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The future of maintenance for distributed fixed assets

Why people are key to successfully implementing technology-led maintenance transformations

In collaboration with Lumics

Methods and sources for deriving insights in the report

Extensive interview series with over 20 maintenance leaders across industries, e.g., power grids, telecommunications, and oil and gas.

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Executive summary

This paper focuses on how to drive change to capture the full value of technology-enabled maintenance transformations – it is not simply another article purely describing technological innovation. For the past few years, industries with distributed fixed assets have mostly concentrated on increasing asset availability and system reliability. As a result, these have reached new heights across industries on average. In contrast, the opportunities for labor efficiencies created by new technologies have not yet been fully realized. The key challenge to capturing the full value from technology-enabled maintenance transformations is a massive mindset shift. Companies need to entirely rethink how they manage their maintenance workforce: from identifying clear technology-enabled business cases to capturing their benefits in the deployment phase. They need to minimize the root causes for low productivity, adapt their organizational setup and performance management, and build the required skills.

Today's specific challenges of maintaining distributed fixed assets

In many industries, the asset structure is fragmented throughout a region and burdened by legacy equipment with limited technological possibilities. Typically, there is no dedicated maintenance team per asset; the teams cover whole areas and regions. The past focus on high asset availability has often led to low labor productivity levels, typically caused by non-optimal maintenance frequencies, no or limited remote information on asset conditions, long travel and transport times, as well as unevenly distributed knowledge in the workforce.

Opportunity for companies with distributed fixed assets

To drive efficiency and labor productivity for distributed fixed assets, optimizing preventive maintenance, reducing the number of maintenance trips, minimizing travel time, and sharing knowledge are key. New technologies such as sensor-based condition monitoring, automated and dynamic planning, scheduling, dispatching and routing, and digital instructions allow for significant changes in all these areas. Already today, advanced companies have realized technology-enabled efficiencies in labor productivity and a 20 to 30 percent decrease in maintenance costs. As maintenance costs amount to 20 to 60 percent of overall opex spend, depending on industry and asset type, these opportunities are sizable and should be captured. In addition, the cost of innovative technology has dramatically decreased over the past several years. The opportunity has therefore never been better.

Structure of this paper

In Chapter 1: The next level of maintenance, we outline the opportunity and challenges with respect to maintenance efficiency for industries with distributed fixed assets.

In Chapter 2: New technologies at scale, we analyze the specific possibilities that arise from new technologies to optimize field force productivity.

In Chapter 3: The recipe for success, we provide guidance on how to move forward and capture value.

In Chapter 4: The next step, we look at how companies can seize additional options for growth – once having mastered the maintenance transformation themselves – by offering maintenance solutions and services to other operators.

The next level of maintenance – capturing the full benefits of next-generation technologies

Historically, the focus for distributed fixed assets has been on increasing availability

— A strong focus on infrastructure replacement and growth

— Availability/reliability levels reaching new heights across industries

— High maintenance costs due to unaddressed labor inefficiencies and system redundancies

Industries with distributed fixed assets – be they telecommunication broadband or railway networks, wind turbines or drilling facilities, elevators and escalators or washing machines – share specific challenges when it comes to maintenance. As the assets are distributed throughout a region, there is usually no dedicated maintenance team per asset. To the contrary, maintenance workers cover whole areas, travel to the assets' various locations, and bring the appropriate instructions, spare parts, and tools. This leads to a number of issues for asset maintenance:

— Non-optimal maintenance frequencies due to rigorous time-based maintenance or utilization-based maintenance strategies

— Limited remote information on asset conditions, entailing unnecessary maintenance trips or costly manual inspections

— Long travel and transport times, rendering unplanned maintenance highly costly and incurring additional safety hazards for maintenance workers

— Particularly challenging knowledge sharing and preservation as well as performance management due to the decentral nature of maintenance crews

— Detachment of central planning, scheduling, and dispatching teams from frontline maintenance workers' needs

— High reaction times in cases of emergency due to a lack of information on maintenance workers' locations.

Excursus 1

Three categories of distributed fixed assets with differing maintenance strategy goals

Even though they face similar challenges with respect to maintenance, distributed fixed assets differ in their purpose: transmission, production, or service. These assets thus fall into three categories based on their typical maintenance priorities (see Exhibit A).

1. Network structures

Assets that are connected to a network structure, e.g., telecommunications broadband networks, oil and gas pipelines, or power grids, typically have a transmission purpose. These assets have particularly high reliability needs as they are often subject to high regulatory requirements, with shortfalls severely penalized. Operators address these high reliability requirements by incorporating redundancies into the network structure and prioritizing asset availability in their maintenance strategy.

2. Standalone structures with productive functions

Fragmented productive assets, e.g., solar panels or wind turbines, have similar availability needs to the network structures discussed above. Here, asset downtime incurs high revenue losses and breakdowns create significant safety and environmental hazards. The goal is therefore to avoid them: maximizing asset availability has been the typical maintenance priority over the past few years.

3. Standalone structures with service functions

The availability requirements of distributed assets with service functions, e.g., white goods or elevators and escalators, differ from the "always on" imperative required by network structures and standalone structures with productive functions. Standalone assets with service functions need to be available "on demand" only. Furthermore, maintenance is often provided by OEMs as an aftersales service or by independent workshops. For these maintenance providers, reducing maintenance costs has typically been a priority over the past several years.

Exhibit A

Each asset category has a different maintenance goal

Priority: High · Medium · Low

			Typical maintenance strategy goals		
Asset category	**Characteristics**	**Examples**	**Maximize availability**	**Minimize cost**	**Minimize system redundancy**
1 Network structures	Transmission purpose Very fragmented across regions High availability needs Many built-in redundancies	Telco broadband Power grids Oil and gas pipelines Rail networks	High	Medium	Low
2 Standalone structures with productive functions	Production purpose (e.g., energy) High availability requirements to avoid revenue losses	Wind turbines Solar panels	High	Medium	n/a
3 Standalone structures with service functions	Service purpose On-demand availability requirements Maintenance often an aftersales service	Elevators/escalators White goods	Medium	High	n/a

Maintenance costs typically range between 20–60% of opex spend, depending on industry, asset type, and capex spend – an opportunity that has only been a minor priority over the past couple of years

At the same time, ensuring high levels of asset availability and system reliability is a key priority for operations leaders. Often, regulations severely penalize shortfalls (e.g., of power transmission and distribution), breakdowns incur high revenue losses (e.g., for wind turbines) or breakdowns result in high safety and environmental dangers (e.g., in drilling facilities). Companies have been investing heavily in increasing their asset availability; for instance, through large investments in new infrastructure (e.g., in the telecommunications industry) or via the introduction of new technological assets (e.g., sensor-based condition monitoring). As a result, the availability and reliability of distributed fixed assets is very high across industries. To give a few examples from various industries and regions:

— The German power transmission and distribution network reached a reliability level of 99.997 percent in 2018 – translating to an average outage duration of only 13.91 minutes for end consumers.[1]

— Telecommunications companies offer broadband services with service-level agreements ensuring 99.999 percent availability.

— New wind turbines reach availability levels of 97 to 98 percent.[2]

The combination of challenging maintenance conditions and high asset availability requirements typically results in increased labor and thus in high overall maintenance costs. Depending on factors like industry, asset type and age, fragmentation level, or capex spend, maintenance costs typically range between 20 and 60 percent of overall opex spend. Even though the opportunity is significant, improving labor productivity and thus driving down maintenance costs has been given less priority over the past few years. However, as skilled labor is becoming increasingly scarce – particularly in remote areas – boosting labor productivity in maintenance is becoming more and more important on operations leaders' agendas.

New technologies can help address this issue and move companies closer to best practices, including best practices from other industries and sectors. The opportunity is particularly ripe as the cost of new technologies has dramatically decreased over the past few years (see Exhibit 1). Most companies have therefore already started their journey towards a more digitized and automated maintenance regime.

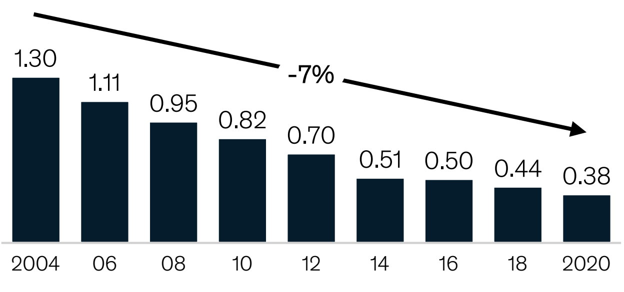
1 Bundesnetzagentur, SAIDI.
2 See Sebastian Pfaffel, Stefan Faulstich, and Kurt Rohrig, "Performance and reliability of wind turbines – a review," Fraunhofer Institute for Wind Energy System Technology, November 19, 2017.

Exhibit 1

Technology has matured and is here at scale – e.g., the YOY cost for IoT sensors is decreasing by ~7% p.a.

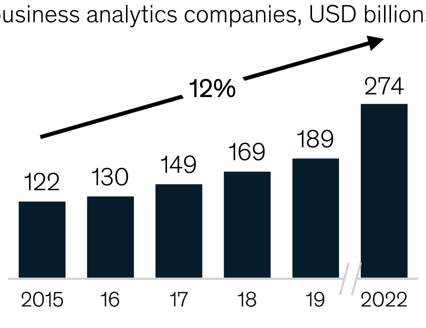
The cost of IoT solutions for predictive maintenance is dramatically declining …

Example: Average cost of IoT sensors, USD



… while technology provider revenues are increasing steeply

Example: Worldwide revenue of big data and business analytics companies, USD billions



Source: Statista; Bank of America; Merrill Lynch; IDC

New technologies at scale – increasing asset availability and labor productivity

New technologies yield up to 30% in maintenance cost reductions

New technologies yield vast maintenance efficiency potential for industries with distributed fixed assets. Companies that have digitized and automated their maintenance processes now show a significant increase in labor productivity and a 20 to 30 percent reduction in maintenance costs.[3,4]

However, industries move at different paces of digitization. Those less burdened with legacy equipment and high cost pressures (e.g., telecommunications operators and infrastructure providers) are leading the way whereas capital-intensive, highly regulated industries (e.g., power and gas transmission and distribution) with long-lifecycle assets usually lag behind.

In this chapter, we will discuss the most promising technological innovations for realizing field force efficiencies in maintenance. Simply speaking, cost-efficient maintenance for distributed fixed assets needs to follow two key principles:

1. Maintain only when needed

2. Maintain efficiently

Technological innovation simplifies excellence in both areas (see Exhibit 2). Note, however, that the feasibility of technologies and their individual benefits for a company depend on the specifics of its asset landscape and its readiness to change its way of working.

1. Maintain only when needed

Efficiently identifying the "when," "where," and "what" for field maintenance is crucial to labor productivity and lower maintenance costs. To this end, companies frequently observe time-based or usage-based maintenance strategies. As an asset's actual condition is unknown when using these strategies, maintenance cycles are often either too long or too short, leading to either breakdowns and thus unplanned/emergency maintenance or to too high a maintenance frequency and thus excess maintenance costs. The cost-optimal maintenance frequency per asset is rarely achieved. In order to avoid breakdowns and gather information on an asset's condition, companies often carry out additional manual inspections, thus incurring additional labor costs. Nowadays, technological innovation provides the means to significantly improve these strategies.

3 See Ian Didion, Pablo Hernández, Avani Kaushik, and Kobi Masri, "Operations management, reshaped by robotic automation," McKinsey, December 2019.
4 See Steve Bradbury, Brian Carpizo, Matt Gentzel, Drew Horah, and Joël Thibert, "Digitally enabled reliability – beyond predictive maintenance," McKinsey, October 2018.

Sensor-based condition monitoring can set cost-optimal asset maintenance frequencies

Sensor-based, system-integrated condition monitoring

For many components and assets, sensor-based condition monitoring is the maintenance strategy of choice and should be used to derive the necessary interventions. Advanced analytics algorithms based on information like historical sensor data, maintenance records, or failure mode analyses help define thresholds per asset or component that act as decision criteria in day-to-day monitoring. Asset and component conditions are then continuously monitored remotely. If a threshold is about to be surpassed, an intervention is carefully planned and scheduled. Ideally, the remote monitoring is done in an automated way and integrated within a company's ERP and maintenance workflow systems. This way, manual monitoring can be avoided, and planning, scheduling, and spare-parts management can be automated according to the assets' conditions.

Sensor-based condition monitoring requires new data-related skills from the entire maintenance organization

When it comes to distributed fixed assets, the requirements for implementing a condition-based maintenance strategy might prove demanding from both a technological and organizational viewpoint: assets and components need to be equipped with the appropriate sensor technology, which is often costly for legacy assets. Furthermore, all assets need to be connected to the company's system to enable continuous data transmission. However, especially in remote areas, this might be time consuming to set up and require significant investments. Even with all the technological prerequisites in place, successfully setting up a condition-based maintenance strategy is an organizational challenge. For example, new data analytics, management, and interpretation skills are needed within the maintenance organization. This refers not only to data analysts but to the overall maintenance team: every maintenance leader and worker needs to be able to interpret the results in order to adjust their way of working accordingly.

Example

Remote condition monitoring for the wind farm industry was introduced more than two decades ago. Nowadays, newer turbines can reach availability levels of 97 to 98 percent.

Exhibit 2

New maintenance technologies yield vast efficiency potential

Lever	Current issue	Key technologies (not exhaustive)	
Maintain only when needed	Maintenance frequency not optimal	Integrated, sensor-based online condition monitoring	**20–30%** reduction in maintenance costs
	No information on asset conditions available remotely	Remote external monitoring	
Maintain efficiently	Long travel times	Automated and dynamic planning, scheduling, dispatching, and routing	**20–50%** decrease in machine downtime
	Unevenly distributed knowledge (specialization in the maintenance workforce)	Digital instructions and remote support networks	

Remote external monitoring may be used to reduce manual inspection times, especially in areas that are hard to access

Remote external monitoring
If a sensor-based condition-monitoring maintenance strategy is not feasible, external monitoring means such as drones, thermographic cameras, smart pipeline inspection gauges, or measuring trains could help improve maintenance and inspection frequency. These devices are usually not fixed to the assets, thus providing information on asset conditions and/or failure type "from the outside," e.g., through cameras or infrared sensors.

Depending on the continuity of the information, external monitoring may be used to define a condition-based maintenance strategy, thus achieving better maintenance frequency levels. In case not enough information is obtainable this way, remote external monitoring may be used to replace or complement manual asset inspection. Additionally, receiving information on asset conditions might reduce unnecessary trips, e.g., due to missing tools or spare parts, further improving labor productivity thanks to reduced inspection time.

The deployment of external monitoring to reduce manual inspection requires organizational changes as well. For instance, new skills related to evaluating measurements from external monitoring devices are required in the organization. Additionally, maintenance strategies and manual inspection schedules have to be adapted according to the monitoring results.

Example

Measure, an aerial intelligence company, offers drone inspection solutions for the energy sector. Their case studies reveal cost reductions of up to 46 percent for solar plant inspections as well as person-hour reductions of up to 75 percent for wind turbine inspections.[1]

1 See www.measure.com.

2. Maintain efficiently

For industries with distributed fixed assets, maintenance efficiency is not only about reducing non-value-added activities. Reducing travel time (and idle time) and avoiding unnecessary trips are equally important, lowering safety risks at the same time. Optimized planning, scheduling, dispatching, and routing as well as small maintenance team sizes are key levers for increasing productivity while keeping or even increasing asset availability levels – all enabled by new technologies.

Automated and dynamic planning, scheduling, dispatching, and routing
Nowadays, maintenance workers are often provided with a list of planned maintenance jobs at the beginning of the day or week, which they have to carry out by the end of that period. However, unplanned or emergency maintenance jobs come up unexpectedly and are fit into the list "on the fly," leading to disruptions and greater-than-optimal travel times.

Automated and dynamic planning, scheduling, dispatching, and routing is a means to minimize these extra, unexpected trips. The idea is to provide each maintenance worker with only one job at a time – depending on their location, their skills, the urgency of the job, the time required to finish it, etc. – with the help of smart algorithms. On top of optimizing maintenance workers' routes this way, the amount of manual planning, scheduling, and dispatching is also reduced. Ideally, the corresponding algorithms are even integrated into the organization's maintenance workflow support system.

On top of boosting labor productivity, a dynamic dispatching system is valuable in emergency situations. As the skills and locations of maintenance workers are known at all times, the closest suitable maintenance workers can be sent to deal with an emergency situation without time-consuming coordination.

Dynamic dispatching assigns maintenance workers one job at a time – depending on location, skills, time, and urgency

There are a few prerequisites for an automated and dynamic planning, scheduling, dispatching, and routing system to work efficiently, such as:

— A list of all maintenance jobs, including emergencies, the average times needed to complete them, and the corresponding standard deviations

— Information on the maintenance workers' skills and locations

— Information on the assets' locations.

Setting up these prerequisites may require considerable effort, depending on a company's current planning, scheduling, and dispatching strategy. Once the new strategy is in place, a solution for transmitting information to the maintenance workers needs to be deployed. There are many software solutions on the market offering capabilities in this area. Note that ease of use for the maintenance workers is key for achieving actual improvements – and should be prioritized when developing or selecting a software solution (see Chapter 3: The recipe for success).

Example

The Finnish telecommunications operator Elisa completely automated its network operations center. The state of the network is automatically monitored 24/7. In case of an anomaly, its cause and location are identified, as is the next available maintenance worker. A virtual agent then calls the worker and shares the necessary information about the maintenance job.[1]

1 See www.elisaautomate.com.

Digital instructions can shorten the time per job in workforces with unevenly distributed knowledge

Digital instructions and remote support

Nowadays, companies with distributed fixed assets often rely on a specialized maintenance workforce. As assets have become more complex over time, specialists are required for individual failures or components to ensure quick and efficient completion of maintenance jobs. However, specialized workforces raise inefficiencies in other ways, e.g., by requiring high overall team sizes or multiple trips from different specialists to maintain an asset. Two technological opportunities can help address this issue and contribute to increased labor productivity: digital instructions and remote support networks.

1. Digital instructions, e.g., maintenance instructions provided via an app or AR glasses, provide the maintenance worker with information on the required maintenance routines. This way, workers can be upskilled to perform tasks they are not yet familiar with, mitigating the risk of knowledge loss due to a reduced workforce size (e.g., caused by unwanted attrition through an ageing workforce and lack of skilled labor).

   However, maintenance workers require a whole new set of skills to deal with digital instructions. They should thus be closely involved in the development of these instructions, having their specific needs taken into account. This ensures they adapt easily to the new way of doing maintenance, realizing efficiencies more quickly (see Chapter 3: The recipe for success).

2. A remote support network can complement digital instructions: if a maintenance worker runs into difficulties finishing a job, they can call an expert colleague to help solve the problem. To work most efficiently, maintenance workers need to be equipped with cameras and connectivity to be able to show their expert colleagues the difficulties they encountered, in order to be guided effectively. This helps avoid unnecessary trips from specialists to finish the maintenance job, thereby increasing labor productivity.

A remote support network requires up-to-date information on the skills and availability of each maintenance worker to ensure that suitable and available experts are called when needed. Furthermore, existing incentive systems need to be adapted so as to promote mutual assistance (e.g., pay raises for experts, special events as rewards for high performance).

Implementing technical solutions that improve maintenance strategies can lead to an improvement of the overall safety performance of an organization. For example, if a piece of equipment is maintained only when strictly needed, fewer field visits will be required, resulting in reduced exposure to hazards (e.g., fewer car crashes); furthermore, if equipment is maintained more efficiently thanks to digital instructions or remote support, fewer technicians are needed to execute the interventions, limiting the number of employees at risk.

Example

Italgas, one of the main incumbents in gas distribution in Italy, has started to roll out AR glasses to its maintenance field force with three use cases in mind: instruction display, remote AR support, and video recording for training purposes. The overall aim is to upskill the maintenance field force that is currently managed per task and in silos. Eventually, labor efficiencies will be realized as incidents will be handled by one maintenance worker only, and the end-customer experience may also be improved thanks to increased uptime of assets.

Excursus 2

Harmonization of safety and maintenance processes leads to overall performance improvement

Safety management and maintenance processes are deeply interlinked: effective maintenance keeps machines, equipment, and the work environment safe and reliable, and a safer environment contributes to effective maintenance interventions (e.g., cleaner inspection areas, fewer mistakes).

A direct link can also be found between safety controls put in place by an organization and their consequent effect on maintenance activities (see Exhibit B). For example, the removal of hazards or the replacement of equipment with safer alternatives can result in changes to equipment design, like eliminating portions that are hard for inspectors to access or removing obsolete equipment that requires more frequent intervention. The development of detailed procedures, training plans, and supervision shifts can lead to more competent and therefore effective maintenance technicians.

Exhibit B

Integrating safety and maintenance processes is paramount for performance

	Hierarchy of safety control	Potential effect on maintenance processes
Eliminate	Discontinue the work process Remove hazard	Removal of hard-to-access/obsolete equipment
Substitute	Replace with safer alternatives	
Isolate	Create distance or a barrier to the hazard	Development/purchase of clean designs with facilitated inspection opportunities
Engineer	Design or modify components against hazards	
Administrate	Develop procedures, training, supervision	Training of competent and effective maintenance technicians
Protect	Defend with dedicated protective equipment	Supply of proper tools, including Safety 4.0 solutions

The recipe for success – capturing value while avoiding common pitfalls

70% of all maintenance transformations fail – mostly due to employee resistance and lack of change in leadership behaviors

The two most common pitfalls awaiting operations leaders when transforming their maintenance processes are 1) the lack of a clear business case and strategy for capturing value, and 2) the lack of clear transformation and change management. Therefore, almost 70 percent of maintenance transformations fail to deliver the desired outcome (see Exhibit 3).

To successfully transform their maintenance processes, companies need a carefully designed approach. Our experience working with clients across all industries in transformation settings has led us to create a comprehensive framework for transformation success. There are 11 key questions that companies should ask themselves that will help them design a successful transformation (see Exhibit 4).

Exhibit 3

Only about 1/3 of maintenance transformations achieve their objectives

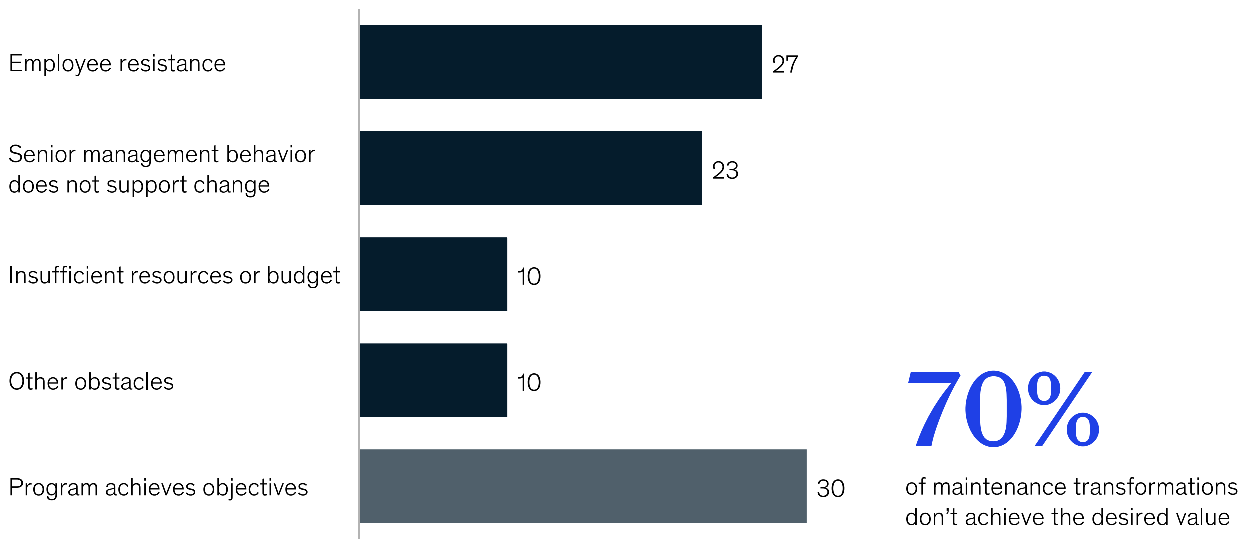
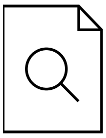


Exhibit 4

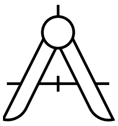
11 key questions for maintenance transformation success

Define clear goals and outline a robust transformation plan

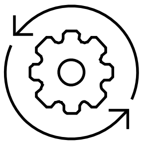


Have we identified the total amount of non-value-added activity?

Have we identified and aligned on an end goal?

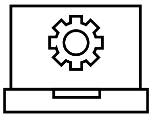


Did we design a robust, executable transformation plan?

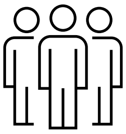


Is there a governance and performance management system in place to derive impact?

Ensure technical and organizational prerequisites for value capture

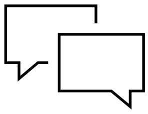


Have we locked in the structure, processes, tools, and technology to support the transformation?

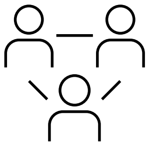


Have we ensured that the right talent is in critical roles to drive value?

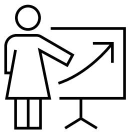
Create conviction and build skills and capabilities among leadership and the workforce



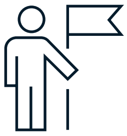
Are we engaging all employees with a compelling change story and communication plan?



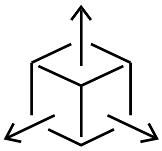
Have we built and refined our functional, executional, and leadership capabilities?



Have we established financial and non-financial incentives to help achieve the desired outcomes?



Have we built up the abilities of senior leaders to role model change?



Are we using both formal and informal change agents to catalyze change?

Think big and avoid pilot purgatory – define clear goals and outline a robust transformation plan

Identifying the bottom-line impact of new technologies before deciding to pilot is the key to success

To capture the entire potential of new maintenance technologies, it is important to first develop a perspective on the entire amount of non-value-added activity within maintenance, define clear goals, and consider and evaluate all strategic options for the maintenance target state. This not only refers to the deployment of new technologies in the process but also includes “make or buy” decisions, strategic partnerships, and options for the target operating model with respect to maintenance.

To then enable a fair and balanced evaluation of all strategic options (e.g., the deployment of a new technology), a clear business case is needed, followed by the establishment of a blueprint for value capture, i.e., a robust transformation plan. This includes a target operating model, target maintenance processes, and an implementation plan.

Finally, a governance and performance management system to steer the transformation needs to be set up. Transparency on the transformation’s status will help an organization navigate and adjust in case the transformation is in danger of veering off course.

Transform your organization and lay the groundwork for success – ensure technical and organizational prerequisites for value capture

5% of roles drive 95% of transformational value – identifying and filling them is the key to success

Having defined a clear goal for the maintenance transformation and developed a robust transformation plan, it is now important to ensure that the technical and organizational prerequisites for success are in place. This refers to the technology environment, which has to be created in a comprehensive, integrated, and secure way.

As maintenance workers and leaders will have to change their traditional ways of doing things, solutions should be developed that ensure usability for the field force, ideally by incorporating frontline expertise into the design phase and executing a pilot to test user friendliness before scaling up.

Finally, organizational prerequisites must also be ensured to enable transformational success. Having the right people in critical roles is vital for driving transformational value, as traditional roles tend to evolve, and new roles need to be created in technology-led transformations. McKinsey research suggests that 5 percent of roles drive 95 percent of transformational value.[5]

[5] Scott Keller and Mary Meaney, *Leading organizations – ten timeless truths*, London: Bloomsbury Business, 2017.

Bring it to the front line – create conviction and build skills and capabilities among leadership and the workforce

Commitment in all relevant change areas increases the chances of transformation success to 79%

Maintenance transformations need strong change management from the start to succeed. Besides the elements discussed above, this includes:

— Building conviction among leadership and the maintenance crew through a compelling change story and communication plan

— Identifying and addressing skill and capability gaps among leadership and the workforce

— Establishing financial and non-financial incentives to help achieve the desired outcome

— Role modeling the desired change by senior leaders

— Activating change agents as influencers in the entire maintenance organization.

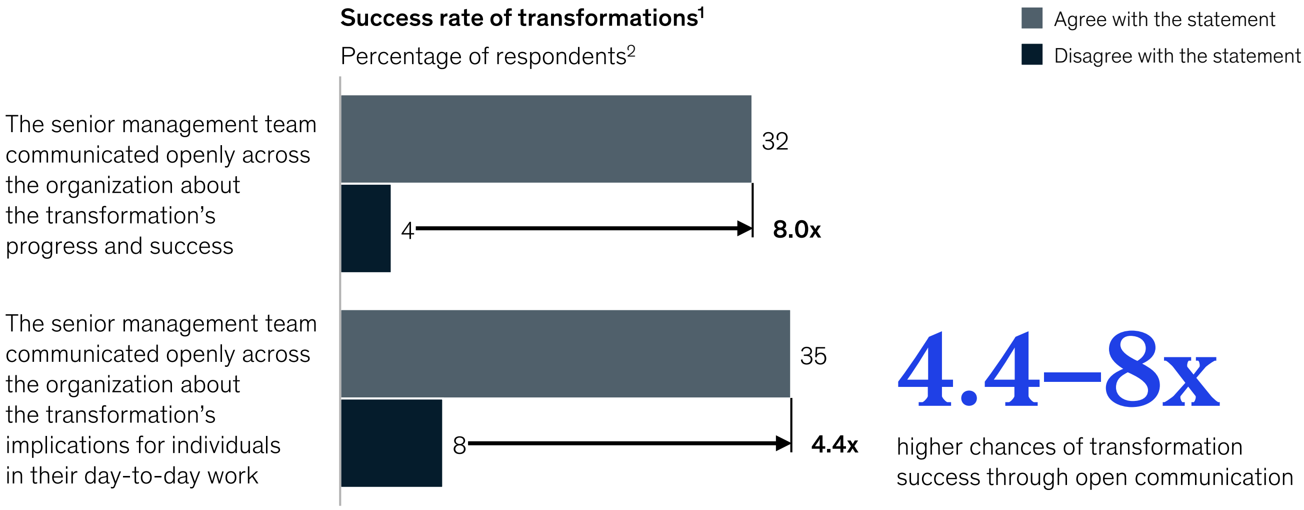
McKinsey research shows that commitment and action in all relevant change areas increases the chances of transformation success from 30 percent to almost 79 percent.[6] Two elements are of particular importance for a technology-driven maintenance transformation: communication and skill building.

Open communication from leadership on the status of the transformation and its implications for day-to-day work are particularly closely linked with transformation success (see Exhibit 5). Maintenance and transformation leaders should therefore maintain transparency and spend a significant share of their time engaging maintenance workers in a well-crafted change story. This is particularly important in organizational environments with distributed fixed assets, as maintenance teams are usually decentralized and work without close daily contact with their leaders.

[6] “How to beat the transformation odds,” *McKinsey Quarterly*, April 2015.

Exhibit 5

Open communication is closely linked with the success of maintenance transformations



4.4–8x

higher chances of transformation success through open communication

1. Respondents who reported "success" said the transformations they are most familiar with have been very or completely successful at both improving performance and equipping the organization to sustain improvements over time.
2. Respondents who answered "don't know/not applicable" are not included.

Companies prioritizing skill building have 2.4x better chances of transformational success

As digitization and automation transformations usually require new skills and capabilities, it is important to identify and address them upfront. This not only refers to those of the workforce but of leadership as well. Companies that prioritize and invest in learning early on in their transformations have significantly better chances of transformational success: McKinsey research shows that they are almost two and a half times more likely to capture and sustain value.[7] Every skill-building effort must be framed against the overarching change story and communication plan.

[7] Scott Keller and Colin Price, *Performance and health – an evidence-based approach to transforming your organization*, New York: McKinsey & Company, 2010.

The next step – expanding and growing by offering maintenance solutions and services

Offering maintenance-as-a-service and maintenance software solutions are potential growth areas for advanced players

After successfully undergoing a digital maintenance transformation, an organization has redesigned its processes to uphold asset availability in a cost- and labor-efficient way. This frees up resources, which may be used in a number of ways, depending on the specific situation of the company; for example, to:

— Directly cut costs and improve profitability in cases of increased cost and performance pressure

— Balance out a lack of knowledge or unwanted attrition, e.g., due to an ageing workforce and scarcity of skilled labor

— Further increase asset availability and system reliability in cases of high secondary costs related to asset failure or excess system redundancy

— Grow the business by offering maintenance services and solutions to other companies in the same or similar sectors.

Offering maintenance-as-a-service or maintenance software solutions to smaller operators are two potential growth areas for companies with advanced maintenance processes. The idea is to shift maintenance from a cost to a revenue center, creating business value with the skills acquired through the maintenance transformation.

Advanced players have already proven the feasibility of this concept, as the following examples will show.

Moving towards the next horizon of maintenance by leveraging new technologies promises significant value in terms of maintenance costs, asset availability, and business growth. The good news is that the opportunity to capture this value has never been better: real-world examples show that transforming maintenance is not a mystery. To enable transformational success, organizations must adopt an efficiency mindset, identify bottom-line impact, and follow a holistic transformation road map.

Examples

The British Telecom subunit BT Fleet offers fleet-management solutions, vehicle maintenance, and accident management to smaller fleet operators.[1]

The telecommunications operator Elisa Automate markets its own software system for network operations centers (automated monitoring, failure identification, job scheduling, and dispatching) to other telecommunications operators.

[1] See www.fleetsolutions.bt.com.

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Are you interested in learning more about how your company can benefit from digital maintenance opportunities? Please contact our authors and content leaders.

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