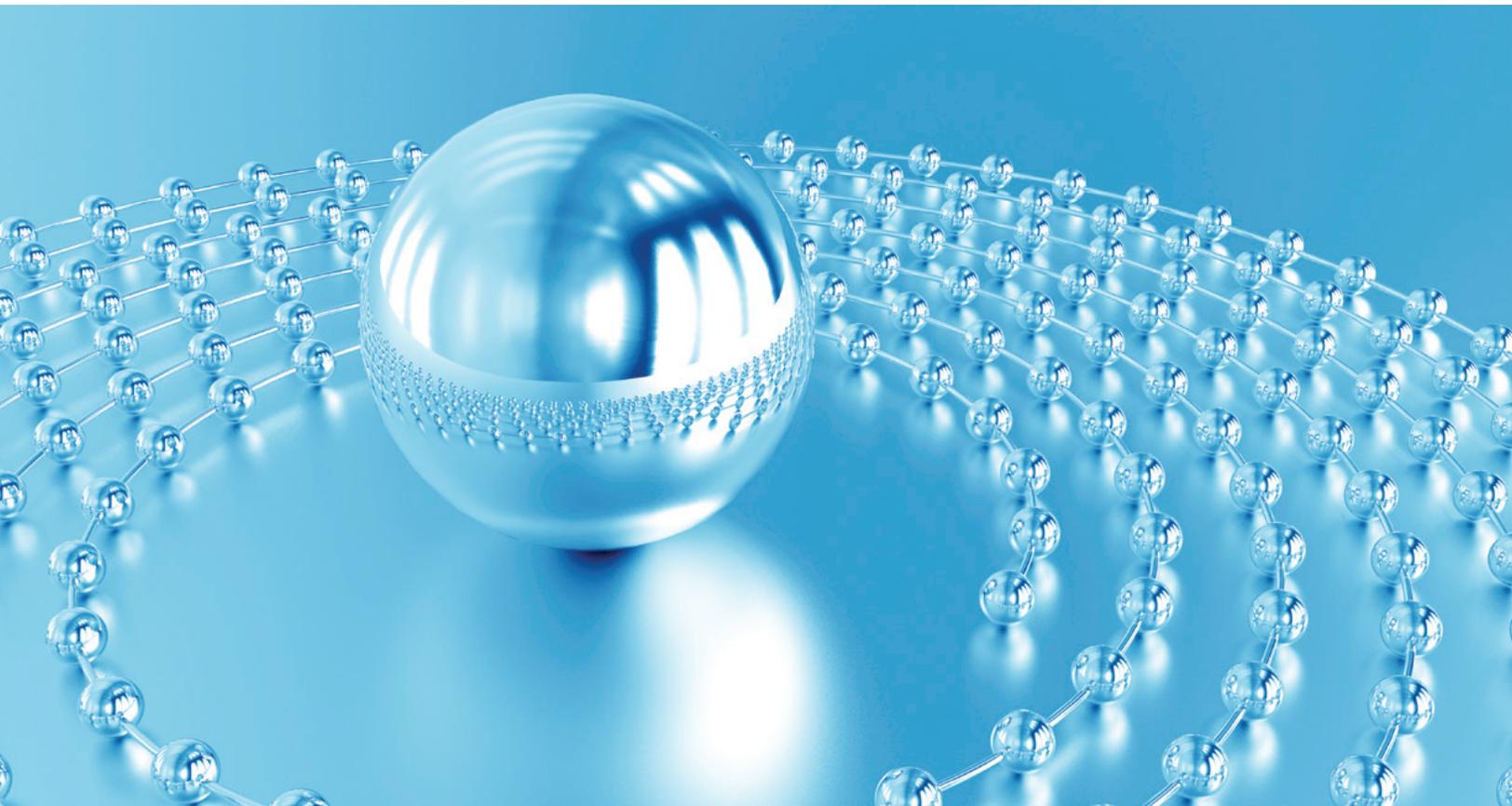# McKinsey Digital

Industrial "lighthouses" for tech-enabled transformations

For industrial companies, "lighthouse" sites that incorporate all applicable tech solutions can help organizations transition from trials to sustainable change.

by Kevin Goering, Yogesh Malik, Victoria Potter, and Kevin Sachs

Knowing tech-enabled transformations' potential to meaningfully improve business performance, executives in the industrial sector have been pondering how to use new tech for maximum effect. The efficiency that tech-enabled transformations can create can also be a major force behind margin growth. While there are many possible areas of focus—such as revenue generation, cost optimization, and operational improvements—our analysis found that the manufacturing and supply chain (making and delivering) area of focus often provides the largest opportunities (Exhibit 1).

However, many industrials fail to capture value from their tech solutions, in part because solutions tend to be spread among too many pilots for their impact to be optimized. While testing might seem to be a low-risk approach to new tech tools, the proliferation of decentralized use cases can lead to lack of focus, organizational fatigue, little enterprise-level understanding of the impact of promising tools, and complications from integration between IT and operations systems.

A few industrial companies have managed to use new tools and tech and have seen bottom-line benefits from greater margins. These companies succeeded not by utilizing one-off use cases, but by implementing an integrated set of solutions across a single manufacturing facility that served as a "lighthouse."

Exhibit 1

Tech-enabled transformations can help industrials improve their performance.

Domains	Auto OEM	Aero OEM or supplier	Industrial distributor	Broader industrial components
Revenue				
· Innovating and product development	0–0	0–0	0–2	1–5
· Selling	0–0	0–0.1	2–5	2–5
· Servicing new	0.3–1.4	0.3–1.4	0–0	0.5–1.2
COGS Making and delivering	5–7	5–10	2–5	3–9
SG&A (incl R&D)				
· Selling	0–0	0–0.1	2–5	2–5
· Servicing new	0.3–1.4	0.3–1.4	0–0	0.5–1.2
· Running a corporation	4–6	4–6	0–0	4–8
· Innovating and product development	0–0	0–0	0–2	1–5

Experience with successful transformations confirms that instead of testing different initiatives and tools across a large number of sites and business units, companies should unleash their tech initiatives on an example lighthouse. Doing so will push companies to develop tech-enabled end-to-end transformations within these lighthouses and maximize margin growth through complementary initiatives. In fact, recent McKinsey research with the World Economic Forum identified 16 lighthouse facilities that used this methodical comprehensive approach to boost their overall productivity by 20 to 30 percent—results that allowed their transformations to break even in less than two years.[1]

Judging by the evidence, industrial companies should set up lighthouses of their own, which will help them redesign processes throughout their organizations and focus on increasing margins by combining the most effective solutions. Conversely, companies that are slow to transform using tech risk falling behind.

Pilots and function-specific focus limit tech's impact

Companies themselves realize that one-off use cases are preventing them from tapping into the full potential of tech-enabled transformations. In a recent international McKinsey survey of manufacturing companies, 52 percent of respondents reported that their companies' tech-enabled solutions were characterized by use cases and ad hoc implementation, not redesigned end-to-end processes that integrated tech. As a result, only 29 percent of organizations believe they will receive value from implementing new tools. The unfocused application of tech means that these use case-rich companies are paradoxically results-poor.

Framing tech-operations implementation as a function-specific initiative can also curtail initiatives' impact. Sixty percent of organizations we surveyed reported that implementation is the responsibility of a single function, usually IT or operations. It's therefore unsurprising that 87 percent of organizations also report minimal cross-cutting digital operations solutions at their organizations when they haven't involved practitioners from all the relevant functions. One company was able to make its lighthouse successful by assembling a team that had expertise in quality, manufacturing, engineering, and IT and having this cross-functional team create an integration plan. This comprehensive approach meant that every function was able to help design the relevant solutions and infrastructure for maximum usability and impact. As a result, the lighthouse saw 33 percent lower rates of equipment breakdowns and required 90 percent less time to resolve quality deviations (Exhibit 2).

Even though the benefits of comprehensive, cross-functional, tech-enabled transformations far outweigh the benefits of less extensive transformations, functional leaders can be hesitant to commit resources to such an effort. In these situations, passionate sponsorship from C-suite executives will be crucial to power the leap of faith leadership teams need to launch a collaborative transformation that changes the way multiple functions work.

A new approach to end-to-end tech-enabled transformations

Organizations must shift their approach to address more than just use cases and individual solutions. While organizations should identify solutions as part of their self-assessments, a more useful implementation model is one that pulls together a set of interlocking solutions that maximize margins, define the required infrastructure, and help the organization build capabilities.
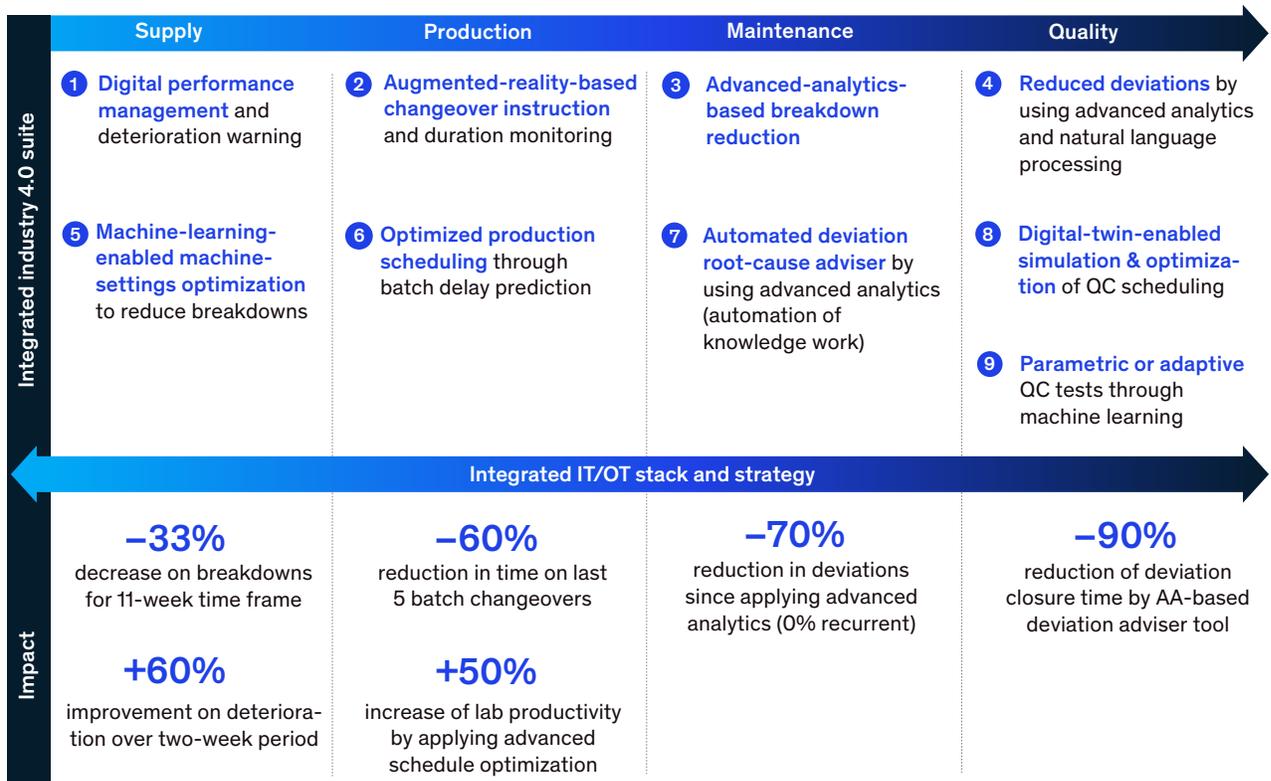
Assess

Before selecting a lighthouse, leaders must set a clear vision for the transformation that includes direct performance targets. Because the lighthouse will serve as an exemplar of digital technologies,

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Exhibit 2

Implementing a cross-functional approach to tech-operations implementation can prove beneficial to organizations.

	Supply	Production	Maintenance	Quality
Integrated industry 4.0 suite	**1** **Digital performance management** and deterioration warning	**2** **Augmented-reality-based changeover instruction** and duration monitoring	**3** **Advanced-analytics-based breakdown reduction**	**4** **Reduced deviations** by using advanced analytics and natural language processing
	5 **Machine-learning-enabled machine-settings optimization** to reduce breakdowns	**6** **Optimized production scheduling** through batch delay prediction	**7** **Automated deviation root-cause adviser** by using advanced analytics (automation of knowledge work)	**8** **Digital-twin-enabled simulation & optimization** of QC scheduling
				9 **Parametric or adaptive** QC tests through machine learning

Integrated IT/OT stack and strategy

	Supply	Production	Maintenance	Quality
Impact	**−33%** decrease on breakdowns for 11-week time frame	**−60%** reduction in time on last 5 batch changeovers	**−70%** reduction in deviations since applying advanced analytics (0% recurrent)	**−90%** reduction of deviation closure time by AA-based deviation adviser tool
	+60% improvement on deterioration over two-week period	**+50%** increase of lab productivity by applying advanced schedule optimization		

leaders must work with both internal and external thought leaders and innovators to set an achievably ambitious goal based on business needs. Leaders and practitioners who are used to working in lean methodologies should resist the habit of looking for 5 to 10 percent improvements through small process changes and instead set bigger margin-enhancement goals. Visits to existing lighthouses or industry-leading thinkers and organizations (also known as go-and-sees) can be powerful sources of inspiration for executives to develop bold visions.

Once ready to select a lighthouse site, leaders should carefully choose a location that has meaningful business impact, is somewhat representative of other sites (especially when it comes to the existing IT/OT stack), and whose leaders are enthusiastic champions of the transformation. From there, the focus should be on decisive execution.

Build and implement
To devise solutions that match the organization's needs, the transformation team must understand underlying business needs as well as the company's operations. In fact, anchoring the design of new solutions in their intended impact is more important than understanding the potential technologies. While this idea may seem self-evident, many companies approach their tech enabled transformations by leading with tech instead of business improvements. One aerospace company

invested tens of millions of dollars in supply chain visibility tools with little understanding of how they could benefit the company. As a result, the tools produced rich visuals from the data they collected, but the company had no ideas on how to meaningfully improve the relevant business outcomes.

An impact-oriented approach also means that each transformation will be distinct in its scale and use of solutions. For instance, while some companies might need to integrate 20 important solutions, others might benefit from just a handful of key technologies. Indeed, the focus of implementations should be on quality solutions that create efficiency gains rather than just the quantity of solutions.

And while it can be tempting to enter the implementation process with an eye on minimizing initial costs, lighthouse teams should approach the build-and-implement phase with enterprise scalability as the goal. While the majority of time and effort should be focused on lighthouse design and deployment, decision makers should consider requirements of diverse sites and account for the current levels of enterprise-level IT. Additionally, transformation teams should use the lighthouse experiences to build strong change-management teams, codify processes, and record lessons learned. This medium-to-long-term perspective will increase the returns of the eventual tech-enabled transformation.

Enabling digital lighthouse transformations

Many standard transformational tenets hold true for tech-enabled lighthouse transformations: organizations must build capabilities, shift team members' mind-sets and behaviors, and establish systems to monitor performance and accountability for the transformation's progress. However, tech-enabled transformations require a few modifications to the best practices associated with traditional transformations.

Building capabilities

Companies likely have some conventional transformation skills in-house, including change-management and continuous-improvement capabilities. But many of them likely lack the technical skills required for successful tech-enabled transformations. At a minimum, companies need translators to help business and tech teams communicate effectively, data engineers and architects to prepare data for analytics, data scientists to derive insights from the data, and user interface experts to prepare digital tools for users. Because organizations rarely possess the complete set of necessary skills, they should hire or contract professionals with the requisite skill sets as needed. However, all skills must ultimately reside with the company's employees. In addition, lighthouse change agents will need to operate in a new way.[2] Because agile delivery requires teams to develop, test, and iteratively improve solutions in close collaboration with key business functions, teams should ideally be co-located, cross-functional, and supported by agile working cadences (usually two-week sprints in which teams design, test, and refine solutions).

Finally, companies should train frontline workers and managers to instill and participate in the development of new capabilities. This approach is twofold: to have employees co-develop solutions to ensure that final products are usable, helpful, and intuitive, and to have change agents train the permanent workforce. Managers and leaders should participate in administering this training so they can help reinforce the organization's understanding of this work once change agents have transitioned to other sites.

Cultivating mind-sets and behaviors

A less siloed mind-set is important if operations and IT teams are to participate as full partners in

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[2] The concept of change agents was first popularized with the advent of lean transformations. Now, change agents are individuals who are help organizations transform. For more on change agents, see "The change agent challenge," March 2017, McKinsey.com.

developing tech and solutions. Operations teams will be the solutions' end users, so technical teams must collaborate with them to make sure tools are easy for them to use and tailored to their needs.

For their part, operations teams should remain open-minded and cognizant of potential technical constraints. This delicate balance means that a cohesive partnership between the two groups is often hard to create, but imperative to success.

Once the transformation is underway, lighthouse change agents must work with a mind-set oriented around decisive action. Approaching lighthouse initiatives as a series of agile sprints instead of projects with hard deadlines that can succeed or fail will be a departure from most organizations' established mind-sets, so leaders must consistently communicate and demonstrate that the emphasis is on decisive action and learning.

Setting up performance infrastructure
Given the fast pace of tech development, all lighthouse initiatives deserve thoughtful ongoing scrutiny. As such, the organization should begin by establishing a transformation office and name a single transformation leader. The transformation office should also establish key performance indicators that address operational, financial, and time-based metrics. These KPIs can help the transformation office keep teams accountable for their—and the organization's—progress. In recurring reviews, progress (or lack thereof) can be measured and will define potential decisions on continuing or stopping agile sprints. The key measures of progress should be based on their impact to core business KPIs instead of merely the progress of

technical execution. To that end, the transformation office should allocate resources and provide help to teams and individuals as needed.

Building a tech backbone
One feature that will be new to experienced practitioners of conventional lean implementation is the development of a tech stack. Lighthouse teams should build an integrated IT/OT stack with a "minimum viable design" for their tech-enabled solutions. A common pitfall is to develop an elaborate tech stack without consideration for the solutions and assuming teams can simply "layer on" use cases. This approach often leads to overspending and overly complex systems that are difficult to maintain and time-consuming to scale.

While specific stack designs may vary, organizations must focus on a few crucial components. The stack must be usable for both customers and in-house operators, which helps it deliver insights. Software must be interwoven with the stack to manage large volumes of data from diverse sources and make it easily accessible across the organization. Cloud or on-premise storage and hardware must be used to store and process large amounts of data, and a database can help obtain, import, and process it. The stack also requires facilities that allow data to be transmitted to a central platform for processing, and connected devices and sensors can continuously gather information about their environment.

When it comes to investments in the lighthouse's IT/OT stack, an approach that emphasizes integrated solutions will help companies reap higher margin improvements from their investments. Indeed, the highest returns on digital investments will come

A less siloed mind-set is important if operations and IT teams are to participate as full partners in developing tech and solutions.

not from implementing a single solution, but from implementing a combination of complementary ones. In one case, a direct supplier of automotive companies combined four solutions that were tied to a single data repository and analytic platform for a key asset. The combined solutions created a 20 percent productivity gain, far greater than the impact that a single solution could make, especially if the company had implemented those solutions in disconnected ad hoc pilots. While organizations can develop portions of the stack in-house, two or three core tech partners can be invaluable in developing the lighthouse's tech and stack. This practice is important because outside tech partners can bring needed skills and perspectives in a time of rapid technological evolution and help create solutions that are highly specific to the lighthouse.

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A system of complementary tech solutions can help organizations avert the struggles of singular use cases and get much greater margin returns, but building this system requires decisiveness, planning, and a mind-set that's suited to a tech-enabled transformation. Following a comprehensive playbook in a lighthouse is the best way to bring promising solutions together. This approach will help organizations maximize the value of the latest tools while gaining insights into how an implementation will translate from the lighthouse to the enterprise.

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