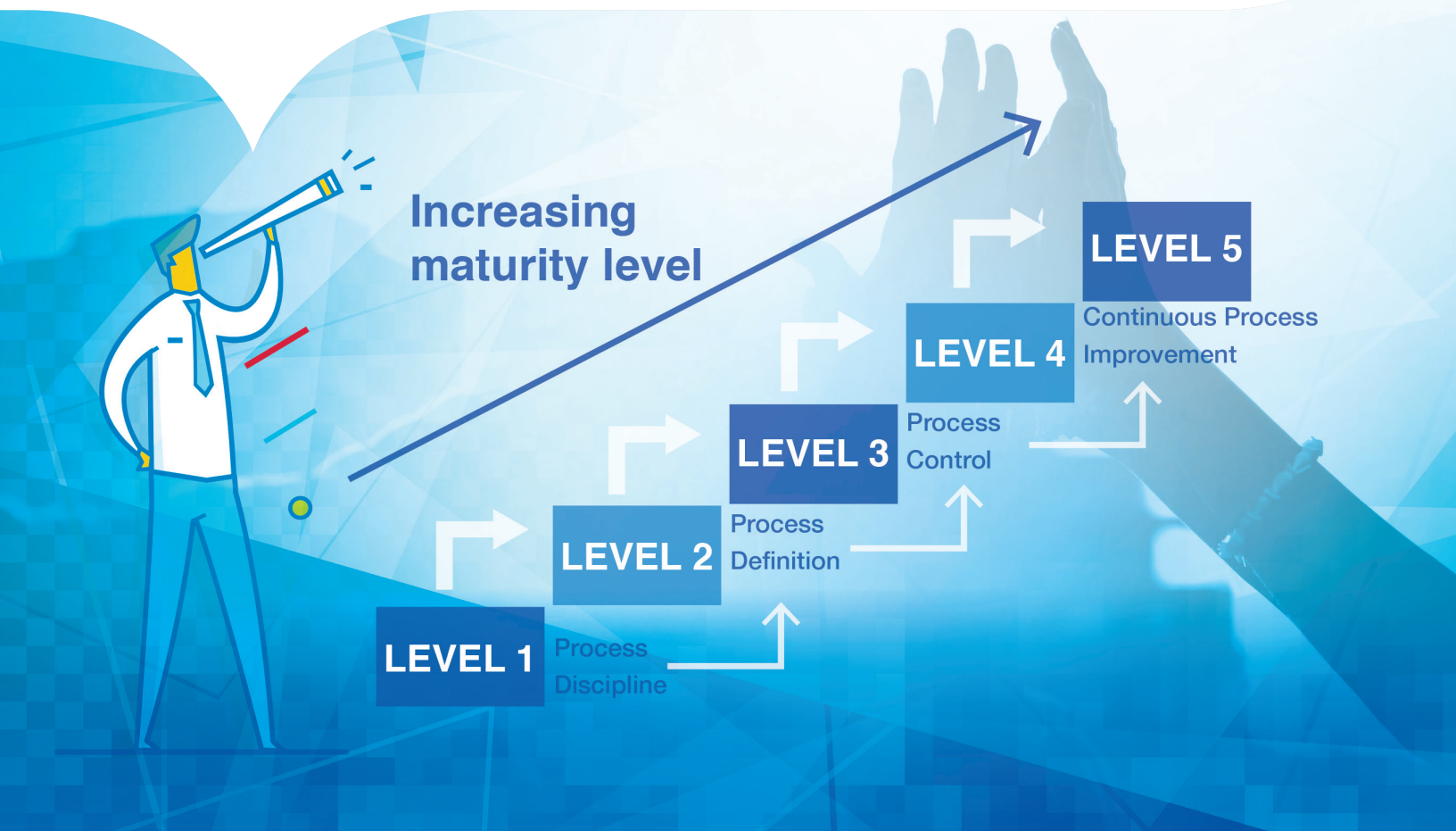


# Asset Performance Management Maturity Model

Strategic Roadmap to Digital Manufacturing



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# Abstract

Asset-intensive industries operate in an environment of volatility and are under tremendous pressure to improve operations and keep a check on costs. Digital Manufacturing or Industry 4.0, enabled by low cost sensors and smart manufacturing operations, is changing the way the industry is operating. With machines communicating and exchanging information in real time, industrial production processes are becoming more and more efficient. The technologies behind digital manufacturing could help manufacturers keep up with the changing demands of the market and stay relevant. But with so many possibilities and technologies around digital manufacturing, how does one get to know the right technology that will help them solve their complex problems?

The key questions that puzzle asset-intensive organizations are “How does one determine if the assets are operating effectively?” and “How can these be improved?” One of the elements of Digital Manufacturing that can answer these questions is Asset Performance Management (APM). Organizations need to periodically assess their assets and determine if they are operating at the ideal level. With ever-changing customer needs, regulatory environments, and advancements in technology, this is a perfect time to assess your position and potential.

This whitepaper highlights the asset performance maturity model as well as the various principles of asset management that may be evaluated.

# 1 Introduction

The business environment for natural resources and manufacturing companies has seen a steady improvement over the past few years, but these firms need to continue their focus on adding shareholder value.

The Digital Manufacturing or Industry 4.0 movement presents a significant opportunity to improve manufacturing outcomes and efficiencies. Advances in information technology and sensors, paired with the availability of copious industrial data, efficient connectivity, and advanced computational ability is proving to be a game changer for improving maintenance strategies and manufacturing outcomes. The factory of the future (and the future is now!) will have end-to-end digitization of information flows, digitization of physical assets, and integration of value chain partners leading to hyper efficiency, yield improvement, and customer centricity.

But has the din and hype around digital manufacturing left you with too many good ideas and no point of departure? In this series of whitepapers, Capgemini identifies and guides clients to move beyond the hype. One of the key elements of digital manufacturing focuses on asset performance management (APM). For asset intensive companies in particular, and manufacturing industries in general, it is critical to include asset performance management as a key component of digital manufacturing strategy.

## 1.1 Overview of Asset Performance Management (APM)

The primary objective of Asset Performance Management (APM) is to help organizations increase their asset efficiency, manage assets sustainability, improve customer centricity, and optimize the total cost of ownership. Improving asset performance helps organizations not only reduce costs, but also keep production plans on track while catering to end demands. According to a McKinsey research report, improved asset efficiency will contribute to an incremental value of more than \$250 billion in the U.S. by 2025.

To improve asset performance, Capgemini recommends an Asset Performance Management Maturity Model approach. The Asset Performance Management Maturity Model approach involves continuous benchmarking that helps organizations determine their present state, compare it with industry peers, recognize improvement areas, and identify opportunities and risks associated with their assets. The APM Maturity model will enable organizations to design the roadmap to improved APM Strategy.

## 1.2 Why 'Now' is a good time to relook at your APM Strategy

One of the reasons for the underinvestment in technology was the lack of clarity on the benefits accrued or the return on investment. Yet with the right technologies in place, manufacturers can focus on core areas while accommodating frequent regulatory environment changes and changing customer needs.

Asset intensive companies face challenges in getting the best out of their assets. Prolonged overlooking of unscheduled maintenance, equipment breakdowns, lack of visibility into operations, and heavy spare part inventory levels, will eventually lead to an unhealthy balance sheet and a company losing out to its competitors.

There is no instant solution to address these problems. Investing in places that do not produce enough gains will only deepen the problem. APM follows a maturity curve, and it is essential to identify the current level of maturity. Once identified, then the next steps—in the areas of process, technology, and governance—can be laid out. By taking this step-by-step approach, companies can understand what technology and process improvements will yield the required benefits.

The right APM strategy will clearly make an impact on company's profitability. The financial areas affected by APM are as follows:

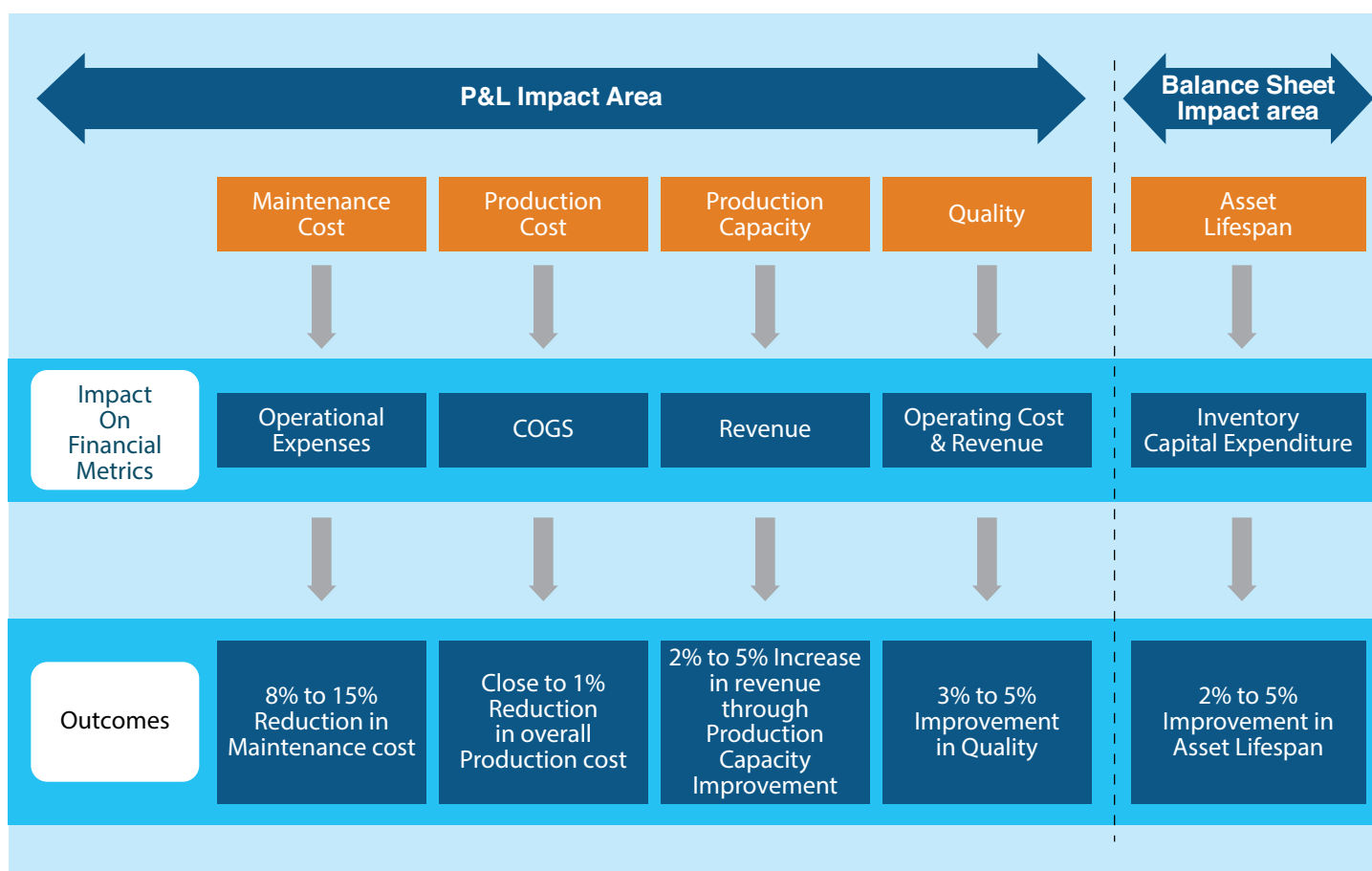


Figure 1 Affect of APM on Financial Areas

## 2 APM Maturity Model

An asset performance management maturity model is a systematic approach to analyzing an organization's asset management processes, technologies, capabilities, and systems. Improving the maturity level will help an organization achieve ideal levels of APM outcomes.

### 2.1 Overview of Maturity Model

The APM maturity model can help organizations understand their present capabilities and skills, and identify a sequence of steps required to progress to the next level. The APM

maturity curve is broken into five stages with each stage having a set of unique capabilities. The first stage of the maturity curve represents manual or unmanaged processes for asset management, while the last (fifth) stage represents an ideal operating level of industrial assets.

Overall equipment effectiveness (OEE) measures the productivity of assets, and efficiency measures total cost of operations. For companies to thrive in the competitive market, it is important that both asset effectiveness and efficiency operate at the best levels. The maturity model approach helps to maximize the effectiveness and efficiency of assets.

The following diagram represents the broad indicators defined by Capgemini at each level of the maturity model:

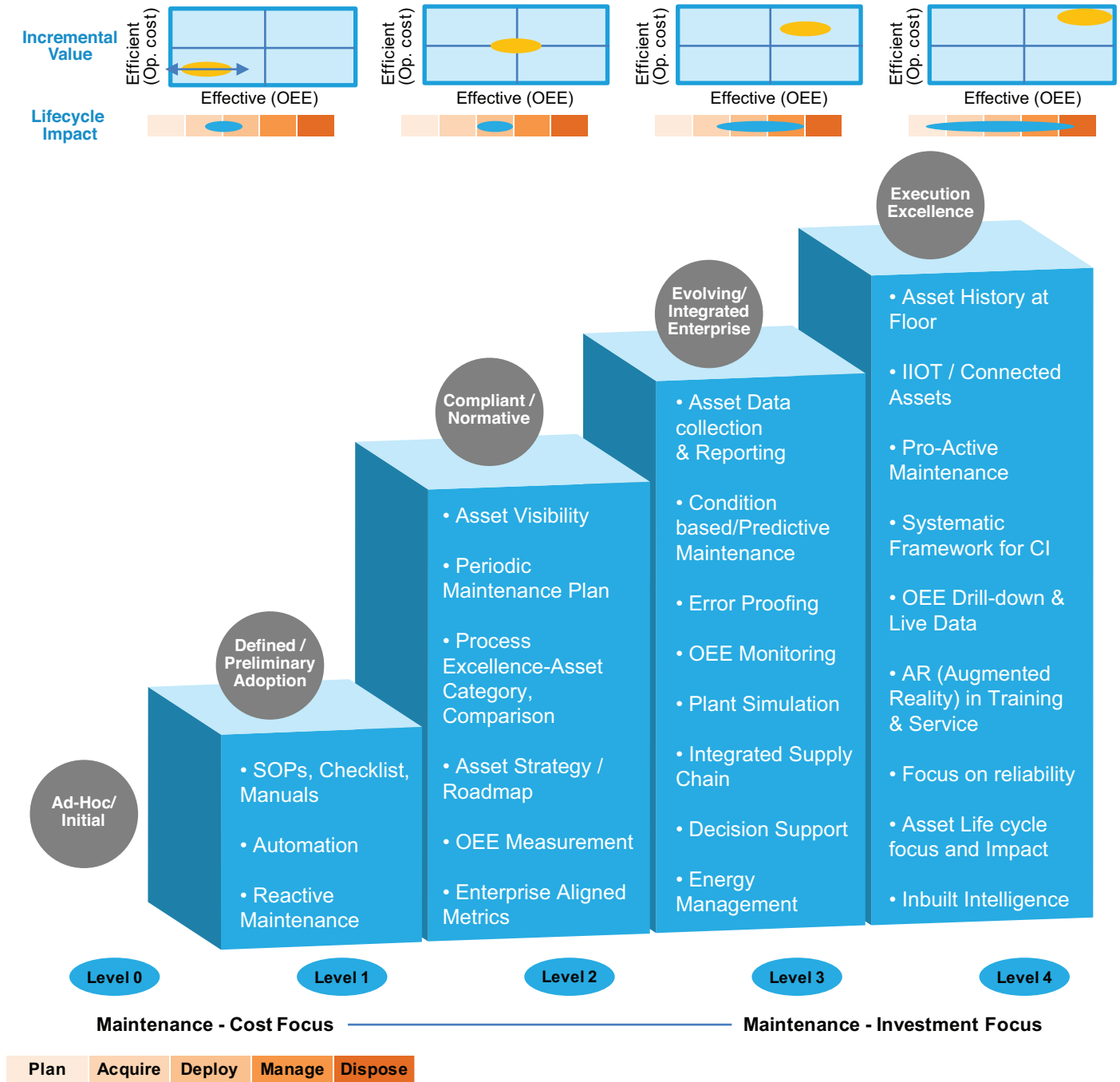


Figure 2 APM Maturity Model

## 2.2 APM Dimensions

Capgemini has defined six APM dimensions along with the capabilities required at each maturity level. An organization's asset management maturity level is evaluated on these six dimensions

### – Asset Information Management:

For an organization to have an effective asset performance management, they need to have accurate information regarding the assets on the plant floor. Lack of availability and access to the information about the assets at the plant floor will impair the organization's ability to make the right decisions. The Asset Information Management dimension will indicate how effectively the organization manages its asset information. The information being assessed will also include asset strategy, financials, and information systems.

The asset information can be used to predict and prevent asset failures. The maturity model approach will help understand the organization's capability to capture asset data, monitor asset information, and predict and mitigate failure proactively.

### – Process Management:

It is necessary for organizations to develop and maintain standard management processes and guidelines to support their asset management systems.

In asset intensive industries, it becomes extremely difficult to track asset warranties. Every asset may have different warranty contracts that expire at different times and have different methods of renewal. Tracking claims can consume significant time and effort. Failure to correctly track and process claims could result in huge losses due to warranty expiration and incorrect claims. The extent to which these management processes and guidelines are enabled through systems and SOPs with continuous monitoring and improvement determines the maturity level.

### – Reliability and Performance:

Reliability is the ability of assets to operate for a specific time period without failure. Downtime of assets can seriously affect profitability. Incorporating maintenance plans with production plans can mitigate the breakdown of assets. Continuous measurement and monitoring of

performance metrics (SMRP KPI's) will help identify areas of improvement. The type of metrics and frequency of measurement determines the maturity level.

### – Governance and Standards:

Governance in asset management deals with clear policies and guidelines to manage assets throughout their lifecycle from commissioning to retirement. With stricter regulations, an organization requires stringent governance structures. Governance does not deal with asset management per se, but it deals with the principles upon which asset management is executed. The maturity model approach will help determine whether or not proper governance mechanisms are in place for asset management.

### – People and Culture Management:

Asset performance is highly dependent on the skills of those working with assets and established processes. There is a strong need to manage the training, the development, and the work force in an asset-based organization. Not focusing on these elements can create a barrier for implementing any asset performance management initiative.

### – Tools and Technologies:

Leveraging the right set of tools and technologies for asset management can significantly transform and optimize asset operations. However, organizations operating in silos will fail to extract the full benefits. The extent to which appropriate tools and technology are used in the organization will determine the maturity level. An organization at level 4 of the maturity curve will utilize technologies like augmented reality/virtual reality for training, big data for asset information management, drones for monitoring, and 3D printing for spare parts replenishment.



Assessment Dimension	Level 0	Level 1	Level 2	Level 3	Level 4
Asset Information Management & Analytics	Not Managed	Capture of Asset operations data	Data Analyzed to predict asset failure	Asset Hierarchy managed with specialized tools	Connected assets for capturing and monitoring data
Process Management	No Defined Processes & Guidelines	Standard processes and guidelines defined	Customized processes are defined & centralized system for warranty management	Comprehensive framework with clearly defined roles and responsibilities	Continuous performance monitoring of documented processes
Reliability & Performance	Lack of Automation and no specific initiatives for maintenance	Maintenance manual, SOP for operations maintained	Metrics captured and monitored against targets	Virtual plant simulations used for plant optimization	Advanced plant simulations are used for optimizing schedule
Governance & Standards	No defined governance standards	Standard guidelines defined by OEM/Asset Vendors	Guidelines for each Asset type	Governance plan continuously reviewed and updated	Enterprise level Guidelines with Best Practices maintained and enforced
People & Culture Management	No Skill Development programs	Need based Training	Comprehensive training plan	Periodic measurement of competency plan and defined development plans	Dedicated training labs with Augmented reality, virtual simulation
Tools & Technologies	No IT systems	Systems operate in Silos	Integrated IT systems	Seamless data and process integrations	Enterprise wide integration to enable geographically spread units to work together

Figure 3 Dimensions on which Asset Maturity Level is assessed

## 2.3 Maturity Assessment Approach

The maturity assessment approach begins with benchmarking the organization's asset performance. Benchmarking involves the identification and collection of relevant KPI's. The maturity assessment process involves understanding the as-is process and the current technology landscape of the organization. The current technology landscape includes the architecture,

interfaces between various systems, data, and product-vendor relationships. Once all of this information is mapped, it is compared with industry best practices and assessed if they are at the optimum level. The outcome of the maturity assessment helps in charting out the future roadmap that includes the technology and means to improve asset performance.

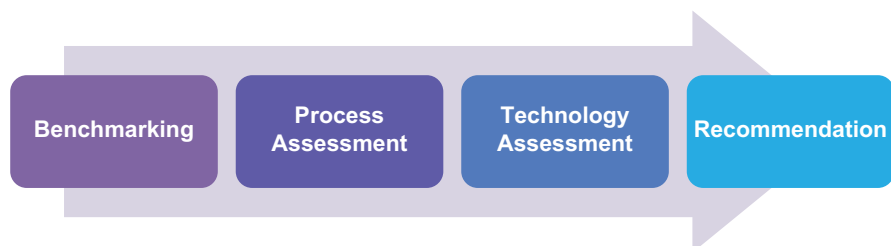
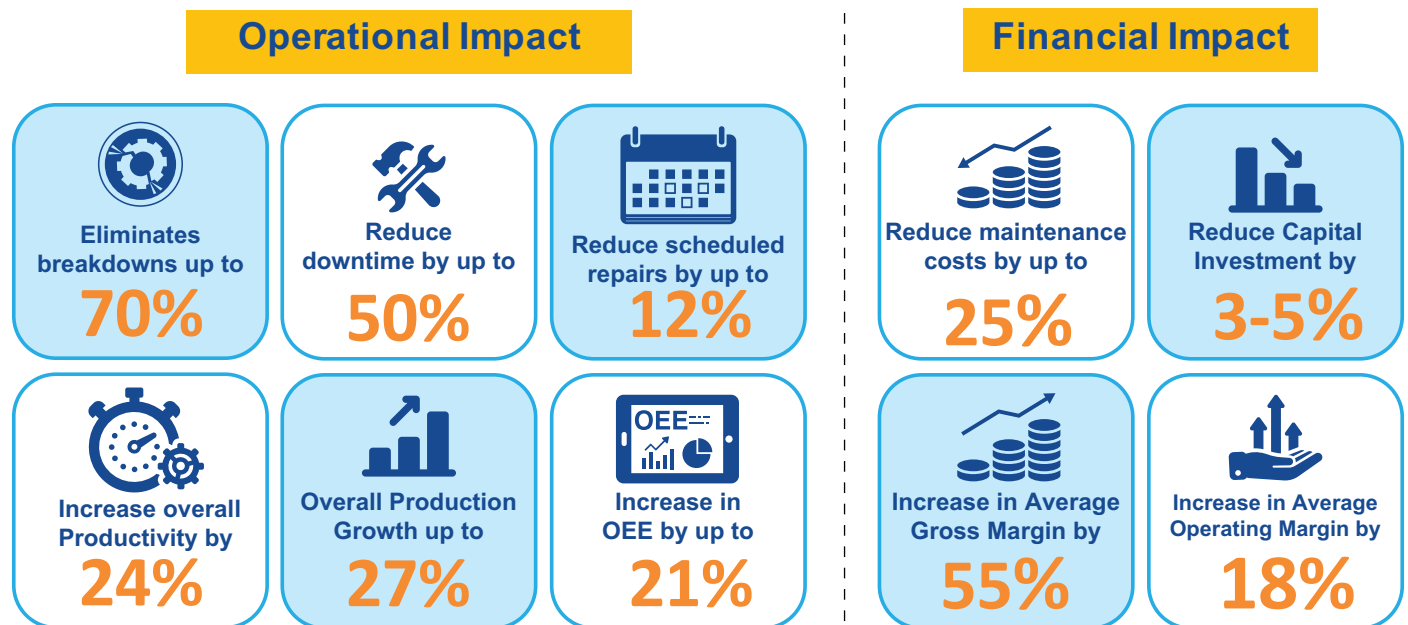


Figure 4: Maturity Assessment Approach

# 3 Business Benefits of APM

APM enables optimal deployment of assets to maximize profitability and predictability. Some of the tangible business benefits of APM are demonstrated below, both operational and financial:



# 4 Conclusion

Companies are facing increased pressure to reduce manufacturing costs and maximize return on assets. Making assets more productive remains the key objective of asset intensive organizations. To achieve this objective, organizations need to ensure that maintenance programs happen at the right time without affecting the productivity of the assets. Digital

Manufacturing and relevant technologies have made it possible for companies to simplify their maintenance programs and keep operating assets at the ideal level. The first step for an asset intensive organization in the digital manufacturing journey is to identify its APM maturity level.

# About the Authors



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Mike Dennis has over 25 years of manufacturing, supply chain and maintenance experience in both industry and consulting. He is a leader and SME in North America for Natural Resources, Chemicals and Services.



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