Project Controls EXPO London, UK

Project Controls Expo – 14th November 2018
Emirates Arsenal Stadium, London

Enhancing Predictability with EcoSys to Achieve World-Class Projects Performance

Champions Suite

Session T5: 14:10 - 14:55

About the Speaker

Degree:

- Civil Engineering

Experience:

- Vice President Business Development EcoSys Europe
- Member of DACE, AACEI and ICEC
- Upcoming President AACE International Benelux Section
- More than 20 years of industrial experience in consulting various industries such as oil & gas, petrochemical, power, mining & materials, chemicals, construction and pharmaceutical

EcoSys part of Hexagon PPM Family:

- Hexagon PPM is the No. 1 overall worldwide provider of engineering design tools for plant design for TEN consecutive years in 5 different categories
- Our solutions are used by nearly all of the Fortune Global 500 Owner / Operators as well as the majority of EPC companies
- More than 2,500 employees, with offices in 60 countries

EcoSys: Enterprise Projects Performance

Market Leadership

- EcoSys founders were the original developers of Primavera P6
- First to market and industry leader in Enterprise Projects Performance platform
- Deep portfolio & project management expertise

Business Momentum

- Largest adoption in enterprise projects performance space
- Global presence – users in 20+ countries
- A part of Hexagon PPM (formerly Intergraph Process Power & Marine) since 2015

Loyal & Growing Customer Base

- 200+ clients globally
- Strong partnerships: SAP, Oracle, Microsoft, Accenture, IBM, and more

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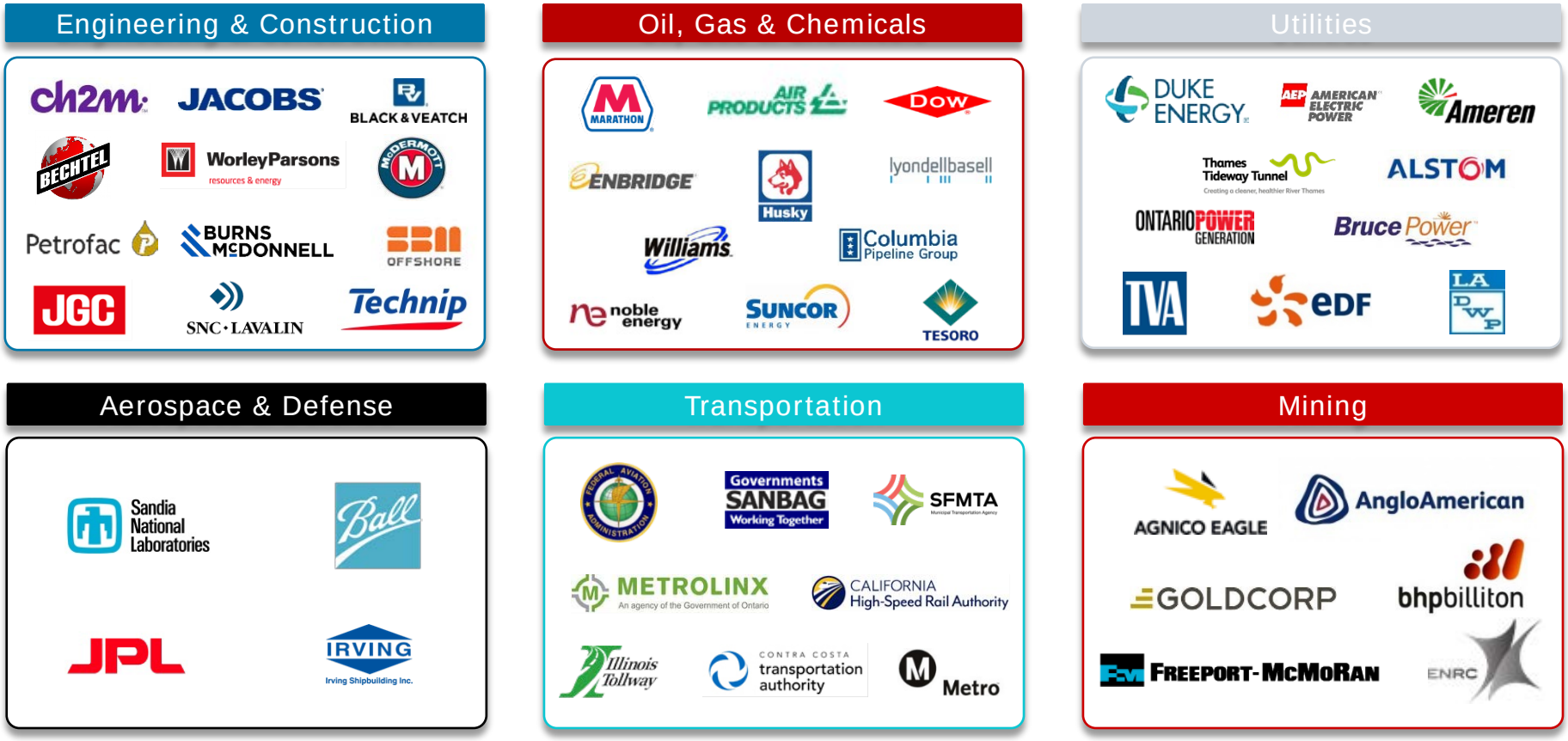
EcoSys Customers by Industry



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EcoSys: Enterprise Projects Performance

ECOSYS PRODUCTS AND PROCESS AREAS ACROSS THE PROJECT LIFECYCLE

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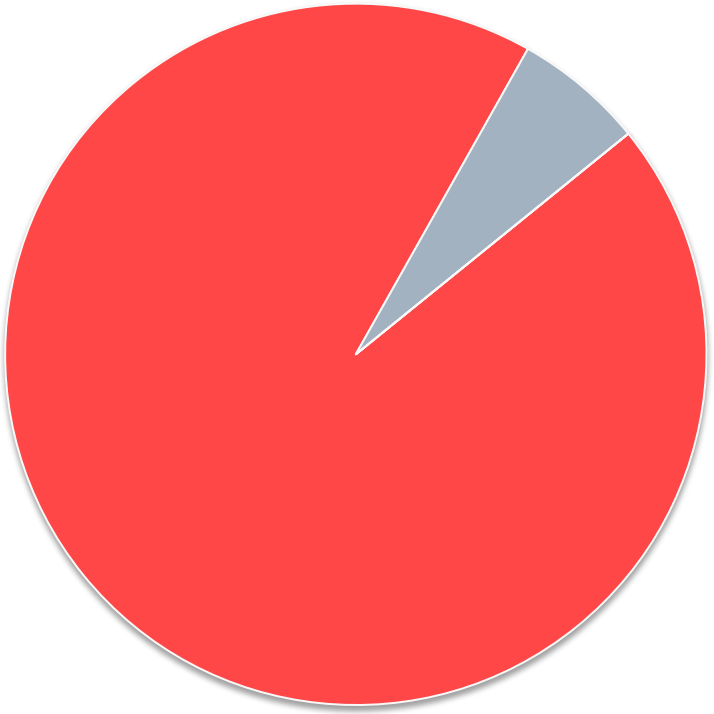
Introduction to Predictability

What is Predictability?



<6%

of projects deliver planned financial returns

98%

of megaprojects see cost overruns greater than 30 percent

Sources:
** Construction Industry Institute*
** McKinsey: The Construction Productivity Imperative*

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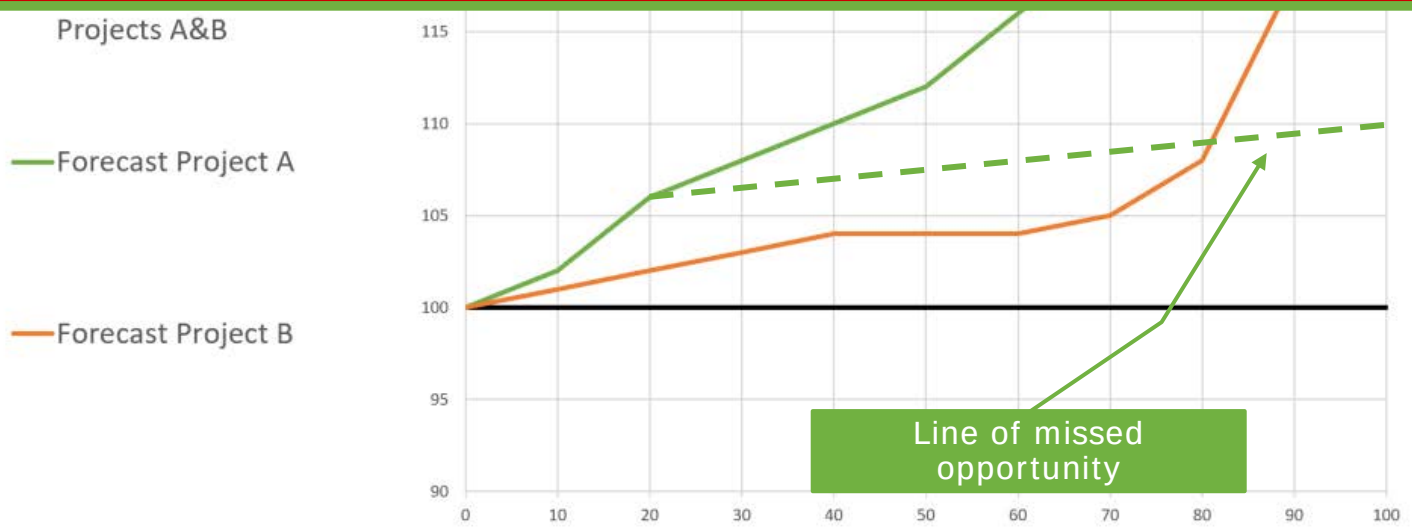
Poor Predictability Across All Sectors

Both Projects have $100M Original Budget and $120M Actual Cost	Which is better and why?

A: The average point in time at which the project forecast becomes accurate



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Common Causes of Low Predictability

Insufficient Effort or Attention

- Improperly staffed (too many projects)
- Process improvement and project controls are low priorities
- Insufficient automation, high inefficiency

Low Maturity

- Basic planning, estimating and risk management processes
- Siloed organization and low levels of standardization (process / systems)
- No Enterprise Projects Performance platform (rife use of Excel)

Optimism Bias

- Benefits will be high, costs will be low
- Early, inappropriate use of contingency
- "Poor performance can be recovered in time to avoid overruns"

Poor Transparency and Accountability

- Mixed motives for project approval and sustainability
- Unwillingness to deliver bad news or kill bad projects
- Multiple baselines and versions of the truth

Early predictability adds value by enabling the proper response to surprises and changes.

Construction Industry Institute

70% of Projects

report ZERO budget variance prior to **50%** project duration

On average, variance reporting starts at **65% duration**

HEXAGON PPM

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Common Causes of Low Predictability

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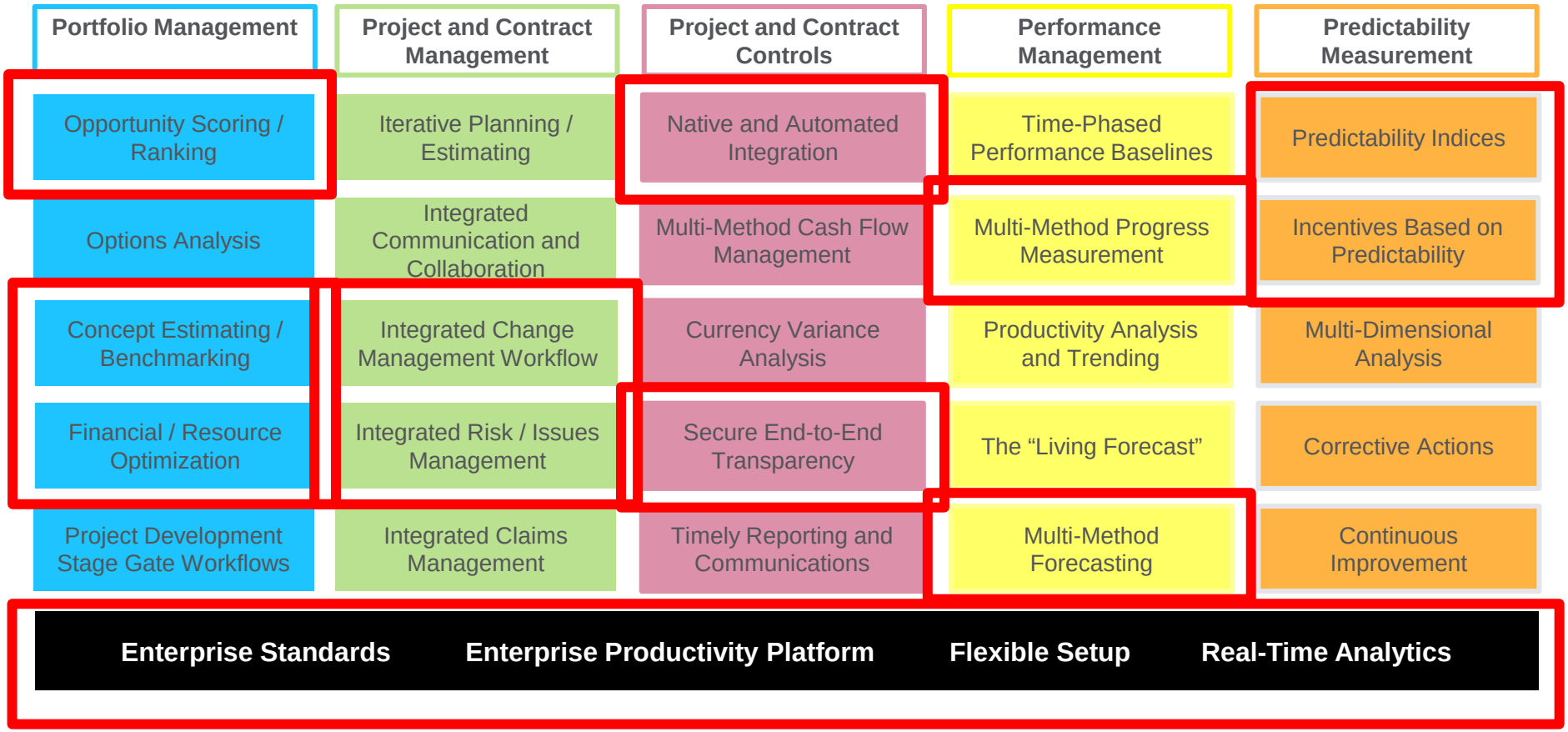
Pillars of Predictability – People, Processes, Technology



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Pillars of Predictability – People, Processes, Technology

Portfolio Management

Opportunity Scoring / Ranking	• Establish a scoring/ranking mechanism that aligns with your business strategy • Incorporate probabilistic estimating and risk analysis into the scoring process
Options Analysis	• Develop scenarios for each opportunity or project, ensuring thorough financial and resource analysis and what-if scenarios for each
Concept Estimating / Benchmarking	• Properly capture projects performance data to support future reusability • Produce early estimates based on similar projects executed in the past
Financial / Resource Optimization	• Compare opportunity demand with Enterprise capacity • Where resource availability is limited, run what-if scenarios to see the impact of timing and demand variations
Project Development Stage Gate Workflows	• Ensuring all key stakeholders have visibility at each stage provides opportunity for challenge and validation • Embed the development process into an electronic system and ensure 100% usage compliance

Enterprise Standards **Enterprise Productivity Platform** **Flexible Setup** **Real-Time Analytics**

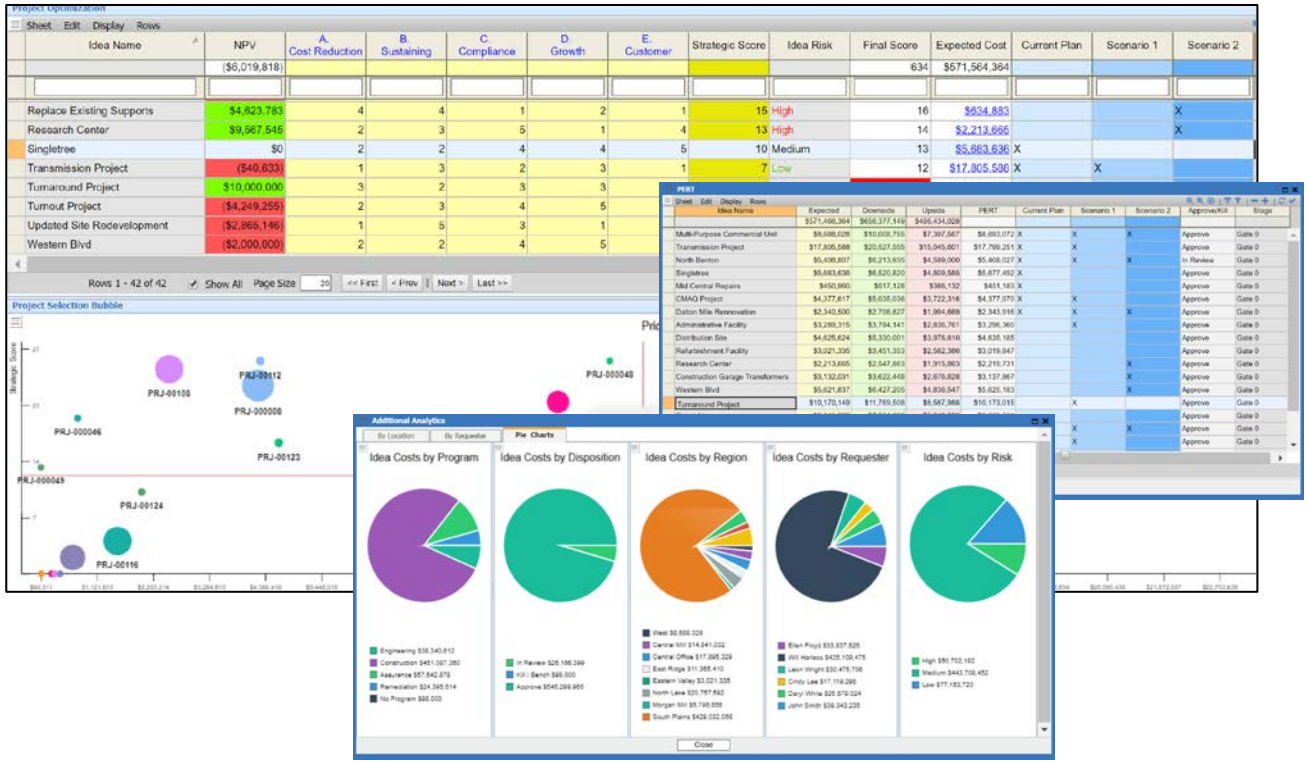
Pillars of Predictability – People, Processes, Technology

Portfolio Management – Software Examples

- Ranking projects and running what-if scenarios
- Concept estimating and benchmarking
- Resource availability analysis

Pillars of Predictability – People, Processes, Technology

Portfolio Management – Opportunity Scoring / Ranking



- Review all open and pending opportunities
- Filter opportunities by region, business unit, idea originator and other attributes
- Assess opportunity strategic scores, risk impact and financial/cost details
- Approve, Place In Review and Kill opportunities based on strategic alignment, business impact/value
- Create and view prioritization bubble charts based on strategic score, risk impact and financial measure such as NPV.

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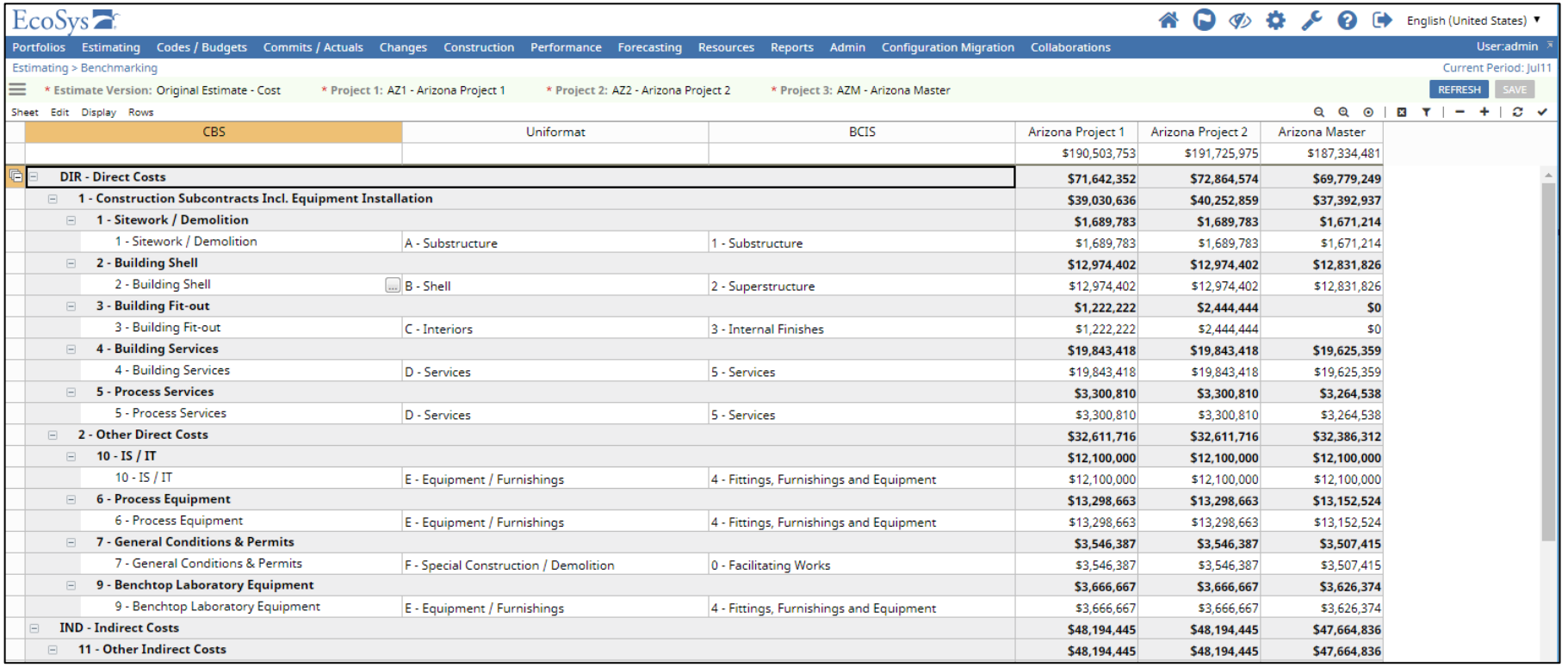
Portfolio Management – Concept Estimating and Benchmarking



CBS	Uniformat	BCIS	Arizona Project 1	Arizona Project 2	Arizona Master
			$190,503,753	$191,725,975	$187,334,481
DIR - Direct Costs			**$71,642,352**	**$72,864,574**	**$69,779,249**
1 - Construction Subcontracts Incl. Equipment Installation			**$39,030,636**	**$40,252,859**	**$37,392,937**
1 - Sitework / Demolition			**$1,689,783**	**$1,689,783**	**$1,671,214**
1 - Sitework / Demolition	A - Substructure	1 - Substructure	$1,689,783	$1,689,783	$1,671,214
2 - Building Shell			**$12,974,402**	**$12,974,402**	**$12,831,826**
2 - Building Shell	B - Shell	2 - Superstructure	$12,974,402	$12,974,402	$12,831,826
3 - Building Fit-out			**$1,222,222**	**$2,444,444**	**$0**
3 - Building Fit-out	C - Interiors	3 - Internal Finishes	$1,222,222	$2,444,444	$0
4 - Building Services			**$19,843,418**	**$19,843,418**	**$19,625,359**
4 - Building Services	D - Services	5 - Services	$19,843,418	$19,843,418	$19,625,359
5 - Process Services			**$3,300,810**	**$3,300,810**	**$3,264,538**
5 - Process Services	D - Services	5 - Services	$3,300,810	$3,300,810	$3,264,538
2 - Other Direct Costs			**$32,611,716**	**$32,611,716**	**$32,386,312**
10 - IS / IT			**$12,100,000**	**$12,100,000**	**$12,100,000**
10 - IS / IT	E - Equipment / Furnishings	4 - Fittings, Furnishings and Equipment	$12,100,000	$12,100,000	$12,100,000
6 - Process Equipment			**$13,298,663**	**$13,298,663**	**$13,152,524**
6 - Process Equipment	E - Equipment / Furnishings	4 - Fittings, Furnishings and Equipment	$13,298,663	$13,298,663	$13,152,524
7 - General Conditions & Permits			**$3,546,387**	**$3,546,387**	**$3,507,415**
7 - General Conditions & Permits	F - Special Construction / Demolition	0 - Facilitating Works	$3,546,387	$3,546,387	$3,507,415
9 - Benchtop Laboratory Equipment			**$3,666,667**	**$3,666,667**	**$3,626,374**
9 - Benchtop Laboratory Equipment	E - Equipment / Furnishings	4 - Fittings, Furnishings and Equipment	$3,666,667	$3,666,667	$3,626,374
IND - Indirect Costs			**$48,194,445**	**$48,194,445**	**$47,664,836**
11 - Other Indirect Costs			**$48,194,445**	**$48,194,445**	**$47,664,836**

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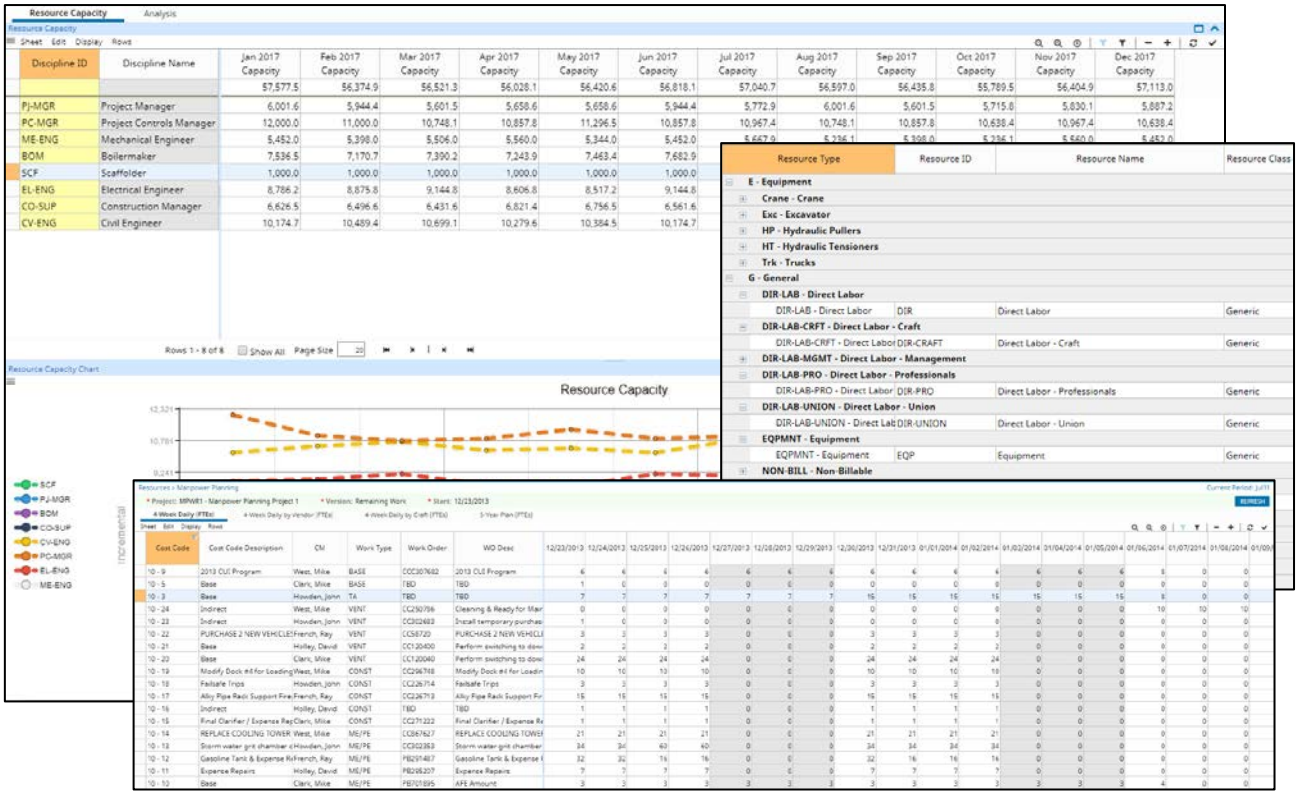
Pillars of Predictability – People, Processes, Technology

Portfolio Management – Financial / Resource Optimization – Capacity Planning



- Create resource capacity plans by named resource, role or discipline
- Define resource attributes such as business group, manager, etc. to support communication and enterprise level utilization
- Set thresholds and tolerance levels for over/under utilization

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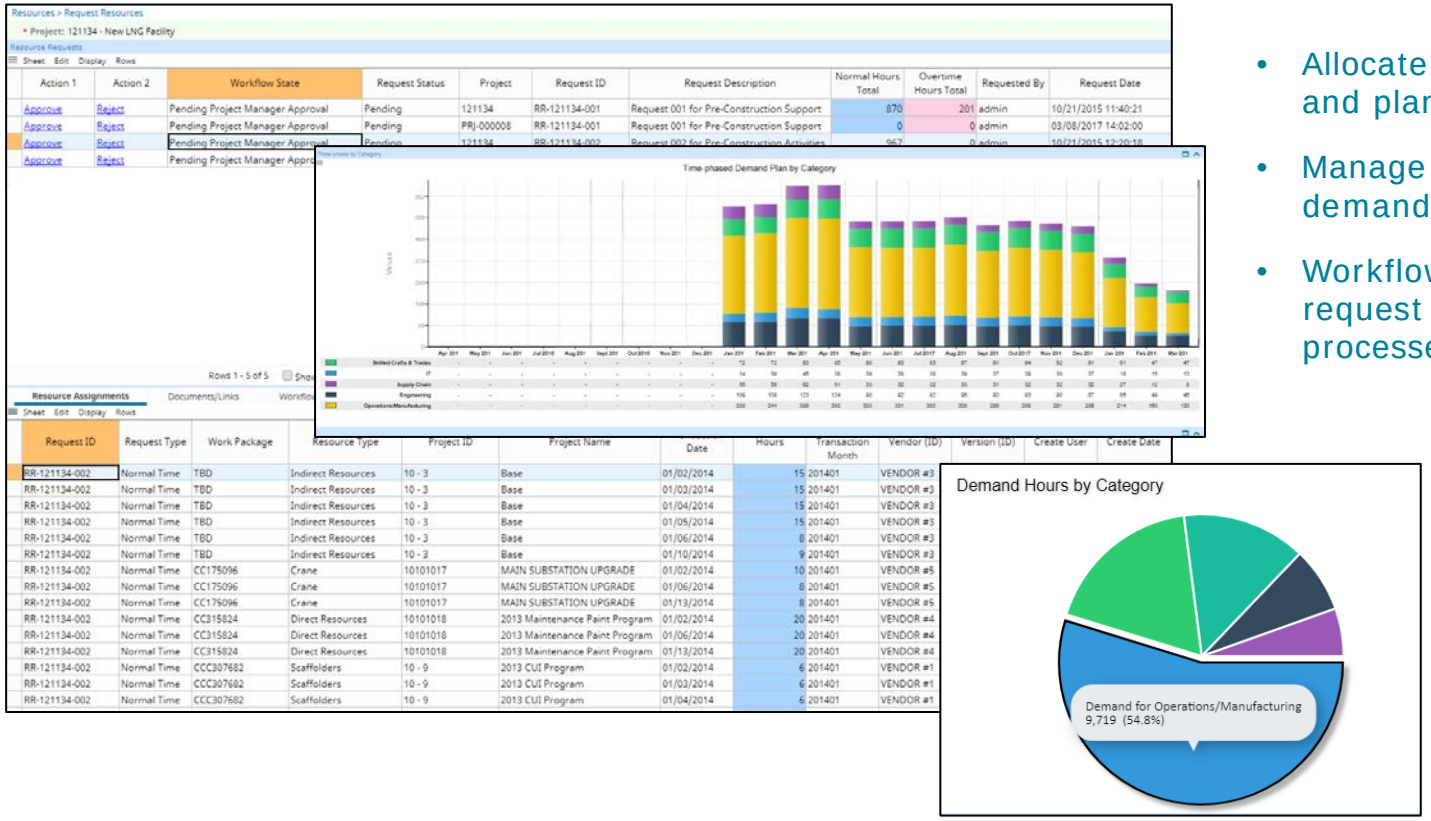
Portfolio Management – Financial / Resource Optimization – Demand Planning



- Allocate resources for approved and planned projects
- Manage project resource demand requests
- Workflow driven resource request review and approval processes

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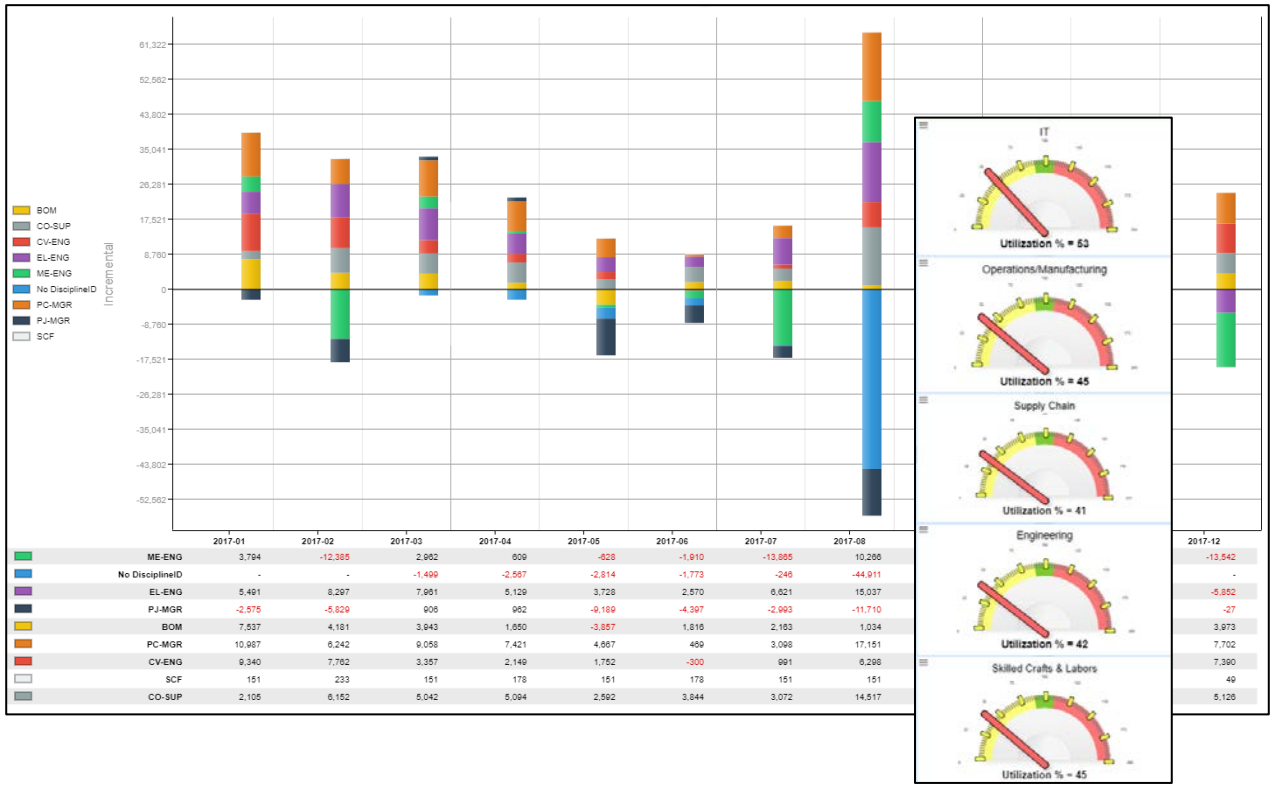
Portfolio Management – Financial / Resource Optimization – Availability Balancing



- Determine resource capacity to meet business and project demands
- Quickly identify resource over and under utilization
- Manage short and long term resource plans to match demand
- Analyze resource availability in accordance with different capacity planning strategies

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Project and Contract Management

Iterative Planning / Estimating	• As the project develops, ensure multiple estimates • Estimate methods and level of detail should align with the evolving plan
Integrated Communication and Collaboration	• Communications must be integrated with the embedded workflow processes to avoid disjoint and surprise • Real-time automated notifications and alerts based on standard KPIs and performance thresholds
Integrated Change Management Workflow	• Mandate that change be managed via a comprehensive workflow with automated impacts on forecast • Adopt standard reasons and types for Change and Forecast Variance
Integrated Risk / Issues Management	• Proactively manage risks and issues in one system • Integrate or provide real-time visibility into all sources of potential change to ensure nothing gets missed
Integrated Claims Management	• With integrated risk, issue and change management, many claims can be avoided • Unavoidable claims should be tracked electronically with auditable workflow

Enterprise Standards **Enterprise Productivity Platform** **Flexible Setup** **Real-Time Analytics**

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Project and Contract Management – Software Examples

- Change management tracking with workflow
- Risk register and analysis

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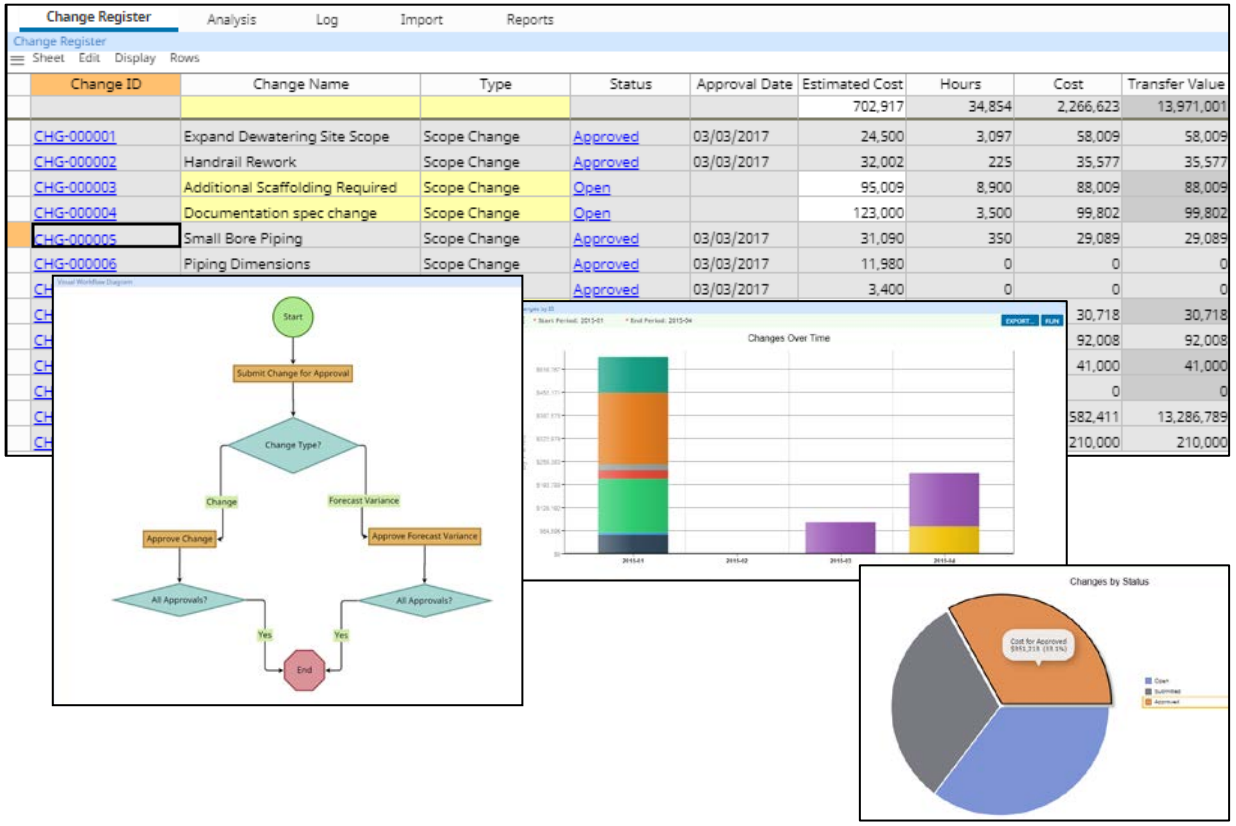
Project and Contract Management – Integrated Change Management Workflow



- Define change categories and types to support trend analysis and benchmarking
- Manage workflow driven change approvals
- Use EcoSys Visual workflow to create simple and complex management processes
- Maintain audit trail between risks, issues and changes
- Perform what-if scenarios to understand potential change impacts

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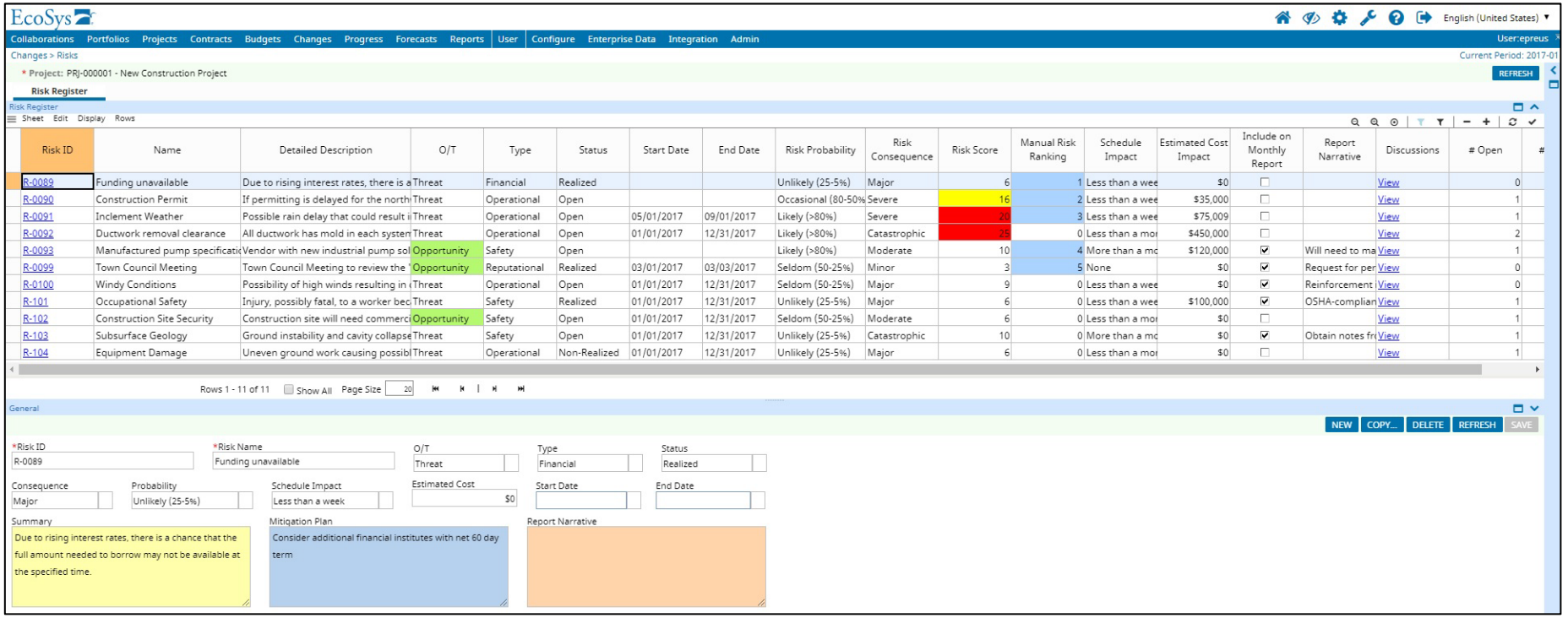
Pillars of Predictability – People, Processes, Technology

Project and Contract Management – Integrated Risk / Issue Management



Risk ID	Name	Detailed Description	O/T	Type	Status	Start Date	End Date	Risk Probability	Risk Consequence	Risk Score	Manual Risk Ranking	Schedule Impact	Estimated Cost Impact	Include on Monthly Report	Report Narrative	Discussions	# Open
R-0089	Funding unavailable	Due to rising interest rates, there is a	Threat	Financial	Realized			Unlikely (25-5%)	Major	6	1	Less than a wee	$0	☐		View	0
R-0090	Construction Permit	If permitting is delayed for the north	Threat	Operational	Open			Occasional (80-50%	Severe	16	2	Less than a wee	$35,000	☐		View	1
R-0091	Inclement Weather	Possible rain delay that could result i	Threat	Operational	Open	05/01/2017	09/01/2017	Likely (>80%)	Severe	20	3	Less than a wee	$75,009	☐		View	1
R-0092	Ductwork removal clearance	All ductwork has mold in each systen	Threat	Operational	Open	01/01/2017	12/31/2017	Likely (>80%)	Catastrophic	25	0	Less than a mor	$450,000	☐		View	2
R-0093	Manufactured pump specificatic	Vendor with new industrial pump sol	Opportunity	Safety	Open			Likely (>80%)	Moderate	10	4	More than a mo	$120,000	☑	Will need to ma	View	1
R-0099	Town Council Meeting	Town Council Meeting to review the '	Opportunity	Reputational	Realized	03/01/2017	03/03/2017	Seldom (50-25%)	Minor	3	5	None	$0	☑	Request for per	View	0
R-0100	Windy Conditions	Possibility of high winds resulting in (	Threat	Operational	Open	01/01/2017	12/31/2017	Seldom (50-25%)	Major	9	0	Less than a wee	$0	☑	Reinforcement	View	0
R-101	Occupational Safety	Injury, possibly fatal, to a worker bec	Threat	Safety	Realized	01/01/2017	12/31/2017	Unlikely (25-5%)	Major	6	0	Less than a wee	$100,000	☑	OSHA-complian	View	1
R-102	Construction Site Security	Construction site will need commerci	Opportunity	Safety	Open	01/01/2017	12/31/2017	Seldom (50-25%)	Moderate	6	0	Less than a mor	$0	☐		View	1
R-103	Subsurface Geology	Ground instability and cavity collapse	Threat	Safety	Open	01/01/2017	12/31/2017	Unlikely (25-5%)	Catastrophic	10	0	More than a mo	$0	☑	Obtain notes fr	View	1
R-104	Equipment Damage	Uneven ground work causing possibl	Threat	Operational	Non-Realized	01/01/2017	12/31/2017	Unlikely (25-5%)	Major	6	0	Less than a mor	$0	☐		View	1

Pillars of Predictability – People, Processes, Technology

Project and Contract Controls

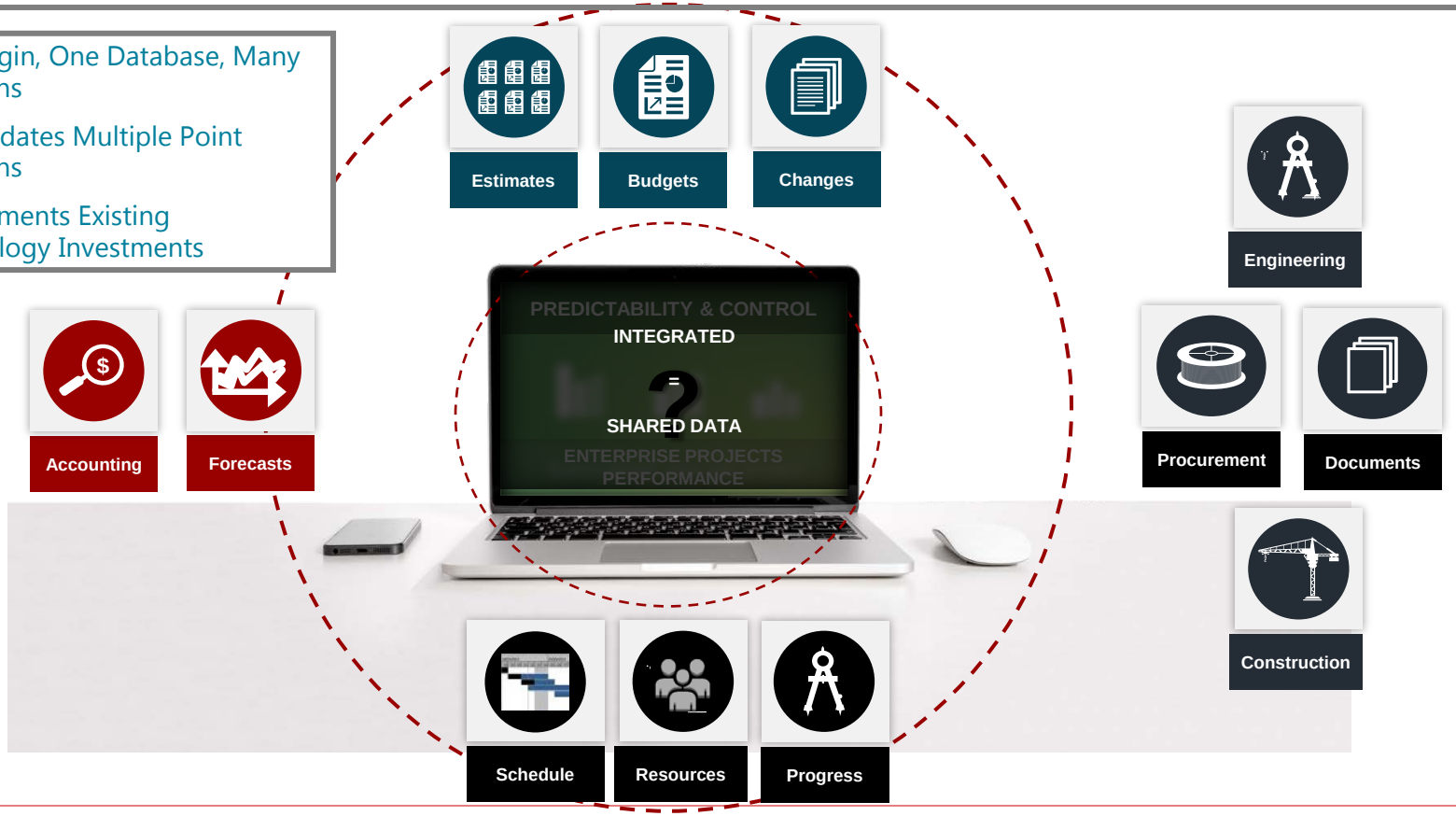
Native and Automated Integration	• Automating ERP integration provides near real-time visibility into procurement and accounting data • Semi-automated, on demand Schedule integration allows Project Managers to drive timely updates
Multi-Method Cash Flow Management	• Forecast cash flows separate of the performance baseline, based on similar or dissimilar methods and sources • Align with treasury policies and practices to maximize value
Currency Variance Analysis	• Highlight the value of analyzing currency variance “above the line” • Automate CVA by combining fixed and variable exchange rates from dynamic tables or from the ERP
Secure End-to-End Transparency	• Build a secure, role-based user experience to provide appropriate access to any information • Take a “why-so” approach to business intelligence, providing intuitive drill down into root causes of trends
Timely Reporting and Communications	• Leverage automation, standards and proactive alerts to deliver timely analytics the business can depend upon • Provide ample time and information to support corrective action

Enterprise Standards **Enterprise Productivity Platform** **Flexible Setup** **Real-Time Analytics**

Pillars of Predictability – People, Processes, Technology

Project and Contract Controls – Native and Automated Integration

- One Login, One Database, Many Solutions
- Consolidates Multiple Point Solutions
- Compliments Existing Technology Investments



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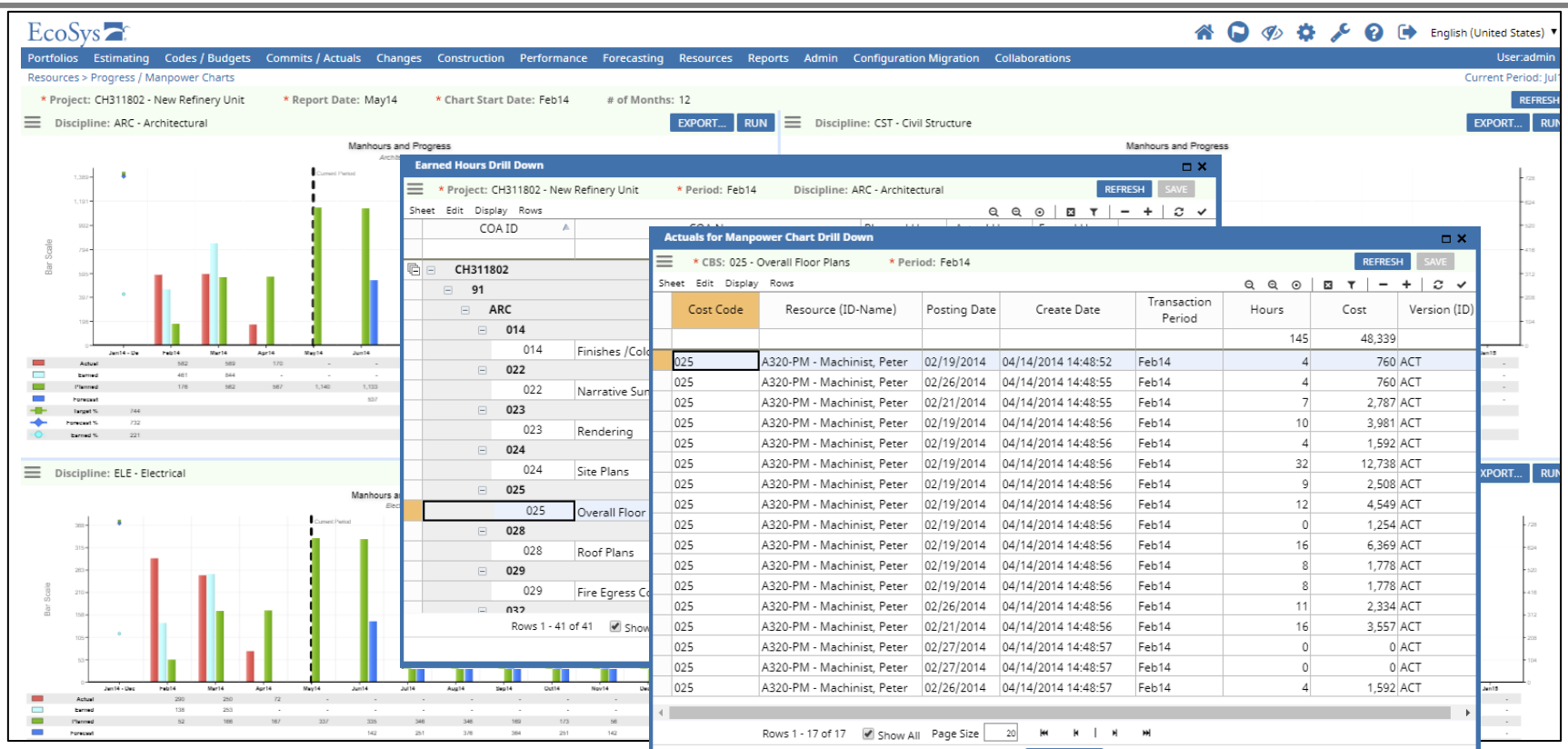
Pillars of Predictability – People, Processes, Technology

Project and Contract Controls – Software Examples

- Top to bottom visibility, throughout the lifecycle
- Why-so analysis enabled by flexible drill down

Pillars of Predictability – People, Processes, Technology

Project and Contract Controls – Secure End-To-End Transparency



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Pillars of Predictability – People, Processes, Technology

Performance Management

Time-Phased Performance Baselines	• Forecast PB separate of the cash/cost flows, based on similar or dissimilar methods and sources
Multi-Method Progress Measurement	• Map multiple sources of progress, fully- and semi-automate imports on a reliable schedule • Provide real-time access to those sources
Productivity Analysis and Trending	• Collate the right metrics and deliver to the users/stakeholders at the right time • Build role-based dashboards
The "Living Forecast"	• Avoid the monolithic "just in time" forecasting methods of the past • Support transactional forecast adjustments as and when business processes are executed
Multi-Method Forecasting	• Don't limit forecast calculations to one or few EAC/ETC calculations, provide many based on available data • Empower PM/PC end users to select the most appropriate methods, with real-time access to underlying data

Enterprise Standards **Enterprise Productivity Platform** **Flexible Setup** **Real-Time Analytics**

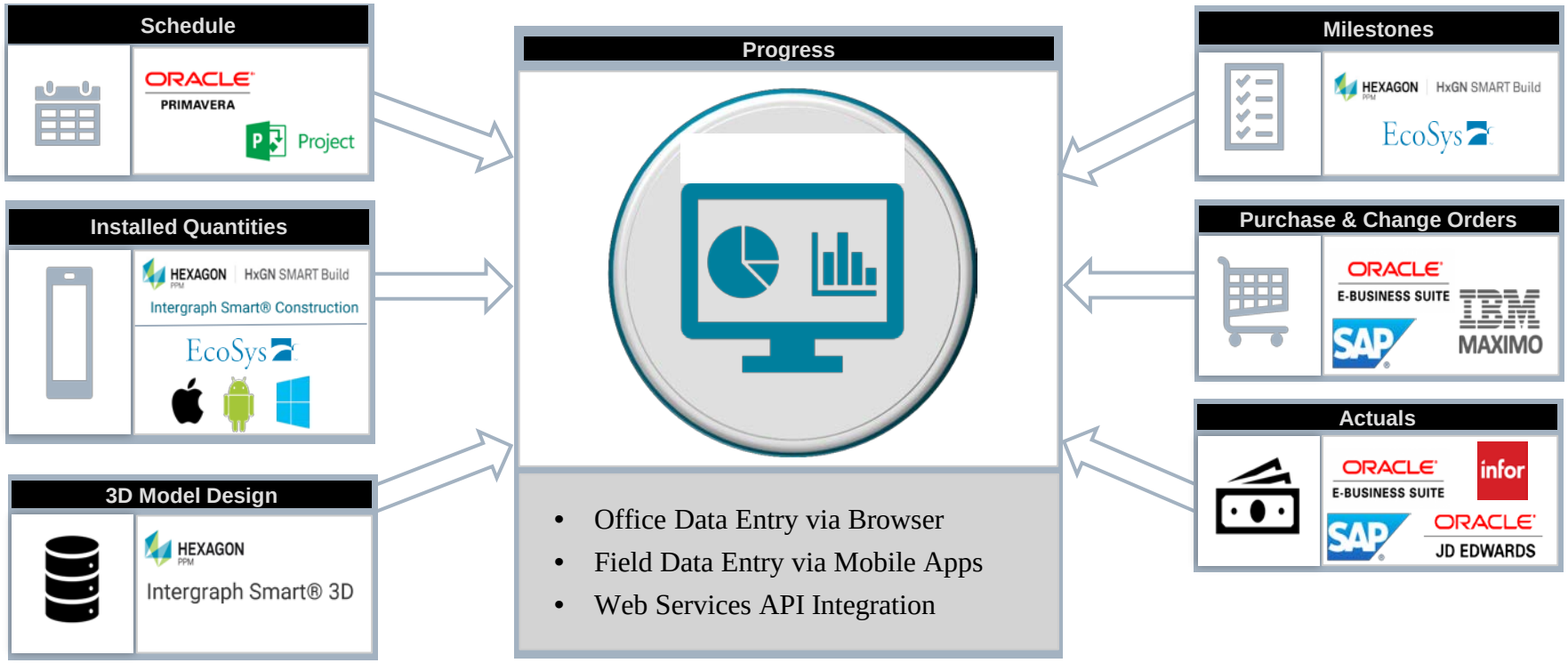
Pillars of Predictability – People, Processes, Technology

Performance Management – Software Examples

- Multi-method and multi-source progress measurement
- Fully integrated multi-method forecasting

Pillars of Predictability – People, Processes, Technology

Performance Management – Multi-Source Progress Measurement (Data Sources)



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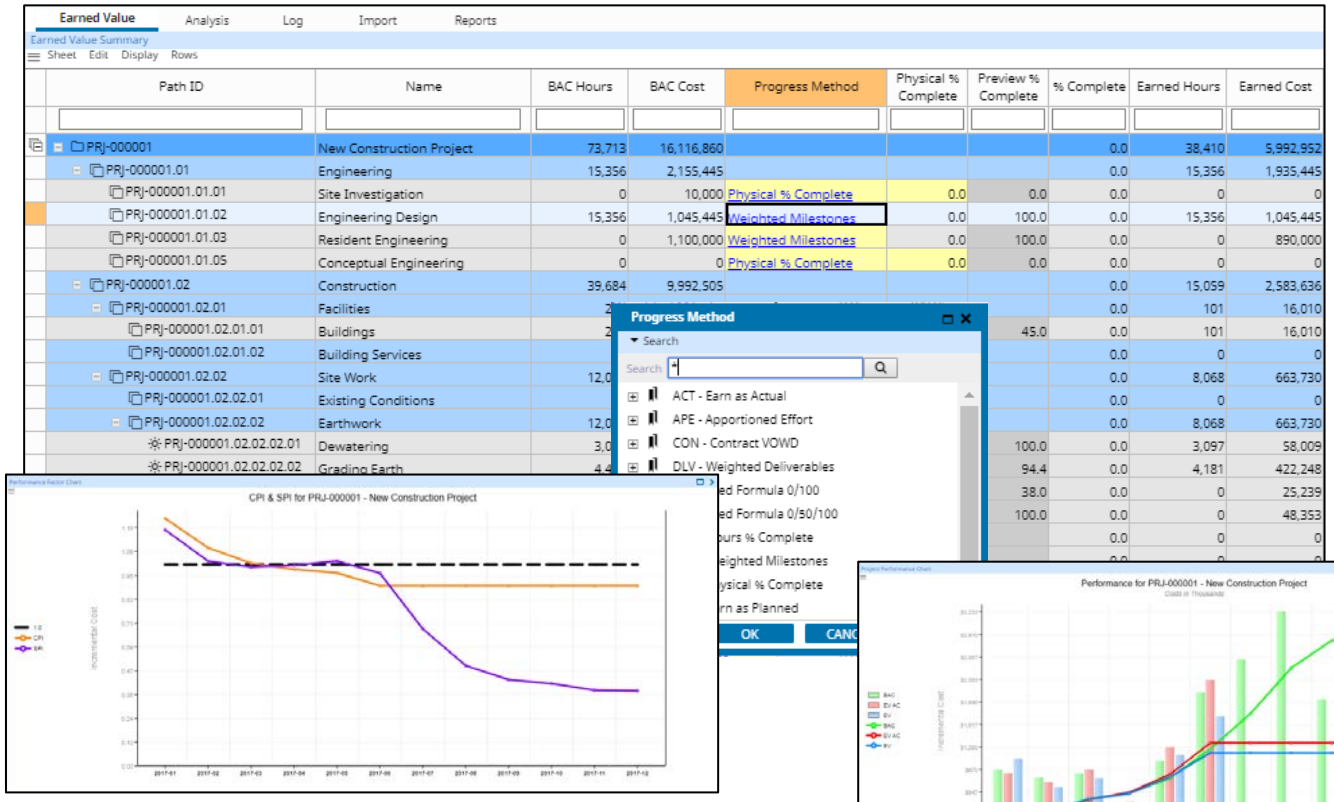
Performance Management – Multi-Method Progress Measurement



- Apply deliverable specific progress measurement methods
- Use physical complete to calculate Earned Value based on BAC Cost and Hours
- Compare progress against historical project benchmarks
- Derive progress from multiple data sources

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Pillars of Predictability – Metrics and Culture

Predictability Measurement

Predictability Indices	• Adopt CII's Predictability Index to provide visibility into forecast update timeliness
Incentives Based on Predictability	• Use the Predictability Index to tie performance incentives to forecasting timeliness, not just outcome variance
Multi-Dimensional Analysis	• Aggregate Predictability by multiple dimensions to help pinpoint institutional issues
Corrective Actions	• Track corrective actions taken as a result of forecasting and predictability analysis
Continuous Improvement	• Review past performance during future lessons learned exercises and in early stages of future projects

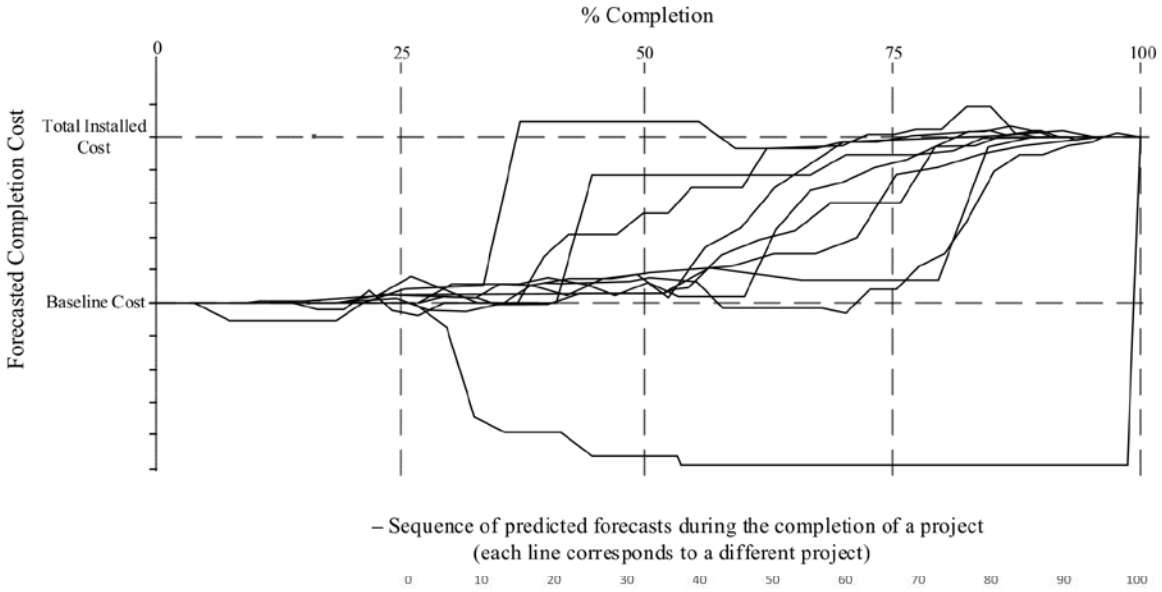
Enterprise Standards **Enterprise Productivity Platform** **Flexible Setup** **Real-Time Analytics**

Pillars of Predictability – Metrics and Culture

Predictability Measurement – Predictability Indices

Normalized Cost Timeliness (**NCT**) = Inverse Area Under Line

Cost Predictability (**CP**) = NCT x % Cost Deviation



NCT & CP available in EcoSys 8.3

- Immediate benefits to EcoSys customers:
  - Applies to all existing projects in EcoSys
  - Provides view into predictability over time, by division, region, etc.
  - Identifies areas for improvement

- Source of ROI measurement:
  - Has predictability improved since implementing EcoSys?
  - Has improved predictability resulted in reduced cost/schedule variance?

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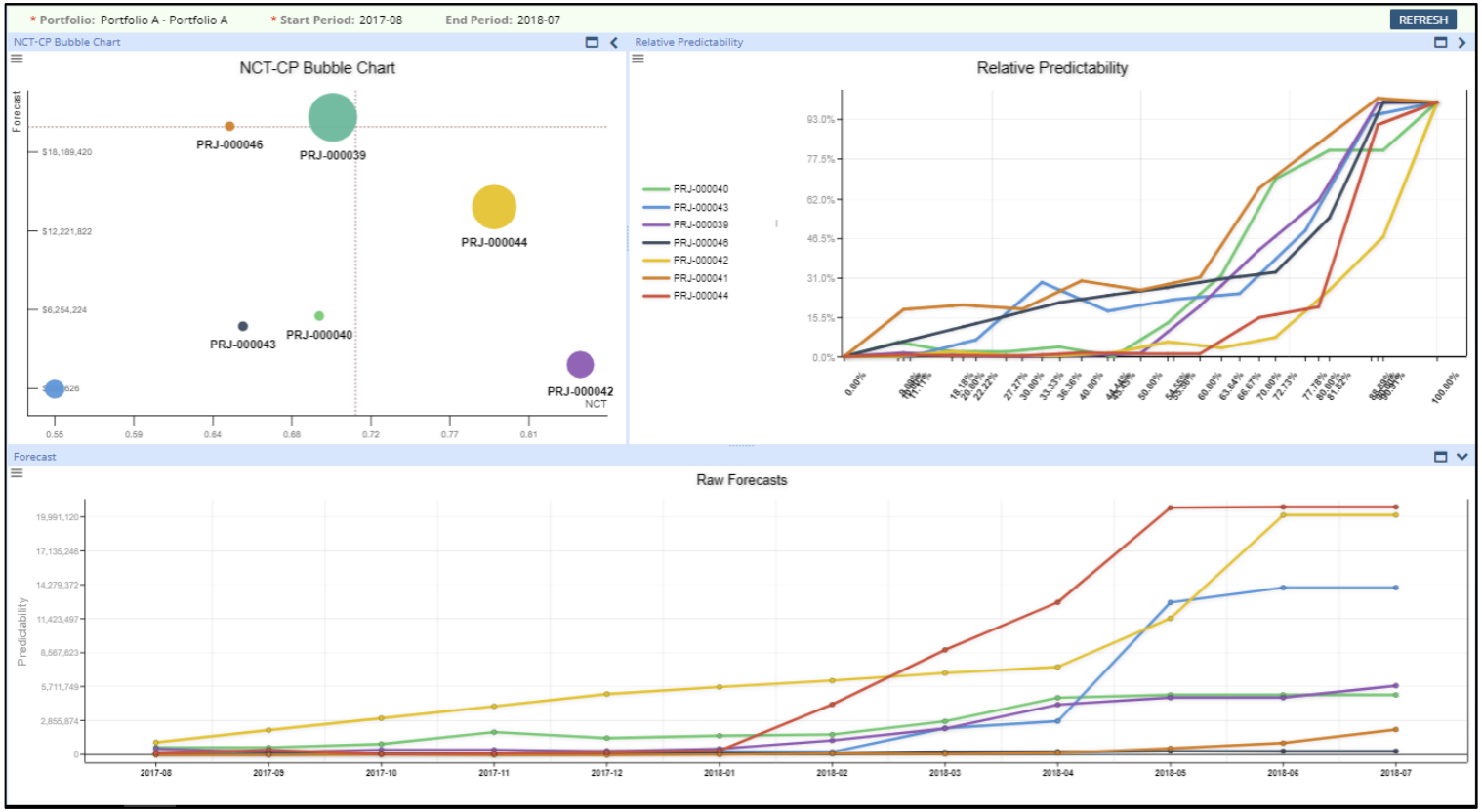
Pillars of Predictability – Metrics and Culture

Predictability Measurement – Predictability Indices



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Pillars of Predictability – Metrics and Culture

Predictability Measurement – Predictability Indices

- CII RT 291 measured 135 projects, totaling USD $28.8BN
- From this they established a benchmark for Predictability

Table 6. Cost Predictability Threshold Values

	Cost predictability	
Cost performance	Minimum	Maximum
Very good	0	3.5
Good	>3.5	7.8
Poor	>7.8	15.2
Very poor	>15.2	None

Pillars of Predictability – Metrics and Culture

Predictability Measurement – Predictability Indices

- To focus on systemic issues (internal to the nature of the project), metrics should be normalized for:
  - Escalation
  - Capacity and product changes (owner changes)
  - Regulatory changes
  - Unforeseeable risk events
- This ensures project teams are not penalized for issues outside of their control
- RT 291 did not separate issues outside the control of the project team, so new benchmarks are necessary

Pillars of Predictability – Metrics and Culture

Predictability Measurement – Incentives Based On Predictability

- **Direct Incentives –** project bonuses tied to:
  - Budget, schedule, quality, safety
  - AND Predictable delivery

- **Indirect Incentives –** career paths tied to:
  - High predictability
  - Implies reliability, diligence, integrity and competence

Benefits of High Predictability

Proactive / Corrective Decision-Making

- Early warnings of overruns stimulates corrective action:
  - Value engineering
  - De-scoping
  - Modifying the business case
  - Killing the project

Management Confidence / Trust

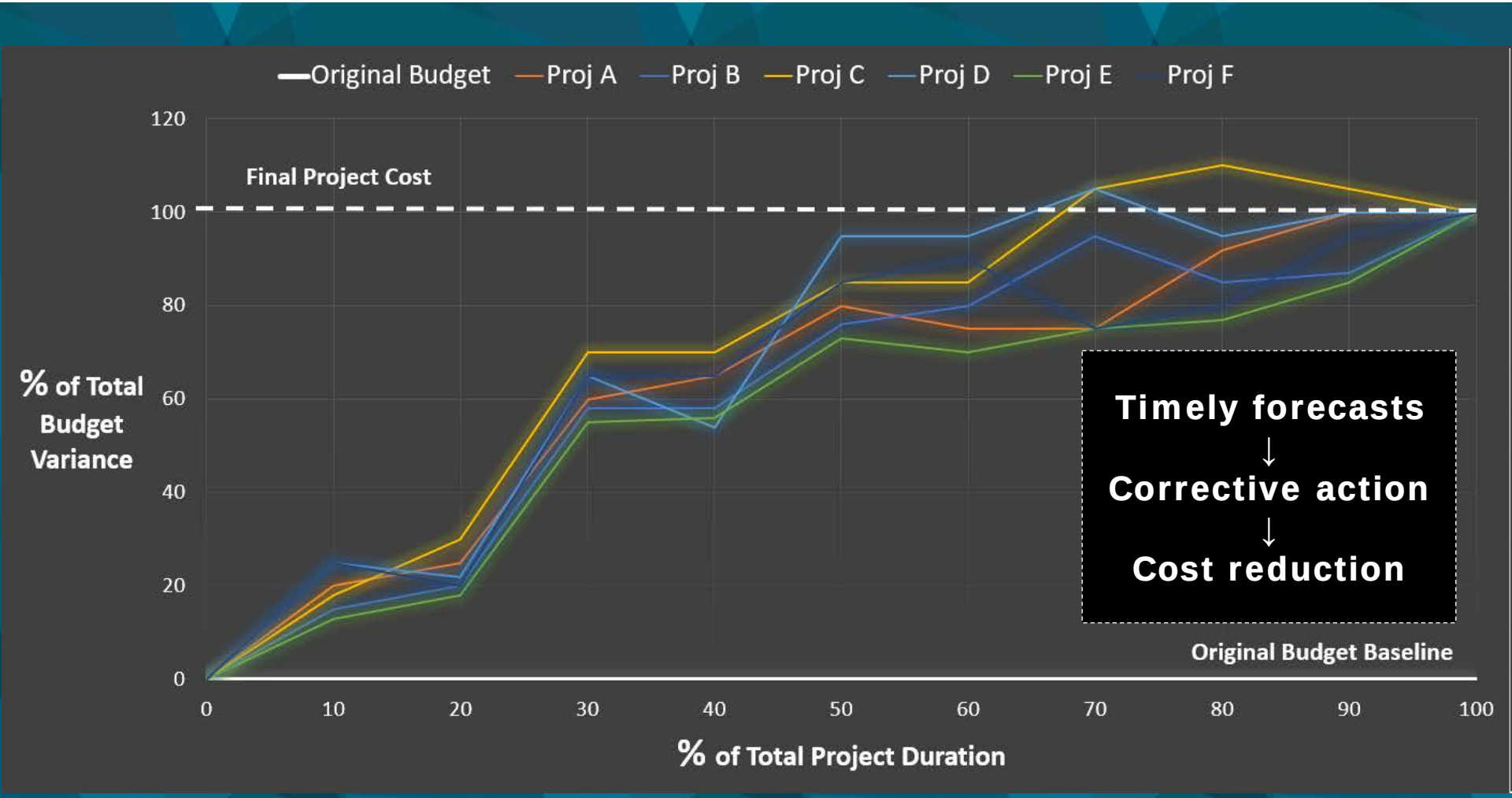
- Increased likelihood of retention / promotion
- Award of future projects

Cost and Schedule Reduction

- Early corrective action or scrutiny can and should reduce overall cost and schedule
- Avoids opportunity cost

Heightened Capital Efficiency

- Optimized ROCE and fiscal year performance
- Avoids finance charges due to poor cash management and surprises



Pillars of Predictability – People, Processes, Technology

Portfolio Management	Project and Contract Management	Project and Contract Controls	Performance Management	Predictability Measurement
Opportunity Scoring / Ranking	Iterative Planning / Estimating	Native and Automated Integration	Time-Phased Performance Baselines	Predictability Indices
Options Analysis	Integrated Communication and Collaboration	Multi-Method Cash Flow Management	Multi-Method Progress Measurement	Incentives Based on Predictability
Concept Estimating / Benchmarking	Integrated Change Management Workflow	Currency Variance Analysis	Productivity Analysis and Trending	Multi-Dimensional Analysis
Financial / Resource Optimization	Integrated Risk / Issues Management	Secure End-to-End Transparency	The “Living Forecast”	Corrective Actions
Project Development Stage Gate Workflows	Integrated Claims Management	Timely Reporting and Communications	Multi-Method Forecasting	Continuous Improvement

Enterprise Standards **Enterprise Productivity Platform** **Flexible Setup** **Real-Time Analytics**

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What if predictability was included as bid qualification criteria?

Are Predictability Metrics too powerful and revealing to adopt?

Should we lead or be led in adopting Predictability Metrics?

Using Past Predictability with Predictive Analytics

Predictability is a backward looking metric…

We can turn it into a Predictive Analytic by applying Artificial Intelligence to:

1. Big Data Benchmarks of Predictability Index and other metrics
2. Standard parameters and attributes (e.g. RT 291, PDRI, ICMS)
3. Risk and issues
4. Unstructured Status Information
5. Other data sets (e.g. team competence assessment

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Conclusions

- World-Class Enterprise Projects Performance can only be achieved by:

Adopting ALL of the Pillars of Predictability, enabled by an Enterprise technology platform

↓

Combines out-of-the-box best practices with customer-centric data and business processes

↓

Automate integration and predictability analytics

↓

Promote transparent, proactive behaviors

Q&A

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Thank you!

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