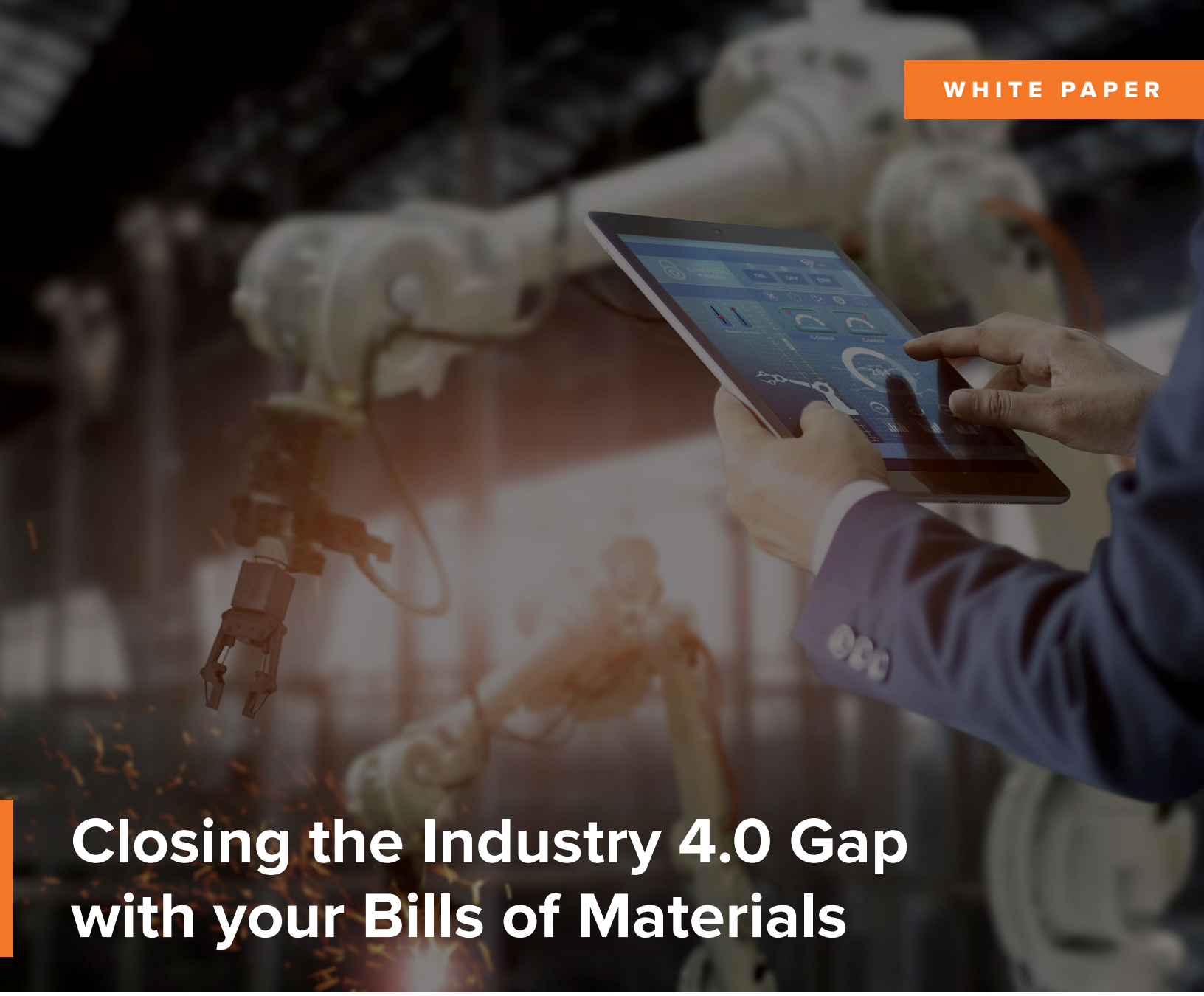

WHITE PAPER

Closing the Industry 4.0 Gap with your Bills of Materials

Avoiding massive unexpected recall and repair costs while reducing your enterprise risk

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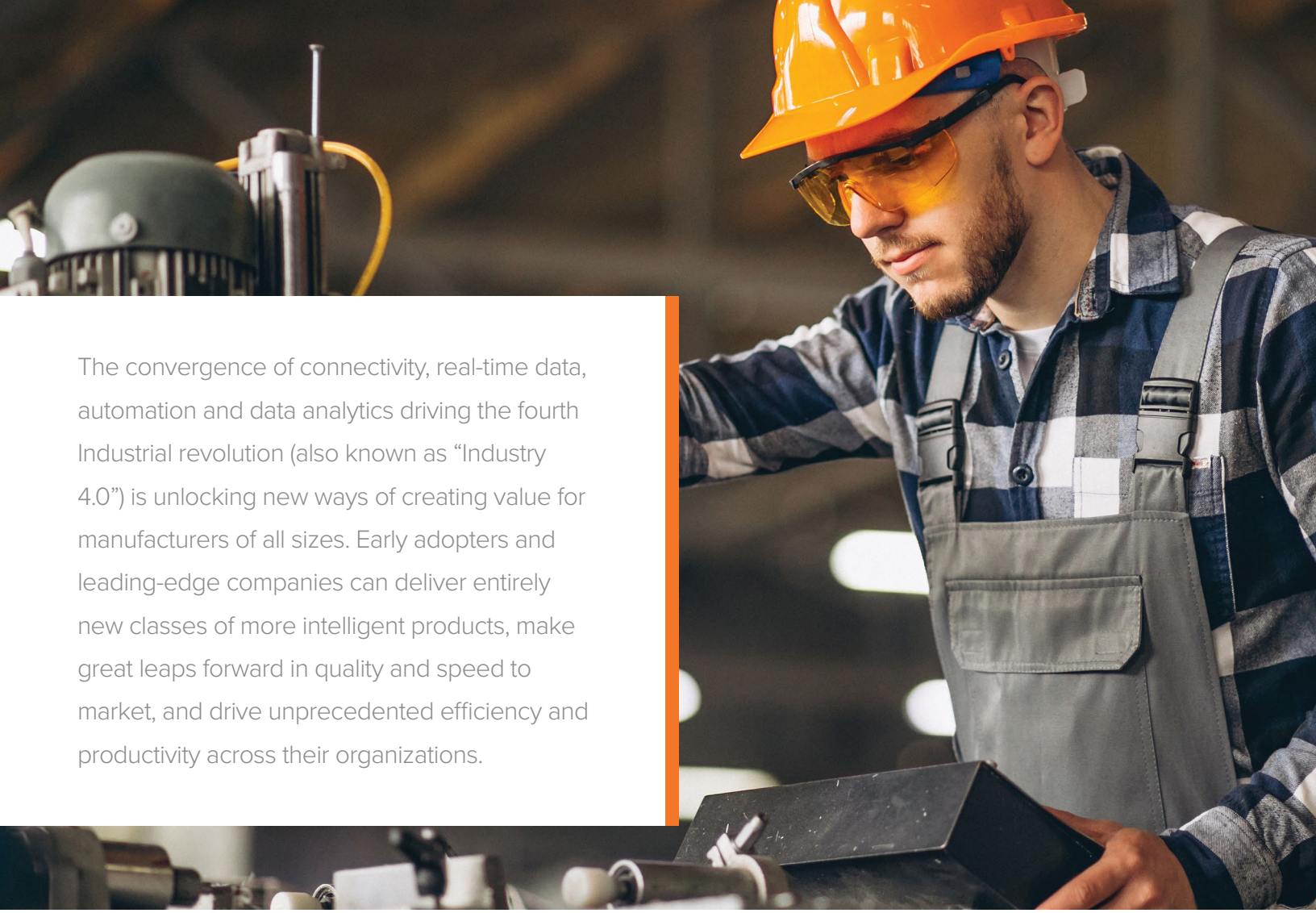


The convergence of connectivity, real-time data, automation and data analytics driving the fourth Industrial revolution (also known as "Industry 4.0") is unlocking new ways of creating value for manufacturers of all sizes. Early adopters and leading-edge companies can deliver entirely new classes of more intelligent products, make great leaps forward in quality and speed to market, and drive unprecedented efficiency and productivity across their organizations.

With game-changing benefits like these being realized, it's not surprising that 94% of manufacturing, energy, and mining industry leaders in 11 countries are reporting that digital transformation is a top strategic objective for their organizations, and they are committing an average of 30% of their operations/IT budgets on digital transformation initiatives.[1]

But *attitude* – a desire for digital transformation – is just one piece of the equation; the other is *aptitude*, or the ability to actually transform the organization. In this area, manufacturing leaders are far more pessimistic, with just 1 in 5 feeling like their organization is "highly prepared" to successfully execute digital transformation across all aspects of their operations.[2]

As a result, many of today's manufacturing organizations – particularly those with multi-site, multi-national operations and supply chains – are caught at various phases of internal digital maturity. Some teams and departments that are more ready, willing and able to adopt fully digital processes are operating full speed ahead, while others are passively (and sometimes actively) working to maintain the status quo for as long as possible.

This inconsistency is especially problematic for end-to-end processes that depend on and interact with a variety of teams and departments in order to function. Employees reliant on these horizontal processes can feel like they have one foot on the unmoving dock of the manufacturing world and the other in a digitally-native boat that's quickly pulling away... with the situation rapidly growing more uncomfortable by the moment.

[1] *The Industry 4.0 Paradox*, Deloitte, 2019
[2] *The Fourth Industrial Revolution is Here—Are You Ready?*, Deloitte, 2018

The Bill (of Materials) Comes Due

Perhaps the best example of this effect is the Bill of Materials (BOM) that nearly every manufacturer relies on to produce physical goods. BOMs capture the exact quantities of raw materials, sub-assemblies, components, sub-components and parts needed to successfully complete a finished good, whether the end product is as simple as a shopping cart or as complex as a commercial aircraft.

The majority of organizations have two BOMs; an engineering BOM (EBOM) and a manufacturing BOM (MBOM). The EBOM is created during the product development phase using 3D CAD software, so the process and output are entirely digital.

At that point the manufacturing team edits the EBOM to incorporate elements there is no CAD for. These are often purchased items like black box designs, grease and Loctite that are essential for the manufacture of the final product. All these items have to be managed and accounted for in the MBOM, right down to the last washer.

The EBOM and MBOM sit right in the overlap of the physical and digital worlds, influencing and being influenced by every activity that supports the product's development, manufacturing and lifecycle. As a result, they are exceedingly vulnerable to discrepancies and disconnects that occur between highly physical processes and highly digital processes anywhere in the product's lifecycle.

When BOMs aren't in complete synchronicity, the consequences can be catastrophic, including:

- **COMPLETE PRODUCT RECALLS, REPAIRS AND REISSUES**
- **SURPRISE WARRANTY EXPENSES**
- **MASSIVE INVENTORIES OF SCRAP**
- **EXPEDITED ORDERS OF REPAIR PARTS AND MATERIALS**
- **INSURANCE CLAIMS AND CLASS ACTION LAWSUITS**
- **LOSS OF MARKET SHARE**
- **INABILITY TO MEET DEMAND OR SHIPMENT DEADLINES**
- **LONG-TERM NEGATIVE IMPACT ON YOUR BRAND AND REPUTATION**

Depending on the type of product being manufactured and the impact of its malfunction, product defects due to BOM inaccuracies can introduce a significant amount of unnecessary enterprise risk – risk substantial enough to put the future of your company at stake.

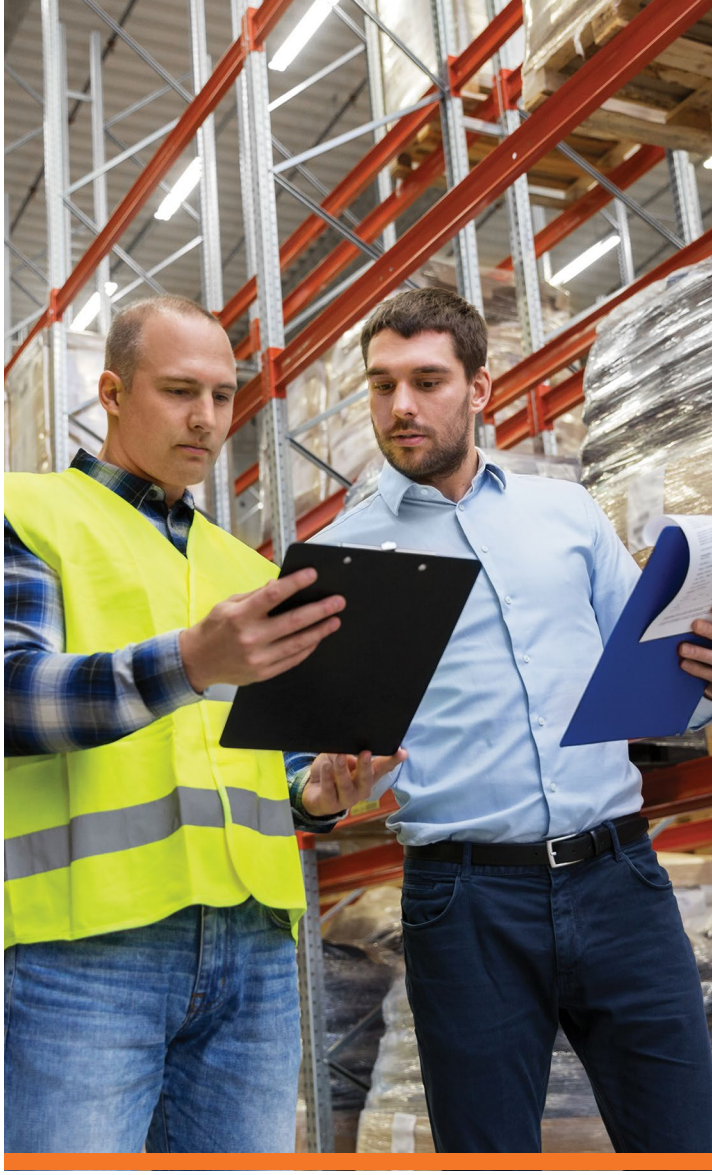
“We never saw it coming”

If the BOM is so critical and the potential impact so disastrous, why do product defects due to BOM inaccuracies happen in the first place? Based on the experience of Persistent engineers who are called in to investigate these incidents after the fact, a few common denominators come up frequently, including:

- **Large volume runs**
- **Tight production and shipment deadlines**
- **Multiple sites manufacturing identical products**
- **International suppliers and global supply chains**
- **Multiple upstream partners providing source materials, components, sub-assemblies or parts**

Each of these characteristics on its own increases the risk of a BOM-related product defect; the more of these characteristics that fit your own manufacturing operation, the more likely you are to be subjected to a BOM-related product defect at some point in the future. And in every post-incident investigation, the manufacturer *never saw it coming*.

What if you could all but eliminate the potential for a BOM-related product defect leaving your manufacturing facilities? Would you spend a fraction of the cost of a product recall now to avoid the potential for such an event in the future?



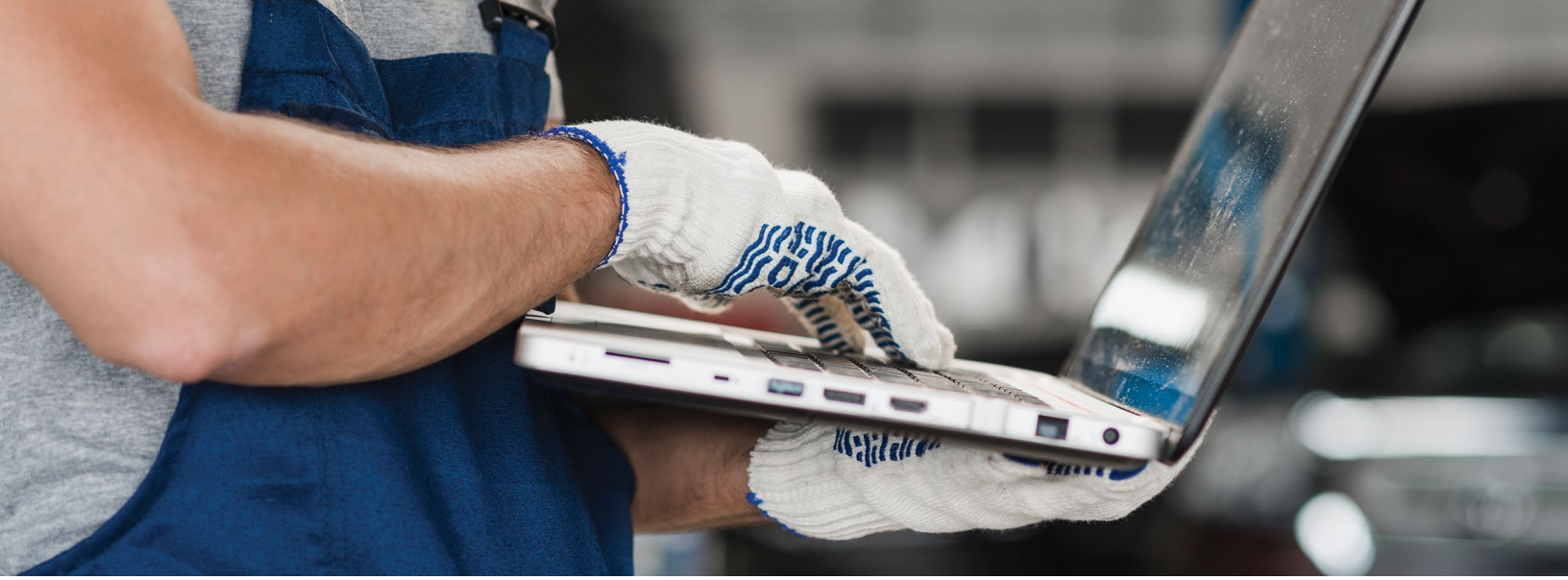
Can you spare some change?

The first place to look to eliminate the risk of BOM-related product defects is your organization’s BOM change management process. BOM changes are a constant in today’s complex product development and lifecycle management environment, driven both internally (continuous improvement, for example) or externally (updated industry regulations, etc.) With that in mind, ask yourself:

1. **When any individual in your organization initiates a change to one of your products, how does that change get handled?**
2. **How are multiple concurrent changes to the BOMs handled in your organization?**
3. **Do you have a workflow to ensure that information gets to everyone who might be impacted upstream or downstream?**
4. **Does that process happen digitally or is it still paper-based?**
5. **Does it happen in real time? Hours later? As soon as the targets get the email or memo?**
6. **Does that process extend beyond the walls of your organization to your upstream suppliers?**

The smallest cracks in your change management process can have a massive impact on your BOMs -- and the smallest changes to your BOMs can have a massive impact in your production environment.

Anything less than a real-time, automated, truly end-to-end digital change management solution simply can’t keep up as products and supply chains have grown faster and have become more global and increasingly complex. The solution is Product Lifecycle Management (PLM) software.



Unlocking the Potential of Your Factory Operations

It's easy to see why the PLM software category has grown into a US$43.5 billion market in 2017 and is expected to exceed US$63.2 billion by 2023. PLM solutions are purpose-built to meet the needs of today's product developers and manufacturers. As organizations become increasingly digital, global and collaborative, they're also more able to leverage Industry 4.0-driven improvements in intelligence, automation, analytics and machine learning/AI.

The global PLM market leader today[3] is ENOVIA™ by Dassault Systèmes, one of the true pioneers in the market. ENOVIA offers a dedicated Bill of Materials Management function that lets product engineers create and maintain complete, accurate and up to date BOMs as changes occur through the product development process.

Users across your organization can access a consolidated, fully connected global or site-specific view of the BOM at any time, supported by a common automated development and change process that updates the BOM and notifies impacted users in real time in order to maintain accuracy.

ENOVIA's Bill of Materials Management function delivers manufacturing organizations a "single source of truth" that scales easily to support the world's most complex products with thousands of parts organized across many levels of hierarchy, and the assembly structure automatically updates when new component revisions are released.

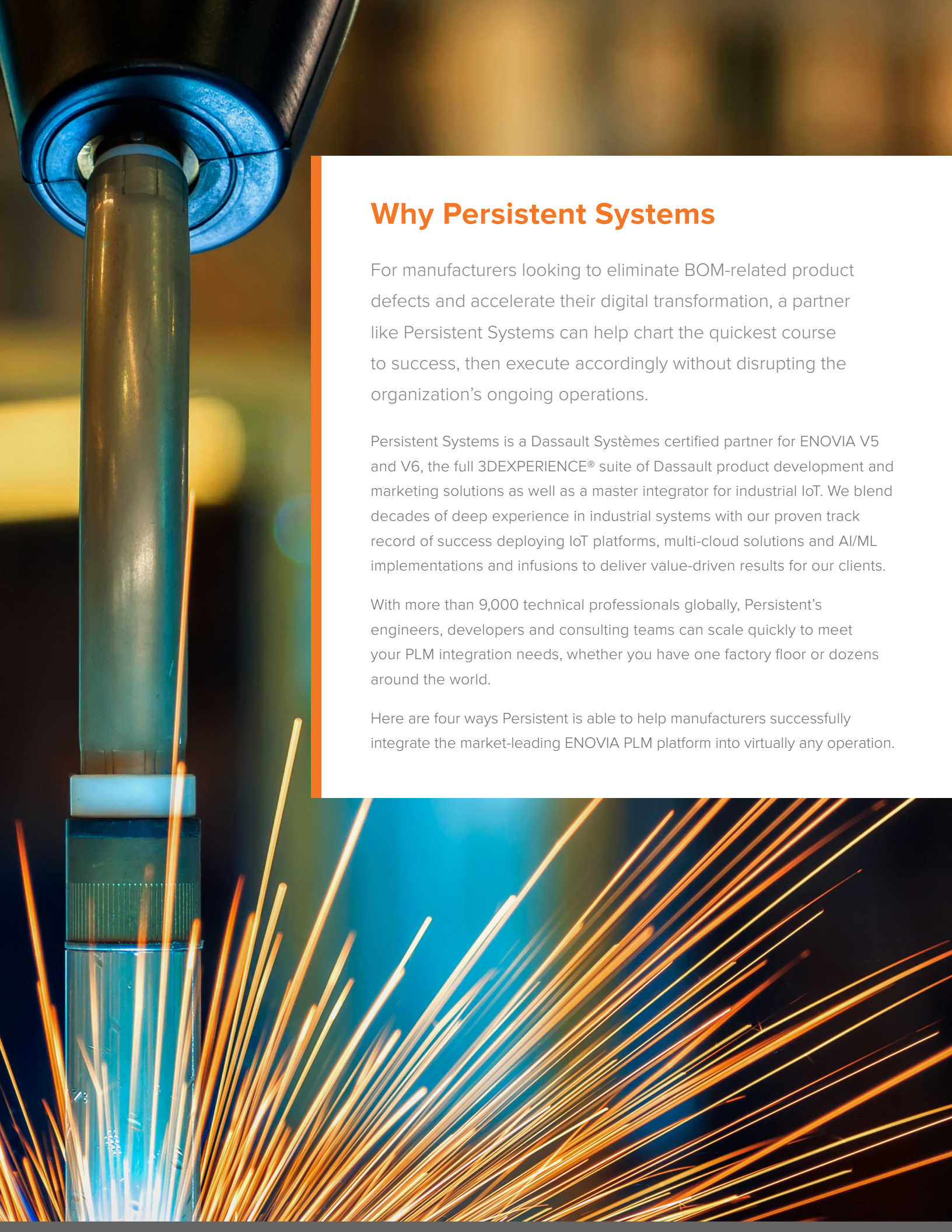
PLM platforms like ENOVIA remove the possibility of having BOMs that are obsolete or out of sync, which in turn *eliminates* the possibility of potentially catastrophic product defects due to BOM errors.

One secondary benefit of platforms like ENOVIA is the best practices that are "baked in" the code. By implementing a PLM platform, not only will you be equipping your users with state-of-the-art software and tools, but you'll be optimizing your BOM change management processes as well.

Product defects are the bane of any manufacturer; at a minimum they create distractions, slow time to market, create unexpected expenses and hurt your reputation. For some manufacturers, product defects can cause injury or death, triggering class action lawsuits, punitive damages, and potentially force you out of business.

PLM platforms can effectively mitigate this risk and deliver several other process and business benefits as well, but the perceived size and complexity of these installations can lead many companies to stall their own procurement and integration efforts, despite the obvious need… sometimes until after it's too late.

[3] *Top 10 Product LifeCycle Management and Engineering Software Vendors and Market Forecast 2017-2022,* Apps Run the World, 2019



Why Persistent Systems

For manufacturers looking to eliminate BOM-related product defects and accelerate their digital transformation, a partner like Persistent Systems can help chart the quickest course to success, then execute accordingly without disrupting the organization's ongoing operations.

Persistent Systems is a Dassault Systèmes certified partner for ENOVIA V5 and V6, the full 3DEXPERIENCE® suite of Dassault product development and marketing solutions as well as a master integrator for industrial IoT. We blend decades of deep experience in industrial systems with our proven track record of success deploying IoT platforms, multi-cloud solutions and AI/ML implementations and infusions to deliver value-driven results for our clients.

With more than 9,000 technical professionals globally, Persistent's engineers, developers and consulting teams can scale quickly to meet your PLM integration needs, whether you have one factory floor or dozens around the world.

Here are four ways Persistent is able to help manufacturers successfully integrate the market-leading ENOVIA PLM platform into virtually any operation.

BUSINESS PROCESS CONSULTING

Some manufacturers are committed to integrating a PLM platform, but the existing IT team is simply too stretched to add a PLM implementation to their roadmap. Persistent consultants and engineers can augment the manufacturer's internal resources by:

- **Mapping the current end-to-end processes**
- **Identifying the digital maturity of each team or function, including upstream vendors and downstream partners**
- **Identifying gaps in maturity**
- **Developing a roadmap to integrate PLM into each aspect of the process to maximize its process and business metrics and outcomes**
- **Seamlessly integrating the PLM alongside the ongoing business and IT operations**

ALM/CAD/PLM CONNECTORS

Data is the lifeblood of today's digital organization, and connectors are the circulatory system. Persistent Systems has decades of experience developing custom connectors to ensure the data providers and consumers can ingest and deliver clean data seamlessly and securely, including:

- **Application lifecycle management (ALM) to PLM providers and consumers**
- **CAD to PLM connectors for legacy or multi-CAD environments**
- **PLM to PLM connectors, for organizations where multiple PLM platforms are in use**

MULTI-CAD AND ENTERPRISE INTEGRATIONS

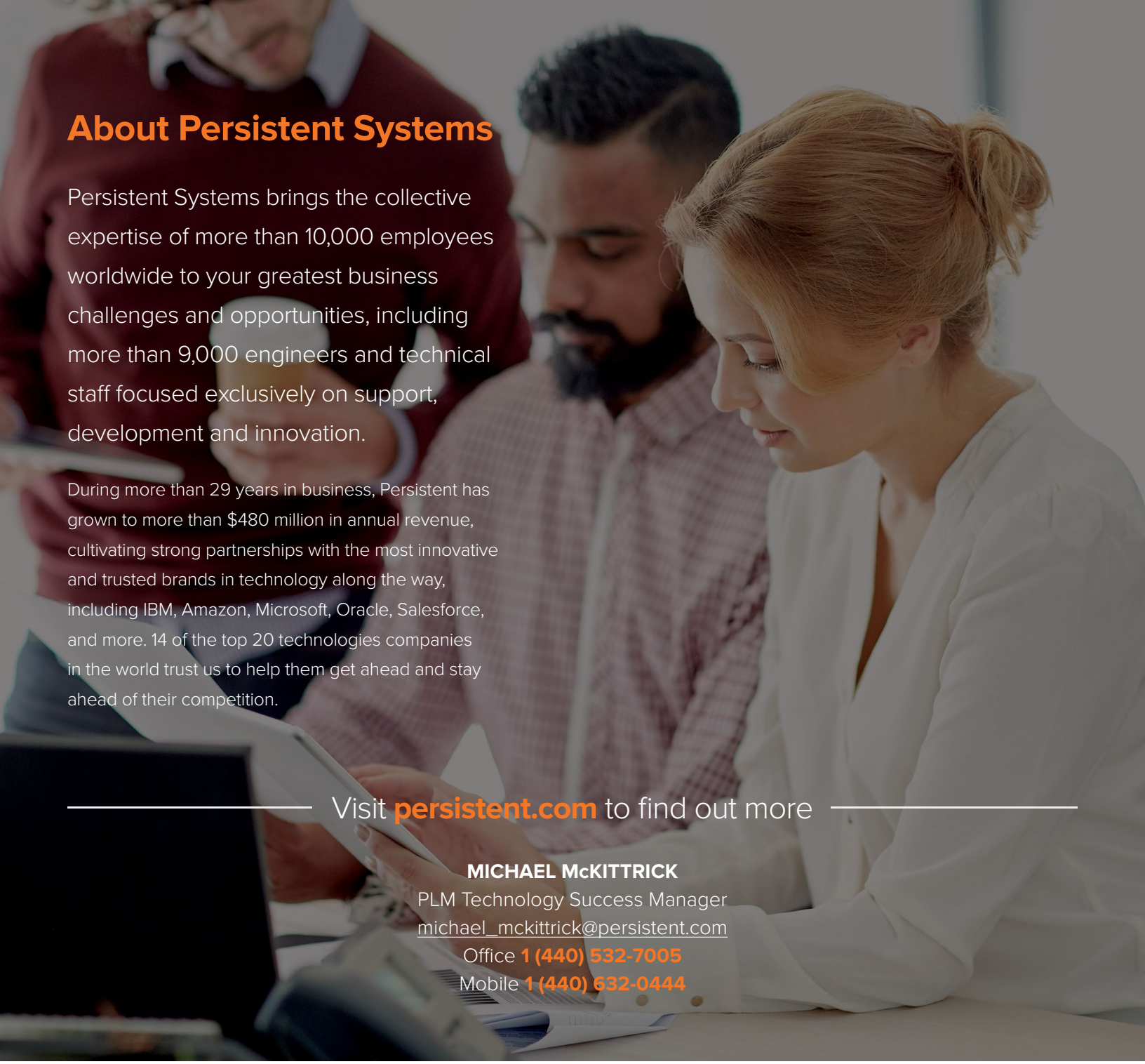
Most manufacturers – particularly larger organizations with multi-national operations – rely on a variety of CAD tools across the enterprise. Persistent specializes in complex integrations like this, ensuring that each CAD platform is supported and maximized to its fullest potential as part of the ENOVIA PLM platform.

PLM platforms also don't exist in a vacuum; they must integrate fully with a variety of other enterprise platforms in order to eliminate data islands and ensure the digital transformation across the organization is executed to its fullest potential. So Persistent developers and engineers have experience successfully integrating ERP platforms like SAP, IoT platforms like DCP and product content management systems like Hybris, just to name a few.

IMPLEMENTATION & CUSTOMIZATION

Out of the box, PLM platforms like ENOVIA are built around the industry's leading best practices using a variety of templates. But to maximize the return on the PLM investment, the platform should reflect the people and processes it supports, not the other way around.

If your ENOVIA PLM instance simply isn't delivering the process and business benefits you expected, Persistent developers have experience developing solutions designed around your specific needs, not ENOVIA's default capabilities. Persistent can also develop new features specific to your business, if the existing limits of the platform are leaving your organization frustrated.



About Persistent Systems

Persistent Systems brings the collective expertise of more than 10,000 employees worldwide to your greatest business challenges and opportunities, including more than 9,000 engineers and technical staff focused exclusively on support, development and innovation.

During more than 29 years in business, Persistent has grown to more than $480 million in annual revenue, cultivating strong partnerships with the most innovative and trusted brands in technology along the way, including IBM, Amazon, Microsoft, Oracle, Salesforce, and more. 14 of the top 20 technologies companies in the world trust us to help them get ahead and stay ahead of their competition.

Visit **persistent.com** to find out more

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