Measuring Performance with Digital Progress Management

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Smart Digital Reality for Autonomous Industrial Facilities

SAFETY

QUALITY

EFFICIENCY

PRODUCTIVITY

Digital Projects

Digital Assets

Plan	Design	Execute	Operate	Maintain	Secure
Portfolio & Project Planning	Conceptual Design | Detailed Engineering	Supply Chain | Fabrication | Construction	Operations Management | Environment, Health & Safety Risk	Maintenance Management | Asset Integrity & Reliability | Sustaining Engineering	OT / ICS Cybersecurity

Single Pane Of Glass | **Composable Services** » **Digital Backbone** « **Data Orchestration** | **SaaS Platform**

Autonomy Enablers

Cloud Infrastructure — **Artificial Intelligence** — **IIoT / Sensors** — **Robots & Scanners**

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What is the future of Execute?

Solutions Today

- Smart 3D
- Smart Materials
- Smart Completions
- iConstruct
- Smart Construction
- EcoSys Project Performance

Digital Backbone SDx

- Data Consolidation
- AI-Based Smartification
- Contextualization

Embedded Work Processes

Execute

Visualization and Personalization

Role-Based Single Pane of Glass

If you are still dealing with non-integrated systems and processes, you are missing a significant opportunity to minimize or even eliminate wastage during construction - whether that be time, money, material, or resources.

Decision Support Analytics

Outcomes

- SAFETY
- EFFICIENCY
- QUALITY
- PRODUCTIVITY

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Why Is Progress Management Important

Identify Enterprise and Project Goals

Successfully executing projects hinges on many variables. Yet, the fundamental question that must be answered before any proactive or prescriptive measures can be implemented is this: Where are we today? Deceiving in its simplicity, this question often proves difficult to answer accurately. How can we make this easier?

1

Why Is Progress Management Important

Are We There Yet?

2

Challenges and Outcomes

Set desired outcomes and benefits

3

Right Source, Right Data, Right Insight

Start Right and Stay Right To The End

4

Enabling Digital Projects

Connecting Processes and Data

5

Digital Progress In Action

Integration Demo

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Why Is Progress Management Important

Are We There Yet?

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Why Is Progress Management Important

Are We There Yet?

Progress Measurement enables all stakeholders to understand the status of project tasks and activities. Accurate performance measurement is essential to know how the project aligns to planned cost, schedule and performance targets

Key Benefits of Accurate Progress Management

Visibility Into Progress

Provide Predictable Forecasts

Identify Process Improvements

Increase Stakeholder Confidence

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Challenges and Opportunities

From Poor Performance To Exceeding Expectations

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Challenges and Opportunities

From Poor Performance To Exceeding Expectations

Poor productivity, tight profit margins, resource shortages and low technology adoption are all well documented challenges faced by the engineering and construction industry. Driving performance improvement through digital progress measurement and management will help alleviate the impact on successful project delivery

Current State

Historical Performance

- Projects Over Budget
- Projects Delivered Late
- Projects Failing To Deliver Planned Benefits
- Productivity Below Averages
- Too Much Time and Money Wasted
- Low Profit Margins Compared To Other Industries

Perception Versus Fact

- Limited Access To True Progress and Performance Data
- Status Based False Perceptions

Common Issues

- **Siloed** and **disconnected** processes and data management
- **Too subjective** and open to interpretation
- **Misalignment of delivery** completion with schedule
- **Lack of standardization** – No standard rules of credit
- **Inefficient** manual process with potential for error
- **Data intensive** – multiple sources requiring consolidation, manipulation and analysis
- **Difficult to validate** reliability and accuracy of information
- **Optimism Bias** – Reporting “inaccurate” progress especially early in project lifecycle

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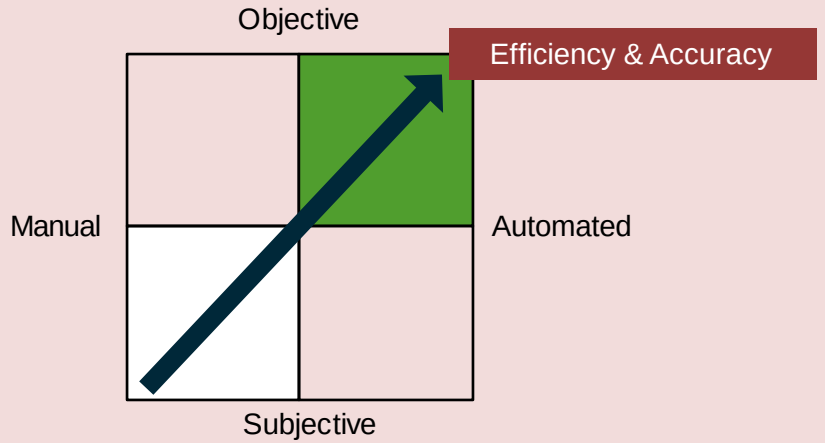
Automated Objectivity

Data Driven Decision Making

Provide accurate and timely progress information to allow all project stakeholders to focus on maximizing schedule and budget performance and delivering planned benefits and targets

Key Considerations

- Speed
- Accuracy
- Completeness
- Data Coverage
- Scalability



- Remove Silos
- Shift from Manual based Data Management
- Automate Data Management
- Ability to drilldown into source data
- Auditable Progress Data
- System Driven Values

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Getting It Right

5 Key Elements

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Getting It Right

5 Key Elements

Any performance management system, whether digitized or not, requires the following 5 key elements to be successful.

1	Right Data	The relevant performance data needs to be available as needed by stakeholders to effectively control and manage the project
2	Right Source	The right performance data needs to come from the appropriate source, at the right level of detail and cadence
3	Right Time and Place	Automated workflows within an integrated environment allows timely access to data
4	Right Person	Notifying the right project team members and providing access to actionable insights improves decision making
5	Right Decision	The correct course correcting decisions are communicated and carried out quickly with immediate impact on performance

Business Impact of Digital Progress Management

An Example

	Project Performance Solution	Digital Project Progress Solution
1 Data	Framework established to capture progress at different project stages and details	**Both automated and manual processes** established to capture timely progress from the right source
2 Source	Siloed and disconnected tools require extensive data capture, preparation and consolidation	**Instant access to accurate and timely performance data** based on rule-based integrations
3 Time and Place	Progress analyzed after the fact with limited ability to eliminate or minimize performance issues	Immediate access to **progress from the field or office**.
4 Person	Progress reported to right people to understand performance but without clear visibility into source data or ability to quickly identify problems	**Connected data** provides visibility into performance at summary and detail level. KPI driven analysis supports easy identification of issues
5 Decision	Performance issues identified and corrective actions taken but visibility into actions taken is difficult	Performance addressing actions **integrated with cross-system change management** processes

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Enabling Digital Projects

Connecting Processes and Data

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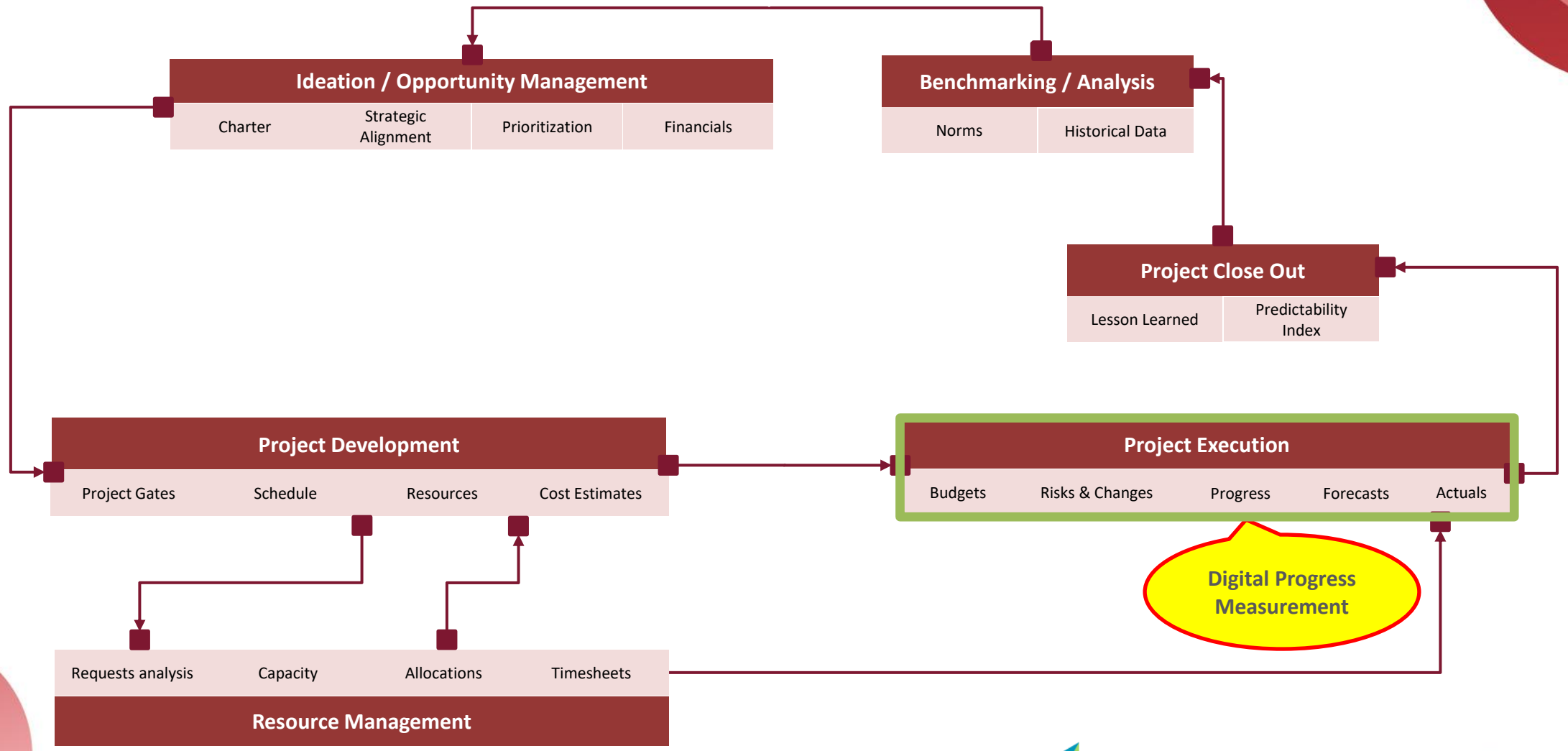
Managing the Entire Project Life Cycle



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A Digital Reality

EPP – Delivering Digital Progress Management

Digital Progress Management

Construction Management (Installed Quantities)

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Intergraph Smart® Construction

- Work Package Progress
- EPP Solution Accelerator

Design Software (Engineering Deliverables)

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Intergraph Smart® 3D

- Model Progress
- EPP Solution Accelerator

Completions and Commissioning (Package Progress)

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Intergraph Smart® Completions

- Work Package Progress
- In Design / Roadmap

Information Management (Deliverables Progress)

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HxGN SDx™ Projects

- Drawings and Documents
- Productized Integration / Live Connector

Scheduling (Tasks and Activities)

ORACLE PRIMAVERA
Project

- Activity and/or Step Progress
- EcoSys Connector / Solution Accelerator

ERP (Accruals and Actuals)

ORACLE E-BUSINESS SUITE
SAP

- Actuals and Milestone Progress
- EcoSys Connectors

Materials Management (Material Receipts)

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Intergraph Smart® Materials

- PO Progress
- Smart Materials Driven Integration

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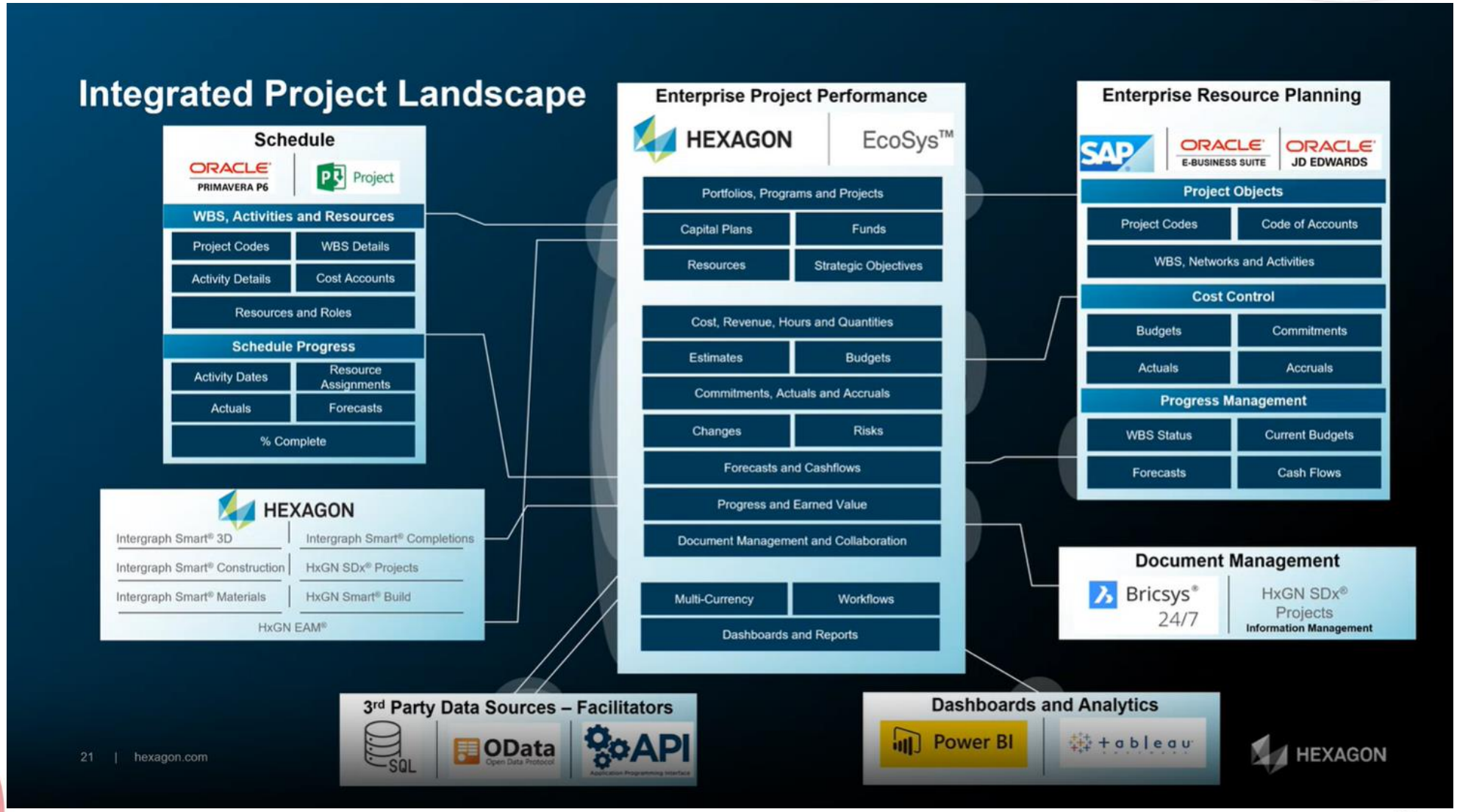

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Enabling Digital Projects

Connecting Processes and Data

Enterprise Resource Planning Systems

SAP · ORACLE E-BUSINESS SUITE · ORACLE JD EDWARDS · IBM maximo

External Project Solutions

ORACLE PRIMAVERA · aspentech · HEXAGON

- Intergraph Smart® 3D
- Intergraph Smart® P&ID
- Intergraph Smart® Construction
- Intergraph Smart® Materials
- Intergraph Smart® Completions
- HxGN SDx® Projects
- HxGN Smart® Build
- Bricsys® 24/7

Supports ALL EcoSys Integrations

- Increased reliability and simplified maintenance
- Reduced implementation time and cost
- Improved performance

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ERP
Accruals & Actuals

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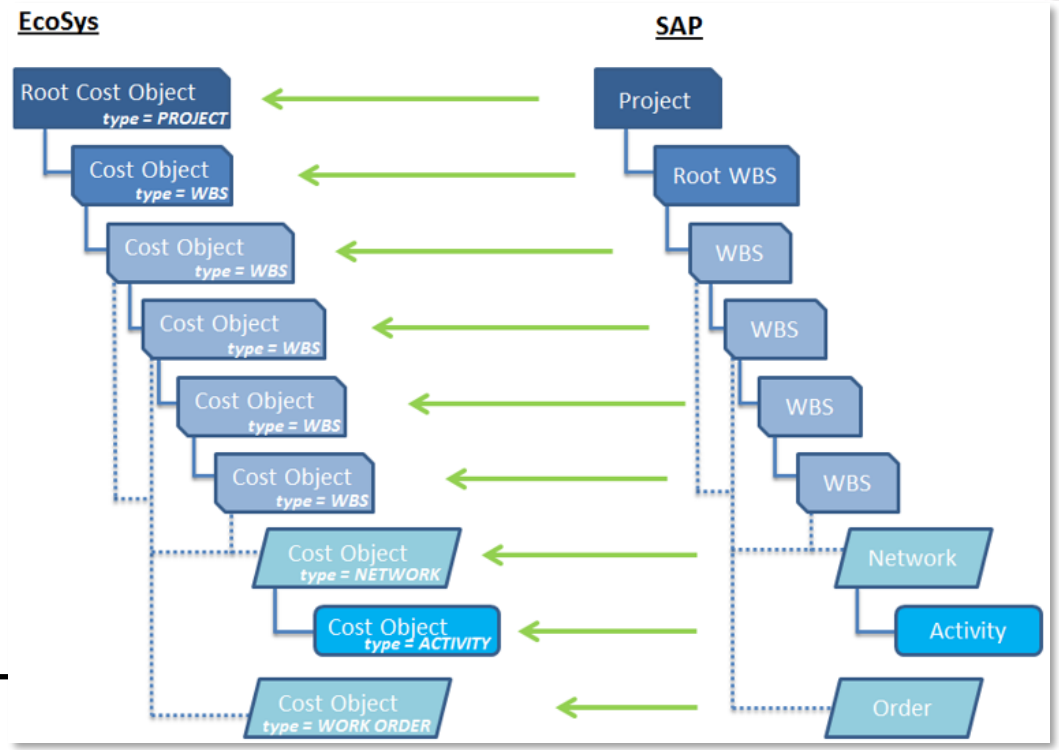
EcoSys SAP Integration

HxGN SAP Connector

HxGN SAP Connector

Key Features:

- Standard EcoSys integration product for SAP
- Full integration with SAP PS module
- S/4 HANA (ECC support available Q3 2023)
- SAP web services integration
- Cloud Compatible
- CBS to WBS Mapping
- EcoSys Workflow Automation
- Fully Configurable



Subject Areas - Imports to EcoSys:

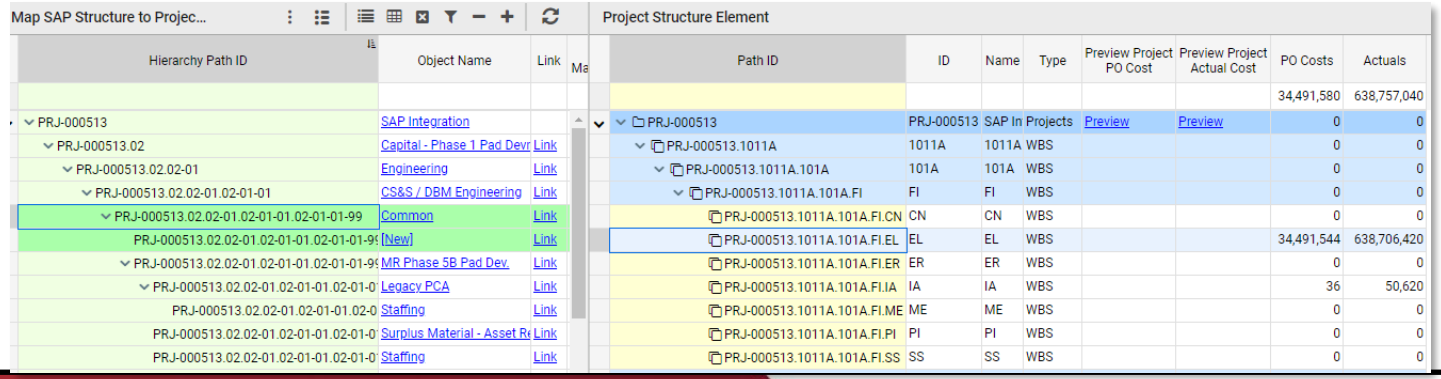
- Project Structure
  Including WBS, Networks, and Work Order
- Actual Cost and Revenue
- Commitments
- Planned Costs and Revenue
- CATS Timesheets
- Budget Totals
- Enterprise Data

Subject Areas – Export To SAP:

- Project Structure
  Including WBS, Networks, and Activities
- Forecast Costs

CBS to WBS Mapping

- Ability to define mapping rules from SAP to EcoSys Cost Control Level
- Ability to preview costs before pushing data



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Schedule Integration

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Schedule Integration

EcoSys Connect Overview

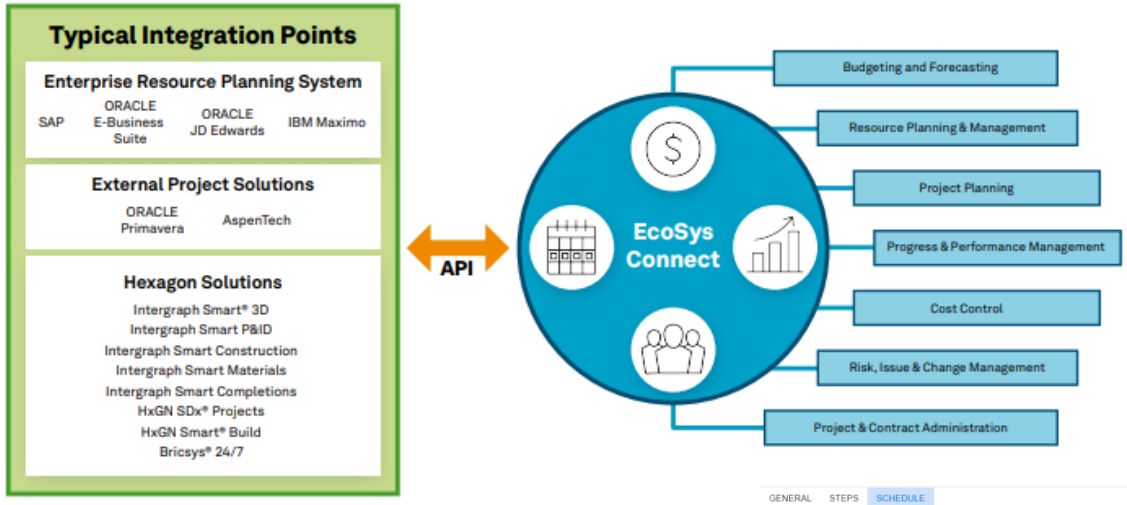
EcoSys Connect

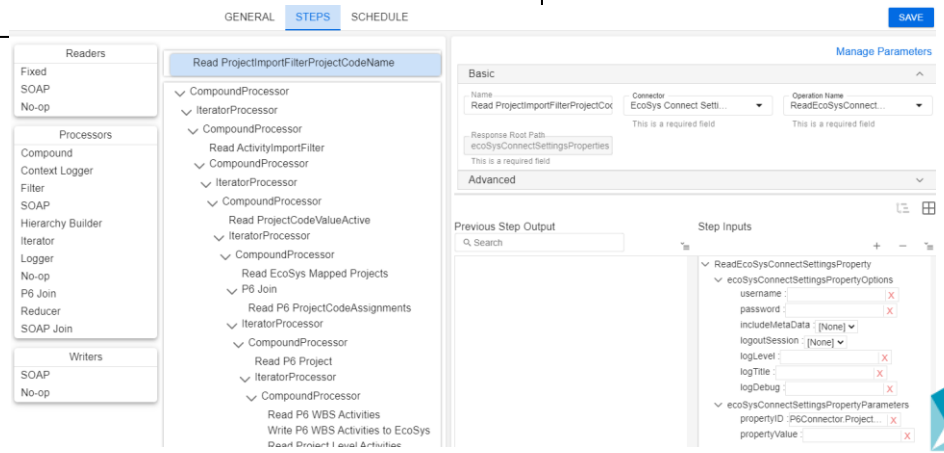
Main Benefits

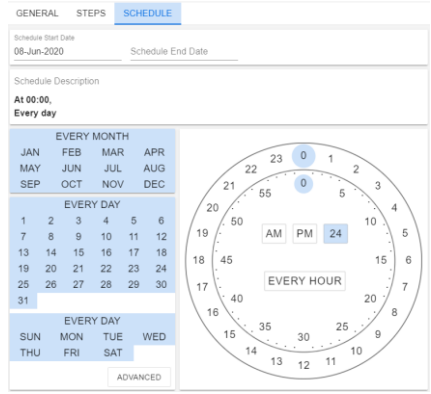
- Cloud-enabled platform purpose-built to support all EcoSys integrations
- Eliminates need for custom integration code
- Reduced implementation time and cost
- Increased reliability and simplified maintenance
- Improved performance

Main Features

- User Dashboard to monitor job status and audit log
- Job automation for scheduling and running on-demand executions (PATENT PENDING)
- Integration error handling (resend option in R2)
- Configurable field mapping and transformations







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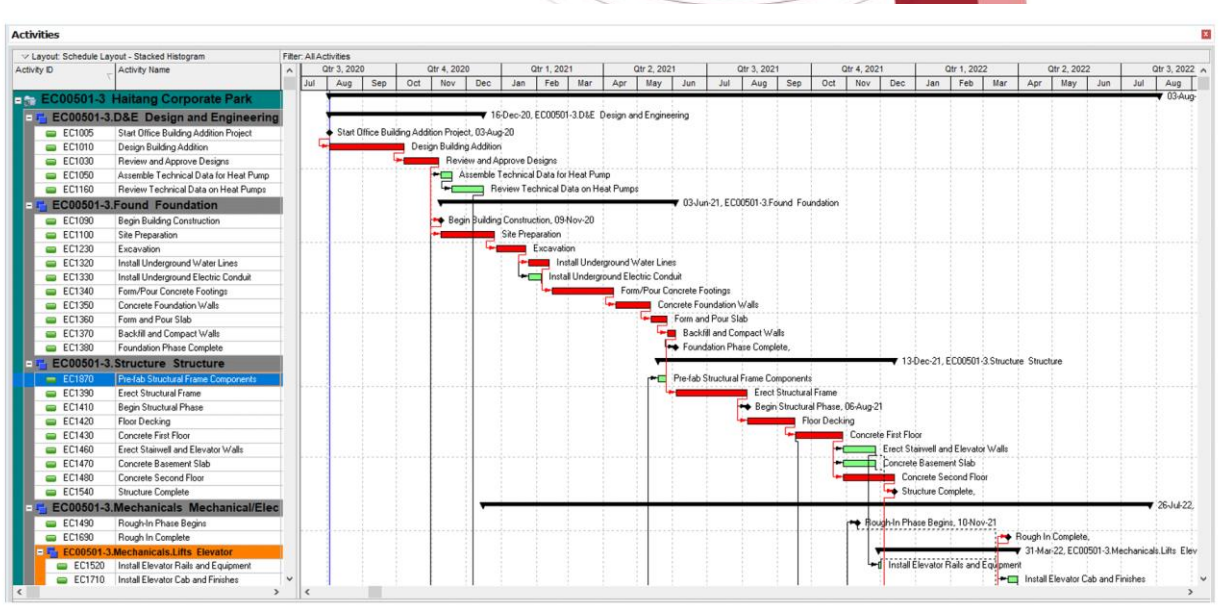
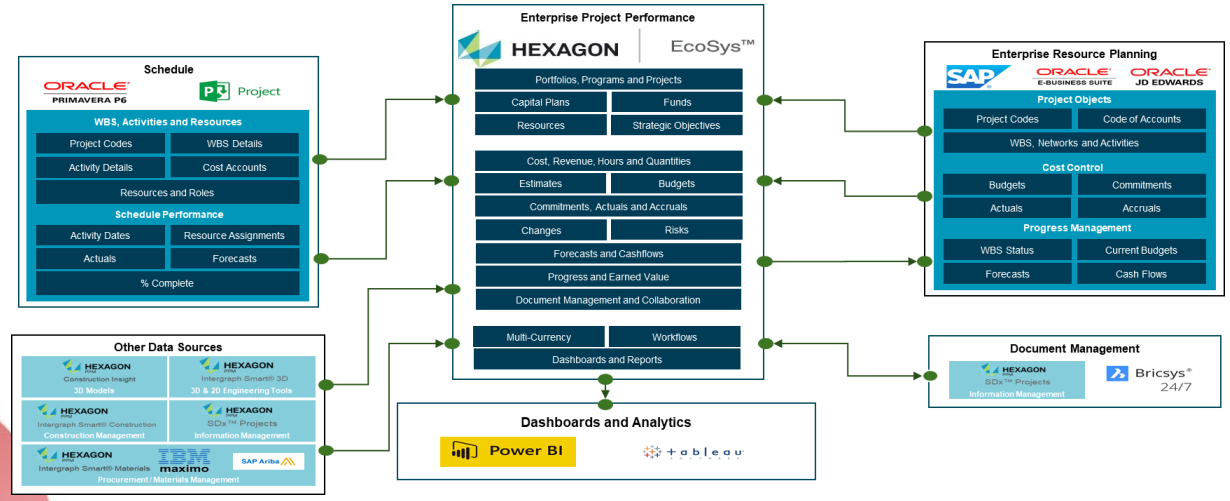
Schedule Integration

Primavera P6 / EcoSys P6 Connector

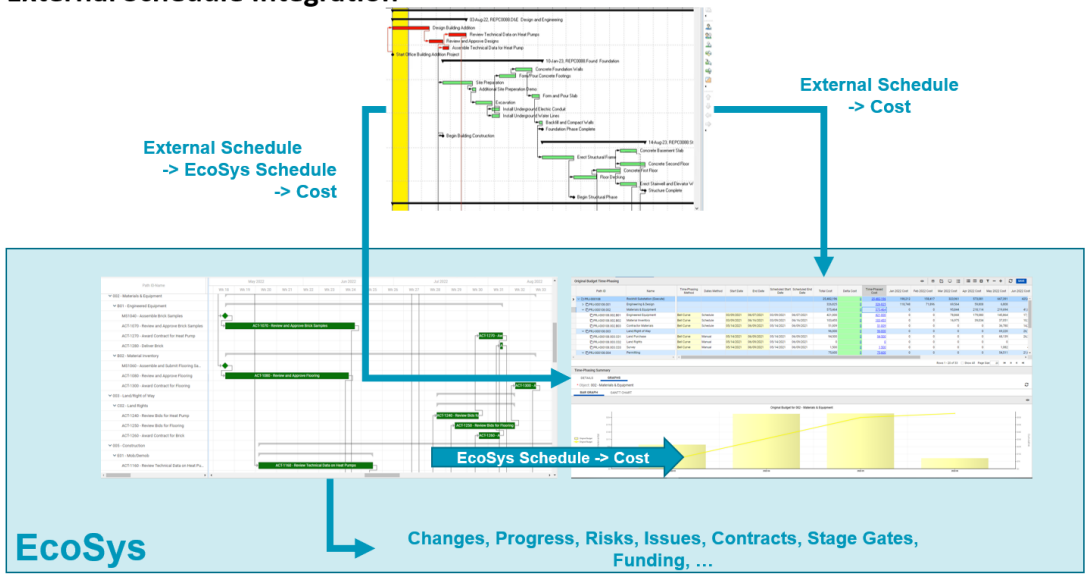


Primavera P6 / EcoSys Connector

- Fully Cloud enabled integration platform
- Simply integrate with MULTIPLE P6 instances
- Import Activity Progress including Milestones
- Import Activity Planned and Actual Start / End Dates to drive progress timeframe
- Import Activity Progress to generate EVM metrics and support productivity analysis



External Schedule Integration



Engineering Progress Measurement

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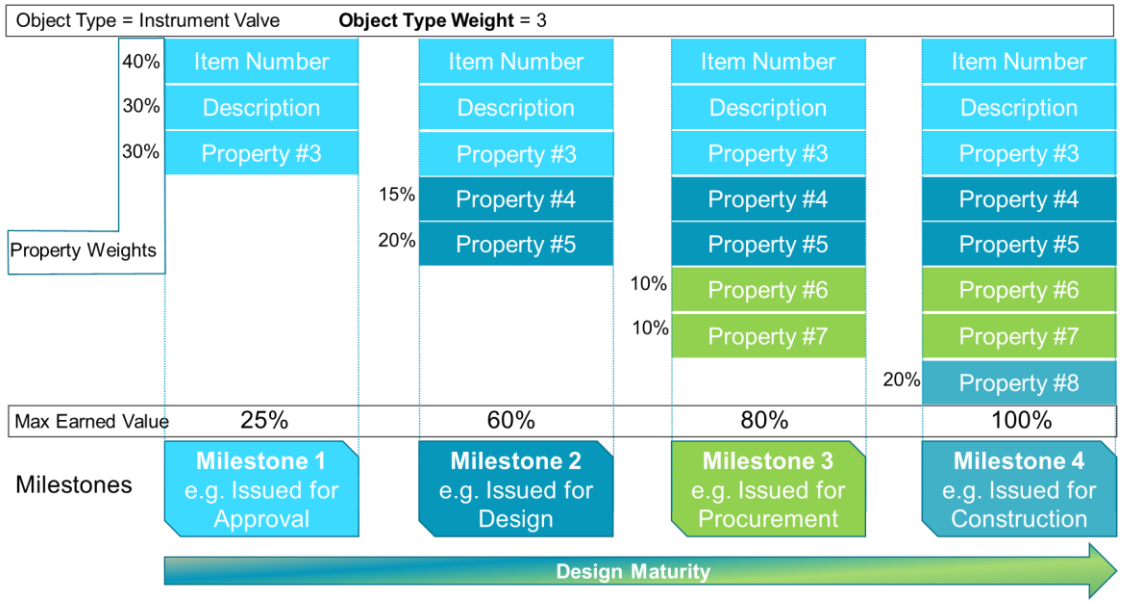
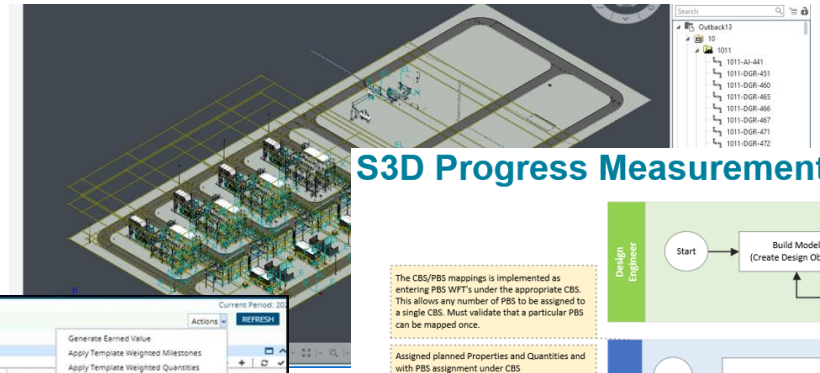
Engineering Progress Management

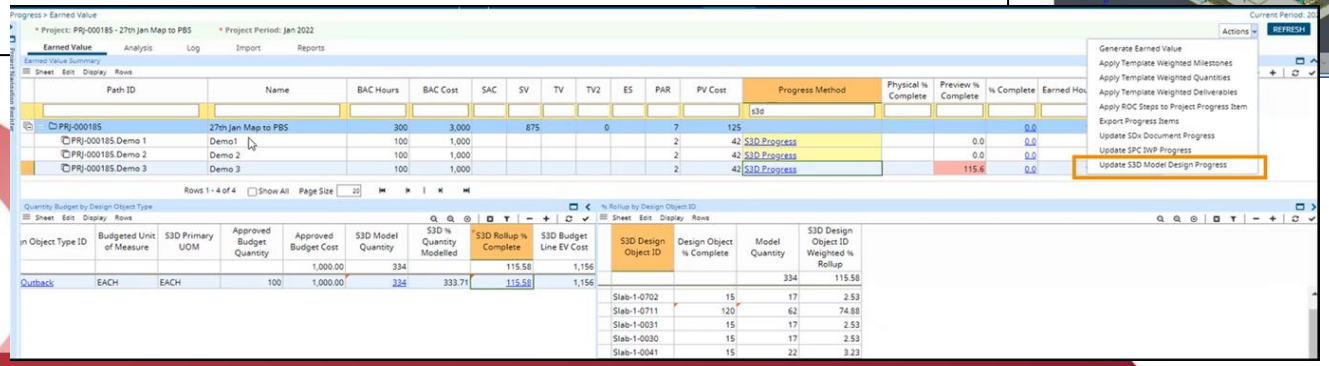
HxGN S3D

S3D

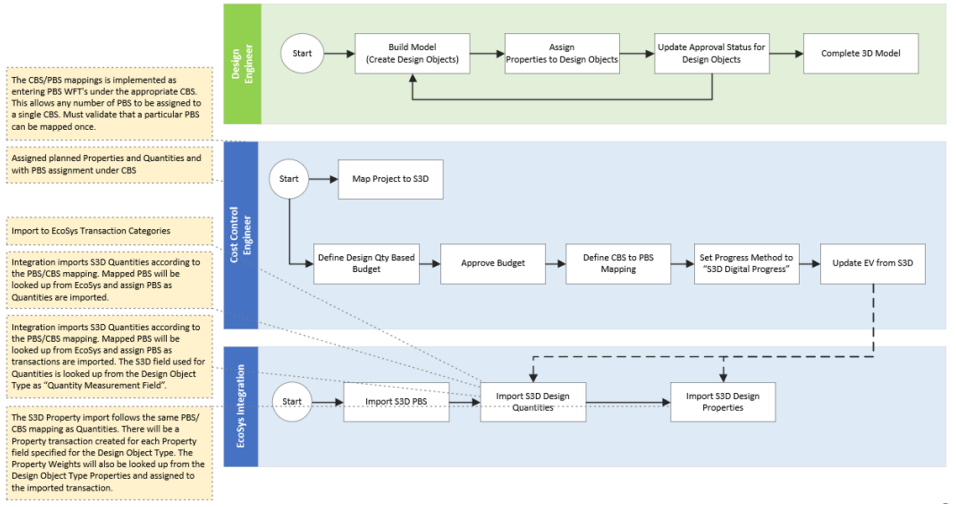
- Measures S3D Design Progress by Design Object Type based on approved design status
- Ability to Generate EV from S3D Design Object Progress
- Imports Design Quantities and Properties summarized by S3D Plant Breakdown Structure
  - PBS is typically: Plant / Site / Area / Unit / Discipline
- Design Progress is measured according to:
  - S3D Design Quantities compared to the EcoSys Quantity-based Budget
  - S3D Properties compared to EcoSys Stage of Design Milestones
- S3D PBS to EcoSys CBS Mapping
  - S3D PBS Structure is imported as EcoSys Transaction Categories
  - EcoSys User to do Manual Mapping of PBS to EcoSys CBS
- Solution will come with pre-configured S3D Filters on Design Object Type







S3D Progress Measurement



Information Management Integration

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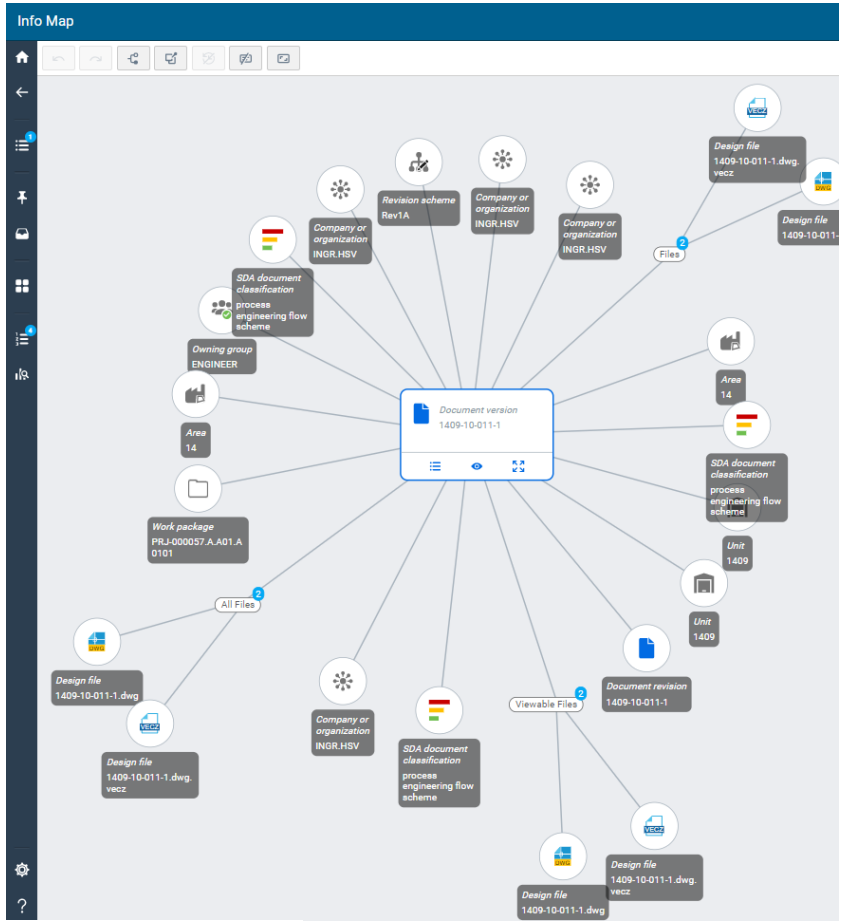
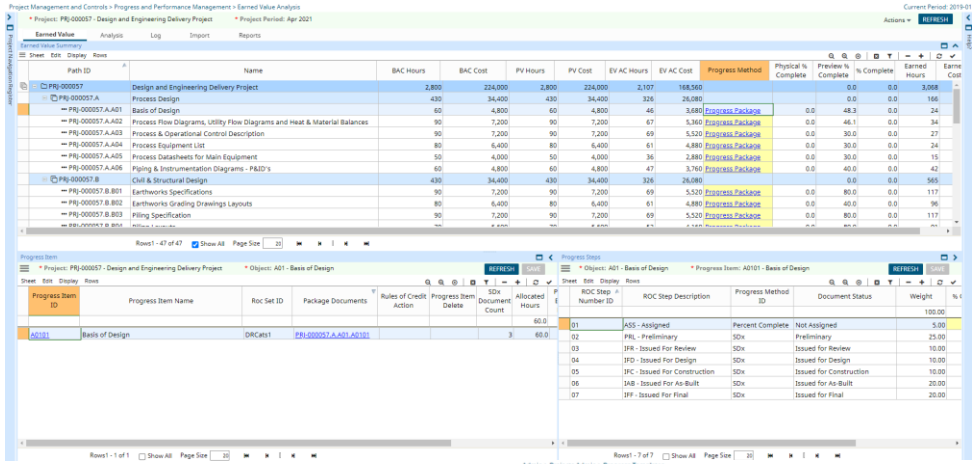
Information Management Integration

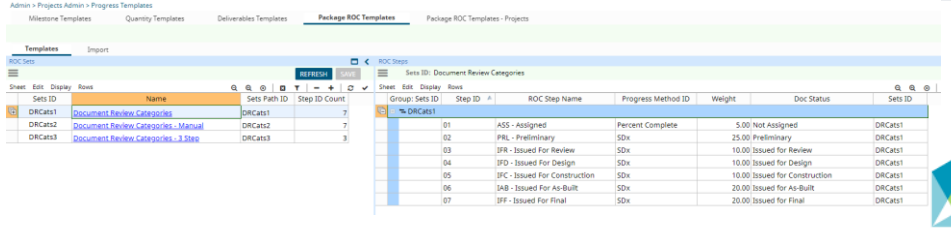
HxGN SDx Projects

SDx Projects

- Track Progress against Document and Drawing Deliverables in SDx
- Utilize Progress Rules of Credit aligned to Document Issue Status to determine % complete
- Bi-directional integration to transfer progress package details and package contents
- Utilize EcoSys Live Connector to view documents from within SDx
- Generate EV metrics based on planned actuals and progress in EcoSys
- Analyze productivity and performance in EcoSys







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Procurement Progress Measurement

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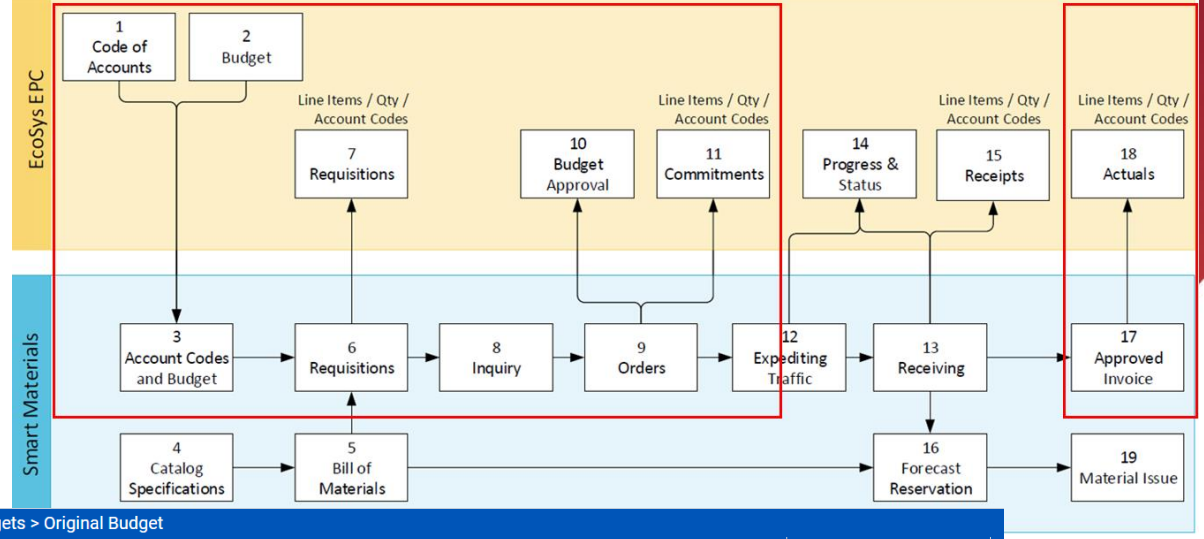
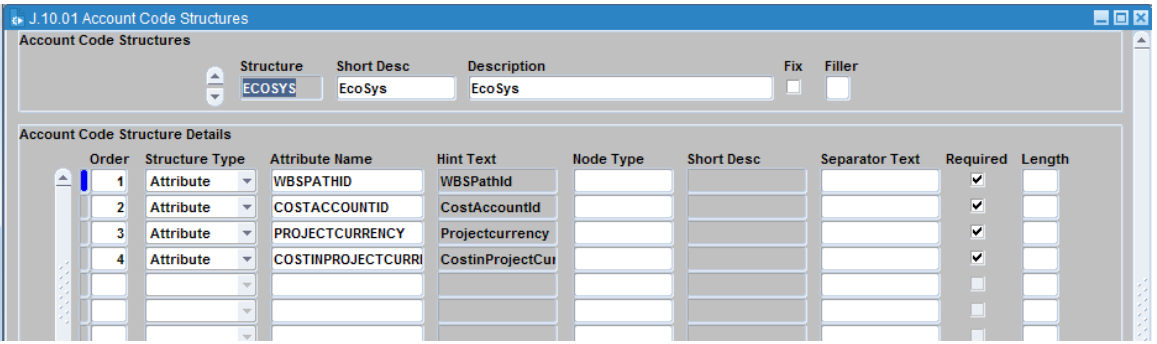
Procurement Progress Management

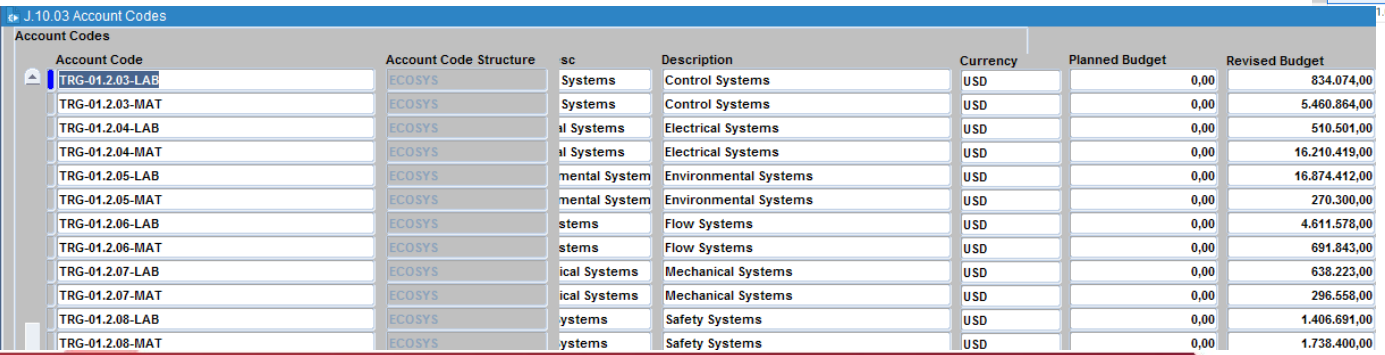
HxGN Smart Materials

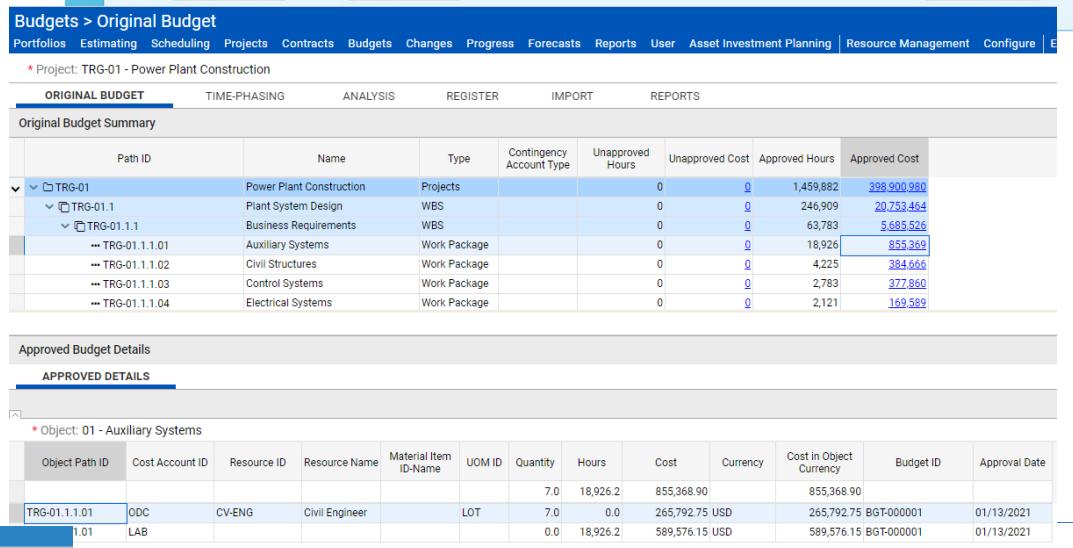
HxGN Smart Materials

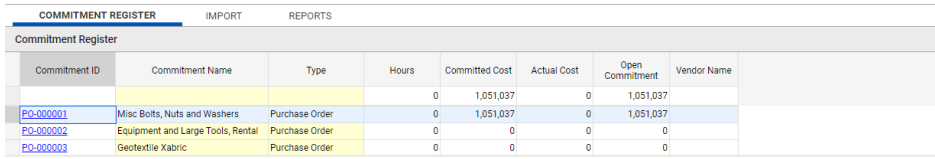
- WBS & budget info from EcoSys to Smart Materials
- Requisition, P.O. line item, Commitment from Smart Materials to EcoSys
- P.O. revisions and other costs are captured
- Quantities and Cost
- Inquiry through Delivery

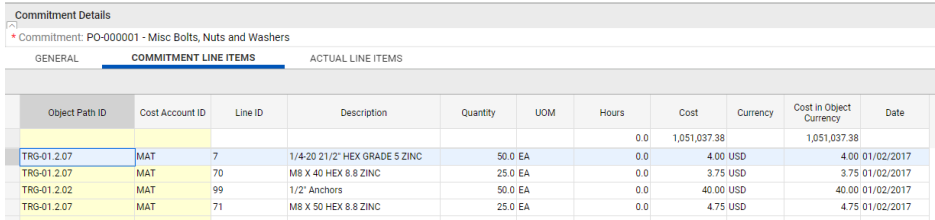












Construction Progress Measurement

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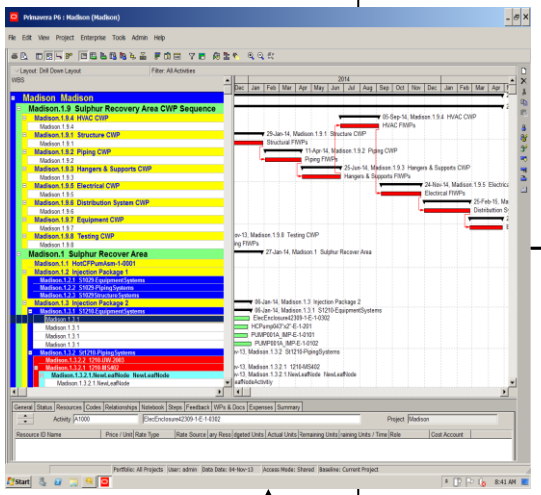
Construction Progress Management

HxGN Smart Construction

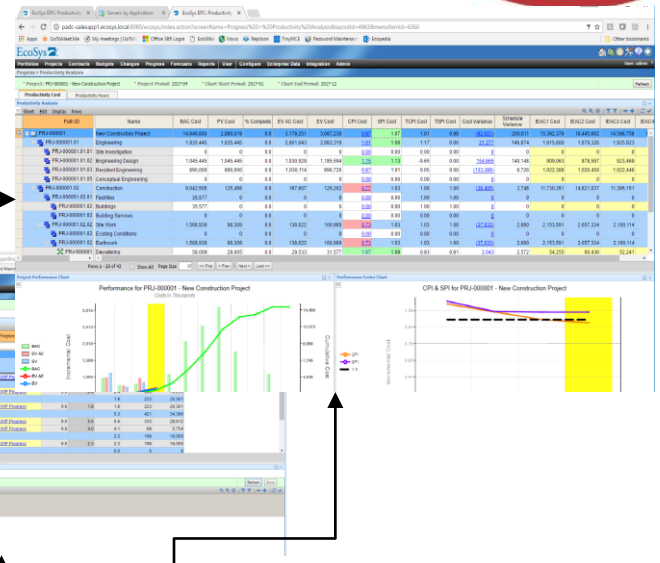
HxGN Smart Construction

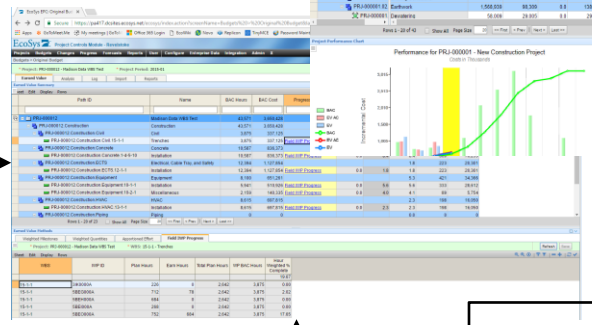
- Scheduled or ad-hoc Field Construction Progress updates
- Update progress based on Installations Work Package (IWP) approval status
- Update progress based on Construction Work Package (CWP) modifications
- Identify progress/performance issues early
- Update EcoSys with following Work Package details
  - CWA Number
  - CWP Number (WBS Code)
  - IWP Number
  - Plant ID
  - Planned Manhours
  - Actual Manhours
  - Planned Start/Finish Date
  - Actual Start/Finish Date
  - Discipline
  - Purpose
  - Crew Size



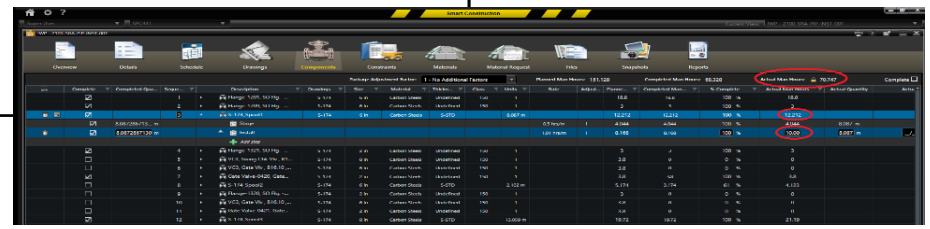
Export Optimized Schedule at CWP Level to P6

On Demand Schedule Updates from P6





On Demand IWP / CWP Progress Updates to EcoSys



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Other Methods

Digital Options and Opportunities

Every project involves many sources of progress. We continue to build ways to integrate with other Hexagon solution and non-Hexagon products to provide access to the “right” source of progress data

ORACLE PRIMAVERA / Project	Schedule WBS, Activities, Relationships, Dates, Resource Assignment, and Progress	 Standard Product	EcoSys P6 Connector MS Project Solution Accelerator
HEXAGON Intergraph Smart® Materials	Structure and Classification Master Data, Project Commitments, Progress (Material Receipts), and Actuals (Invoices)	 Standard Product	Custom Integration developed by Smart Materials Product Team
HEXAGON Intergraph Smart® Construction	Construction Work Package (CWP) and Installation Work Package (IWP) Progress	 Standard Product	Custom Integration Code developed by EcoSys Product Team
HEXAGON Intergraph Smart® Completions	Construction Work Package Progress and Deliverable Completions	 Roadmap Integration (Configured With Services)	Customer Smart Completions API enabled via Services
HEXAGON HxGN Smart Build™ Insight	Integrated HxGN 5D Vision; Budgeting, Progress, Change Management and EVA Enabled Forecasting	 Standard Product	Productized Integration Code developed by Smart Build Project Controls Product Team

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Recording S3D

The Future Is Digital

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Project Portfolio Management

- Portfolio Planning and Control
- Fund Management
- Resource Planning and Mgmt

Project Management and Controls

- Project and Contract Planning
- Scheduling
- Estimating
- Budgeting and Forecasting
- Cost Control
- Progress and Performance Mgmt
- Risk, Issue, and Change Mgmt

Roles

- Executives
- Portfolio Managers
- Project Managers
- Project SMEs
- Project Controls
- Engineers
- Contractors
- Schedulers

Summary

The Future Is Digital

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THANK YOU

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