



## Smarter ways to make smarter products.

Fully 66% of products developed in the past year included some kind of embedded information technology. We're living in a world of smarter products, and that brings myriad benefits – not to mention a lot of interactive fun – to all of us.

But what does it mean for the creators of those products? What are the implications for *them* of infusing computing into things we would never think of as computers: phones, cars, appliances, clothes, household goods, medical devices and more? And what changes must they make for a world in which products are ever more personalized, interconnected and adaptive?

One reality is clear: software is becoming a strategic business asset for every company, no matter what they produce. The makers of smarter products have to become just as proficient in complex systems integration and software development as they've been in conventional product design and manufacturing. They'll have to manage their software as a core business process, applying the same levels of discipline and expertise they already bring to customer relationships, finance, human resources and product lifecycle management.

This shift is profound, and urgent. For instance, how does a company manage and integrate software across a complex, ever expanding supply chain when more and more components are sourced from different locations, arrive with software already embedded and are assembled in various combinations? Aerospace industry leaders are responding by transforming the way they manage a constantly changing set of design and manufacturing requirements. They are implementing new systems that let them share more reliable data with global suppliers and deliver smarter products at lower costs.

At the same time, product development cycles are being challenged by the integration of mechanical, electronic and software technologies

into the design process. This requires new levels of interoperability – but for those who make the shift, the results are real. BMW, for example, reshaped its engineering processes, modeling them on the development processes of leading software providers. They create digital design concepts that allow projects to be shared, modified and improved virtually as they flow across the company's far-flung divisions. This has dramatically reduced testing and manufacturing costs. Overall, best-in-class manufacturers that have built software systems or virtual prototyping into their business practices are meeting 90% of their product deadlines and 87% of their budget targets.

Finally, no product today is, in fact, a "finished product." Even after it is made, shipped and purchased, its makers need to build its capacity for continual and dynamic updating, to respond to upgrades, audits and the increasingly interactive nature of how products are used today.

For example, one global manufacturer of medical devices needed a more efficient, reliable way to track and validate their product requirements – every upgrade, every response to a problem and every bug fix required documented analysis. Their solution was to migrate 95% of their requirements from a manual process (involving volumes of complicated documentation) to a seamless automated process that not only reduces production complexity but also helps to make sure that the devices satisfy requirements.

These products, and myriad others, are making our lives more efficient, reliable, healthy and delightful – and they're being created beyond the confines of the assembly line. With smarter ways to make all the things we want and need, we now have the opportunity to do for product creation in the 21<sup>st</sup> century what mass production did in the 20<sup>th</sup>.

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