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## SMART MANUFACTURING IN AUTOMOTIVE

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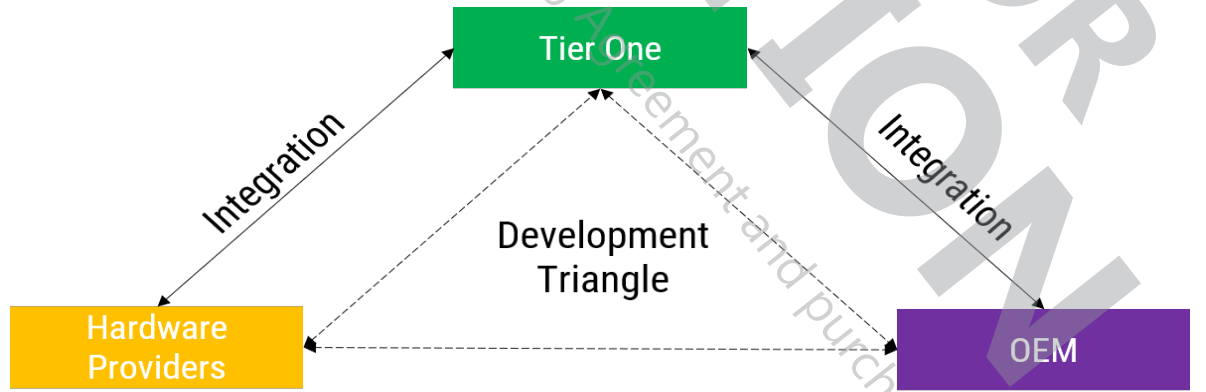## 1. EXECUTIVE SUMMARY

The adoption of smart manufacturing technologies has already started to grow in almost all industries within the leading manufacturing countries, and the automotive industry has acted as a pioneer for most technologies in each country. This includes technologies such as Additive Manufacturing (AM), Artificial Intelligence (AI) and Machine Learning (ML), Augmented Reality (AR), and Collaborative Robotics (cobots), as well as Industrial Internet of Things (IIoT) platforms. Some of the leading automotive Original Equipment Manufacturers (OEMs) have at least piloted and, in some cases, scaled these technologies, including Audi, Volkswagen (VW), Ford, Honda, Daimler, and BMW.

The automotive industry faces many of the same challenges as other industries, such as bridging the gap between Information Technology (IT) and Operations Technology (OT) and providing low-code or no-code tools for content creation, app development, and logic configuration. In addition, automotive OEM IT departments tend to have some of the strictest security policies, which can make it more difficult to connect new devices to their Wi-Fi. Also, automotive has a tiered supply chain, meaning the OEMs assemble and integrate multiple systems, each of which has a Tier One supplier that has assembled and integrated parts from Tier Two suppliers/hardware providers. Figure 1 provides a simplified view of the automotive value chain.

Figure 1: The Simplified Automotive Value Chain

*(Source: ABI Research)*

*Smart manufacturing technology vendors need to understand the challenges, offer solutions with obvious business cases, and have a stakeholder management strategy for all involved parties*

Additionally, automotive OEMs tend to have fragmented internal organizations with few branches of management that take a holistic view of applying technology or innovation across the enterprise. This makes maintaining digital threads and digital twins from design through production to final products more complicated than most other industries.

How can smart manufacturing technology vendors tackle not only the vast number of problems that they solve in every industry, but also take on the additional challenges that come with automotive? To do this, they need to go in with an understanding of the challenges, solutions with obvious business cases, and a stakeholder management strategy for all of the parties involved, from the factory floor workers and their unions to the OEMs' executives, IT departments, and all the suppliers. Most of the OEMs and their suppliers know they need to transform. Competition will spur them onward, but each new technology needs to make business sense and not burn bridges with stakeholders.

Smart manufacturing vendors face the following challenges in the automotive industry:

- How can vendors empower manufacturing firms to create content, develop apps, and configure logic in a scalable way without too much custom code?

- How can vendors align with the strict IT policies of automotive manufacturers?

- How can vendors integrate their technologies in current processes with minimal disruption?

- How do vendors guarantee Return on Investment (ROI)?

ABI Research makes the following recommendations, explained in greater detail below, for Chief Technology Officers (CTOs) of smart manufacturing vendors to solve the above problems:

- Meet with different stakeholders.

- Prioritize the business case.

- Build or partner with a vendor that builds production simulation technology.

- Stay hardware agnostic, spend time with customers' IT and OT professionals, and leverage existing infrastructure.

## 2. STRATEGIC GUIDANCE FOR SMART MANUFACTURING VENDORS

Technology vendors targeting the automotive manufacturing industry need to understand that while automotive shares many challenges with other industries, it often takes them to extremes. For example, while all industries struggle right now to deploy new technologies and integrate them with current processes, the magnitude and complexity in automotive manufacturing presents greater risks. One minute of down-time in automotive can cost tens of thousands of U.S. dollars.

Automotive manufacturing deals with relatively high-value, high-volume, and high-complexity products. OEMs in this industry generally design the vehicles, then outsource the production of many of the systems, sub-systems, and parts before assembling, painting, finishing, and testing the final products themselves. Also, most vehicles now have options and extras that require slight alterations

or reconfigurations to the assembly processes, as well as the supply chain, and every new option, part, or feature requires test cars for the production team to practice building it into the vehicles and for functionality testing.

The automotive industry has acted as a pioneer in many transformative technologies because it has more of a need and a demand to increase flexibility and agility. To meet and exceed the complex demands of the automotive industry and scale adoption, smart manufacturing vendors must:

*Meeting and exceeding the complex demands of the automotive industry and scale adoption are necessary goals for smart manufacturing vendors*

- **Meet with Different Stakeholders**: The automotive industry carries a weight of publicity, volume, complexity, and national pride that most other industries do not. Automotive worker unions wield immense power in countries like the United States and Germany. Governments and political leaders pay attention to their OEMs; in some cases, this means navigating health and safety regulations, especially around cobots or AR on the production line. In other cases, such as in China or France, that might mean the government directly invests in or subsidizes the industry. Smart manufacturing vendors should consider and talk to the stakeholders in each individual company they target, especially in the automotive industry. Obviously, this includes the IT, operations, Research and Development (R&D), and other relevant departments within the company itself.

- **Prioritize the Business Case**: Because the automotive industry involves high-volume, high-value, high-complexity products, down-time and loss of productivity come at a much higher cost, while incremental increases in productivity or quality pay off quickly. If vendors cannot guarantee ROI at scale, manufacturers in this industry will not implement their solutions. This industry does act as a pioneer, but only for solutions that can prove their value.

- **Build or Partner with a Vendor that Builds Production Simulation Technology**: Considering the cost of test vehicles and the demand for ROI, production simulation tools can prove extremely valuable in demonstrating the benefits of new technologies in production processes, identifying bottlenecks, meeting health and safety standards, and achieving first-time-right production. Most clients will still want to go through physical test runs, but simulation technology can reduce the failures of those test runs.

- **Stay Hardware Agnostic, Spend Time with Customers' IT and OT Professionals, and Leverage Existing Infrastructure**: Automotive manufacturers tend to have some of the strictest and least flexible IT policies on the types of devices or data that connects to their networks. Vendors should meet with cross-functional teams from every new client to determine how to adapt solutions to both IT and OT needs. For software vendors, this means staying hardware agnostic and running on whatever devices the client has already or already knows how to integrate.