Capgemini

EAM AS PART OF INTELLIGENT INDUSTRY

EAM - Enterprise Asset Management

INTRODUCTION

The enterprise asset management (EAM) has undergone constant change and evolution over the last decade. Market pressure coupled with the inclusion of disruptive technologies in the industry has driven a **digital transformation in asset management and associated EAM solutions**.

The consolidation of technologies such as IIoT, Automation, Modeling, Mobility, AI, Cloud Computing among others accelerate a demand for more **intelligent and interconnected EAM solutions**. These are based on a trend towards **IT and OT convergence** along with real-time visibility of **asset condition and health**, and **awareness of potential failures**.

In addition to the technological component, there is also an interest in industries to adopt asset and reliability management standards (such as the **ISO 55000** series or I**SO 14224**). These drive the requirement of advanced EAM solutions design to support the achievement of asset management **policies, strategies and objectives** and thus enhance **operational excellence**.

At the user level, so-called **EAM verticals** are becoming a fundamental requirement for industries adopting EAM initiatives. EAM verticals have more **specific features** and **functions** depending on the **type of industry**. These verticals demand **deep industrial knowledge and expertise**. An EAM must be able to manage and support:

- Asset intensive Industry – HSE, MOC, Work Permit, Asset hierarchy aligned to ISO 14224
- Transportation Companies – Linear assets, fuel management, dynamic planning
- Pharmaceutical Plants – Calibration functions, Audits Control, Work Management aligned to GMP Guidelines
- Utilities – Flexible mobile solutions, Linear assets, Dispatching, ArcGIS
- Facilities – CAD, BIM, Energy Management, Non-conformities
- Aviation – Configuration Manager, MRO

Given this context, EAM solutions are in a **central and strategic position** to organize **flexible companies** and meet a more **diversified demand** to **improve asset performance** while, at the same time, **minimizing costs** caused by unplanned downtime. This would result in **increased availability** of the systems and **higher return on investment**.

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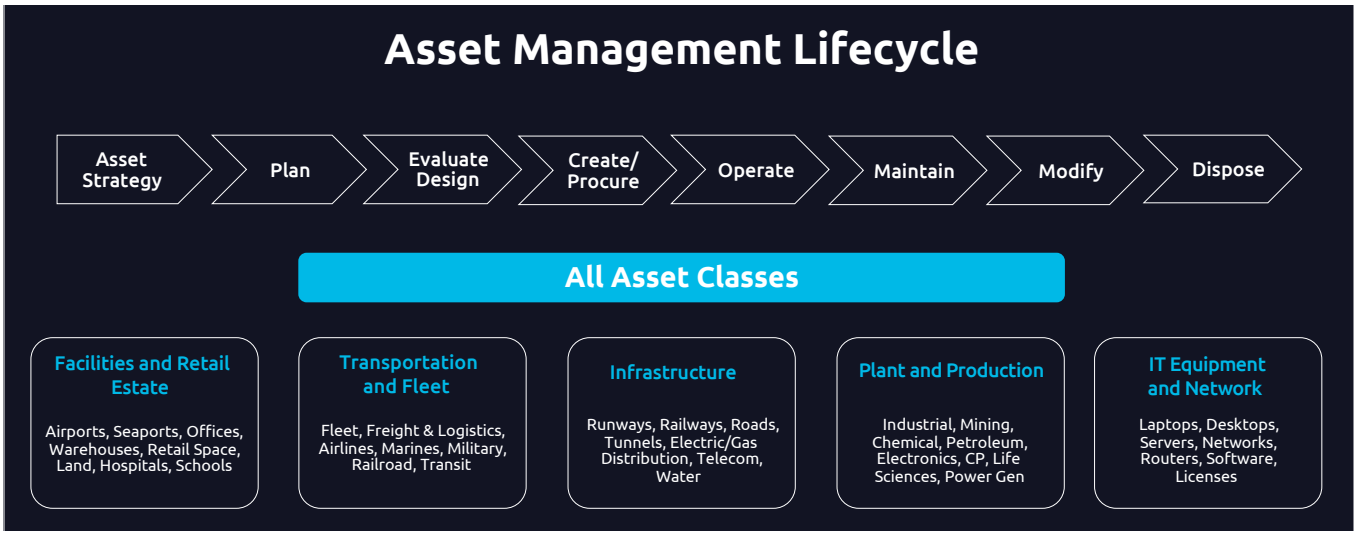
WHAT IS ENTERPRISE ASSET MANAGEMENT (EAM) AND OF WHAT BENEFIT IS IT TO THE COMPANY?

ISO 55000 is the international standard for good practice in physical asset management. According to this ISO an "Asset" can be defined as "An Item, thing or Entity that has potential or actual value to an organization" and "Asset Management" as the "coordinated activity of an organization to realize the value of Assets".

Enterprise Asset Management (EAM) involves managing an organization's physical assets throughout their life cycle to ensure the smooth running of it. Also, it optimizes the value of a company's assets in order to decrease the Total Cost of Ownership (TCO). An EAM handles all aspects of planning, execution, asset control and maintenance for different types of industries and equipment classes.



An EAM enables to **virtually model the equipment physically installed** in the company. It provides a graphical representation of an equipment structure, allowing to interact with it to detect failures and to intervene with corrective and preventive actions.

The main objective of an EAM is to provide the means of analysis for the optimization of asset and maintenance management **assisting in strategic**, **tactical**, and **operational decision making**.

EAM, as a solution, covers at least these functional perimeters:

- Management of Assets – Asset Data & Integrity, Information Repository and Asset Hierarchy
- Management of Inventory – Spares, Materials requisitioning & fulfilment and Technical Purchases
- Management of Work Maintenance and Maintenance Plans – Work Planning, Scheduling, Reactive work orders, fault resolution
- Management of Services and Requests – Ticket & Work order generation, completion, feedback
- Management of Health, Safety & Environment – Incident, Work Permit, lock out, tag out (LOTO)
- Management of Contracts & Invoices – Full-service Contract, Pay per use, automatic generation of invoices
- Management of Capital Projects

The correct implementation of EAM solutions provides competitive advantages for companies:

- To implement the **maintenance management strategy**
- To manage asset and logistics operations
- To optimize the effective utilization of resources
- To provide **cost effective investments on assets** and correct classification of **costs** in the **maintenance department**
- Decrease of 20% in the **Total Cost of Ownership** (TCO)
- For the development of **reliability improvement programs**
- To promote Environmental, Health and Safety Initiatives
- To document and manage the objectives of standards such as ISO 55000
- To reduce the **physical cost of maintenance** through 10–20 % reduction in maintenance material costs, 10–20 % reduction in labor costs and up to 25 % reduction in time lost to equipment failure

EAM SOLUTIONS TOWARDS AN INTELLIGENT INDUSTRY

EAM solutions in an Intelligent Industry context deliver a **holistic**, **sustainable**, and **scalable vision** of asset data sources from collection to industrial use.

This **democratization of information** enables organizations to manage and analyze huge amounts of data flows and thus ensure **digital continuity** throughout the **industrial process** while creating a total **innovation experience** for users.

EAM solutions powered with the use of intelligent technologies and operations deliver the following advantages to industry:

INTERCONNECTIVITY AND MONITORING:

IIoT platforms connect machines, **plants**, and **systems** in a digital environment, generating a network so that they can interact and thus optimize operations, maintenance, and reliability.

Sensorization is a key component of IIoT platforms and is progressively accessible at the industrial level. We see a steady growth of **sensors integrated** or **installed** in new pieces of equipment. This has been driven (among other reasons) by an increased emphasis on the use of IIoT for **Condition Based Monitoring** (CBM) instead of manual measurement intervention.

This interconnectivity and information access capability delivers **online monitoring** of assets allowing **Asset Health Index**, Condition-Based asset maintenance and Automated Work Scheduling to be managed by an EAM.

ADVANCED ANALYTICS:

Big Data analytics examine large amounts of data to discover information, patterns, and recommendations (e.g.: component changes, maintenance strategy changes, reliability analysis).

Access to Big Data related to machine deviations deepens an EAM's understanding of Failure Modes and Effects Analysis (FMEA) or Root Cause Analysis (RCA). This further enhances the ability to proactively remediate failures moving to an Asset Performance Management (APM) approach.

Based on the increasing demand for EAM solutions with APM capabilities, EAM Solutions provides nowadays platforms for RCM (Reliability Centered Maintenance) and **Investment Planning** (Condition and criticality of the Asset, Business Risk, SLA).

In the area of Inventory and Parts management, Big data leads to significant improvements in the cost structure and in the **optimization** of the **MRO Inventory** itself (**Lead time**, **Stock levels**, Demand forecasting, Criticality Analysis).

The interconnectivity of processes and systems (IIoT) and advanced analytics (Big Data) give companies the ability to have a **360° visibility of their assets**. For example, maintenance and equipment condition data maintained in an EAM can be correlated to shop floor (generated by IoT Sensors and MES), to production and quality data (ERP) and finally to support engineering and technical documentation data (PLM). **All this in an integrated, connected, and intelligent industry vision** that will help streamline product delivery cycles.

PREDICTIVE CAPABILITIES:

There is a clear trend in industry to take Big Data analytics to a **predictive, prescriptive, and cognitive level**. This level deals with failures or equipment deviation in which advanced algorithms are required. These algorithms are capable of self-learning when given certain conditions and experiences.

For example, instead of waiting for equipment to be interrupted periodically or to fail, trained **AI algorithms** are applied to identify potential failures and trigger recommended actions to ensure that asset function and value are maintained (**Predictive Maintenance**).

Typical EAM tasks that require manual actions such as failure reporting, repair scheduling, inventory management and anomaly detection can be automated by applying AI models.

Visual Maintenance Inspection has also been boosted using AI algorithms. Complex and long tasks such as the visual inspection of assets and infrastructures in confined spaces or at height, which also entails **safety concerns and large investments**, have benefited from AI. For example, the results (images) of technical inspections using **drones** in wind turbines are analyzed using AI algorithms to detect potential failures. This information is managed in EAM that trigger a notification to repair or inspect.

In the direction of Predictive Maintenance and Visual Inspection, EAM Solutions provides nowadays platforms with remote asset monitoring, maintenance & and reliability applications. It enables detailed **inspection and prediction capabilities** using AI Models to improve uptime and reduce asset failure.

MOBILITY AND CONNECTIVITY:

GPS, **GIS**, **RFID**, IIoT, embedded cameras and **5G** are set to be key technological factors for the Mobile-First digital transformation of industrial companies. Better connectivity, faster internet, cost-effective, real time alerts, access to technical documentation and IIoT data are clear benefits that will impact a **Mobile EAM Solution** implementation.

Mobile EAM for asset management refer to the **mobile extension of work processes for maintenance**. This corresponds to the execution of the work of maintenance teams with a focus on infield technicians and service personnel.

These applications allow field work to be performed, data to be captured, notifications to be received and information about the work performed to be obtained from a mobile device in real time.

Among the improvement of the processes or the advantages of a correct implementation of mobile applications we have:

- More **accurate data capture** – OEE, MTTF or MTTR calculations
- **Reduced Downtime** and improved project control
- More realistic **physical inventories**, bill of materials or spare parts list – To optimize the management of maintenance and Inventory
- **Inspections** – Meter Readings, Safety audits, Checklist
- Maintenance with mobile video assistance – **Technical support**
- Real-time management of equipment condition – Improved **availability**
- **Increased empowerment** of people – Mobile autonomy, Improved **Communication/Safety**

There are technological and processes challenges in the implementation of mobile applications such as security and authentication, hardware, performance, connectivity, error handling (offline mode), scalability and configuration flexibility.

User experience and **adoption** is also a key point of a mobile implementation. Mobile EAM Solutions are designed nowadays with that strategy including user-oriented ergonomics, dynamic customization capabilities and configurable steps using data-entry wizard.

MODELING AND REMOTE ASSISTANCE:

Asset Maintenance requires proper tools for supporting the decision-making process along the asset's lifecycle. **Digital Twins** (DT) aid this digital representation of the physical asset. DT enable simulations to determine faulty components, the best way to optimize the use of assets failure and provide visibility of the current asset's health status.

Its primary role is to federate data from multiple sources and create a 360° view of the assets. For example, the DT integrate data from the EAM with IoT Sensor readings, and data from weather **forecasting and GIS**, so you can simulate how weather condition impact asset usage.

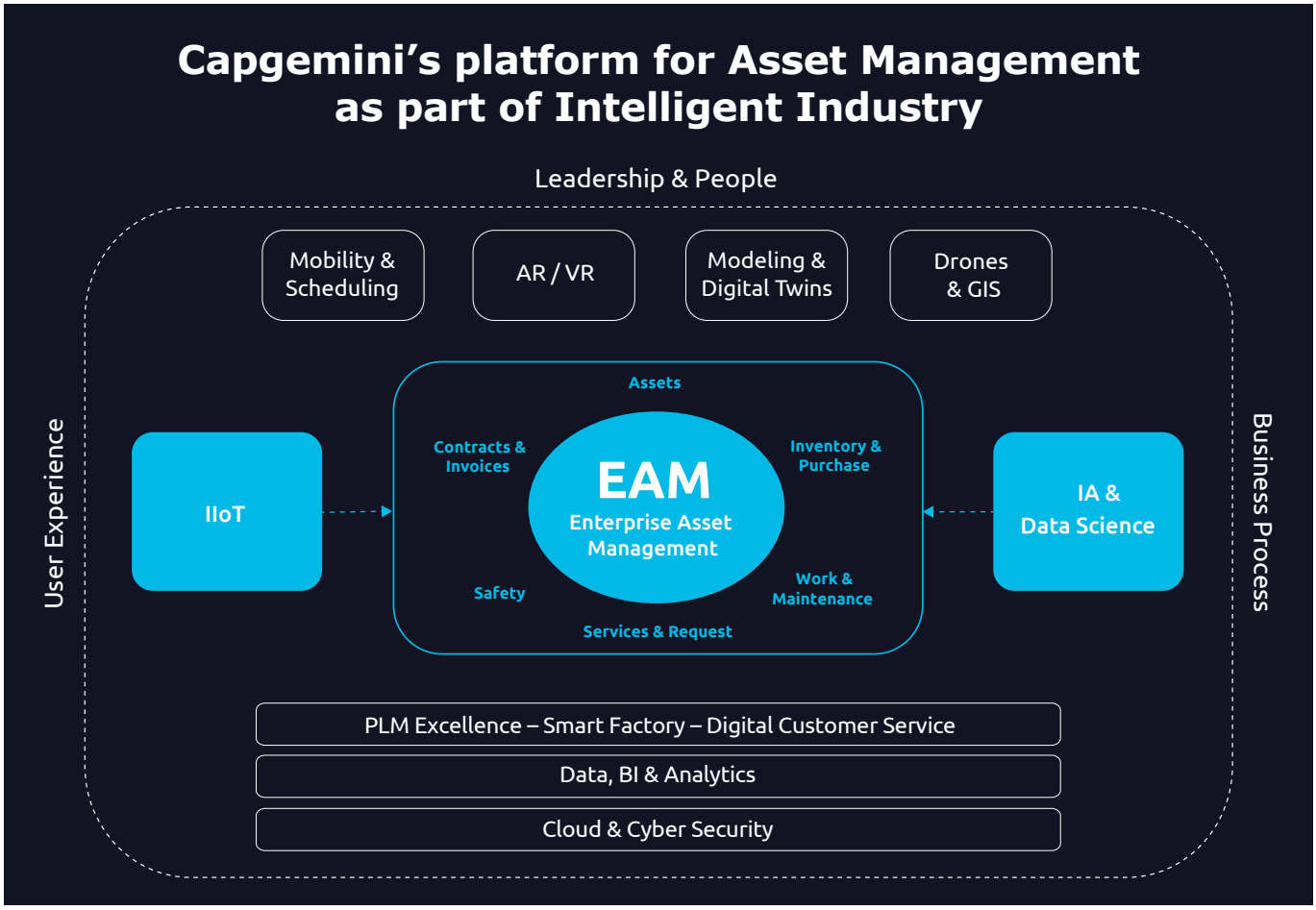
Virtual and Augmented reality (VR/AR) applications for maintenance industry offer a more immersive experience for users enabling them to have remote training, maintenance technical assistance and/or acceptance.

In the context of maintenance activities, users can activate using their Mobile EAM application (mobile phone, tablet, or computer) a remote assistance with audio and video live streams, chat, and file sharing.

CAPGEMINI PIONEERING INTELLIGENT INDUSTRY USING ENTERPRISE ASSET MANAGEMENT

Concerned with being at the forefront of our clients' digital transformation, the Capgemini EAM Practice projects its technological and business vision to the challenges of digital asset maintenance in the era of Intelligent Industry.

The diagram below represents Capgemini's vision of digital asset maintenance in a context of Intelligent Industry with the EAM Solution at its center:



Our belief is that technology is a means to serve the business and not the other way around. This fuel the daily thinking of our employees and enables us to offer the tools that respond to the need of our customers' daily operations.

Many projects, POCs and use cases are implemented (with the collaboration of world class editors), to accompany the digital transformation of our customers, and to mobilize our employees in the digital transformation of asset management and EAM solutions.

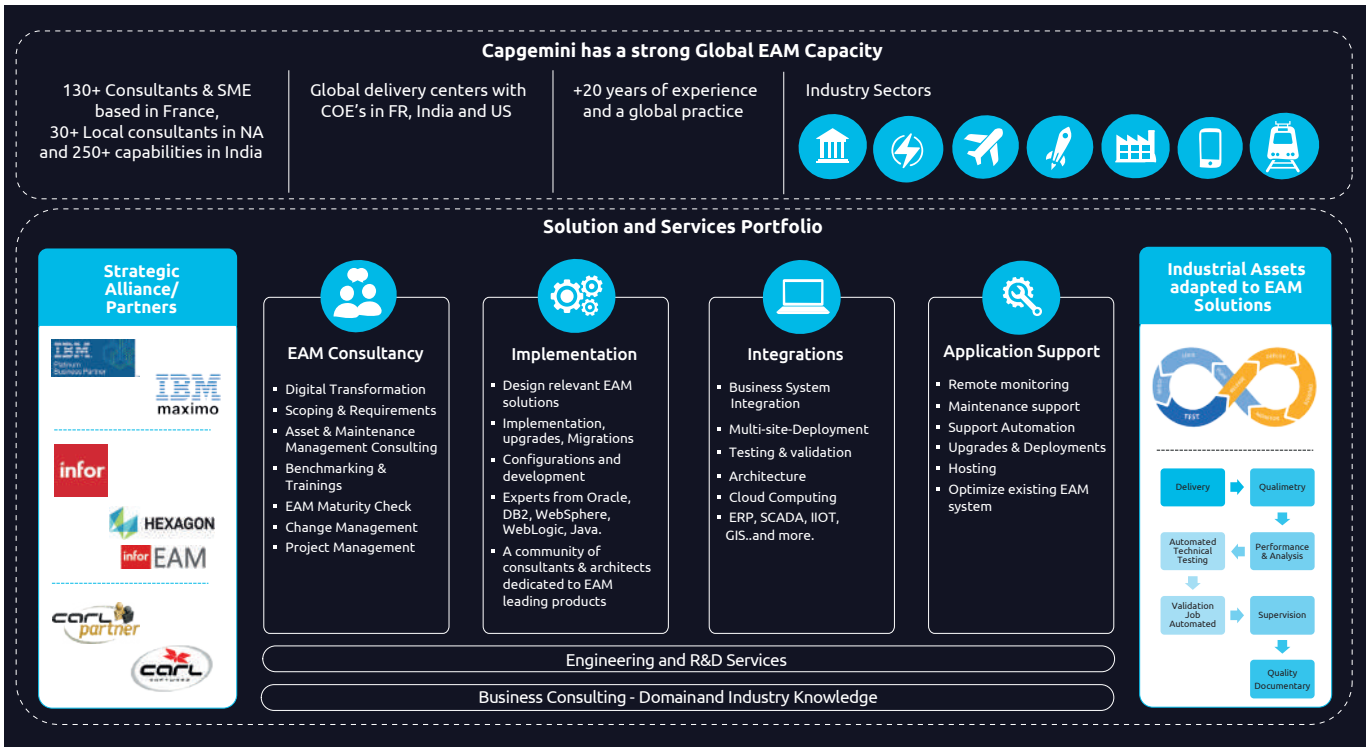
This vision, within Capgemini's "Digital Manufacturing" strategic offer, ensures digital business continuity throughout the valued chain of our customers equipment and its associated operations and maintenance.

A PRIVILEGED PARTNERSHIP WITH THE WORLD CLASS EAM SOLUTIONS AND UNIQUELY POSITIONED TO DELIVER END-TO-END TRANSFORMATION PROGRAMS

Capgemini delivers end-to-end digital asset management solutions with capabilities to successfully run complex asset management transformation programs from business case and business design through to EAM implementation.

The EAM's Capgemini Practice offers more than 20 years of extensive expertise across the entire Enterprise Asset Management life¬cycle, i.e., in Consulting, Implementations, Upgrades, Enhancements and Applica¬tion Maintenance support.

Being a strategic partner of the world-class EAM leaders allows us to provide our clients with the best practices, best solutions, and the latest technology to manage business assets. Moreover, our operational teams manage EAM projects, by interacting directly with editors in line with the product roadmap which ensures a strategic continuity for our clients.



Combining a global footprint network of EAM highly skilled resources with our business consulting and engineering services, Capgemini can provide full capabilities in both industrial and digital technologies to support globally the digital asset maintenance transformation programs of our customers.

This combination gives Capgemini a unique global position to assure the digital continuity of our customers delivering end-to-end transformation programs from the moment the asset was design, through its industrialization and manufacturing to asset operation and maintenance.

About Capgemini

Capgemini is a global leader in partnering with companies to transform and manage their business by harnessing the power of technology. The Group is guided everyday by its purpose of unleashing human energy through technology for an inclusive and sustainable future. It is a responsible and diverse organization of 300,000 team members in nearly 50 countries. With its strong 50 year heritage and deep industry expertise, Capgemini is trusted by its clients to address the entire breadth of their business needs, from strategy and design to operations, fueled by the fast evolving and innovative world of cloud, data, AI, connectivity, software, digital engineering and platforms. The Group reported in 2020 global revenues of €16 billion.

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