Making the case for integrated Asset Performance Management

Baker Hughes

Balancing cost, risk, and performance:

The competing priorities for asset-intensive industries

In a world where every industrial organization has access to the same equipment, assets, and talent pool, how does one gain competitive advantage? By striving for efficient operations, whilst extracting better asset performance and minimizing maintenance costs.

However, as organizations strive to increase capacity and extend asset lives while reducing costs, they often find themselves operating assets on the edge of their performance threshold. On top of all this, is the significant risk that comes with operating assets that can fail catastrophically, leading to missed production targets, significant cost impacts, harm to the environment and people, or even all of the aforementioned.

The challenge then is to develop asset strategies to achieve the optimal balance of risk, cost, and performance. Organizations also need to recognize that assets operate in a dynamic environment where inputs change constantly, making strategy optimization a continuous process.

Gartner defines APM as "*encompassing the capabilities of data capture, integration, visualization and analytics tied together for the explicit purpose of improving the reliability and availability of physical assets.*"[1] APM consists of condition monitoring and protection, asset strategy and reliability, defect elimination, and asset health and analytics, as well as specialized services.

Effective implementation of APM can help organizations optimize operational strategies that account for cost, risk, and performance of industrial assets. Traditional approaches, however, have lacked the desired impact, due to issues with data quality, discrete and disconnected functional silos, and organizational capability.

- **Industrial businesses gain competitive advantage by extracting higher performance from assets while reducing costs**
- **Asset management strategies must account for risk of lost production and potential breaches to health, safety, and environmental standards**
- **APM software is critical for industrial operators navigating these challenges**

[1] Source: www.gartner.com/en/information-technology/glossary/asset-performance-management-apm

The case for integrated Asset Performance Management

Solving for the limitations of traditional APM

Traditional approaches to APM often fail to deliver on their stated goals. In fact, as reported by McKinsey, only 16% of organizations' digital transformations have successfully improved performance and equipped them to sustain changes in the long term.[2]

Many limitations of traditional APM stem from the siloed nature of the underlying functions, tools, and data and the disconnects between foundational systems; asset strategy, asset health, defect elimination, and work management. Compounding this is the addition of new capabilities, such as artificial intelligence (AI) and machine learning (ML). Assuming technology barriers can be surpassed, organizational capability can further stall progress.

Solving for these shortcomings requires the typical, separate elements of APM to be harmonized and connected. Integrated APM generates performance improvement and productivity gains by connecting these discrete silos and augmenting the digital solution with foundation strategy content (such as FMECA libraries) and APM services support.

Limitations of traditional APM

1. Limited integration between functions
2. No enterprise-wide view of assets
3. Typically corporate driven
4. Lack of appropriate technical and equipment expertise
5. Disconnect of advanced analytics, AI and ML to foundational APM systems

[2] Source: https://www.mckinsey.com/business-functions/people-and-organizational-performance/our-insights/unlocking-success-in-digital-transformations

Limited integration between functions

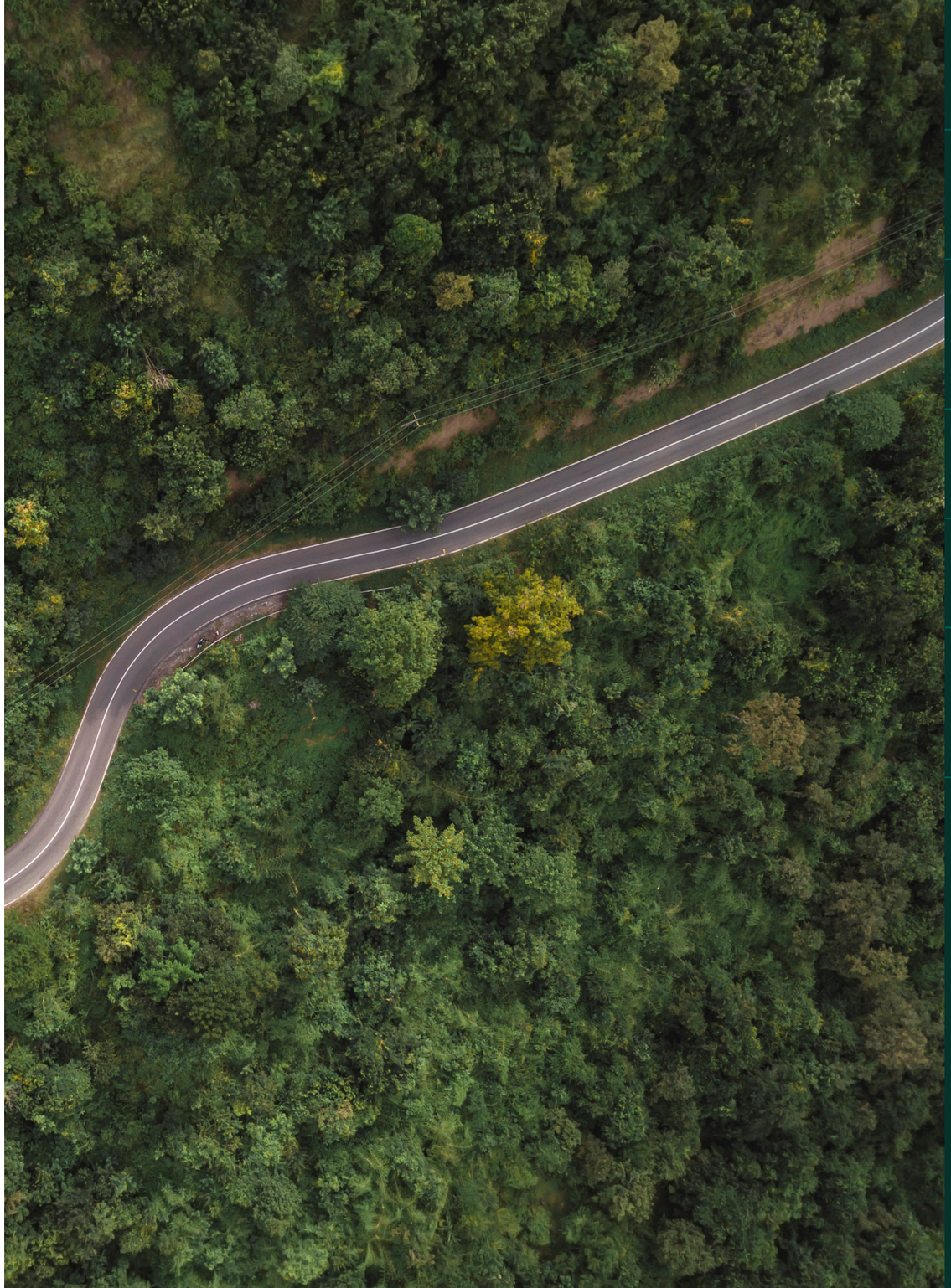
asset criticality, asset strategy, asset health, root cause analysis are all conducted in separate modules with little or no practical connection of data

Impact:

The APM implementation fails to deliver any significant leverage of a holistic approach to asset performance. Each module performs its function, but the lack of practical connection between modules means that manual processes remain and inconsistencies arise between different aspects of asset performance.

Resolution with integrated APM:

Meaningful connections between functions enables real-time decision making and a dynamic and agile approach to asset maintenance and reliability, in sync with operational goals. Ability to deploy at scale, create deeper insights, drive prioritization of improvements and actually implement actions and changes to strategy.



No enterprise-wide view of assets

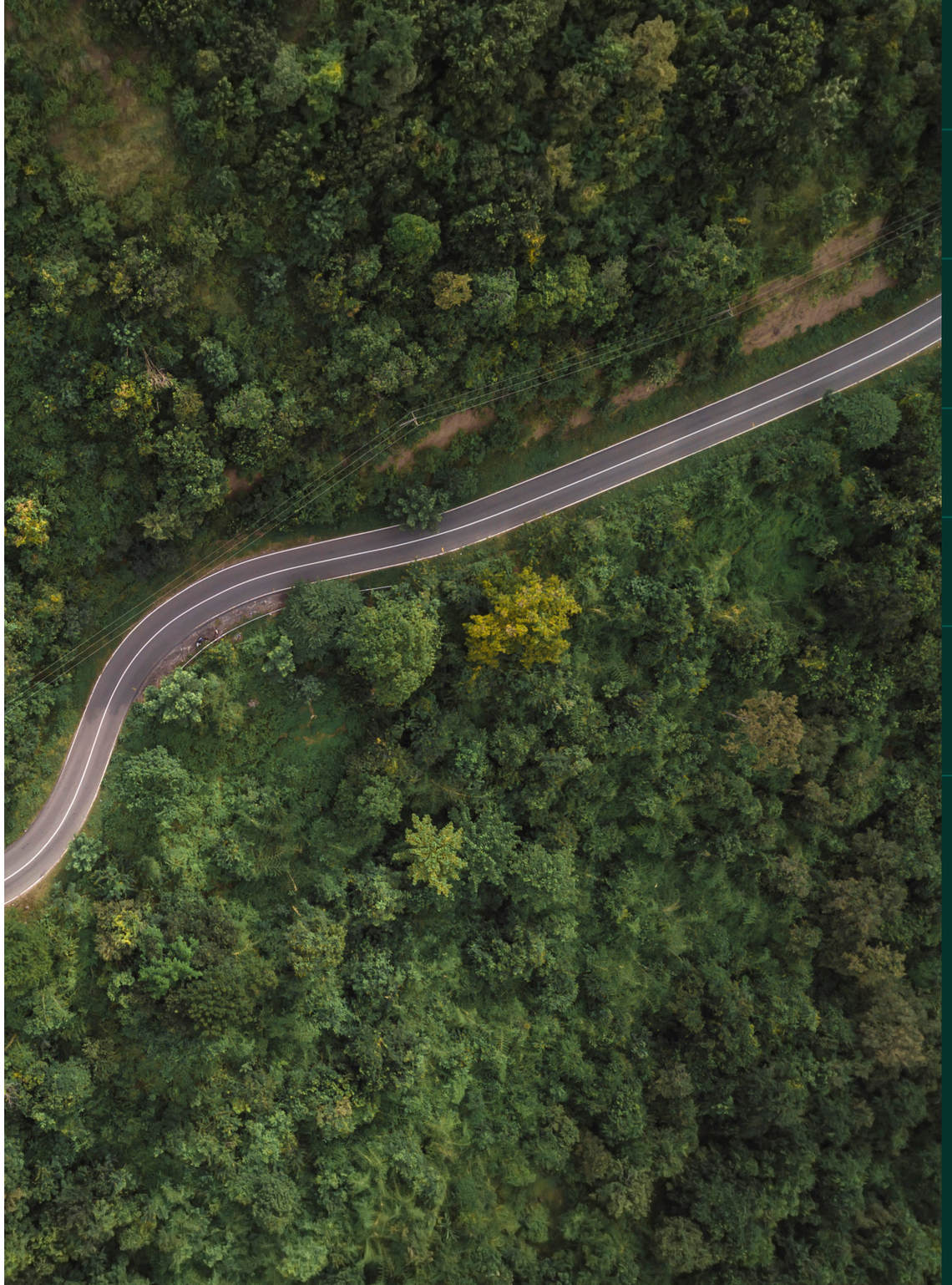
covering asset strategies, asset health, and work execution

Impact:

Priorities are hard to establish and clash across asset strategy, asset health, and operations. There is no effective way to identify where an organization should focus or how to prioritize actions and improvements.

Resolution with integrated APM:

A complete view of asset health and risk, covering condition, strategy, compliance, and defects, enabling data-driven performance management and prioritization.



Typically, corporate-driven

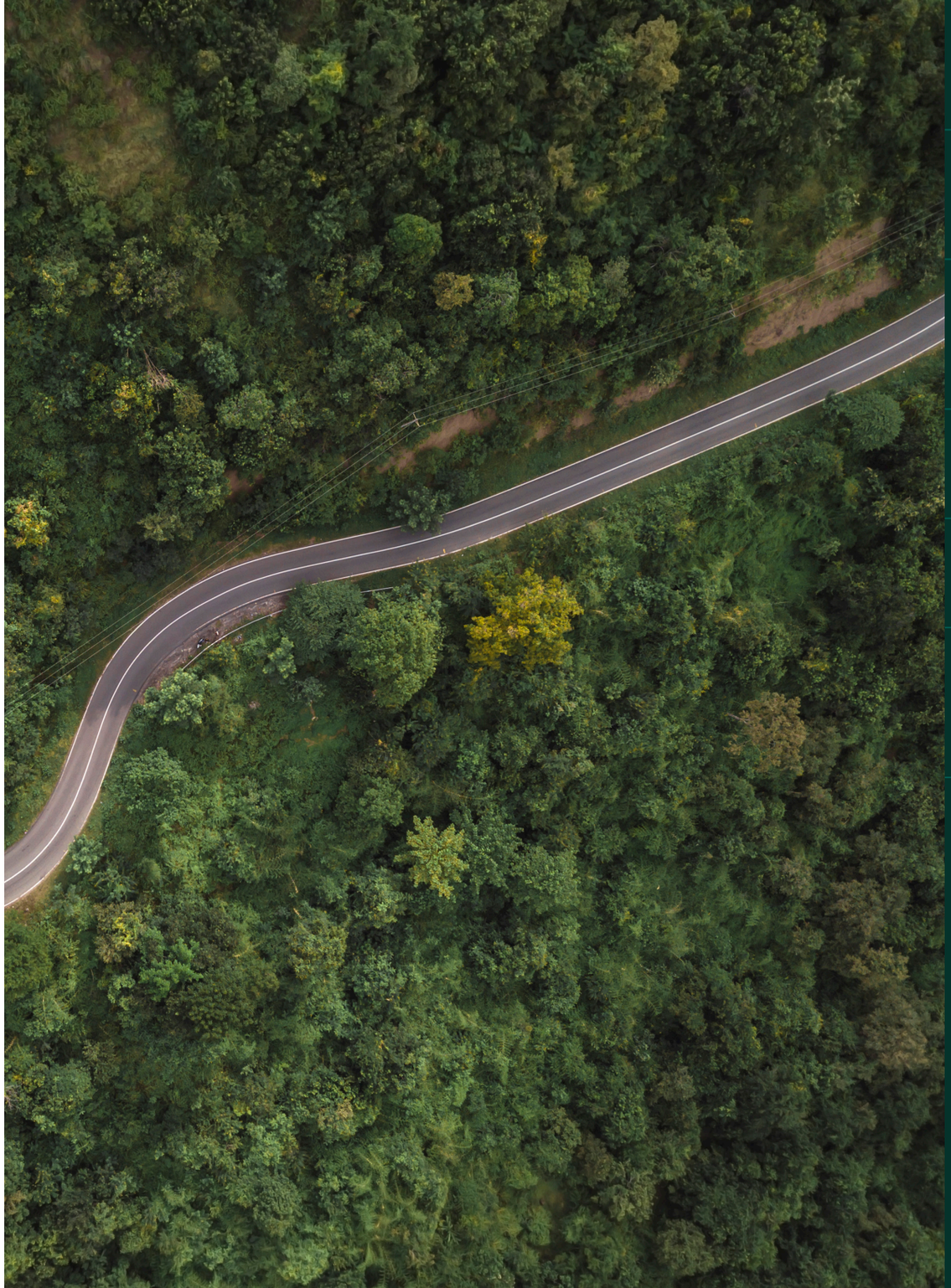
with no flexibility to adapt to regional or site-based needs

Impact:

Leads to the creation of workarounds that fail to deliver desired outcomes, leads to poor governance, and increased risk. No ability to leverage corporate intelligence in any meaningful way since everything requires customization to suit site/asset specifics.

Resolution with integrated APM:

A sophisticated, purpose-built data model drives corporate consistency while supporting required site, region, or asset customization. Approach leads to enterprise-wide adoption, greater governance, improved ability to leverage best practice across an organization, and optimal gains in organizational efficiency and asset performance.



Lack of appropriate technical and equipment expertise

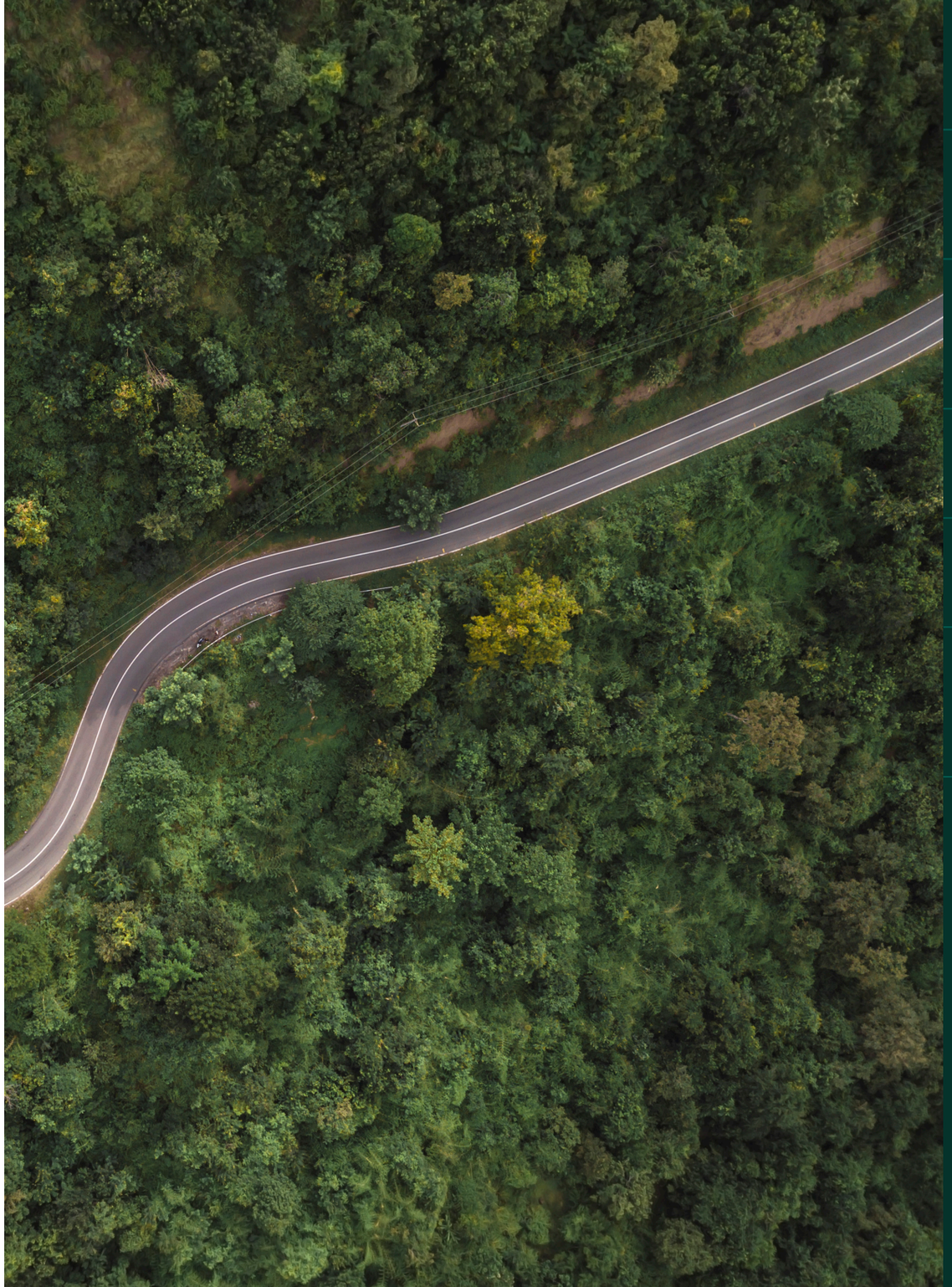
with supplier support models only focusing on product technical support

Impact:

On-site resources struggling to keep up with tasks including reliability analysis, reliability decision making, and asset health management. Difficulty in applying the technical product within the organization's infrastructure and processes to actually make improvement decisions and get them implemented.

Resolution with integrated APM:

Strategic, functional, and technical support provided to support or augment site resources to connect, evolve, and apply asset knowledge. Asset failure mode and diagnostic models and content to support rapid uptake and scalability. Dedicated remote support centers and localized onsite support.



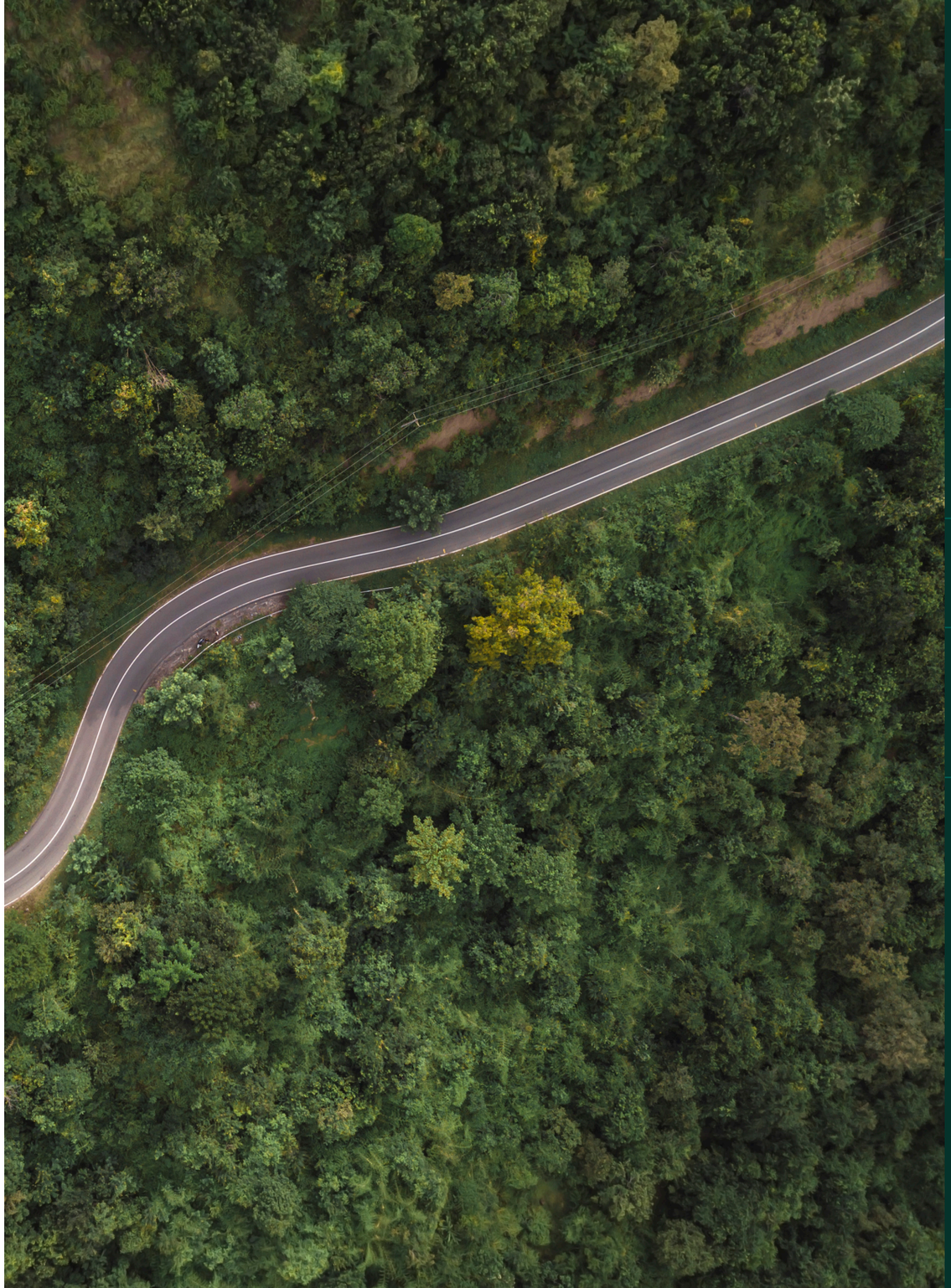
Disconnect of advanced analytics, AI and ML to foundational APM systems

Impact:

Analytics-driven insights do not connect to practical planning, scheduling, or execution of asset maintenance. Adding separate or disconnected AI software programs or modules creates more complexity for operators seeking a single view of asset intelligence.

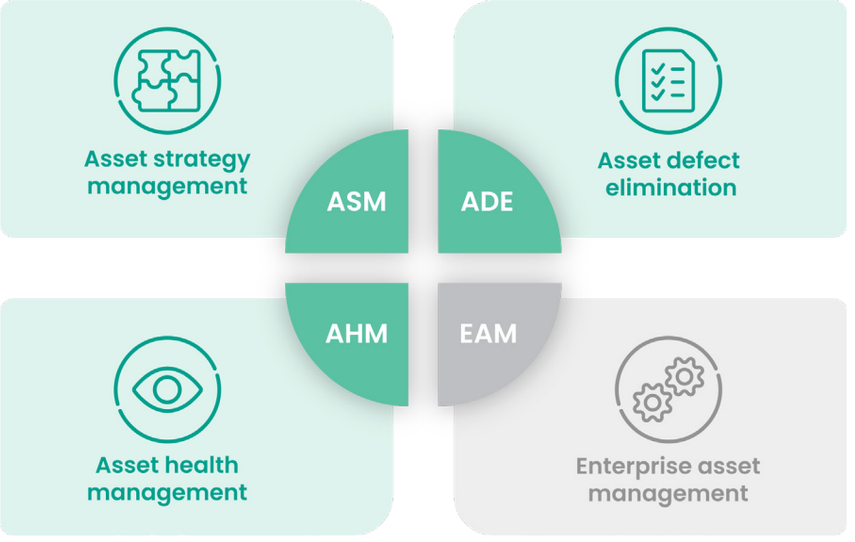
Resolution with integrated APM:

Predictive and prescriptive insights delivered through APM system interoperability of AI and ML systems with foundational APM systems. Hybrid first principles and AI-based models that can scale in the cloud within integrated APM.



Integrated approach unlocks performance and productivity

Integrated APM addresses the shortcomings of traditional APM by joining distinct asset management functions together through a meaningful connected and centralized digital platform, whilst augmenting and building technical capability, enabling APM to be embedded as a business-as-usual process. Implemented effectively, integrated APM optimizes asset health, asset strategy, and asset defect elimination, to balance cost, risk, and performance.



Green = asset performance management

Bringing together the core functions of APM

Toggle to learn more

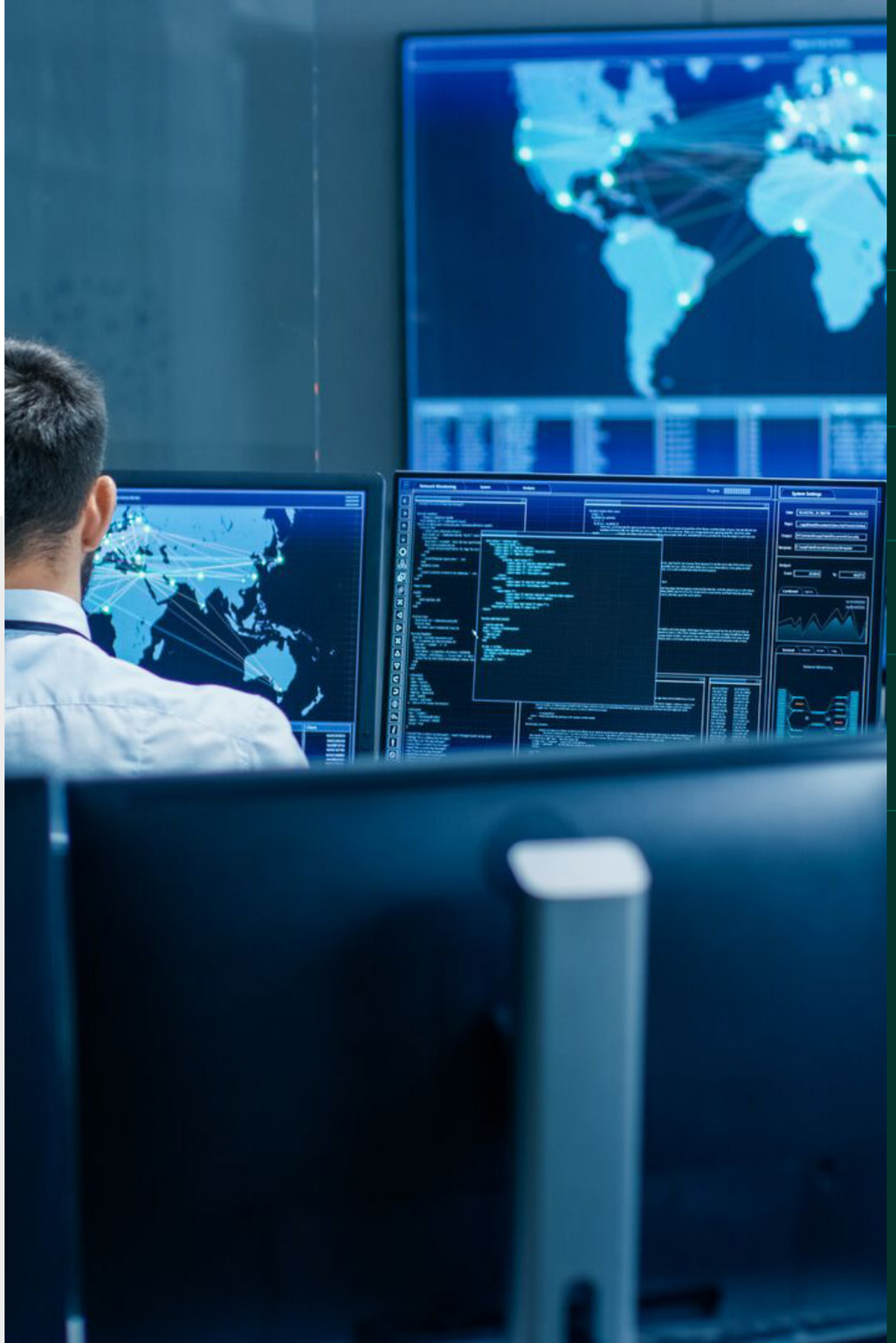
Asset Health Management

Asset Health Management (AHM) is the practice of using software and hardware to monitor asset health in real time. It can be effective in managing the risk of catastrophic failure, particularly on critical assets, by providing alerts when intervention is required.

The use of AHM has expanded in recent years due to advancements in technology and a subsequent reduction in cost to implement. However, even thorough systematic monitoring of asset health can be fundamentally tactical, achieving less than ideal performance and cost results.

Current limitations of AHM

- Standalone from any reliability strategy/maintenance plan decisions
- Standalone from work management, requiring corrective actions to be manually actioned in a EAM/CMMS
- Asset health reporting is based solely on current monitored asset condition with little context of where to focus first



Bringing together the core functions of APM

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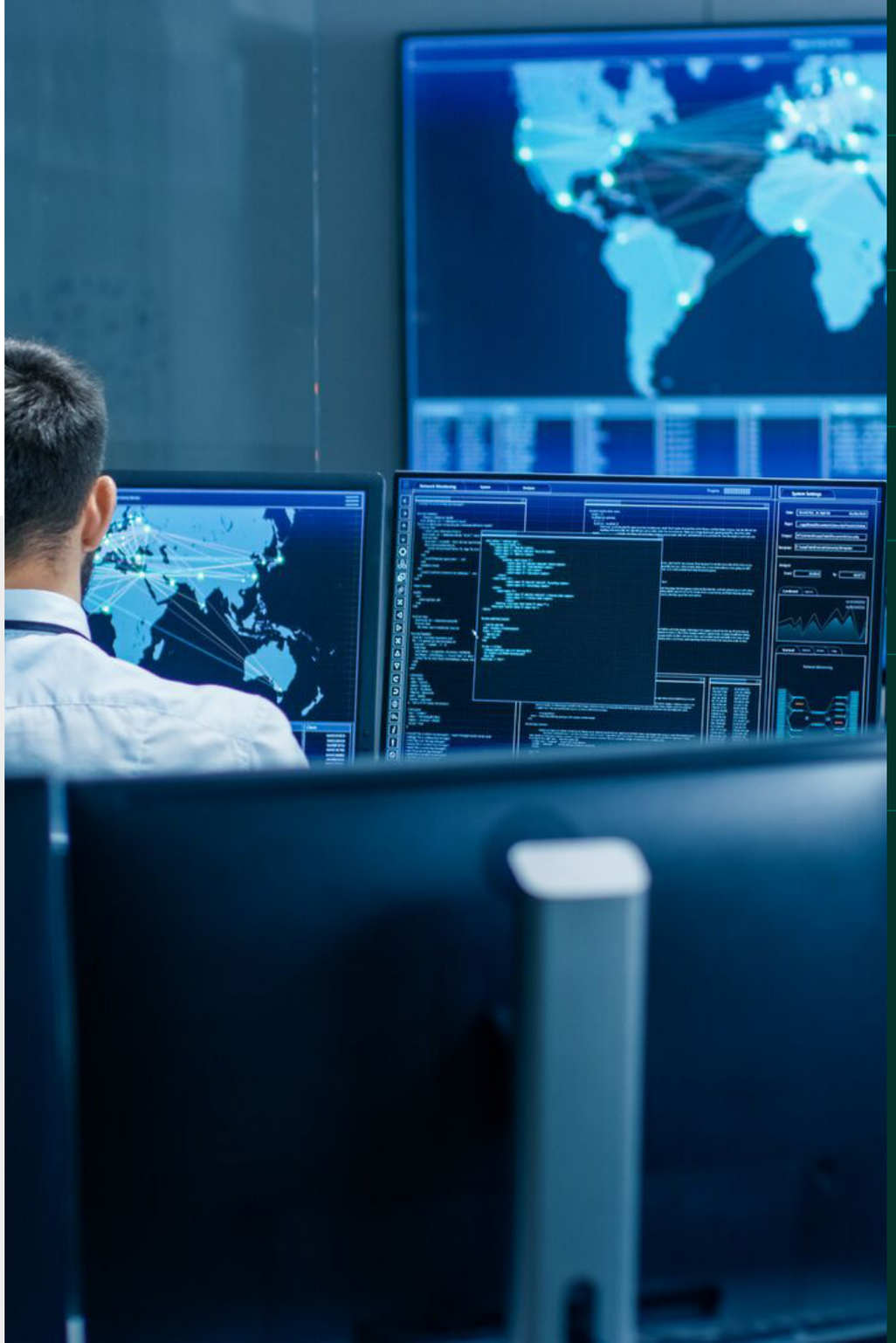
Asset Defect Elimination

The identification of defects through breakdowns, undesirable availability and/or reoccurring problems are prioritized for analysis based on those with the biggest impact on operations, costs, safety or the environment.

Root Cause Analysis (RCA) is the foundation of a Defect Elimination process. RCA identifies causes, using input from all stakeholders to produce an evidence-based understanding of the problem. This evidence-based approach ensures selected solutions prevent recurrence.

Current limitations of defect elimination

- Driven by a top 10 report & highly visible trigger points
- Disconnected from reliability strategy work and condition monitoring programs
- Attention on solutions can dissipate over time with the focus being mainly on the analysis of other problems
- Difficult to leverage any effective solutions to other like assets



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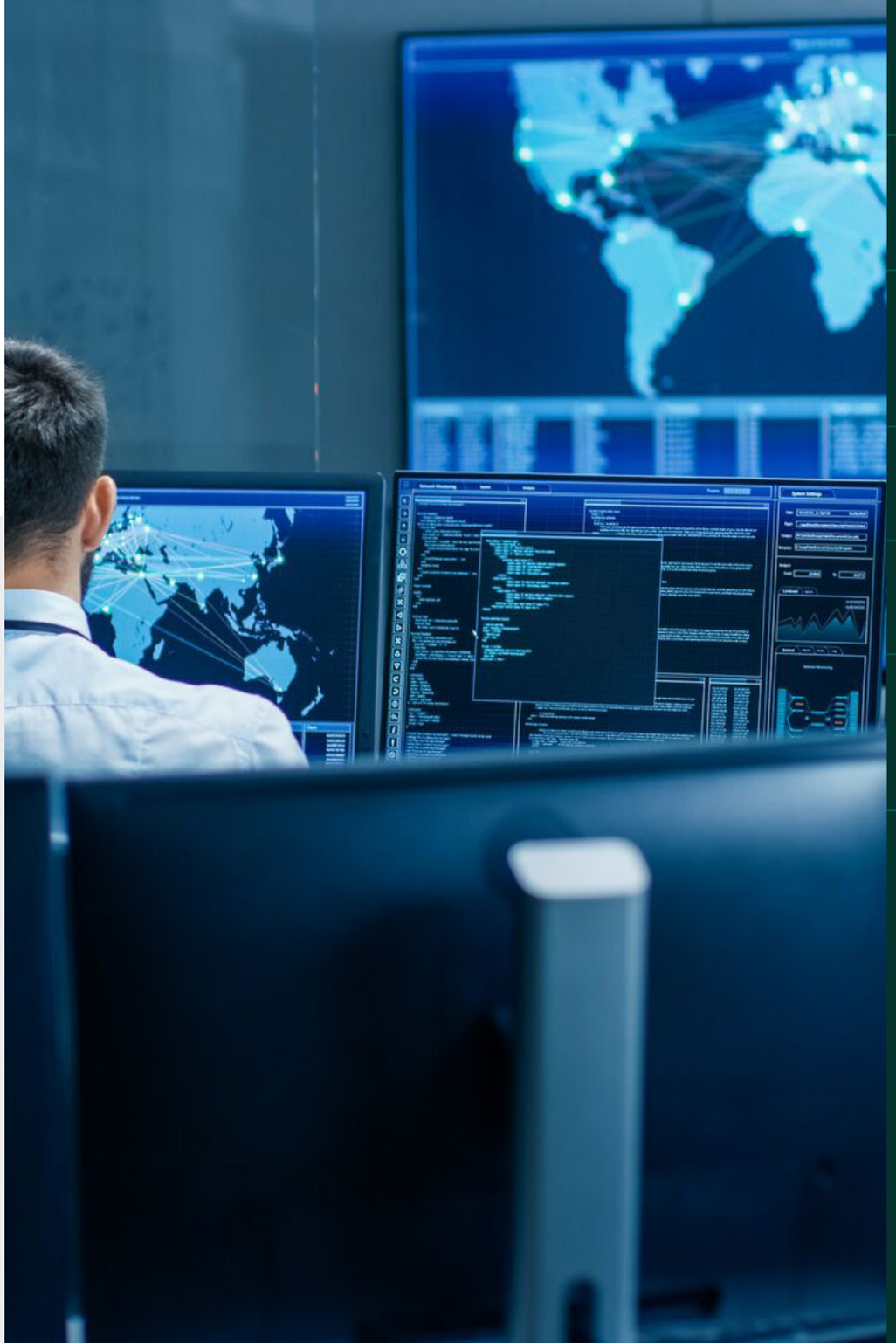
Asset Strategy Management

Asset Strategy Management (ASM) is a best practice approach to managing asset strategies, organization wide. It is a process, enabled by people, technology, and data, to connect physical assets and independent plants and sites to a central system, allowing effective asset strategies to be effectively implemented, maintained, and optimized. These strategies, including optimized maintenance plans, deliver performance improvements and lower costs through increased reliability and the reduction of failures, downtime, and risk.

ASM also generates maintenance plan master data for loading to the EAM/CMMS. Data includes the tasks to be performed as well as details on when they are to be performed, how they are to be performed, who does them, and what materials are required.

Current limitations of ASM

- Typically conducted for new projects only
- Initiated as a project for any existing facility when performance is low or costs are high
- Standalone from asset health management and work execution
- Maintenance plans created are loaded to EAM/CMMS via Excel load files



Bringing together the core functions of APM

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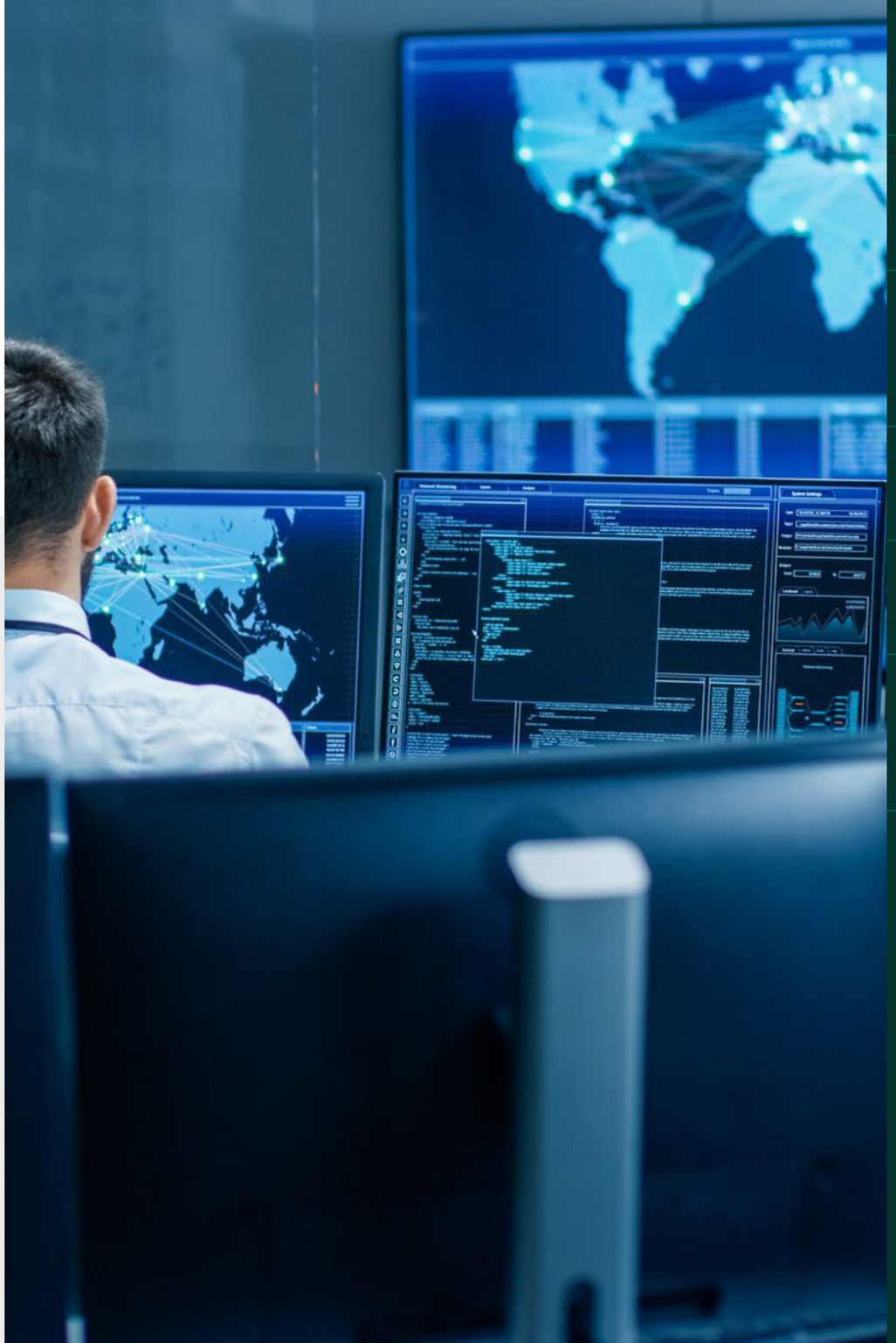
Enterprise Asset Management

Enterprise Asset Management (EAM) supports work execution and is focused on executing tasks, including routine and emergent tasks. It is typically supported by software that helps schedule work more efficiently and tracks costs and work history.

Given how embedded the work management process is in many organizations, there is a tendency to focus on maintenance execution alone, in the belief that reliability will improve. However, inconsistent or sub-optimal strategies are still executed, which can hamper performance and lead to variable results, continued under-performance, and significant costs, failures and outages.

Current limitations of Enterprise Asset Management

- Maintenance plan master data can be changed with little oversight
- Different sites have inconsistent maintenance plans on similar assets
- Standalone from reliability strategy and condition monitoring
- Siloed function makes it difficult it to improve plans, reduce costs, and understand risk



Key benefits of integrated APM

True asset health & risk visualization

Integrated APM provides a complete view of asset health and risk, accounting for asset age, operating condition, maintenance plans, maintenance compliance and current defects.
The insights gained provide a sound foundation for data-driven performance management, helping organizations prioritize activities to manage cost and risk.

Continuous improvement

With ASM, AHM and ADE processes connected and established, any operating context or asset changes are reflected in asset strategies and monitoring applications in real-time, creating a dynamic and agile approach to equipment maintenance and reliability, in sync with operational goals. Connection to the EAM/CMMS application and work management process drives changes through to work execution in the field.

Predictable performance

Creating a seamless connection between asset health, strategy, defect elimination, and work execution supports the management of unplanned costs, the mitigation of risk, and avoidance of catastrophic failure. As a result it supports the lowest cost maintenance plans for each asset.

Increased productivity

Integrated APM helps organizations to maximize and sustain realization of efficiencies and productivity increases through intelligent, real-time, and risk-based reliability management.

Moving towards optimized operation

Every organization has finite resources dedicated to asset management and at any one time there are several issues competing for attention. Without the right insights, it is difficult to quantify risks and make decisions about how to prioritize and allocate resources. This can lead to situations where teams are continually responding to unplanned failures rather than forward managing their risks and delivering improvements in performance and productivity.

In this type of environment, equipment failures and production impacts occur regularly, creating short busy, reactive work horizons. Asset performance is unpredictable, costs are high, and risk of catastrophic failure is high.

Integrated APM allows organizations to centralize, consolidate, evolve, manage, and leverage their data to move from this reactive state to harmonized operations.

As integrated APM is implemented, the focus is on preventing loss through reduction of unplanned failures. As asset performance becomes more predictable and stable the next focal points will be the management of areas of significant risk, areas where likelihood is low but consequence is high.

As the integrated APM implementation matures and scales the organization will begin to capitalize on the opportunities available through the harmonization of operations and asset performance.

Phase 1: Prevent loss

Through the application of integrated APM a comprehensive asset health and risk profile will be established. Risk priorities will naturally create focus on repeat, regular outages within key assets where there is production impact. This transition from reactive to proactive strategies and corrective actions will increase availability and production while reducing costs.

Phase 2: Manage risk

As assets become more reliable and available, the risk prioritization will spotlight areas of significant risk, allowing the organization to ensure that optimal strategies are in place along with any risk mitigation activities such that significant asset related risks are managed to the organizations risk profile.

Phase 3: Unlock opportunity

As unplanned failures and high-risk assets are brought under control and the chaos moves to order, areas of opportunity will be highlighted. The integrated APM implementation now matures to an efficient, evolving knowledge management solution driving improvement across the entire asset base.

Once an organization reaches a state of harmonized operations, it will see the benefits of the ability to operate with a predictable level of performance while displaying the agility to adapt to the changing operational environment. Benefits will come from not only asset performance but also cultural shifts in the approach to asset maintenance and operations. These harmonized operations will ensure that all asset strategies are financially optimized and driven by technology and an underlying process that is resistant to ever-changing markets and dynamic environments.

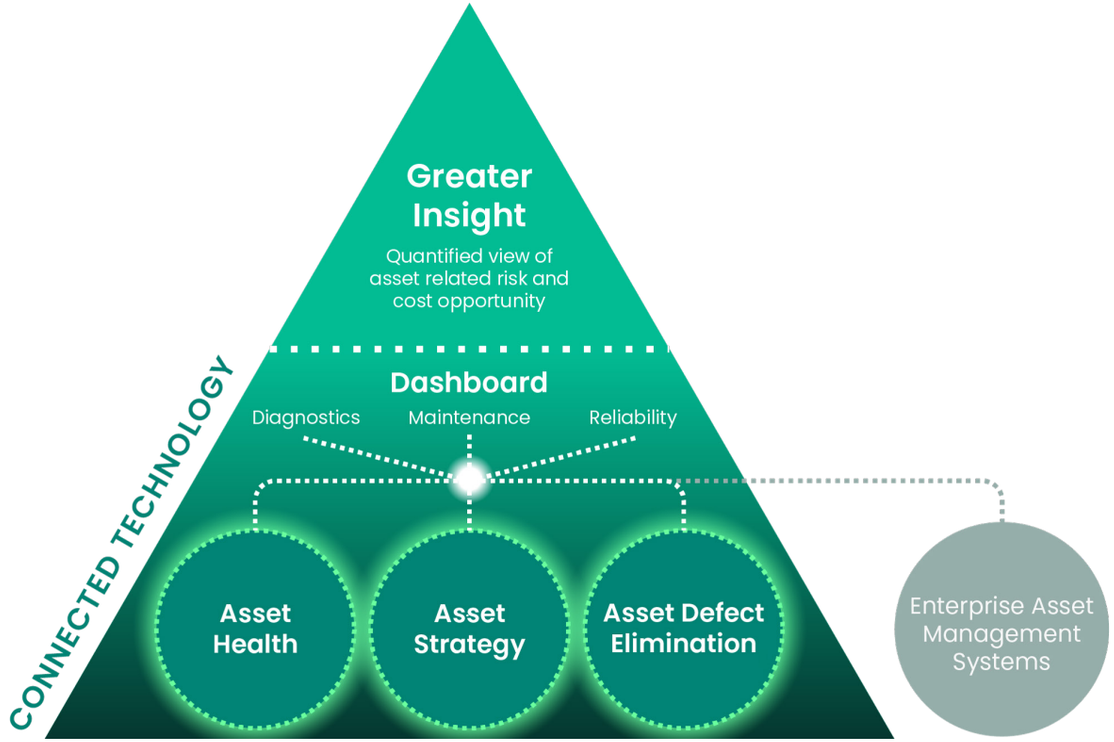
Getting started with integrated APM

Integrated APM cannot be achieved through technology alone. It requires three key pillars: technology, content, and capabilities. It requires the ability to connect these pillars, tying together asset health, asset strategy, defect elimination, and enterprise asset management.

Most importantly, a successful implementation of integrated APM should begin with establishing a process. The stated objective of this process is to drive continuous improvement of assets while managing cost and risk but must relate to the organization, its business, organizational structure, existing systems, and maturity. The development of the process should be used as a mechanism for organizations to rethink their current ways of working.

Only once the process is defined should organizations start to think about what's needed in terms of a technical solution and change management. For example, the ideal process may require changes to the current organizational role accountabilities.

Change management is critical and should consider the maturity of the organization. The management of change becomes an opportunity to drive a culture of reliability across the entire organization.



Pathways to success

Integrated APM provides the most value when deployed across an entire organization. The impact is exponential because any content created, or improvements delivered can be leveraged across the full asset base. There is always the need to account for subtleties in asset type or operating environment, but as momentum builds, this content evolves too.

The reality is that an organization-wide deployment may not make sense for everyone and there are certain benefits associated with a site-specific or phased deployment. It is important to understand the differences and benefits of each approach.

Organization-wide deployment

Site-specific deployment

Phased deployment

Organization-wide deployment

While it may be corporate-led, an organization-wide approach requires strong engagement across sites. This typically begins with coming together to establish a blueprint for each function of APM and mapping out a process to connect them together.

Creating this connection is like taking a thread through each function and stitching them together based on common variables such as an asset, its criticality, and maintenance plan.

Key considerations include:

1. Addressing current silos: What are the constraints or pain points created by current silos and how can these be addressed? For example, when asset strategy is not effectively connected to work execution, changes and updates to maintenance strategies may not be deployed to all relevant assets across all sites. Or when asset health management is not connected to work management, the response to detected degradation is compromised and organizations may end up monitoring to failure.

2. Balancing the needs for consistency and flexibility: Defining the ideal process and technology to support it often requires a balance of consistency and flexibility. Implementing a process to deliver greater consistency supports governance and provides benefits of scale. However, if the process is too rigid, sites will create workarounds to manage their own requirements. Finding the right balance requires thinking through what should logically be consistent, and where it may create value to flex. For example, risk frameworks and data structures should be consistent whereas document formats may need to be flexible to feed into different EAM/CMMS systems.

3. Finding the right organizational structure and skills: Once the process is defined, there should be an assessment to determine whether the organization has the right structure and skills to support it. This assessment will help to inform what resources and training are required to manage the process on an ongoing basis.

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Site-specific deployment

Phased deployment

Site-specific deployment

There are times when a single site may decide to implement integrated APM on its own. This type of deployment affords a greater degree of flexibility to accommodate site-specific requirements but can also be connected to an enterprise-wide implementation without compromise in the future.

Implementation is similar in that it starts with creation of a blueprint for each function and mapping out how to connect them. What is beneficial here is that there's more scope to iterate on the process. This means that sites can choose to get started with a focused group of assets and then test and optimize the process as required.

Sites may also decide to execute the process manually at first and then seek to invest in technology once buy-in has been achieved.

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Organization-wide deployment

Site-specific deployment

Phased deployment

Phased deployment

In an ideal world, integrated APM is deployed organization-wide with content developed for every asset. For some, however, it may be more realistic to start with implementing the process while using existing strategy content and maintenance plans.

The process is expedited with this approach with the only concession being that the integrated APM process may trigger assets to be reviewed, not because there are actual issues with the asset, but because the content is not to the right standard. Either way a benefit is realized as the creation and improvement of content becomes an ongoing activity.

In a phased deployment, content is created for a small number of key assets to start. This approach takes careful planning to ensure any changes to work execution do not impact on assets outside the scope of the initial deployment. However, it is an effective option for those who want to get started quickly.

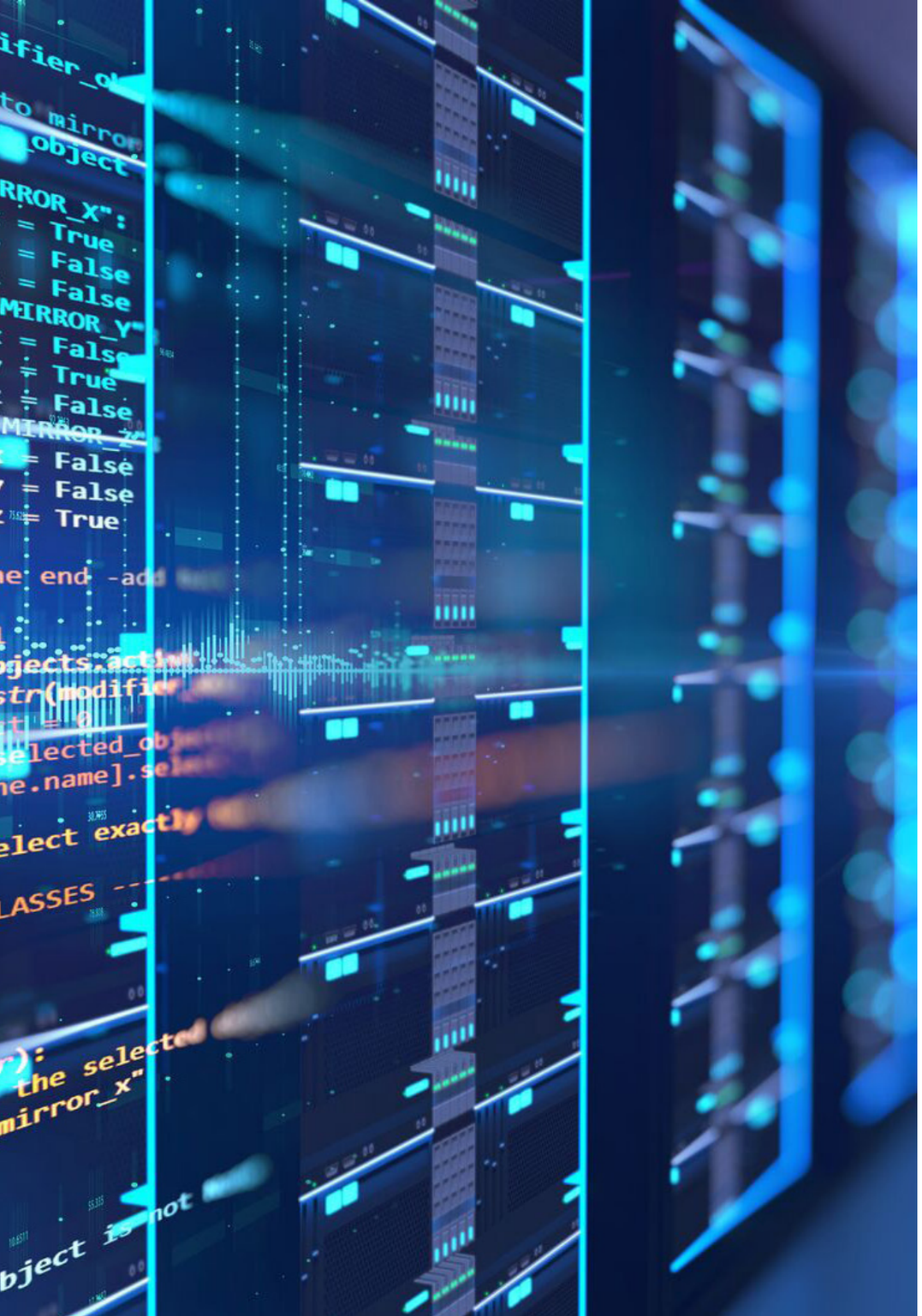
Rightsizing the level of required support

Regardless of the chosen path to deployment, organizations need to consider the resources and training required to support their team. Too often, the deployment itself becomes the focus of training whereas what's more important is that teams learn how to manage the process on an ongoing basis.

Similarly, organizations may bring in technical support for the deployment, but fail to engage those with skills to apply the process or technology. Depending on what skills exist within a team already, an organization may need to engage resources or experts in one or all of the following areas:

- Asset Strategy Management
- Asset Health Management
- Defect Elimination
- Equipment experts
- Specific technology or application expertise
- Solution blue printing
- APM practice

When choosing a deployment partner, it is ideal to find one who can offer expertise in each of the above areas and work alongside internal resources to ensure ongoing success.



Conclusion

Digitization alone cannot address the limitations of traditional APM.

Lack of integration of between functions creates silos and restricts an organization's ability to holistically view and prioritize risk to manage performance. Corporate driven initiatives create further separation between sites and regions, leading to issues with governance and poor adoption of APM across the organization. Lack of appropriate technical and equipment expertise further restricts adoption and the organization's ability to scale and drive value through APM.

Integrated APM addresses these shortcomings by joining distinct asset management functions together through a connected and centralized digital platform, whilst building technical capability and enabling APM in to embedded as a business-as-usual process. Results include:

- Complete end-to-end management of asset health and risk
- Predictable performance
- Continuous and data-driven improvement
- Increased productivity

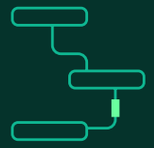
About Cordant Asset Performance Management

Cordant is an integrated suite of solutions that connects Baker Hughes' critical capabilities for asset performance management and process optimization.

A connected dataset providing a complete view of asset strategy and asset health across the global enterprise.

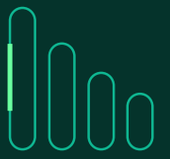
Dashboards showcasing costs and priority actions related to condition risk, maintenance compliance, strategy optimization, and defect elimination.

Interoperability of underpinning systems to drive prioritization and workflow.



Integration with work execution, enabling efficient creation and tracking of cases and the ability to easily deploy solutions across all relevant assets.

Facilitation view which allows for easily modelling and analysis of potential strategy updates.



Real data to justify the value of your reliability program, including financial returns on retired risk.

Learn more

Contact us to learn more about Cordant Asset Performance Management and how we can help you improve the management of your assets and achieve your operational goals.

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