**Whitepaper**

KBR®

# IAM Solution for Asset-Centric Industries

*By Nick Anstee*

# The Challenges that IAM Addresses

Intelligent Asset Management (IAM) is a new breed of solution which successfully integrates cutting edge Artificial Intelligence and Machine Learning (AI/ML) with domain expertise to deliver 10X value and efficiency for asset centric major hazard facilities.

The challenge for asset centric industries is to maximize production at the lowest possible cost. All functions across the supply chain are responsible for achieving this challenge including contracts, procurement, warehousing, inventory management, maintenance planning, turnaround planning, inspection, maintenance execution and operations.

IAM successfully integrates decades of KBR's domain expertise, EPC rich heritage and operational experience with cutting edge AI/ML to execute projects faster, more efficiently, yielding greater client value all with reduced human error.

KBR's unique combination of domain expertise, EPC rich heritage and operational experience enables KBR to bring to the market this new breed of solution that leverages AI/ML where the technology can be leveraged in the most impactful way to accelerate the heavy lifting that humans aren't best suited to.

**IAM is a true digital accelerator which Integrates AI/ML with domain expertise to solve a number of use cases including:**

We support both Greenfield and Brownfield Projects and Operations through advanced AI/ML solutions. These include automated processing of drawings, documents, and data with direct linkage to assets, ensuring efficient data integration. AI/ML also facilitates Master Data Build, Migration, and Enrichment,

# Most clients with medium to large refineries and petrochemical plants will identify between $40m to $90m in value in the first year after implementation

along with robust Asset Hierarchy Build and Verification processes. Criticality assessments, Maintenance Build, and Optimization are similarly enhanced through intelligent automation. Furthermore, our systems streamline Bill of Materials (BOM) creation, cleansing, and enrichment, and enable comprehensive Materials Cataloguing. We ensure total data connectivity across systems, driving smarter Inventory and Warehouse Optimization.

IAM delivers values in two discrete ways, fully quantitative and qualitative. The qualitative value, in turn, leads to quantitative value for the entire operating lifecycle of the asset in day-to-day operations.

The fully quantitative value that IAM delivers includes AI/ML assisted Inventory Optimization where the direct value delivered by the solution is explicitly measurable which results in a 13% to 69% safe reduction in client inventory levels unpinned by the context and audit trial inherent to the platform. Most clients with medium to large refineries and petrochemical plants will identify between $40m to $90m in value in the first year after implementation.

The qualitative value that IAM delivers includes improvement to master data in client's CMMS/ERP/WMS systems which results in reduced risk across the client facilities, improved maintenance, inspection and turnaround execution along with improved plant availability. This is more difficult to quantify in a discrete range as above because it depends essentially on the client's current datum and commitment to change. Collectively, the improvement measures result in improvement in plant availability from 0.5% to 7%, which is significant for example for a 400,000 barrel per day refinery.
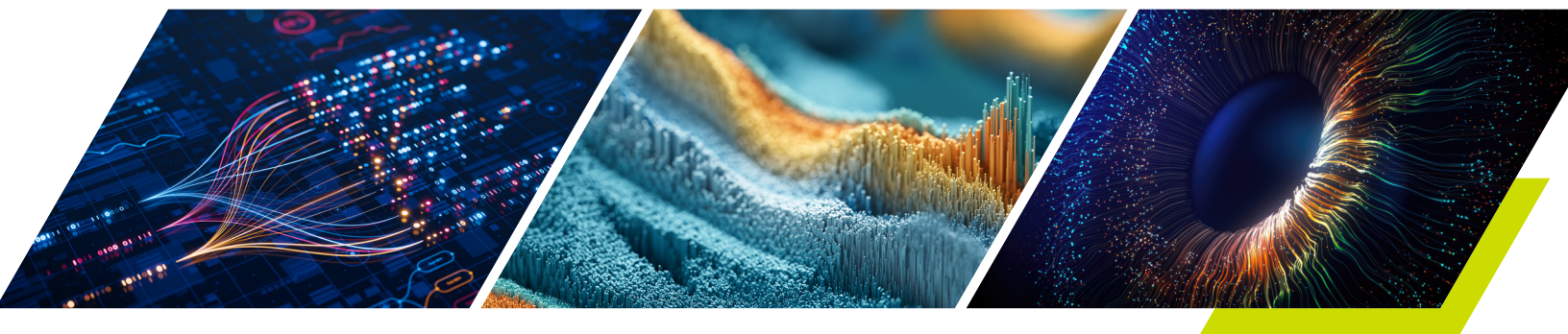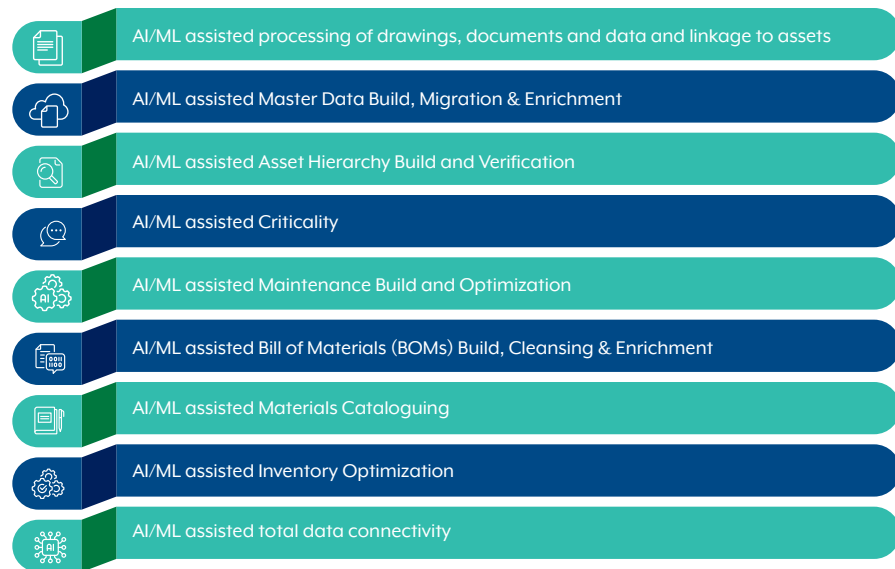
# Intelligent Asset Management (IAM) Overview

KBR's AI-powered solution leverages AI/ML to ingest and intelligently process unstructured engineering data. It identifies and extracts key data points, unifying them into a centralized, searchable information repository. This digital hub makes the entire data landscape easily accessible through powerful search and analytics.

## True Digital Accelerator

**Leverages AI/ML to do the heavy lifting whilst at the same time accomplishes the integeration of the efficiency that contemporary technology enables with the domain expertise**

- AI/ML assisted processing of drawings, documents and data and linkage to assets
- AI/ML assisted Master Data Build, Migration & Enrichment
- AI/ML assisted Asset Hierarchy Build and Verification
- AI/ML assisted Criticality
- AI/ML assisted Maintenance Build and Optimization
- AI/ML assisted Bill of Materials (BOMs) Build, Cleansing & Enrichment
- AI/ML assisted Materials Cataloguing
- AI/ML assisted Inventory Optimization
- AI/ML assisted total data connectivity

## Intelligent. Information. Faster.

**The combination of the platforms advanced AI/ML capability integrated with domain and operations expertise cumulates in Intelligent. Information. Faster.**

### INTELLIGENT
- Integrate Domain Expertise & Operations Experience
- Convert Un-intelligent Documents
- Embedded AI/ML Technology
- True Digital Transformation

### INFORMATION
- Total Connectivity of Documents, Drawings & Information
- Enable Human & Machine Collabration Sturctured & Unstructures Data
- Harmonize Disparate Data Maturities

### FASTER
- Scalable Cloud Platform Proven & Trained AI/ML Technology
- Context Specific Data Mesh
- Revision Delta & History

IAM can be deployed in several different modes including:

- Data as a Service (DaaS)
- General Platform Capability
- Inventory Specific Solution

Data as a Service (DaaS) is our turnkey service to ingest, process, analyze and transform unstructured technical data into accessible intelligent Master Data.

General Platform Capability includes our cloud-based solution to integrate digitally transformed intelligent documents and data with other value-added work processes, combined with domain expertise to provide intelligent datasets to clients for greenfield or brownfield projects and sustainability activities.

Our inventory specific solution is our cloud-based Inventory solution for collaboration, enriching spare part and BOM information, perform Inventory segmentation, OEM to OCM conversion, deduplication, obsolescence and Min/Max optimization etc.

## Greenfield Vs Brownfield Challenges

**GREENFIELD | MASTER DATA BUILD**

**BROWNFIELD | MASTER DATA IMPROVEMENT**

### Typical Scope

| Greenfield | Brownfield |
|---|---|
| PO Focused - Data Batches | Asset Focused – Link Back To Original PO Lost |
| Capture, enrich and build project master data \| Data Standards | Close gaps/risks exposed through operational experience |
| Asset Hierarchy, Criticality, Material Masters, Maintenance | Optimize existing inventory levels based on operations |
| Maintenance BOMs & Repair BOMs, Repair & Spares Strategies | Liquidate Excess Stock / Run Down Levels |

### Challenge

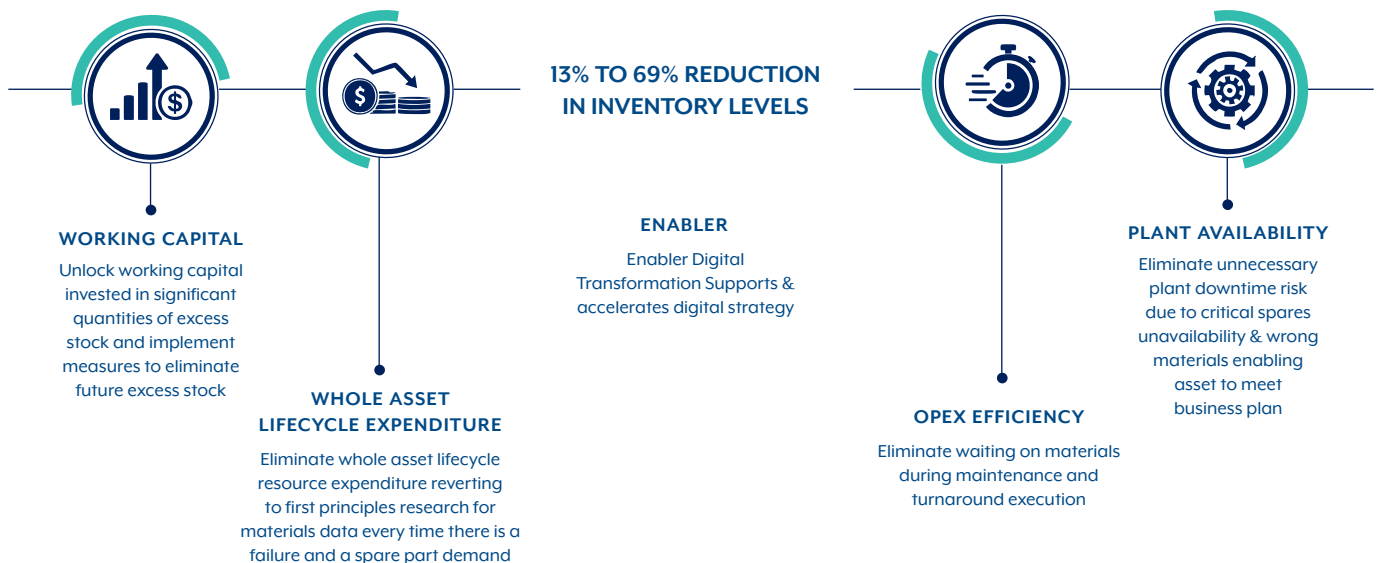| Greenfield | Brownfield |
|---|---|
| Ensure master data is in-place X Months prior to Start-Up (RFSU) | Operational experience exposes incorrect sparing assumptions |
| Installed Base & Interchangeability dynamic | Actual failures & level/type of repairs different to assumptions |
| Requires multiple reconciliations | Difficult to Play Catch-up in Operations with Project Data |
| SPIR & Vendor Data in disparate formats & timescales | Unraveling "noise "Duplicates, Poor Quality Data/Cataloguing |
| Materials GAP Analysis to align Vendor Rec with operating context | More onerous than no data - transactional data is involved |
| Align Materials Strategy with Spares budget – Complete Picture | Update incorrect Materials, BOMs, Tag and Criticality data |
| Optimize Min/Max levels and Reorder points | Operations faces legacy of poor project data for entire lifecycle |

IAM is built from the ground up to address the unique and different challenges presented by greenfield projects and the brownfield operations environment.

IAM is built on 5 key value pillars including:

- Unlocking clients working capital
- Reducing chronic whole asset lifecycle expenditure
- True digital accelerator Enabling digital transformation
- Improved OPEX utilization and efficiency
- Improved plant availability

## Five Key Pillars of IAM

**Benefits Targeted Based On Operational Experience**

**13% TO 69% REDUCTION IN INVENTORY LEVELS**

**WORKING CAPITAL**
Unlock working capital invested in significant quantities of excess stock and implement measures to eliminate future excess stock

**WHOLE ASSET LIFECYCLE EXPENDITURE**
Eliminate whole asset lifecycle resource expenditure reverting to first principles research for materials data every time there is a failure and a spare part demand

**ENABLER**
Enabler Digital Transformation Supports & accelerates digital strategy

**OPEX EFFICIENCY**
Eliminate waiting on materials during maintenance and turnaround execution

**PLANT AVAILABILITY**
Eliminate unnecessary plant downtime risk due to critical spares unavailability & wrong materials enabling asset to meet business plan

# Modules & Description

The IAM platform comprises 5 main modules and advanced reporting including

- Workbench
- Equipment Hub
- Knowledge hub
- Engineering hub
- Inventory hub
- Advanced reporting

## IAM Modules

### WORKBENCH
Display potential savings options | MIN MAX scenarios
Insurance Spares | Calculation settings

### EQUIPMENT
Configure: FLOC's, BOM's, Materials, Construction Types, PM Plans etc.

### KNOWLEDGE
Provide intelligently searchable documents | Create equipment hierarchies | Mark up drawings e.g. corrosion loops, SIL Levels, criticality

### ENGINEERING
Class Library | Data Mapper Source Matrix | Registers

### INVENTORY
Consolidate Material Master data | Display transactions, BOM's etc associated with each MM item

### ADVANCE REPORTING
Reporting accross datasets
Visual intractive heat map generation

## Workbench

The Workbench enables users with advanced AI/ML assisted data analytics and contextual decision-making for business intelligence. The workbench employs AI/ML and Statistical methods to compute the optimum Min-Max values for materials which users can view in a single pane in the form of recommendations and analyze the predicted forecast to mitigate potential stockouts in the future. This functionality enables users to make informed decisions with calculated risk.

The data driven dashboard is configurable but typically provides the ability to view the following data and drill down to:

- Overview of total inventory
- Potential duplicates
- Insurance spares
- No-BOM items
- Obsolete materials
- Slow-Moving materials

Inventory optimization enables users to create scenarios for groups of materials. Users can then review the AI/ML combined with statistical recommendations and initiate the approval process for selected materials. The system forecasts 10 years of future stock movements for each recommendation in graphical form which users can refer to make informed data driven decisions underpinned by AI/ML and statistical methods. A high-level summary of savings against the respective scenario is also available for user information.
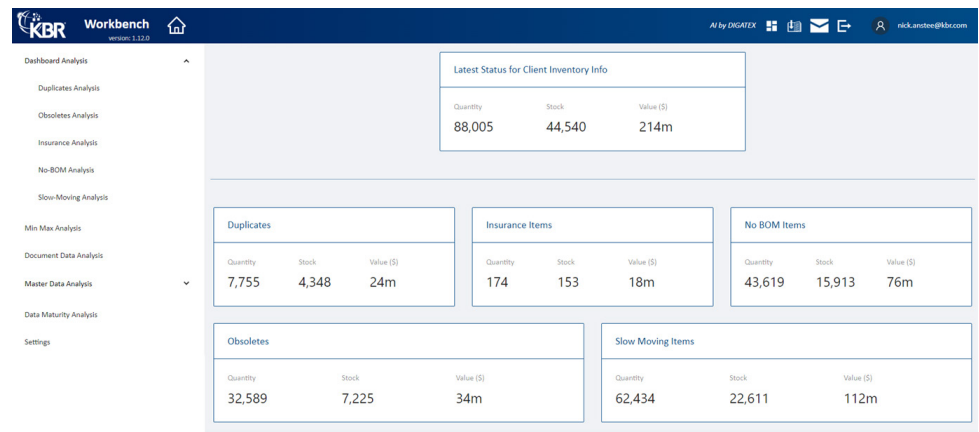


*Figure 6 – Workbench Configurable Dashboard*

IAM is also optimized for insurance spares to help manage the 10X risk to the organization and mitigation. The optimal holding quantity is calculated based on Shelf Life (years), Demand Interval (Years), Installed Quantity, Required Quantity, Demand Quantity, Part Cost, Equipment Criticality, Running Hours etc.
The system compares the Stockout Cost, Write-off Cost, Interest Cost, Warehouse Cost, Holding Cost, Total Cost, Part Availability and recommends the optimal holding quantity for a particular insurance spare. The master data analysis section is configurable but, for example, offers an overview of equipment with and
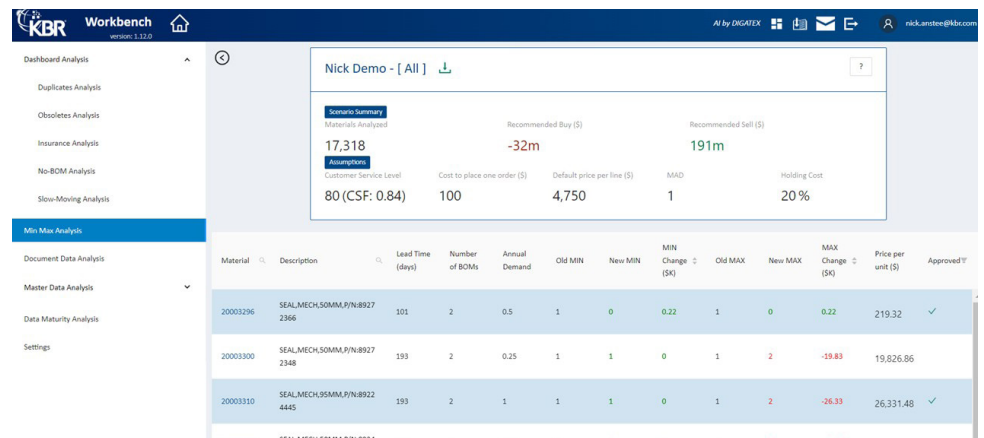


*Figure 7 – Spare Part Optimization*
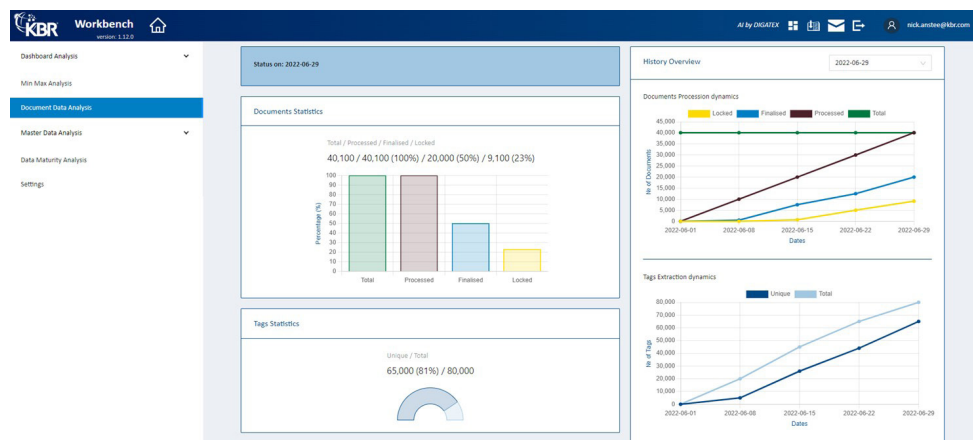
*Figure 8 – Document and Data Dynamics*
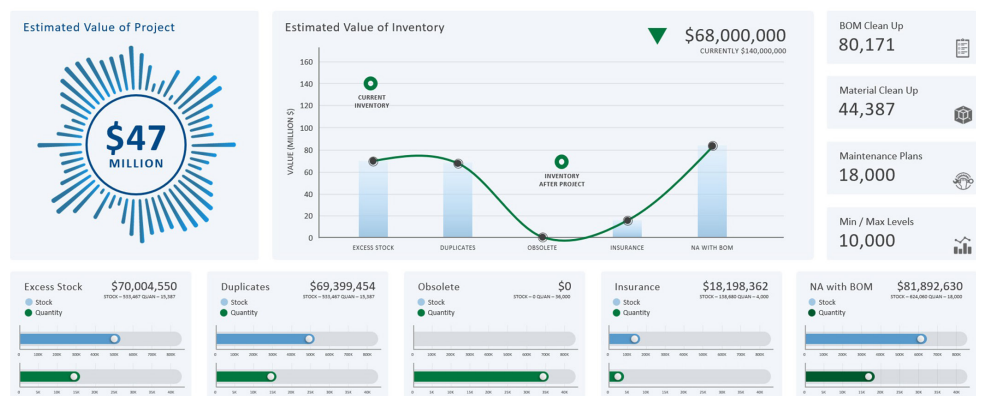


*Figure 9 – Value Dashboard*

without BOM, the PM:CM ratio at the project's inception, current status, and target values, etc. Other key features in the workbench include document data analysis, data maturity analysis, exception reporting, scope and dashboard management and settings to choose desired holding cost %, service factor etc. These powerful features provide the user with data driven insights and flexibility to use the platform.

## Equipment Hub

The equipment hub comprises a configurable hierarchy which consists of several types of nodes and can be used to configure a wide range of information including Functional locations, Equipment, BOMs, Materials, Maintenance, Lube Oil Schedules, Failure Modes etc.

The expanded view enables users to view the path to the current node from the hierarchy root. Users can access the details of the currently selected node in the hierarchy and can search the hierarchy items with the help of a search box. Users can navigate between FLOC, Equipment, BOM & Material pages in the platform to access various attributes associated with that node. Users can create PM plans, construction types and assign them to specific equipment in the hierarchy.
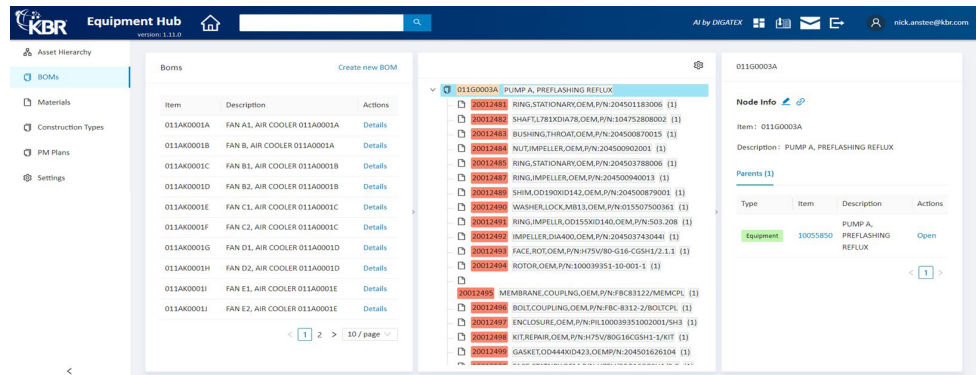


*Figure 10 – Equipment Hub*

## Knowledge Hub

Knowledge Hub integrates advanced AI/ML to process and analyze drawings, documents, name plate data images, complex drawings such as Isometrics and complex composite documents such as SPIR forms and multipage datasheets. In short, anything discernible by the human eye.

IAM extracts actionable insights from the data, transforming static engineering documents into dynamic, searchable assets along with intelligent layers for corrosion loops etc. The IAM platform is pivotal in harnessing the power of artificial intelligence to derive meaningful data insights.
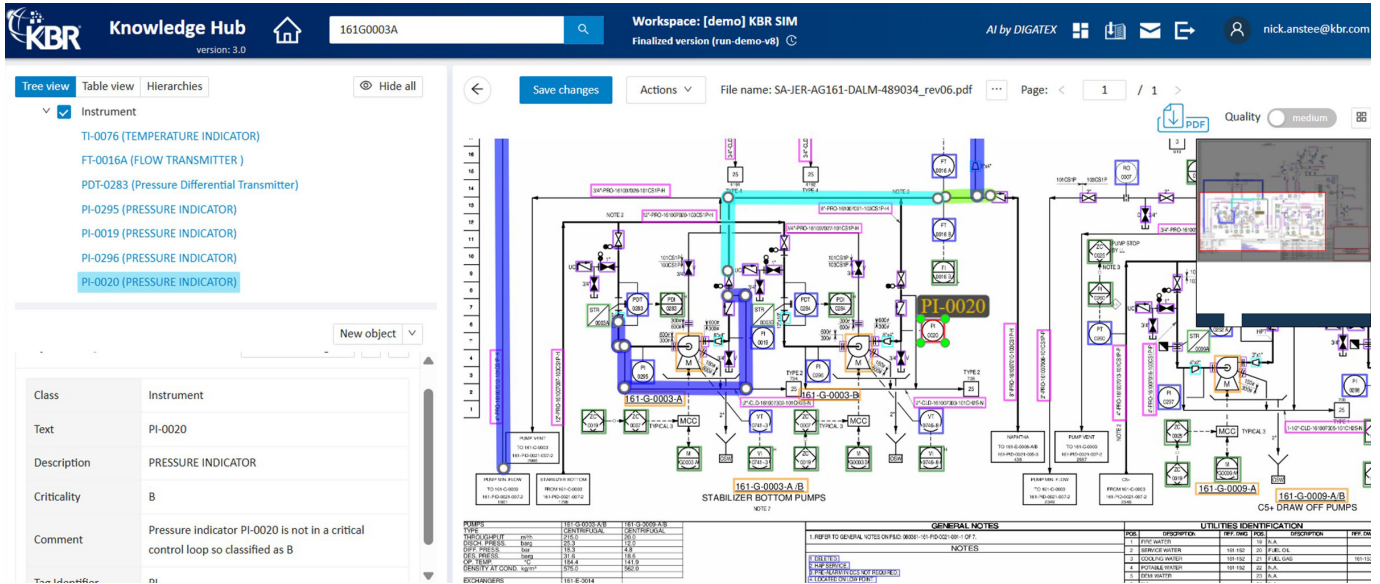
Figure 11– Knowledge Hub

## Engineering Hub

Engineering Hub uses AI/ML for the structured assimilation of diverse asset data, ensuring uniformity and consistency across datasets. It primarily focuses on mapping text to attributes for class library classification, streamlining the classification of very large datasets to enrich data such as standardization of materials cataloguing and identifying data gaps.
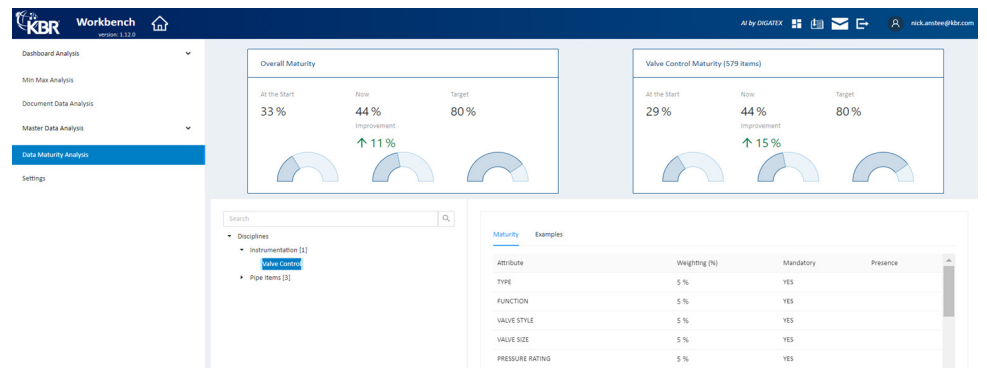


Figure 12 – Data Maturity Analysis

## Inventory Hub

Inventory Hub stores material master data and transactional history to enable IAM's advanced AI/ML Inventory Optimization capability. In addition, the Inventory Hub provides inventory sharing models across organizations. In the event of a failure of a critical asset and a stock-out of critical materials within the organization, subscribers to Inventory Hub can request the required spares parts and materials from other subscribers in the Hub.

Inventory Hub also serves as a centralized hub for the identification and validation of items, such as detecting duplicate materials. Material Master Data is processed by the Inventory Intelligence Platform. It utilizes rapid search and mapping algorithms to cross-reference and enrich data, interfacing with potentially multiple ERP systems, and other platforms like the Asset Data Integrator for seamless data flow.
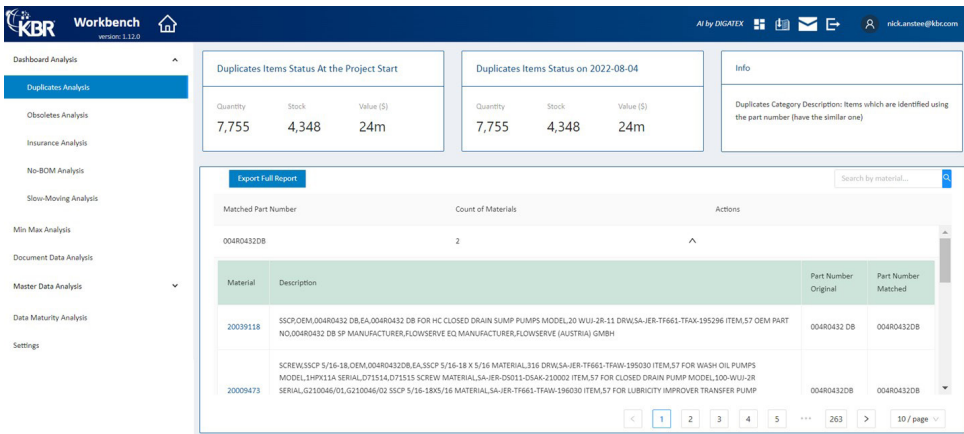


*Figure 13 – Duplicates Analysis*

The Inventory Intelligence Platform also holds equipment (assets) and their associated bill of material data, which can then be mapped to the material items, such that material items can be cross referenced and checked against BOM's highlighting commonality and orphan materials (not assigned to a BOM).

Material movement and stock data are incorporated to complete the picture, allowing for detailed transactional analysis of the inventory.

The Inventory Hub integrates with the platform so the user can always track and explore the relevant data sources if more detail is required.

# Inventory Use Case Deep Dive

Problem: The traditional inventory optimization process is resource intensive, time-consuming, and demands substantial human effort to review each item and their characteristics.

## Solution:

- Leverage Artificial Intelligence and Machine Learning combined with statistical methods to provide a hybrid AI/ML and statistical algorithm to determine safe, optimal inventory levels where the recommendations are always relevant and supported by auditable context.
- Integrated data analysis: Aggregate data from diverse sources, ensuring comprehensive inventory visibility.
- Real-time Inventory Access: Utilizing the cloud-based solution ensures real-time inventory access, significantly reducing search times.
- Standardization & Deduplication: Streamline inventory by standardizing material master data, effectively minimizing redundant stocking of identical items.
- Domain Expertise Integration: Integrating domain knowledge, the system ensuring comprehensive visibility of integrated data, empowering users to make informed decisions.

The screenshot below tabulates the AI/ML and statistical recommendations. The current Min/Max is configured in SAP as Min 1501 and Max 3000. The recommended new Min is 205 and new Max is 205 which represents a 77% saving whilst still maintaining a service level close to 100% for the maintenance stakeholders despite the Min and Max levels being significantly reduced.
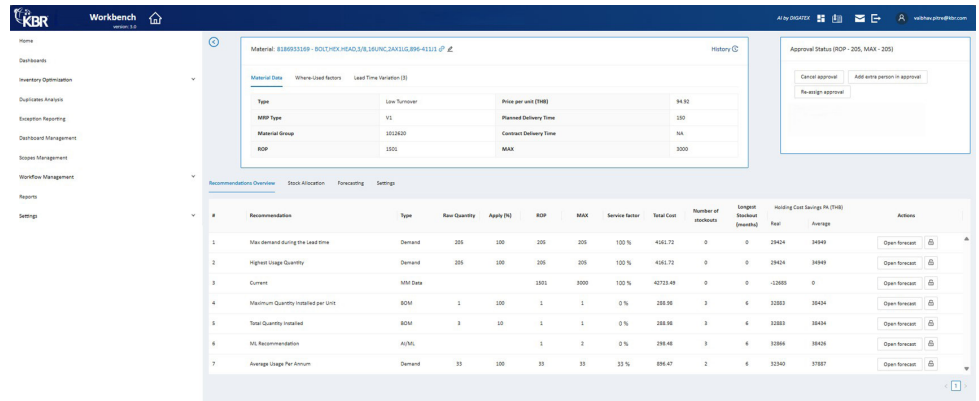
*Figure 14 – Inventory Optimization Recommendations Summary*

The analysis uses all available transactional history to train the AI/ML model which in this case spans approximately 9 years. The data is synchronized with SAP and approved Min/Max changes follow an automated multi-level and multi stakeholder approval workflow involving key stakeholders from the organization including stockowners and material analysist. Approved updated Min/Max levels are automatically synchronized back to SAP.
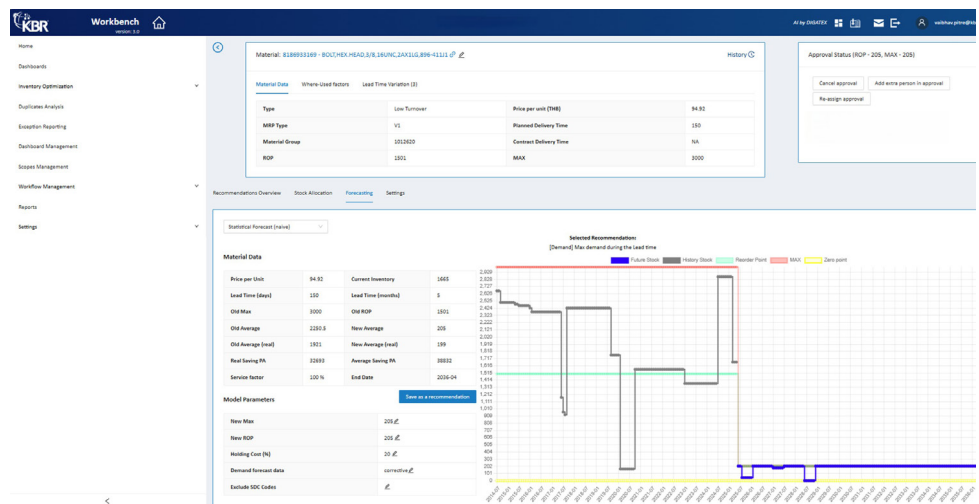


*Figure 15 – Demand Prediction Forecast (No Stock-Out)*

The screenshot below shows the demand prediction for the same material with predicted future demand until 2036. As the screenshot shows, the selected recommendation does not experience any stockout during this period as the blue predicted demand line does not go below the yellow zero baseline.
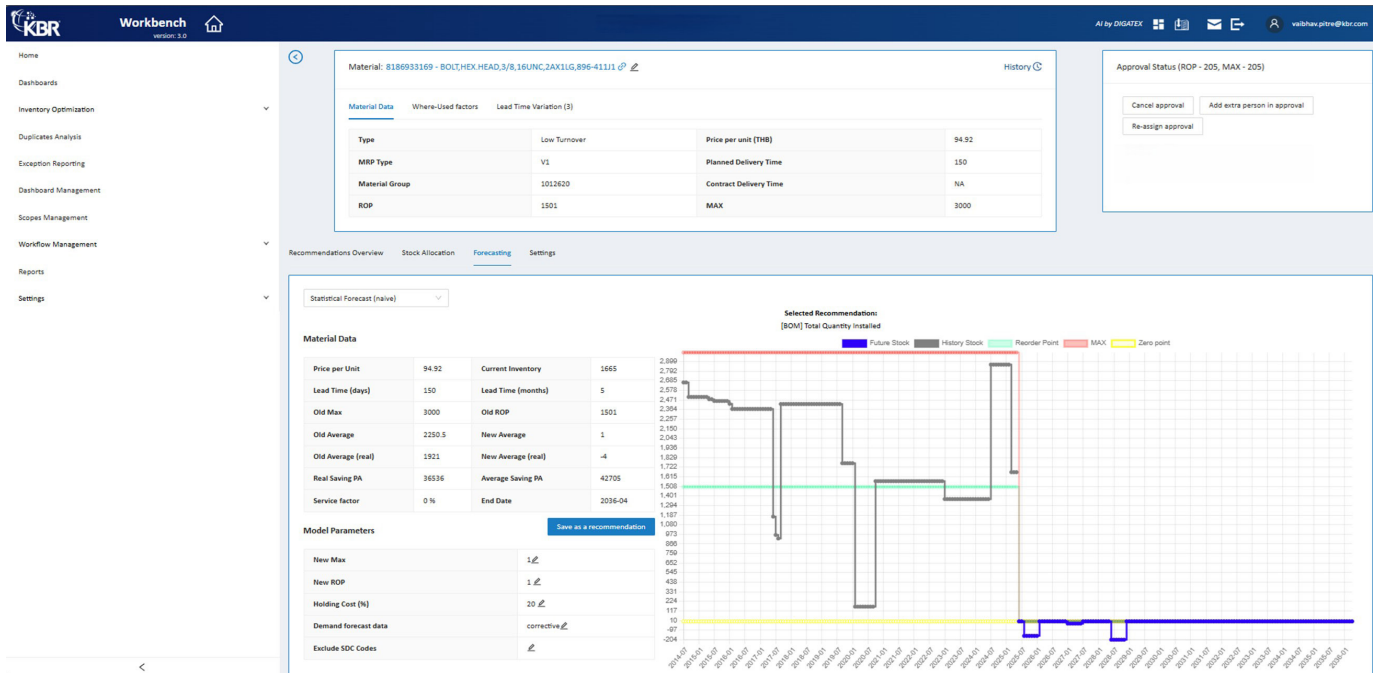
*Figure 16 – Demand Prediction Forecast (Stock-Out)*

Conversely, the screenshot below when selecting a non-optimal recommendation predicts periods of future stockouts where the stock goes below the zero baseline. IAM therefore provides a powerful inventory optimization capability and combines contextual data in a single pane to provide an audit trail for user decisions and to enable key stakeholders to approve the new recommended Min/Max levels.

The contextual data would normally require navigating 25 plus transactions and screens from a typical CMMS which is both resource intensive, confusing, often subject to human error and non-completion of the inventory optimization activity.

# Architecture

Intelligent Asset Management (IAM) is deployed on modern, contemporary cloud-based architecture which leverages cutting-edge high-performance GPUs for the required compute power, elasticity and scalability.

The high-performance GPUs are required during periods of intensive AI/ML assisted processing of engineering drawings and AI/ML based predictive models and data mapping. IAM is cloud agnostic and can be deployed on the cloud infrastructure from providers including AWS and ORACLE etc.

IAM is currently deployed on cloud in Kingdom in Saudi using the ORACLE Cloud Infrastructure (OCI) datacentre which is Saudi Communications & Information Technology Commission (CITC) compliant. The ORACLE Cloud Infrastructure (OCI) datacenter makes provision for the high-performance virtual GPUs required for the AI/ML assisted data processing. It is also deployed in Europe, North America and Singapore etc. on AWS datacenters.

## What are the benefits to the client? »

THE UPSIDES FOR THE CLIENT INCLUDE THE FOLLOWING

Cheaper, faster and more scalable

The client requires no special hardware or infrastructure to use IAM, the only requirement is a standard PC, Laptop or Tablet with a data connection – the cloud infrastructure does the heavy lifting

Security – data remains In-Kingdom/country/region on the secure cloud-based infrastructure which is continuously backed-up with provision for disaster recovery

The client does not incur any infrastructure maintenance costs but instead the solution utilizes low-cost, high-performance GPU based datacenters

Scalability – the solution is infinitely scalable using the cloud-based infrastructure

Speed – the solution runs fast on the cloud-based infrastructure with almost instantaneous results when searching through millions of records

# Deployment Modes & Commercial

IAM has flexible and diverse deployment modes, KBR offers a comprehensive range of deployment models tailored to suit client needs and operating environments, ensuring seamless integration, scalability, and measurable outcomes. Our Intelligent Asset Management solution can be delivered in the following modes:

## 1. Data as a Service (DaaS)

Our turnkey service for ingesting, processing, and transforming unstructured technical data into structured, intelligent master data.

- Ideal for organizations seeking data readiness without investing in toolsets or infrastructure.
- Delivered as a fully managed service including data ingestion, transformation, and quality assurance.
- Subscription-based pricing model.
- Best suited for greenfield or brownfield data migration and enrichment projects.

## 2. General Platform Capability

A scalable cloud-based platform for digital transformation of engineering documents and asset data, enhanced with built-in domain expertise.

- Enables intelligent data structuring to support brownfield and greenfield initiatives.
- Subscription includes access to platform capabilities for visualization, reporting, and analytics.
- Supports sustainability, reliability, and maintenance planning initiatives.
- Offered as an annual or multi-year subscription.

## 3. Inventory-Specific Solution

In Inventory specific solution is a targeted solution to streamline inventory master data and spare parts strategies aligned to real operational requirements.

- Specific, tailored solution for both Operational and Insurance materials and spare part analysis types for inventory optimization

- OEM-OCM conversion, and supplier rationalization.
- Subscription includes inventory analytics, optimization tools, and hosting.
- Can be deployed as a standalone module or integrated with client ERP systems.

## Services Included
- Software Subscription: Includes user licenses, platform updates, and feature access.
- Cloud Hosting: Secure, scalable hosting infrastructure ensuring high availability and data security.
- Support Services: Includes helpdesk, training, user onboarding, and knowledgebase access.
- Managed Services: Optional services for ongoing data maintenance, QA, and enhancement.

## Engagement Flexibility
- One-time Projects or Multi-year Contracts: Engagements can be tailored as short-term pilot projects or longer-term strategic programs.
- Custom Integrations: Designed to work alongside existing client systems like SAP, Maximo, Oracle, etc.

## IAM Deployments Modes

### Data as a Service (daas)

Our turnkey service to ingest, process, analyze and transform unstructured technical data into accessible intelligent Master Data.
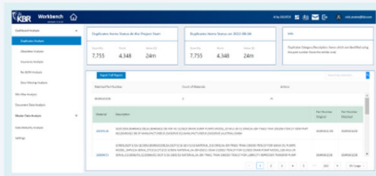


- Complete Greenfield & Brownfield Data Integrator & Build Service
- Manage Vendor Documents & Data including SPIRs, P&IDs, PFDs, ISOs, O&M Manuals etc
- Manage & Compare Revisions
- Structured & Unstructured Data

### General Platform Capability

Cloud based solution to integrate digitally transformed intelligent documents and data with other value-added work processes, combined with domain expertise to provide intelligent data-sets to clients for greenfield or brownfield projects and sustainability activities.



- Criticality
- Asset Hierarchy
- Data Sets to support Projects & Initiatives
- Corrosion Risk Assessment & Inspection Planning
- Asset Verification
- Data To Support Commissioning & Maintenance Builds

### Inventory Specific Solution

Cloud based Inventory solution for collaboration, enriching spare part and BOM information, perform Inventory segmentation, OEM to OCM conversion, deduplication, obsolescence and Min/Max optimisation etc.
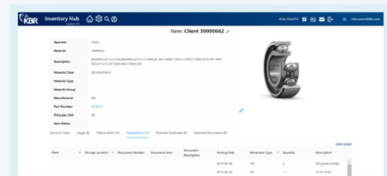


- Clean Materials Master Data
- Repair & Spares Strategies Aligned to Operating Context
- Optimised Holding Levels (ROP/Min & Max)
- OEM To OCM Conversion
- Supplier Optimisation
- Identification of Excess Stock
- Interchangeability

*Figure 17 – Intelligent Asset Management – Deployment Modes*

# Why KBR

Our expertise encompasses deep domain knowledge in engineering, asset operations and maintenance, combined with robust AI capabilities via in-house data science teams and strong AI technology partners. This combination of domain knowledge and digital know-how makes KBR uniquely suited to deliver solutions that ensure practical relevance and adoption. Our proven methodology accelerates digital transformation.

# Next Steps

**Let's unlock the full potential of your operations.** Whether you're modernizing legacy systems of record, tightening identity governance, or scaling for resilience, our IAM solutions are designed to meet the unique demands of your business.

- **Book a live demo:** See how our platform solves real-world challenges.
- **Talk to Our Experts:** Contact our technology team for a detailed assessment of your data environment and management needs. We provide solution proof of value and ROI forecasting based on your circumstances and objectives. You can take advantage of flexible engagement models for rapid pilots and incremental expansion.

**kbr.com**

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