



# Advancing digital plant maturity

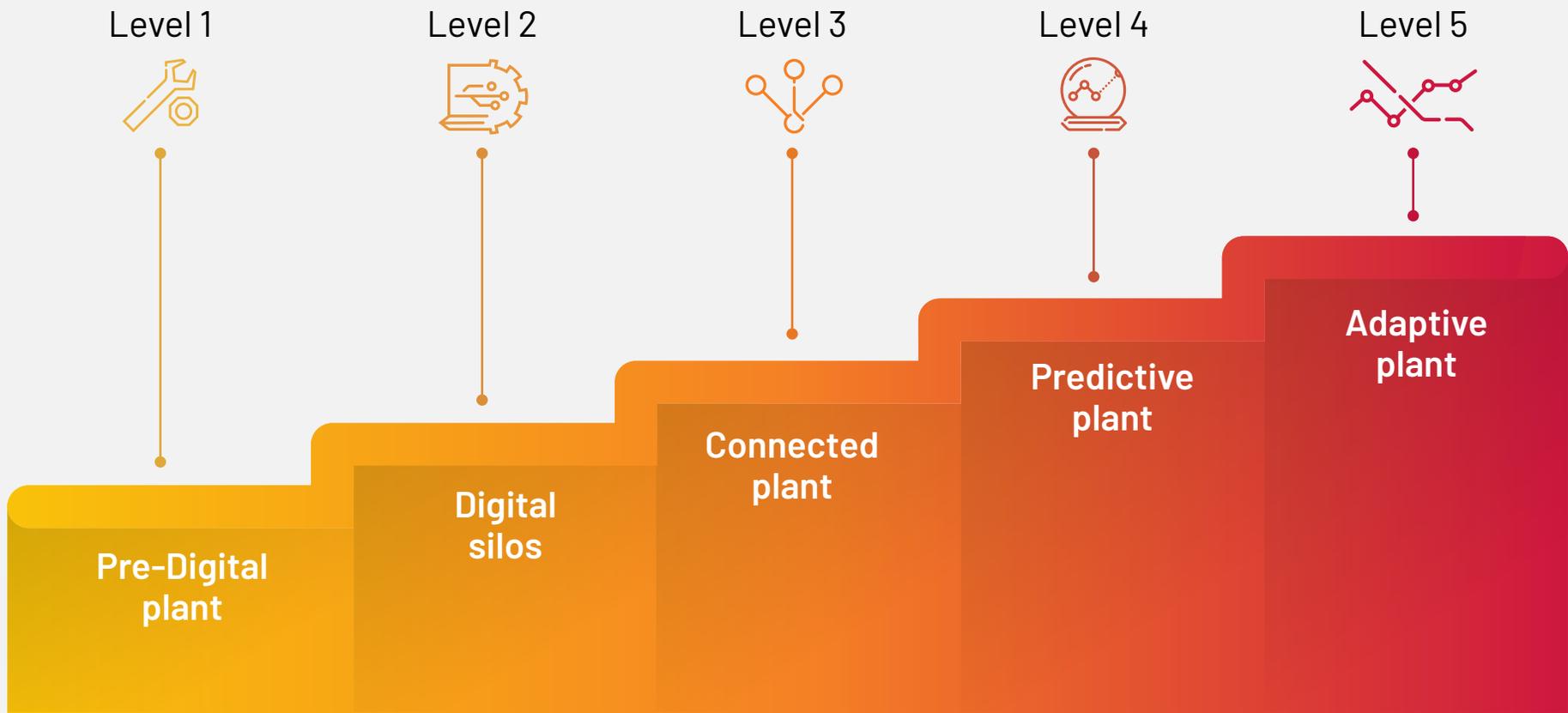
The journey to the adaptive plant for Life Sciences manufacturers



# Understanding the Digital Plant Maturity Model

Digital transformation in Life Science manufacturing requires careful strategic planning and clear benchmarking. [BioPhorum's Digital Plant Maturity Model \(DPMM\)](#), provides organizations with a comprehensive framework to assess their current digital capabilities and plan their technological evolution.

Serving as a strategic assessment tool, this structured approach empowers organizations to pinpoint their current level of digital maturity and define their future target states in alignment with their strategic objectives. No matter where you are on your digital plant maturity journey, Rockwell Automation is the premier partner for solutions and services to help you.





# Level 1

## Pre-Digital Plant

At this foundational level, organizations rely heavily on manual processes and physical documentation, often managing information through paper records and handwritten logs. While this traditional approach has long been the industry standard, it can lead to inefficiencies and potential errors.

Reliance on manual data entry and retrieval can be time-consuming and prone to mistakes, while physical storage of documents presents challenges for accessibility, searchability and disaster recovery. This stage highlights significant opportunities for streamlining operations, improving data accuracy and enhancing overall productivity through the adaptation of digital solutions.





# Level 1 Challenges

## Speed time to market

Lack of digitally native documentation, increasing time spent transposing and migrating information from one site or area to another

## Flexible, scalable manufacturing

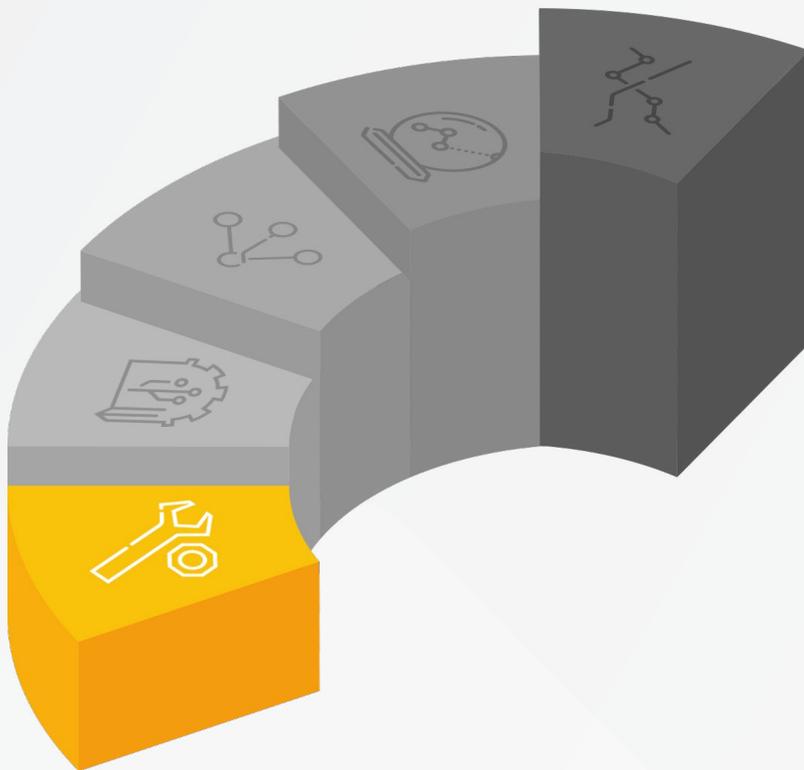
Minimal automation deployment, further reducing the ability to effectively scale production to meet market demands

## Regulatory compliance

Manual, predominately paper-based, processes represent risks for compliance aspects across the facility

## Workforce shortage

Lack of intuitive training regimen increases training ramp-up times causing increased operator workload leading to higher attrition





## Level 2 Digital Silos

This level signifies the initial phase of transitioning towards digitalization, marked by the adoption of individual digital solutions for specific tasks or processes. While these isolated digital implementations offer some improvements over paper-based methods, they often exist as separate entities within the overall operational framework. This lack of integration hinders data flow and limits the ability to leverage information across different functional areas.

For example, a digitalized inventory management system may not communicate with a digitalized production scheduling system, leading to potential discrepancies and missed opportunities for optimization. While individual processes may be digitalized, the absence of interoperability prevents the realization of full potential of a truly connected and efficient digital ecosystem.





# Level 2 Challenges

## Speed time to market

Lack of digitally native documentation, increasing time spent transposing and migrating information from one site or area to another

## Flexible, scalable manufacturing

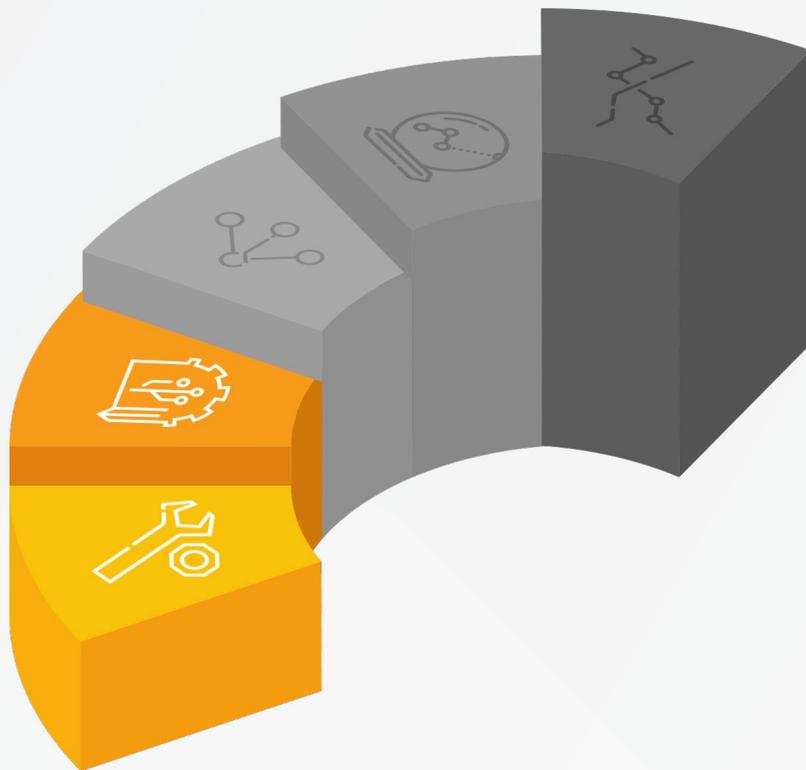
Islands of automation increase complexities of data aggregation and manufacturing flexibility, further reducing the ability to effectively scale production to meet market demands

## Regulatory compliance

Remaining paper-based and manual processes still exist in large pockets continuing to pose risk for compliance aspects across the facility

## Workforce shortage

Lack of application integration increases training ramp up times and causes increased workload leading to higher attrition





# Level 3

## Connected plant

At the connected operations level, facilities achieve meaningful integration between systems. This interconnectivity allows for seamless data exchange between different functional areas, such as manufacturing execution systems (MES), laboratory information management systems (LIMS), and enterprise resource planning (ERP) platforms.

For example, real-time data on production line performance can be used to optimize resource allocation, predict potential bottlenecks, and proactively address quality issues. Organizations at this stage begin to realize the substantial benefits of their digital investments. Real-time data flow empowers informed decision-making to improve production throughput, reduced downtime, and improved product quality.





# Level 3 Challenges

## Speed time to market

Lack of systems readily poised to accept digitally native documentation increases time spent migrating information from one site or area to another

## Flexible, scalable manufacturing

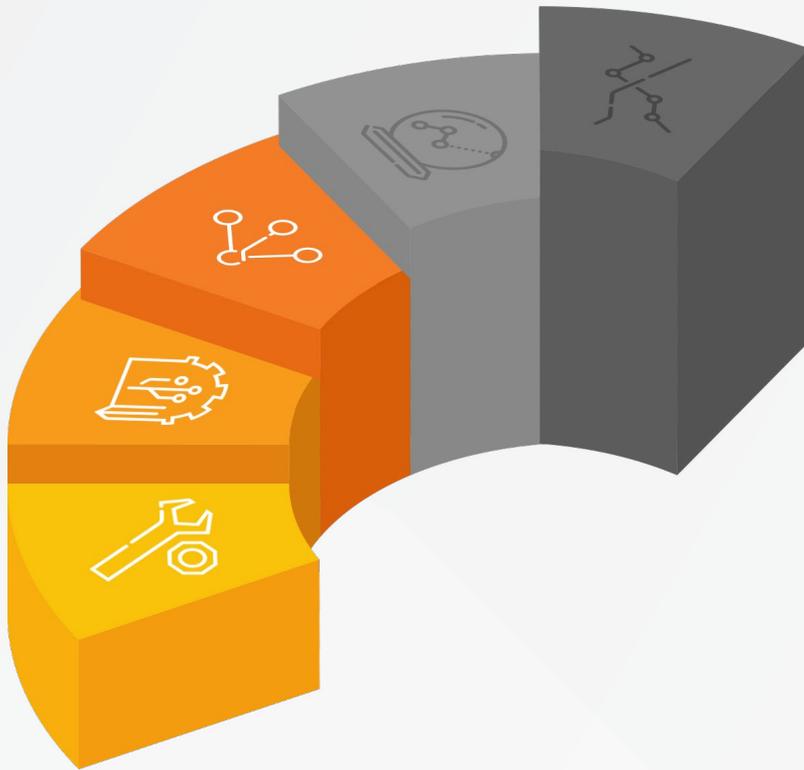
End-to-end site connectivity efforts begin to take shape, but interoperability absence poses hurdles. Attempts to orchestrate connectivity across a facility's systems uncovers unforeseen complexities within each system layer

## Regulatory compliance

While paper-based and manual processes no longer exist, compliance is now hindered by any remaining systems requiring integration with one another

## Workforce shortage

Lack of application integration hinders training, execution, and remediation data distribution across non-OT based systems, causing increased workload to manually migrate data from system to system

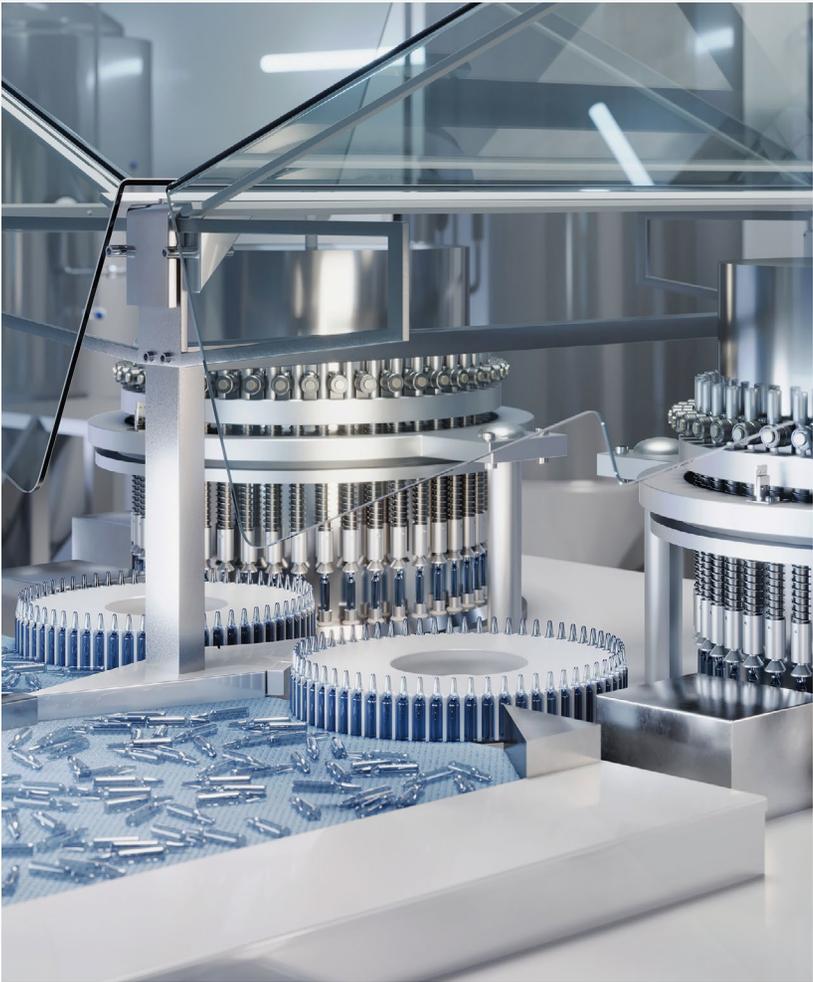




# Level 4 Predictive plant

At the predictive plant stage, organizations can leverage the power of advanced analytics, including machine learning and artificial intelligence, to anticipate potential issues and optimize processes proactively. This leap forward in digital sophistication enables predictive maintenance. Achieving this level allows for timely interventions to prevent equipment failures to minimize downtime, enhance efficiency, and improve resource utilization.

Proactive risk management becomes a reality as potential risks are identified and mitigated before they can impact operations. This level represents a fundamental shift from reactive, break-fix operational models to a proactive, data-driven approach, significantly reducing operational costs and improving overall performance.



Level 1  
Pre-digital plant  
PG 3

Level 2  
Digital silos  
PG 5

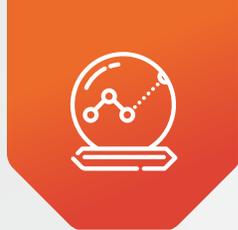
Level 3  
Connected plant  
PG 7

**Level 4  
Predictive plant  
PG 9**

Level 5  
Addaptive plant  
PG 11

Strategic  
considerations  
PG 13





# Level 4 Challenges

## Speed time to market

Inability to discern product quality in-line impacts the sites ability to implement real time release, even if the existing OT systems support this function

## Flexible, scalable manufacturing

While sites are now entering a state of end-to-end connectivity, their ability to share and visualize data with one another and across the enterprise often requires manual integration efforts

## Regulatory compliance

Developing a plan to ensure all systems are capable of sharing data in an open manner to provide a central location for regulatory reporting across a products life cycle

## Workforce shortage

Adoption of AR technologies has allowed expedited training and SOP execution on the floor through digital work instructions. However, more advanced AR capabilities remain unused - no live data transmission from IT & OT systems





# Level 5 Adaptive plant

The highest level of digital maturity, level 5, represents the pinnacle of manufacturing excellence, featuring fully automated and integrated facilities capable of self-optimization. These adaptive operations leverage sophisticated artificial intelligence (AI) and machine learning (ML) algorithms to analyze real-time data while autonomously adjusting processes and parameters in response to dynamic conditions like changes in demand, resource availability, or environmental factors.

This level of automation and responsiveness minimizes human intervention, reduces operational variability, and maximizes overall equipment effectiveness (OEE). Furthermore, Level 5 facilities often incorporate closed-loop feedback systems, continuously learning and improving their performance over time, driving towards a fully autonomous and self-optimizing manufacturing environment.



Level 1  
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PG 3

Level 2  
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PG 7

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PG 9

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PG 11**

Strategic  
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PG 13



# Level 5 Challenges

## Speed time to market

With real-time release in place, the next challenge is to connect these quality predictions to autonomous actions in the control system (closed-loop) to maintain quality automatically without manual interventions

## Flexible, scalable manufacturing

To realize your vision of “plug-and-play” everything, extensive work will need to be done with all vendors to align compatibility with evolving standards

## Regulatory compliance

As closed loop process verification/control, adaptive analytics and machine learning are used, it is critical to stay lock-step with new regulations on how to maintain quality and compliance

## Workforce shortage

Simplifying processes and using advanced automation and digital solutions throughout manufacturing to enable an adaptive and autonomous facility. Network connectivity provides secure remote access for experts



# Strategic considerations

## ASSESSMENT AND PLANNING

Organizations must conduct thorough assessments of their current digital capabilities across all operational areas.

This evaluation should consider:

- Current technological infrastructure
- Data management capabilities
- Process automation levels
- Workforce digital competencies

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## STRATEGIC ALIGNMENT

Digital transformation initiatives should align with broader organizational objectives. The DPMM framework enables organizations to:

- Identify capability gaps
- Prioritize investment areas
- Develop targeted implementation roadmaps
- Establish meaningful metrics for success

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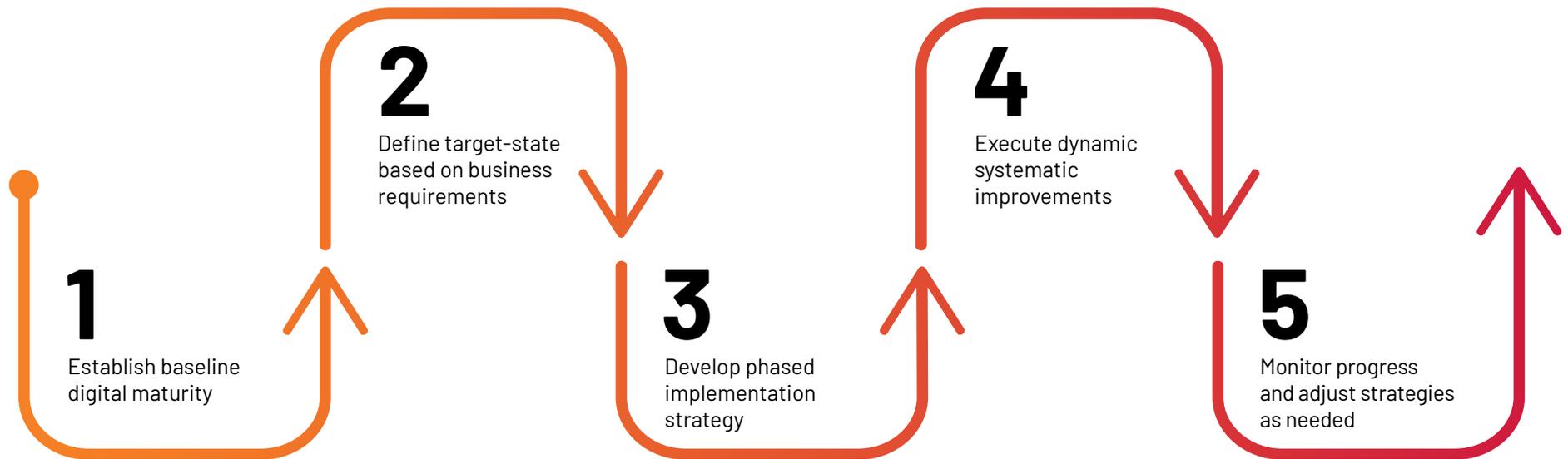
Level 5  
Adaptive plant  
PG 11

**Strategic  
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PG 13**



# Implementation approach

SUCCESSFUL DIGITAL TRANSFORMATION REQUIRES A METHODOICAL APPROACH



# Operational impact

THE DPMM FRAMEWORK DELIVERS SIGNIFICANT OPERATIONAL BENEFITS





# Future considerations

The Digital Plant Maturity Model offers Life Sciences manufacturers a structured approach to digital transformation. By understanding and applying this framework, organizations can develop more effective digital strategies, make better-informed investment decisions, and achieve higher levels of operational excellence. The key to success lies in the thoughtful application of the model, aligned with organizational capabilities and strategic objectives. Rockwell Automation is the trusted digital transformation partner, with experience helping 100% of the top ten life sciences companies. Ready to get started? Request a consultation today to learn how you can begin your journey.

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