Big Data Analytics Finds a Home in the Engineering Toolkit

Big data analytics are touted as the secret sauce behind a lot of innovation–helping retailers tailor novel user experiences to sell more products, arming health care professionals with insights that bolster patient care, and facilitating fraud detection and new revenue streams for companies in the financial sector.

You hear less about the powers of big data analytics for product development, yet the discipline can be just as potent for the engineering community. Big data analytics, fuelled by the rise of the Internet of Things (IoT) and connected products, can provide invaluable context to direct future design iterations, optimize sourcing and parts standardization, improve customer experience, bolster operational excellence for engineering and manufacturing processes, and foster preventive product fixes with the goal of achieving predictive maintenance.

Such innovation, not just around features and functions, but for product delivery and service, is paramount today given the breakneck pace of change and fierce competitive climate. However, the reality is design innovation is a difficult nut to crack. A Deloitte study found that 96% of product innovations fail to return the cost of capital and two-thirds fail within two years. To swing the tide, many manufacturers have big data analytics in their sights as a way to drive product innovation while keeping tabs on their digital transformation success.

IoT Leads the Charge

Sophisticated industrial assets like aircraft engines and wind turbines along with consumer gear like smart thermostats and light bulbs are being reimagined, employing sensors and Internet connectivity to collect near-real-time usage data in the field.

IoT Leads the charge

That deluge of data can serve as a treasure trove of insight that if properly managed and mined, can direct engineering decisions over the course of a product's entire lifecycle. By diligently recording everything from temperature to stress points to speed, that in-field data mix can be coupled with external data sources and massaged with analytics to reveal patterns—for example, a particular part that's pre-disposed to breakage under certain environmental conditions or an assembly that routinely operates at subpar speeds. Any of these selective insights could trigger a design change on subsequent iterations of the product or initiate a proactive fix that keeps customers happy by avoiding unplanned down time.

For sure, adopting a data-driven approach throughout a product's lifecycle lets

engineering organizations tap into IP capital and garner insights they may have otherwise overlooked or never knew existed. Specifically, insights gleaned from analysis of quality inspection data can be vital to inform future products iterations, BOM analytics can help hone designs to hit cost targets, and data captured from warranty claims and service calls can provide crucial intelligence into flaws that can be addressed in subsequent product redesigns.

While PLM systems are home to lots of product-related material—requirements documents, 3D CAD models, bill of materials data, among the bounty—they typically lack any information about the product once it's left the manufacturing line. Moreover, traditional PLM systems have limited, if any, analytics capabilities, and it's a major project to integrate them with external systems.

Block Chain data security

In fact, data aggregation is proving to be one of the biggest hurdles keeping product intelligence out of reach for most engineers. Many in product design remain heavily reliant on Microsoft Excel to manage product-related information, and there are additional repositories of 3D models under the jurisdiction of individual CAD packages—most of which are not integrated, therefore not accessible as part of a broader analytics campaign. Add to the mix an increasing amount of relevant product data residing with suppliers or far flung development partners and you can see how engineers end up with scant intelligence that can guide product-related decision making.

Big Data can be the real game changer

Melding big data analytics into the core PLM platform can be a real game changer in addressing the gap, and most of the leading vendors in this space are stepping up and augmenting their platforms with new analytics capabilities. To be effective, big data analytics must operate within the context of a configured graph with the ability to leverage semantics and words, must be accessible within core tools like CAD and PLM, and actionable insights and resulting decisions must be managed within the engineering environment. "If at the end of the day, people are sending emails as a result of the analytics, you've once again recreated silos and lost digital continuity," notes Morgan Zimmermann, CEO of NETVIBES-EXALEAD at Dassault Systèmes.

Given the scale and variety of IoT data, these solutions must deliver more than base analytics and visualization functionality—they need to be infused with machine learning, artificial intelligence, and automation capabilities to effectively process and interpret IoT data. In that way, they can provide the context for patterns and predictions that can drive better engineering decisions, shape future product designs, and propel companies on their journey to achieve that elusive innovation edge.

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