

Operations Practice

The right tools for every job: Lean and agile in maintenance

Why tomorrow's maintenance function will combine the strengths of lean and agile organizations.

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Over the past seventy years, lean management's focus on the reduction of waste and process variability through rigorous standardization and continuous improvement has transformed operational performance in many industries. More recently, the growth of Industry 4.0 and related digital technologies has brought a new methodology onto the scene. Born in the world of software engineering, agile techniques use cross-functional teams, rapid iteration, and regular testing to improve both the speed-to-market and quality of product and service development.

Industrial operations increasingly find themselves at the intersection between these two highly successful improvement approaches. As an organization looks to digital solutions to achieve further performance improvements, should it build and implement those systems within existing lean frameworks, or should it adopt an enterprise-wide agile approach?

Worries about a potential clash are overblown. Although they use different terminology, lean and agile share many fundamentals: both approaches seek to maximize the value delivered to customers while safely minimizing the resources used. Increasingly, agile methods show the potential to address longstanding challenges in many organizations, breaking down silos between different functions or groups of technical specialists, and aiding the efficient allocation of resources in tasks with varying or intermittent workloads. The challenge for most organizations is not whether they pick one approach over the other, but how they combine the strengths of the two to achieve better results.

Agile's potential in maintenance

The experience of one mining organization illustrates the potential of agile in maintenance, where inefficiencies remain despite the considerable successes companies have had in applying lean approaches.

Much of the difficulty results from the complexity of maintenance organizations, which typically coordinate an unusually wide range of tasks with varying frequencies, objectives, and

work requirements. Moreover, the timing of maintenance interventions may be fixed—or may be variable based on data extracted from condition-monitoring systems and analytical tools. Amid these uncertainties, planners juggle regular preventative-maintenance activities, emergency repairs, and intermittent upgrades or overhauls. And, working closely with colleagues in manufacturing, quality, and procurement, reliability teams design and execute improvement activities.

Yet the hierarchical structure of maintenance organizations creates a strong tendency for different functional teams, crews, and trades to work mainly in isolation, with planning, execution, and reliability teams usually operating in silos. This tendency is reflected in the organizational-health scores of maintenance organizations, which average seven points lower than those of other operations within the same organization.

The lean–agile hybrid

At the mining company, disconnects such as these made delays a chronic problem. The organization's leaders therefore turned to agile principles as a potential solution. But, as they learned, incorporating agile methods into an existing maintenance organization isn't trivial. It requires careful coordination between different functions and changes to roles, processes, and working methods.

The first step in making the lean–agile model work in maintenance was to draw clear distinctions between the different kinds of work involved. As in most maintenance organizations, the mining company's maintenance staff performed three basic types of tasks:

- *Optimization and improvement* activities include the design of overall maintenance strategies, the planning of major shutdowns, and ongoing reliability improvement activities
- *Operational support* activities include specialized services used to solve problems or implement new processes

- **Frontline execution** activities include day-to-day preventative-maintenance tasks, troubleshooting, and emergency maintenance work and the execution of planned activities during shutdowns

Each activity type calls for a different team structure. The intensive coordination involved in optimization and improvement means that an agile cross-functional, co-located team will likely prove most effective. At the other end of the spectrum, the well-defined tasks characterizing frontline execution are a good match for a self-managing team operating under lean principles. In between, operational-support activities—which involve a degree of regularity but are subject to peaks and valleys of demand—can follow a “flow-to-work” approach combining lean and

agile thinking: personnel with different expertise join teams as needed, providing the resources necessary to complete projects quickly and effectively (Exhibit).

Agile maintenance optimization

For the mining company, the most urgent maintenance problems centered on plant shutdowns—an optimization-and-improvement issue. Accordingly, it began its agile-maintenance journey by establishing a new cross-functional team dedicated to shutdown planning and execution. The team included personnel from the maintenance function, together with operations and third-party contractor representatives.

Exhibit

Maintenance organizations conduct three different types of work that match three team structures.

Types of work	Methodology	Structure	Examples
 <p>Optimization and improvement Creative work: drive continuous improvement by designing and implementing solutions to optimize a process under a minimum-viable-product approach—then refining through iteration.</p>		<p>Cross-functional teams A cross-functional, co-located team working together day to day and having a defined mission and a clear set of objectives</p>	<p>Data-driven planning optimization and improvement</p> <p>Data-driven plant-reliability impact</p> <p>Observation-based ongoing maintenance-execution improvement</p>
 <p>Operational support Perform semiregular activities and can be included ad hoc in continuous-improvement projects calling for specific expertise</p>		<p>Flow-to-work teams Center of excellence with specialists that flow dynamically to teams when needed to introduce scarce expertise for a priority piece of work, eg, technical services</p>	<p>Technical-services expert in increasing life of specific equipment</p> <p>HR culture expert to integrate contractors and internal personnel</p>
 <p>Frontline execution Repetitive work: run and maintain the organization performing clearly standardized and defined tasks and striving for process excellence in execution.</p>		<p>Lean self-managing teams Operational run team that has a defined mission and KPIs for which they are responsible</p>	<p>Plant-shift operations team dedicated to specific facility</p> <p>Shutdowns maintenance-execution team</p>

Starting with a backlog of possible activities, the agile team worked in a series of agile sprints to define a prioritized list of initiatives to be completed before and during the shutdown. Each agreed action was given an owner and a deadline, and the team tracked its progress using visual workflow-management (or “kanban”) boards, a staple lean tool, supplemented with an agile digital maintenance-management platform.

This lean-and-agile approach improved both the collaboration between stakeholders and the team’s ability to track the overall progress of the shutdown event. As a result, the company was able to dramatically reduce schedule overruns, which had been as high as 25 percent in previous shutdown events, while reducing the overall duration of the shutdown by a meaningful amount.

“Bringing agile to my team has been a major game changer for shutdown prep,” says one of the miner’s

superintendents. “Now we have a team that is fully devoted to preparing and executing the shutdown and there is no more ambiguity about who’s responsible for what. That allows the rest of my organization to be focused on routine maintenance and follow their standard processes without getting distracted. It’s the best of both worlds.”

Lean and agile methods have much in common, but for maintenance activities the two approaches work best when they work side by side. By understanding the different strengths of each approach, and applying them selectively across their organizations, maintenance functions are able to plan more effectively, resolve issues faster, and execute with greater efficiency.

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