Enterprise Engineering Analytics

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Overview

- Presentation will discuss the Engineering Analytics Dashboards (EAD) framework including:
 - Specialized key performance indicators (KPIs) and metrics selected to support the framework
 - Agile and MBSE process assumptions to support the framework
 - Proposed Agile and MBSE use cases
 - Insights on the challenges and lessons learned to adopting
 - Summary and future direction of the framework

Goals

- Engineering Analytics Dashboards will provide architects, engineers, and managers with the right knowledge at the right time to support effective, integrated decision-making
- Dashboards will be built on a flexible framework of reusable templates and patterns that can be customized to an Agile enterprise's processes, roles, and distributed data sources
- KPIs, metrics and visualizations will harness the power of distributed MBSE and Agile enterprise data to
 - Create holistic, Agile enterprise knowledge
 - Inform effective, integrated decision-making
 - Highlight issues and reduce risk



Engineering Analytics Dashboards transform distributed data to inform effective, integrated decision-making.

The Relationship between MBSE and Agile





FY21 Dashboards Scope: Levels of Enterprise Scope

- Within an enterprise, there are multiple levels of scope where MBSE and Agile can be applied
- Each level of scope has its own roles and use cases with differing perspectives and concerns
- Engineering Analytics Dashboards have the potential to be applied at any level, but must be tailored to that level's roles and use cases
- Initial scope address proof-of-concept System Level Dashboards





Agile Focused Dashboard

Agile Considerations: Process Assumptions



- Select Agile Tracking Tool (e.g, Jira)
- Identify Program Increment (PI), Minimal Viable Product (MVP) and Technical Debt in tool to enable metric generation
 - Determine authoritative source of truth for calculation purposes

Agile Considerations: Process Assumptions



- Select Agile requirement hierarchy for program
 - Defines metrics to be visualized

Use Case Ideas for Agile



| Use Case | Description |
|---|---|
| Monitor MVP Progress | Dashboard used by Materiel Lead to monitor overall program progress with respect to prioritized MVPs and to understand risks associated with key events and/or dependencies (e.g., hardware). Also used by Product Manager to monitor progress and quality of the MVP work effort and to understand risks associated with achieving MVP for timely user feedback. |
| Track Program Increment (PI) Status | Dashboard used by Product Manager to monitor progress and quality of the PI for the release train and to understand risks associated with achieving increment goals, team goals and resourcing bottlenecks. Also used by Release Train Engineer to monitor progress towards PI goals, as agreed to by stakeholders at PI planning, and to understand risks associated with achieving product functionality and quality based on PI goals. |
| Monitor Agile Development | Dashboard used by Release Train Engineer to monitor Agile processes and health of the release train and to understand risks associated with resourcing, team velocity, and quality. |

Use Case: Monitor MVP Progress

Stakeholders: Materiel Lead, Product Manager



- Requires assumptions on Agile requirements hierarchy
- Requires identification of MVP, Technical Debt, and Blockers

Dashboard monitors overall program progress, effort, and quality of prioritized MVP.



MBSE Focused Dashboard

MBSE Considerations: Process Assumptions



- MBSE is used to develop the architectural runway and to inform the Agile Increment Planning Process
 - Epics and/or Features will be identified in the model and traced to model elements
 - Subset of system model will be used as design / reference architecture for the Epic (and maybe Features too)
- · System implementation changes will need to be flowed back up
- Some Requirements Management tools and processes are responsible for maintaining and reporting on external requirements

MBSE Considerations: Accessing Data in MBSE Tools

- Many MBSE tool environments offer capabilities to access model data through either the modeling tool itself or the model configuration management tool
- Some MBSE metrics can be universally applied without the need for customization, e.g., number of model elements, number of Activity Diagrams
- Other MBSE metrics are dependent on the model implementation and require customization

Accessing metric data from MBSE tools is not straightforward and will require development of tool and metrics customizations.

Use Case Ideas for MBSE

| Use Case | Description |
|---|--|
| Monitor MBSE Model Development | Dashboard used to track the overall model development and how well the PI Epics and Features are satisfied by the design |
| Track Requirement Satisfaction in Design | A lower-level dashboard that tracks the requirement satisfaction of external and Agile requirements in design and Verification and Validation information in the model |

Use Case: Monitor MBSE Model Development

Stakeholders: Lead System Architect

- Requires assumptions/customizations for how Agile requirements are traced into design
- Baseline data assumes some frequency of model baseline

Dashboard monitors overall model development and how well the PI Epics and Features are satisfied by the design.

Metric Customization

- There can be multiple ways to model and chapter information within MBSE models
- For example, there is no standard approach for capturing Epics and Features in models AND there is no standard way to capture the traceability
 - The figure at right shows examples of two equally valid traceability approaches
 - The model query required to calculate requirement satisfaction for Example1 is quite different than the query required for Example 2
- Our proof-of-concept tool will utilize one approach, but customization is needed when applied to a specific program

Dashboards need to be customized based on modeling approach.

Challenges and Lessons Learned

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Agile Process

- Requirements hierarchy differs across multiple programs
- Processes need to be in place and consistent to calculate MVP, Technical Debt, and Blocker metrics

MBSE Process

- Queries for model metrics must be customized based on the model's traceability approach (e.g., requirements, use cases)
- To accurately compute modeling rule compliance, the selected validation suite(s) will need to be customized to the model's content
- Computing baseline metrics must be customized based on the model's configuration management schema or approach

Challenges and Lessons Learned

- Cameo Plugin and API limitations
 - Cameo documentation for API lacked sufficient detail and was difficult to understand
 - Difficult to access branch and version data in Teamwork Cloud
 - Navigating and querying model data challenging due to model size, complexity and diverse model organization
 - We are exploring alternative approaches that may be easier such as using generic tables in Cameo that contain the queried model data
- JIRA
 - May not have full access to the metrics needed to create dashboards
- Tableau
 - Data must be clean for Tableau to understand it
 - With small data sets the views you can create in Tableau are limited

Summary and Future Work

- Presentation covered the Engineering Analytics Dashboards (EAD) framework including:
 - Specialized KPIs and metrics selected to support the framework
 - Agile and MBSE process assumptions to support the framework
 - Proposed Agile and MBSE use cases
 - Insights on the challenges and lessons learned to adopting
- Next Steps
 - Continue to refine and pilot the prototype implementation of Agile and MBSE dashboards at the System level
 - Provide guidance and support of adopting System level dashboards
 - Research KPIs and metrics selected at the System of Systems level and develop dashboards

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