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Digital Shopfloor Excellence

Fast-tracking the digital transformation on the shop floor with rapid diagnostics

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Closing the Smart Factory gap with rapid diagnostics

In the context of shopfloor digitalization, often referred to as the smart factory, industry leaders are rapidly advancing towards Industry 4.0, i.e., advanced production technologies, leading to interconnected and autonomous digital enterprises[1]. However, many organisations remain hesitant to adopt these transformative technologies, resulting in a significant gap between the pioneers and the rest of the manufacturing sector[2]. This hesitancy stands in stark contrast to industry investment intentions. According to Deloitte's 2026 Manufacturing Outlook, 80% of manufacturing executives plan to allocate 20% or more of their improvement budgets to smart manufacturing initiatives, positioning smart manufacturing as the primary driver of competitiveness over the next three years[3]. This substantial commitment reflects industry recognition that continued investment in foundational technologies is essential to boost competitiveness and agility in an increasingly volatile market.

Yet, the path to realizing this potential remains uneven. In a similar vein, a recent study by ETH and Swissmem outlined that the integration of artificial intelligence (AI) in manufacturing is progressing only cautiously[4]: only 28 percent of surveyed companies have a specific AI strategy, while 51 percent have not yet considered any integration of AI solutions, and just 2 percent have implemented AI at scale in their production. This is also backed by our Deloitte's State of Generative AI in the Enterprise report outlining that only 2% of generative AI use cases are pursued in the manufacturing function and only 10-30% are expected to be scaled in future[5]. Notably, Deloitte's 2026 outlook reveals that while nearly 22% of manufacturers plan to deploy physical AI within two years (more than double the current 9%), the scaling of agentic AI from pilots to enterprise-wide deployment remains a critical challenge[3]. These autonomous AI agents, capable of reasoning, planning, and autonomous action, are poised to elevate smart manufacturing and operations through supply chain risk mitigation, institutional knowledge capture, and autonomous decision-making in supplier engagement and workflow optimization.

The hesitancy not only impacts operational efficiency but also threatens long-term competitiveness and resilience in an increasingly digital manufacturing landscape[6]. Furthermore, uncertainty remains due to cost pressures, potential policy changes, and geopolitical risks, yet investments in digital transformation continue to be a strategic focus. This divergence underscores the importance of conducting a rapid, comprehensive, technology-enhanced shop floor assessment to identify high-impact opportunities and accelerate the digital journey step by step building on core manufacturing systems, data analytics, and cybersecurity measures[7]. The rapid diagnostic also puts the emphasis on workforce upskilling and building dedicated internal teams to champion the change and transformation for sustainable success. Given that 81% of manufacturing task hours are expected to remain human-driven, this underscores the continued criticality of human expertise alongside AI-enabled automation, making workforce development essential for sustainable success[3].

"The hesitancy to adopt Industry 4.0 technologies not only impacts operational efficiency but threatens long-term competitiveness and resilience in an increasingly digital manufacturing landscape".

Our rapid diagnostic assessment methodology

Our rapid diagnostic assessment is a comprehensive evaluation toolkit designed to identify opportunities for value creation on the shop floor and has been refined through extensive project experience to bridge the gap in Industry 4.0 adoption. It examines critical functional themes such as automation, data analytics, workforce optimisation, and smart operations to uncover inefficiencies and areas for improvement. This targeted approach enables manufacturing companies to prioritise interventions that drive operational excellence, sustainable performance improvements, and maximise return on investment.

The assessment methodology is built around six key building blocks, each harnessing advanced digital technologies and data-driven insights, which will be tailored and integrated into the project approach according to your specific requirements (see Figure 1 for an overview of the rapid diagnostic assessment areas designed to unlock and capture value on the shop floor):

- **Digital Twin through digitally enhanced Gemba Walks**[8]**:** This building block integrates the traditional practice of observing and engaging with shop floor operations directly with the creation of rapid digital twins, leveraging handheld and mobile scanning technologies to swiftly digitise the shop floor layout. By combining these advanced virtual replicas of physical assets and processes with real-time data capture, digitally enhanced Gemba Walks enable continuous monitoring, detailed analysis, and simulation of production workflows. This approach not only helps identify improvement opportunities and optimise operations without disrupting ongoing activities but also accelerates the feedback loop by providing an accurate, up-to-date digital representation of the physical environment to drive backend improvements efficiently.
- **Process Intelligence (Task & Process Mining)**[8,9]**:** By analysing event data from shop floor, manufacturing execution and enterprise systems, this approach reveals how work is performed, uncovering inefficiencies and bottlenecks. These insights support targeted automation, standardisation, digitalisation, and continuous improvement initiatives that enhance operational efficiency.
- **Agent-based Monitoring on Product Lines:** Intelligent agents deployed on production lines continuously track and analyse manufacturing processes, providing granular visibility and enabling proactive decision-making to improve quality, throughput, and responsiveness.
- **IT-OT Connectivity Assessment:** This building block assesses the integration and communication between information technology (IT) and operational technology (OT) systems. It identifies gaps and opportunities to enhance data flow, system interoperability, and the robustness of the digital infrastructure critical for seamless shop floor operations.
- **Visual AI Applications**[10]**:** Utilising computer vision and artificial intelligence, visual AI applications automate quality inspections, detect anomalies, and monitor processes in real time. This enhances accuracy, reduces manual effort, and supports rapid response to production issues.
- **Virtual and Augmented Reality (VR/AR) Operator Training**[10]**:** Immersive VR and AR technologies create interactive training environments that accelerate operator skill development. This supports workforce upskilling and ensures employees are prepared to work effectively within increasingly digitalised manufacturing environments.

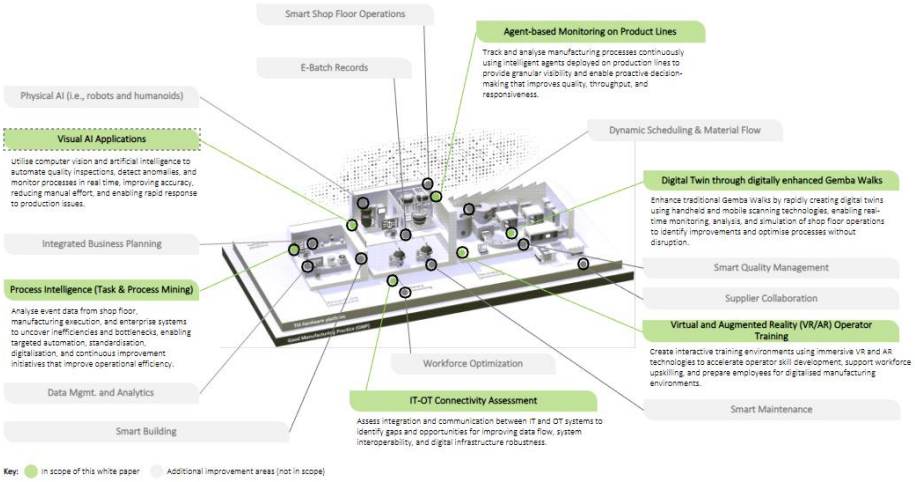

Figure 1: *Overview of the rapid diagnostic assessment building blocks designed to unlock and capture value on the shop floor. Each theme leverages and builds on advanced technologies and processes to enhance operational efficiency, quality, collaboration, and maintenance on the manufacturing shop floor[11].*

Completing a rapid diagnostic in three phases

Our rapid diagnostic assessment follows a structured approach designed to efficiently uncover high-impact opportunities on the shop floor. The process begins with gathering essential inputs through site visits and stakeholder engagement to gain a comprehensive understanding of current operations and challenges. Next, we analyse the collected data using a combination of workshops and advanced digital tools. This phase enables us to validate initial observations, identify inefficiencies, and uncover opportunities for improvement by leveraging digital twins, process intelligence, connectivity assessments, and AI-driven applications. Finally, the insights gained are synthesised into a clear set of prioritised initiatives. These findings are communicated to leadership and stakeholders through detailed reporting and interactive sessions, setting the foundation for targeted interventions and a sustainable digital transformation journey.

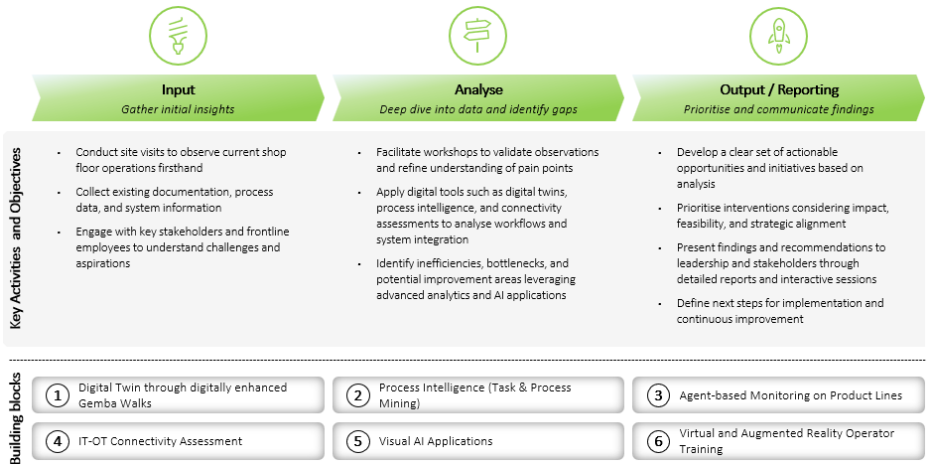

Figure 2: *Overview of our approach to perform the shopfloor rapid assessment.*

To accelerate your digital shop floor transformation journey and take the necessary steps to closing the gap to industry 4.0 best practices, engage with our rapid assessment manufacturing experts to uncover high-impact opportunities on your shop floor. Partner with us to prioritise initiatives that drive operational excellence and deliver long term sustainable growth.

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