

# TOP CHALLENGES OF COST ESTIMATING TEAMS – EMPOWERING SMES WITH BEST PRACTICES AND DATA

# **ProjStream**

## ProjStream – Who We Are

- 50+ years of combined industry experience
- Experts who love to help our users achieve greater growth and efficiency
- We can't wait to help yours do the same!



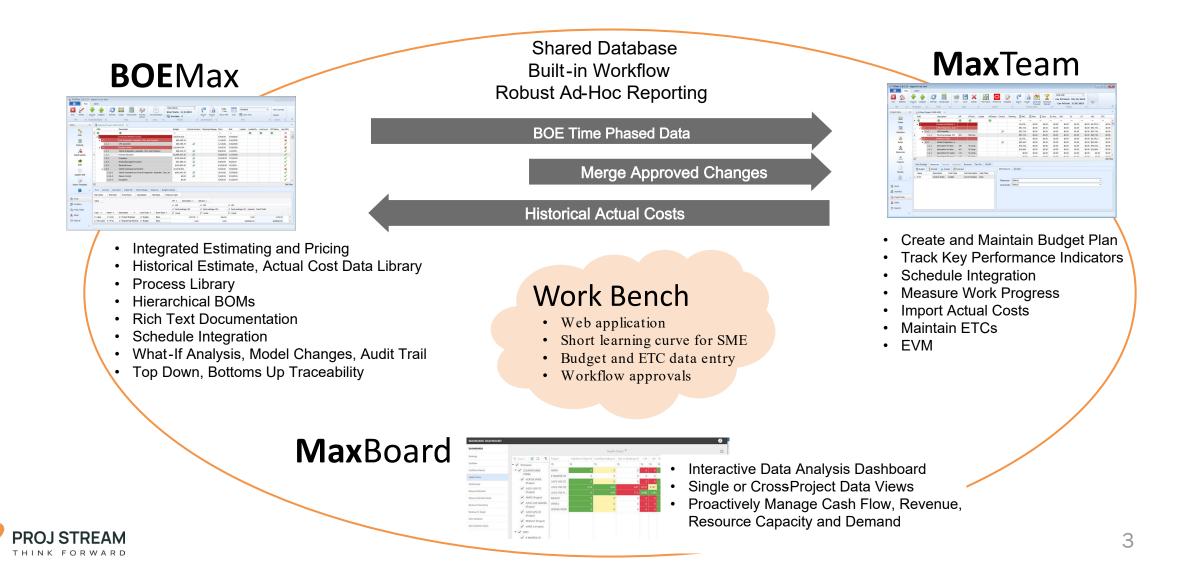


NASA





# Project Life Cycle (PLC) Solution





### Welcome

- 45-minute talk and an interactive Q&A session to complete the hour
- Put any questions you have in chat and join in on the poll
- Stay for the Q&A session at the end

## Your Speakers Today

- Chuck Kurtz—Director of Pricing, BAE Systems
- Tom Shanahan—President and CEO, ProjStream



# **Top Challenges to Address**

Scattered Historical Records – We Don't Have Access to our Data

Lack Of Standardization in Work Products

Variations in SME Risk Assumptions Cause Uncertainty

Tracking Change is Difficult and Takes Too Long

Mystifying Estimate Rationale



# **Best Practices**

Make Data Accessible and Reusable

Provide a Reusable, Repeatable Task Level BOE

Standardize on BOE Attributes, Establish Feedback Loops

Automate Change Tracking

Standardize and Train on Rationale Process



# **<u>1. Scattered Historical Records – We Don't Have</u>** <u>Access to our Data</u>

•Our data storage is scattered, and important records are difficult to find, if not lost completely.

- Cost (Hours, Material Cost, Quantities)
- Technical Requirements, Physical System Characteristics
- Programmatic program parameters that can drive cost
- Schedule Time-Phased Data (when is first material support gate, etc., when is first lot purchase and lead time, etc.)
- Primary vs. Secondary Data



# **1. BP – Make Data Accessible and Reusable**

Adopt a method to store data that SMEs can query and access at their fingertips. Make it as easy as possible to translate historical data into data that can be used on the estimate along with complexity factors and rationale.

- Confidence in the cost-realism of your project estimates because you leverage accurate historical data.
- Primary Data is most defensible, provide this first and foremost.
- Reference Blog https://www.projstream.com/blog/bridging-gap-betweenproject-cost-estimating-cost-management



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| Period Neccessary   |              |        |     |       |       |    |   |      |    |    |     |     |       |             |     | 1  |   |     |      |            |      |   |     | _     |    |      | 50  |    |       |

# **2. Lack Of Standardization in Work Products**

We do repeatable work but don't capture the methodologies or templates and so have to relearn and repeat attributes of an estimate and we have no idea of time to task.



# 2. BP – Provide a Reusable, Repeatable Task Level BOE

Establish a shareable Estimate Component Library and methodology to provide a consistent, repeatable process for fast and accurate estimate building.

• We call this the "process library"



#### Process Library Base Definition of One SRC Unit

| Name           | Description                 | Documentation |   | Resource Role         | Value | Result | Documentation |
|----------------|-----------------------------|---------------|---|-----------------------|-------|--------|---------------|
| RBC            | R B C                       | RBC           | • | NY/NJ Engineer 1      | 31.30 | HOURS  |               |
| 🕀 🥁 Dev Proj X | Dev Proj X                  |               |   | NE Engineer 1         | 25.04 | HOURS  |               |
|                | ENGINE                      |               |   | NE Quality Engineer 1 | 6.26  | HOURS  |               |
| - ENGINE UNIT  | ENGINE UNIT                 |               |   |                       |       |        |               |
| - 🗌 LRC        | Line Replaceable Components |               |   |                       |       |        |               |
| SRC            | Shop Replaceable Compone    |               |   |                       |       |        |               |

Estimators

Library

Apply Process

## Process Library

| dect         Task         Description         Start Date         End Date         Spread         Productivity Factor         Quantity         WBS           Process: Concrete  |  | -)   |                  |                |            |                   |                     |                     |          | iter text to search |   | Find |
|--|--|--|------------------|----------------|------------|-------------------|---------------------|---------------------|----------|---------------------|---|------|
| Process: Concrete         Process: ENGINE         ■ ENGINE UNIT       ENGINE UNIT         ■ ENGINE UNIT       ENGINE Compon         ■ Incc       Linear         ■ SRC       Shop Replaceable Compon         Shop Replaceable Compon       Linear         ■ SRC       Shop Replaceable Compon         Shop Replaceable Compon       B/28/2014         Linear       4.00         Task Detal       1.19         Researce       Resource         Select       Role Name       Role Description         M RE Engineer 1       NE Engineer 1       Proving Qty & UOM         M RE Engineer 1       NE Quality Engineer       Resource         M NE Engineer 1       NE Quality Engineer       0.00         M NE Quality Engineer       Result       Quantity         M N/NJ Engineer 1       N/N J Engineer 1       0.00         M N/NJ Engineer 1       N/N J Engineer 1       0.00         M N/NJ Engineer 1       N/N J Engineer 1       0.00         M N/NJ Engineer 1       N/N J Engineer 1       0.00         M N/NJ Engineer 1       N/N J Engineer 1       0.00         M N/NJ Engineer 1       N/N J Engineer 1       0.00         M N/NJ En   | elect  | Task   | Description      | St             | tart Date  | End Date          | Spread              | Productivity Factor | Quantity | WBS                 |   |      |
| Process: EVGINE <ul> <li>ENGINE UNIT</li> <li>ENGINE UNIT</li> <li>ENGINE UNIT</li> <li>Englaceable Compon</li> <li>Algo 2009</li> <li>Algo 2014</li> <li>Linear</li> <li>Linear</li></ul>   | Proces   | ss: Business Manag   | ement            |                |            |                   |                     |                     |          |                     |   |      |
| Process: ENGINE   ■   ■   ENGINE UNIT   ENGINE UNIT   ENGINE UNIT   ENGINE UNIT   ENGINE UNIT   Engine Unit   Engine Enginee   SRC   Shop Replaceable Compon   8/29/2009   6/28/2014   Linear   1.00   Select   Role Description   MHrs Total   Driving Qty & UOM   Productivity Factor   Value   Result   Quantity   Resource   Value   NE Engineer 1   NE Engineer 1   NE Engineer 1   NE Engineer 1   NE Quality Enginee   NE Quality Enginee   NE Quality Engineer 1   NYNJ Engineer 1   |  |  |                  |                |            |                   |                     |                     |          |                     |   |      |
| ■ BNGINE UNIT       ENGINE UNIT       Inear       1.00       [Select]         ■ LRC       Line Replaceable Compon       8/29/2009       8/28/2014       Linear       1.00       [Select]         ■ SRC       Shop Replaceable Compon       8/29/2009       8/28/2014       Linear       1.00       [Select]         ■ SRC       Shop Replaceable Compon       8/29/2009       8/28/2014       Linear       1.00       [Select]         ■ SRC       Shop Replaceable Compon       8/29/2009       8/28/2014       Linear       0       1.00       [Select]         ■ SRC       Shop Replaceable Compon       8/29/2009       8/28/2014       Linear       0       0.00       [1.9         ■ SRC       Shop Replaceable Compon       8/29/2009       8/28/2014       Linear       0       0.00       [1.9         ■ SRC       Select       Role Description       MHrs Total       Driving Qty &UOM       Productivity Factor       Value       Resource       0.00       0.10.3.321         ●        NE Quality Engineer.       NE Quality Engineer.       Ne Quality Engineer.       0       0       0.01       0.00       0.03.323         Process: Efsion       Efsion       Select       Select       Select       Sel  |  | -  |                  |                |            |                   |                     |                     |          |                     |   |      |
| Inc       Line Replaceable Compon       8/29/2009       8/28/2014       Linear       1.00       [Select]         Image: SRC       Shop Replaceable Compon       8/29/2009       8/28/2014       Linear       4.00       1.1.9         Image: Task Detail       Image: Task Detail       Image: Task Detail       Image: Task Detail       Quantity       Resource         Image: Select       Role Name       Role Description       MHrs Total       Driving Qty & UOM       Productivity Factor       Value       Result       Quantity       Resource         Image: Select       Role Name       Role Description       MHrs Total       Driving Qty & UOM       Productivity Factor       Value       Result       Quantity       Resource         Image: Select       NE Engineer 1       NE Engineer 1       NE Engineer 1       Driving Qty & UOM       Productivity Factor       Value       Result       Quantity       20.00       01.03.321         Image: Select       NY/NJ Engineer 1       NY/NJ Engineer 1       Origonal       Image: Select   |  |  |                  |                |            |                   |                     |                     |          |                     |   |      |
| SRC       Shop Replaceable Compon       8/29/2009       8/28/2014       Linear       4.00       1.1.9         Task Detail       Task Detail       International Control Contenter Contenter Control Contenter Control Control Cont   |  |  |                  |                |            |                   |                     |                     |          |                     |   |      |
| Task Detail       Task Detail       Role Name       Role Description       MHrs Total       Driving Qty & UOM       Productivity Factor       Value       Result       Quantity       Resource         Select       Role Name       Role Description       MHrs Total       Driving Qty & UOM       Productivity Factor       Value       Result       Quantity       Resource         Image: Select       NE Engineer 1       NE Engineer 1       NE Engineer 1       NE Quality Enginee       Result       Quantity       Resource       Resource       01.03.321         Image: Select NV/NJ Engineer 1       NY/NJ Engineer 1       NY/NJ Engineer 1       NY/NJ Engineer 1       NY/NJ Engineer 1       Resource       Resource       01.03.324       01.03.323         Process: Engineering       Nrcess: Engineering       Nr/NJ Engineer 1       NY/NJ Enginer 1       <   | _  |  | -                | -              |            |                   |                     |                     |          |                     |   |      |
| Net Role Name       Role Description       MHrs Total       Driving Qty & UOM       Productivity Factor       Value       Result       Quantity       Resource         Image: Select       NE Engineer 1       NE Engineer 1       NE Engineer 1       NE Engineer 1       Image: Select       Image: Sel  |  |  | Shop Replace     | able Compon 8/ | /29/2009   | 8/28/2014         | Linear              |                     |          | 4.00 1.1.9          |   |      |
| Image: Mark Segineer 1         NE Engineer 1         NE Quality Enginee         Description         Descripion         Description         Description <td></td> <td>-</td> <td></td>  |  |  |                  |                |            |                   |                     |                     |          |                     | - |      |
| Image: NE Quality EngineeNE Quality En   | 9  |  |                  | -              | MHrs Total | Driving Qty & UOM | Productivity Factor |                     |          |                     |   |      |
| Image: Wr/NJ Engineer 1 NY/NJ Engineer 1     Process: Engineering   Process: ESG   Process: Hydrostatic Core Assy   Process: New Process Process: Operating System   |  |  | -                | -              |            |                   |                     |                     |          |                     |   |      |
| Process: Engineering           Process: ESG           Process: Hydrostatic Core Assy           Process: New Process           Process: Operating System  |  |  |                  |                |            |                   |                     |                     |          |                     |   |      |
| Process: ESG         Process: Hydrostatic Core Assy         Process: New Process         Process: Operating System   |  |  |                  |                |            |                   |                     |                     |          |                     |   |      |
| Process: Hydrostatic Core Assy Process New Process Pro |  |  | NT/NJ Engineer 1 |                |            |                   |                     |                     |          |                     |   |      |
| Process: New Process Process: Operating System   |  | ss: Engineering  |                  | ,              |            |                   | ·                   |                     |          |                     |   |      |
| Process: Operating System  | Proces   | ss: Engineering  |                  |                |            |                   | ·                   |                     |          |                     |   |      |
|  | Proces   | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Core   |                  |                |            |                   |                     |                     |          |                     |   |      |
| · •  | E Proces<br>E Proces<br>E Proces   | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Cord<br>ss: New Process  | e Assy           |                |            |                   |                     |                     |          |                     |   |      |
|  | Proces<br>Proces<br>Proces<br>Proces   | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Corr<br>ss: New Process<br>ss: Operating Syste                       | e Assy           |                |            |                   |                     |                     |          |                     |   |      |
|  | E Proces<br>E Proces<br>E Proces<br>E Proces   | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Corr<br>ss: New Process<br>ss: Operating Syste                       | e Assy           |                |            |                   |                     |                     |          |                     |   |      |
|  | <ul> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> </ul>                                 | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Corr<br>ss: New Process<br>ss: Operating Syste                       | e Assy           |                |            |                   |                     |                     |          |                     |   |      |
|  | <ul> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> </ul>                                 | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Corr<br>ss: New Process<br>ss: Operating Syste                       | e Assy           |                |            |                   |                     |                     |          |                     |   |      |
|  | <ul> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> </ul>                                 | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Corr<br>ss: New Process<br>ss: Operating Syste                       | e Assy           |                |            |                   |                     |                     |          |                     |   |      |
|  | <ul> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> </ul> | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Corr<br>ss: New Process<br>ss: Operating Syste<br>ss: Turbine Design | e Assy<br>m      |                |            |                   |                     |                     |          |                     |   |      |
|  | Proces     Proces     Proces     Proces     Proces     Proces     Proces     Proces  | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Corr<br>ss: New Process<br>ss: Operating Syste<br>ss: Turbine Design | e Assy<br>m      |                |            |                   |                     |                     |          |                     |   |      |
|  | <ul> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> <li>Proces</li> </ul>                                 | ss: Engineering<br>ss: ESG<br>ss: Hydrostatic Corr<br>ss: New Process<br>ss: Operating Syste<br>ss: Turbine Design | e Assy<br>m      | Specify Freq/D |            |                   |                     |                     |          |                     |   |      |

PROJ STREAM THINK FORWARD

# 3. Variations in SME Risk Assumptions Cause Uncertainty

We have no learning mechanism or insight into knowledge sharing so uncertainty leads to excessive padding. SMEs do not trust our estimating tools and assume too much risk or too much opportunity.



Define all the appropriate attributes of a quality BOE, for example, what specific labor and non-labor resources go into the estimate, standardize the rationalization and make it part of the process library to create time to task and rationale information. If there are no data or cost drivers to an estimate, consider a 3-point estimate approach.



### <u>3. BP II – Establish Feedback Loop</u>

Reference and leverage relatively current performance data against the tasks homogeneously to normalize that data and update the process library templates.

- Eliminate subjectivity by taking personalities out of the equation vis-à-vis risk-aversion
- Include peer review capability and a process to identify correlations
- Documentation and previous work look-up for insight and history to capture the learnings



### 4. Tracking Change is Difficult and Takes Too Long

We cannot create high-quality estimate scenarios or capture changes. No capacity to see alternatives due to the lack of an automated process to generate scenarios.



# 4. BP – Automate Change Tracking

- Implement a platform with the ability to perform what-if modeling.
- Create a procedure to capture and report changes to the estimate.

|              | 0.000.     | 0110012071100201101010202011    | 20,010.70     | 30,733.13     |
|--------------|------------|---------------------------------|---------------|---------------|
|              |            | 01.03.210 PROJECT ENGINEERING   | 54,448.39     | 58,762.40     |
|              |            | 01.03.220 DRAFTING              | 11,847.65     | 12,786.36     |
|              |            | 01.03.230 AERONAUTICAL ENGINEER | 849,665.21    | 868,439.30    |
|              |            | 01.03.240 MECHANICAL ENGINEER   |               | 1,410,297.72  |
|              | COST Total | ·                               | 944,480.94    | 2,381,084.93  |
| 🖃 102 Test T | COST       | 01.03.107 PROJECT MANAGEMENT    | 2,639,919.71  | 2,661,307.83  |
|              |            | 01.03.210 PROJECT ENGINEERING   | 2,175,881.94  | 4,607,954.53  |
|              |            | 01.03.220 DRAFTING              | 473,459.22    | 492,638.60    |
|              |            | 01.03.240 MECHANICAL ENGINEER   | 13,599.26     | 52,885.73     |
|              |            | 01.03.250 SOFTWARE ENGINEER     |               | 454,267.81    |
|              | COST Total | •                               | 5,302,860.13  | 8,269,054.50  |
| 🖃 103 Turbin | COST       | 01.00.910 DIRECT MATERIAL       | 57,023,662.07 | 62,726,028.28 |
| 🖃 171 Energy | COST       | 01.00.910 DIRECT MATERIAL       | 9,610,496.54  | 10,571,546.19 |
|              |            | 01.03.107 PROJECT MANAGEMENT    | 2,592,496.00  | 2,851,745.60  |
|              |            | 01.03.210 PROJECT ENGINEERING   | 4,273,588.47  | 4,700,947.32  |
|              |            | 01.03.220 DRAFTING              | 929,907.93    | 1,022,898.72  |
|              |            | 01.03.240 MECHANICAL ENGINEER   |               | 1,645,331.56  |
|              |            | 01.03.250 SOFTWARE ENGINEER     |               | 235,047.37    |
|              | COST Total |                                 | 17.406.488.93 | 21.027.516.75 |





# **5. Mystifying Estimate Rationale**

Our SMEs have no supporting rationale or charred methodology on which to base our cost estimates, leading to uncertainty, opacity, and cost margin padding to account for risk at the expense of competitive advantage.



# 5. BP – Standardize and Train on Rationale Process

- Identify, capture, and store the source of the estimated data and the underlying rationale for consistent and repeatable methods to express and format rationale shared by all.
- Establish single source of truth reliability. For example, update the estimate, ensure rationale gets updated accordingly.



# **Standardize the BOE**

| Propulsion         |            |               |                              |  |  |  |  |  |  |  |
|--------------------|------------|---------------|------------------------------|--|--|--|--|--|--|--|
| WBS Number         | 1.1.2      | Status        | In Progress - Functional Mgr |  |  |  |  |  |  |  |
| WBS Title          | Propulsion | SOW Ref       | 3.1.1, 3.1.2                 |  |  |  |  |  |  |  |
| POP Start          | 12/3/2014  | CLIN          | DELIVERY I                   |  |  |  |  |  |  |  |
| POP End            | 8/30/2015  | IPT           | NEWGEN                       |  |  |  |  |  |  |  |
| Preparer           | barterbury | Assumptions   | 1                            |  |  |  |  |  |  |  |
| Functional Manager | cparkhilll | TPM           | 1                            |  |  |  |  |  |  |  |
| Proposal Manager   | jspeer     | Contact Phase | DESIGN                       |  |  |  |  |  |  |  |

|                       | 26DEC2014 | 27MAR2015 | 26JUN2015 | Total    |
|-----------------------|-----------|-----------|-----------|----------|
| AERONAUTICAL ENGINEER | 200.00    | 480.00    | 200.00    | 880.00   |
| MECHANICAL ENGINEER   | 265.45    | 737.71    | 208.18    | 1,211.35 |
| TEST ENG              |           |           | 440.00    | 440.00   |
| Total                 | 465.45    | 1,217.71  | 848.18    | 2,531.35 |

### Work Package or Estimate Level Data WBS Ref 1.1.2 Start Date 12/3/2014 WP Number 101 End Date 3/31/2015 WP Description Design Thrust Vectoring System Estimating Methodology Bottoms Up

|           |                       | 26DEC2014 | 27MAR2015 | 26JUN2015 | Total    |
|-----------|-----------------------|-----------|-----------|-----------|----------|
| 01.03.230 | AERONAUTICAL ENGINEER | 200.00    | 480.00    | 200.00    | 880.00   |
| 01.03.240 | MECHANICAL ENGINEER   | 200.00    | 480.00    | 200.00    | 880.00   |
| Total     |                       | 400.00    | 960.00    | 400.00    | 1,760.00 |

#### BOE ELEMENT DESCRIPTION Design Thrust Vector

#### METHODOLOGY

Subject matter expert judgement is being used here. We are estimating 2 FTE's over a period of 5 months for this design. This is based on level of effort needed against similar design efforts described as......

#### Assumptions

All thrust vector tests are automated **SOW** 

3000

3.1.1. Produce System Drawings of Turbine Design

3.1.2. Design a fluidic thrust vectoring system that diverts thrust via secondary fluidic injections. Minimum thrust deflection should be 13 degrees.

#### ТРМ

Minimum thrust angle of 13 degrees

### WBS Ref 1.1.2 Start Date 4/1/2015 WP Number 103 End Date 8/30/2015 WP Description Turbine Procurement Estimating Methodology Material

Work Package or Estimate Level Data

#### Resource: 01.00.910

| Part Number  | Description           | Manufacturer       | Туре | Qty  | Unit | Unit Price | Total        |
|--------------|-----------------------|--------------------|------|------|------|------------|--------------|
| N0102077     | COMBUSTION<br>CHAMBER | PRATT &<br>WHITNEY | ltem | 2.00 | EACH | 650,000.00 | 1,300,000.00 |
| NT5B04AAADE5 | EXHAUST               | PRATT &<br>WHITNEY | Item | 2.00 | EACH | 555,555.00 | 1,111,110.00 |



# ProjStream Facilitates Best Practices

- ProjStream is an end-to-end software solution for all your project management needs, from bidding and cost estimating to project control and reporting.
- ProjStream handles searches within seconds with accountability
- The ProjStream Estimate Component Library facilitates a consistent, repeatable, and shareable methodology
- ProjStream builds estimates faster with higher profitability
- ProjStream stores a query-able set of data for rapid answers, performance, and profitability











#### ICEAA Workshop May 16-18 in San Antonio, TX

Stop by the ProjStream booth and receive Top 10 challenges and best practices of cost estimation teams

How to engage in a meaningful way:

Process assessment or 60 day QuickStart Program

tshanahan@projstream.com