of the physical product. With this closed loop, a product simulation model (part of its digital twin) allows analysis of real-time product data and monitoring of product assets to improve product design and head off development problems before they can even occur. This closed loop prevents development delays and downtime, exposes new opportunities, and even aids in planning for the future.

As an important note, the digital twin works in conjunction with product lifecycle management (PLM) software to enable the digital thread across all stages of product lifecycle. PLM does this by representing the product definition across the lifecycle and across product variants, providing traceability. This is critical, as the product definition changes at various lifecycle stages. PLM not only tracks data, processes, decisions, and results across the product lifecycle, it provides the ability to trace back in time all inputs, decisions, and data involved in product development.

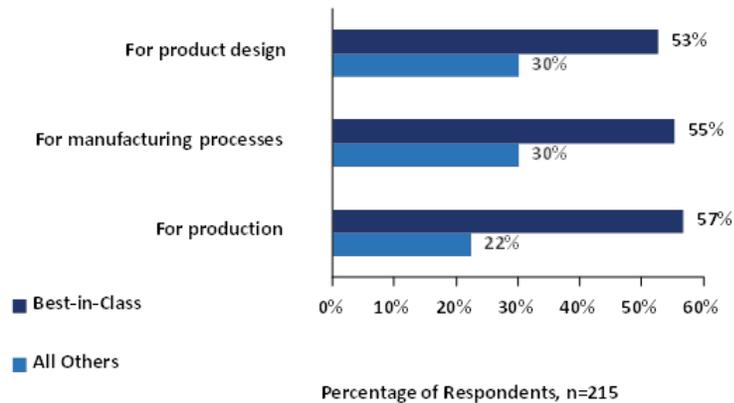
Ultimately, the digital twin accelerates the product development timeline at reduced costs. As the digital counterpart of a physical product, the digital twin allows product developers to create, test, build, monitor, maintain, and service products in a virtual environment. In short, the digital twin empowers organizations to shift to an operations-centric view where proactive and predictive maintenance

enables front line personnel to keep product development humming and to act before costly delays or failures occur.

The Centrality of the Digital Twin in Product Development

The digital twin is central to the digital transformation of product development among leaders. Best-in-Class firms have also recognized the transformative potential of the digital twin in major stages of product development (Figure 1).

Figure 1: Best-in-Class Current Digital Twin Use for Product Development

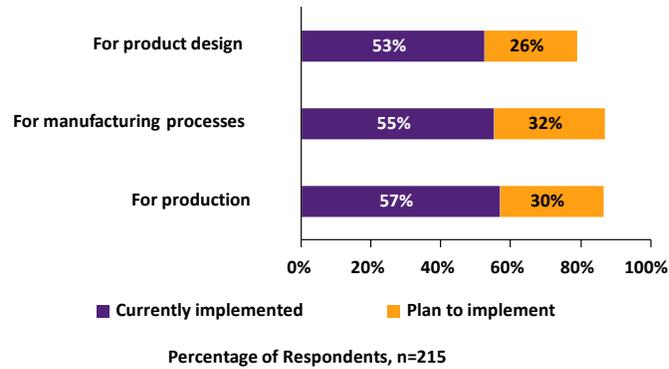


Source: Aberdeen Group, June 2017

Best-in-Class firms are 1.8 times more likely than All Others to deploy the digital twin in designing products and in their manufacturing processes. In product production, the Best-in-Class edge jumps to 2.6 times more deployment of the digital twin than All Others.

Further, the digital twin for product development is trending in the right direction (Figure 2)

Figure 2: Best-in-Class Digital Twin Adoption for Product Development



Source: Aberdeen Group, June 2017

Among the Best-in-Class, both current and planned use of the digital twin is strong at all stages of the product development.

Takeaways

The digital twin is transforming product development. By bridging the gap between physical and digital, the digital twin provides a new level of product visibility.

The rise of IoT platforms has made the digital twin (and digital thread) a reality. In combination with PLM software, the digital thread makes unprecedented product variants attainable and enables traceability across the product development lifecycle, accelerating the product development timeline while simultaneously reducing costs.

Aberdeen research shows that Best-in-Class firms have recognized the transformative potential of the digital twin in product development. Among these leaders, current and future digital twin usage is strong in all stages of product development.

The real advantage of the digital twin materializes when all aspects of product development are brought together. When the digital thread is implemented in conjunction with PLM software to enable the digital thread, the net effect is to optimize the product

asset over its lifetime. From product design and development to product operation, an accurate digital description of a physical product enables faster, better, and cheaper design, prototyping, construction, tracking, tracing, and collaboration. Once the product is operational, the real-time IoT operational data feed enables firms to predict failure more easily, reducing maintenance costs and downtime.

The introduction of digital twin in product development is timely, opening up new avenues for improving manufacturing efficiency — and that’s a good thing at a time when competitive pressures call for rapid product development.

Author: Greg Cline, Research Analyst
Manufacturing and Product Innovation & Engineering



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