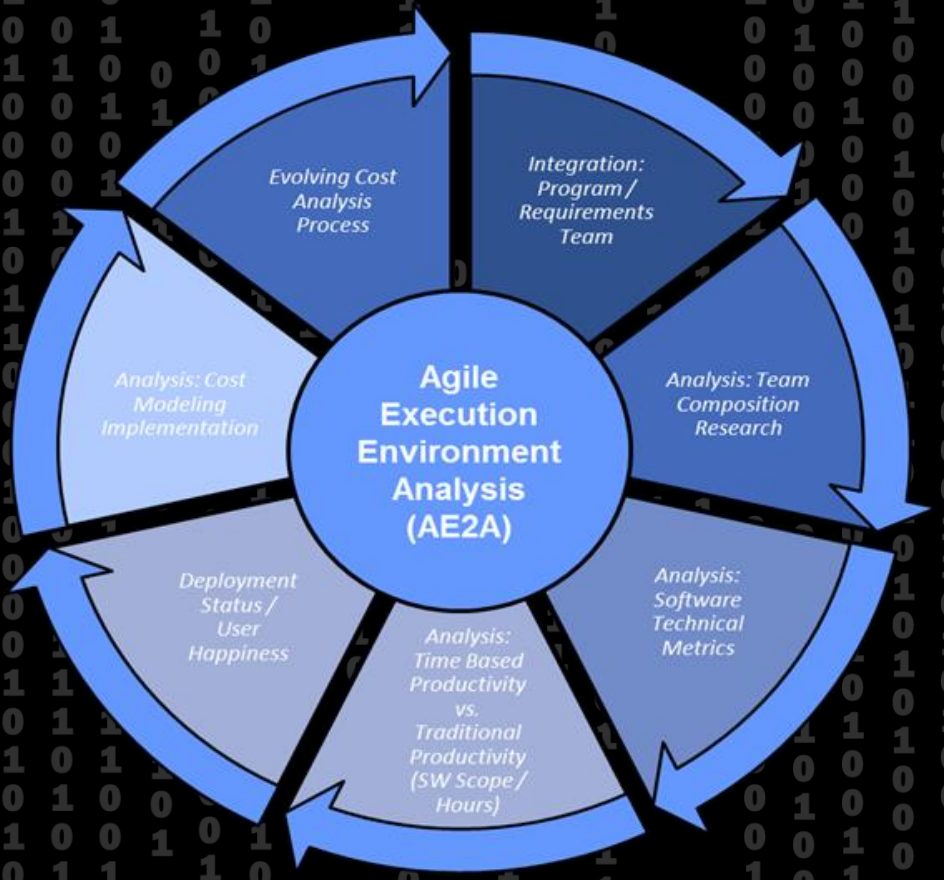
AE2A in C2ISR: Right Metrics for the Right Audience



Matt Hoffman (AFLCMC/HBGF)
Kyle Davis (AFLCMC/HBG, Quantech Services)
Elizabeth Ashwood (AFLCMC/HBG, Quantech Services)
Jennifer Lee (AFLCMC/HBG, Quantech Services)
William Lane (AFLCMC/HBF, Quantech Services)

AE2A in C2ISR: Right Metrics for the Right Audience

Introduction

As Software and Information Systems solutions and technologies adapt and modernize, so should the role of cost analysis within the technology domain

Defense Science Board (DSB) calls for programs to "***modernize cost and schedule estimates and measurements***" to evolve from a SLOC approach

National Defense Authorization Act (NDAA) further specifies to "***use a modern tracking tool*** to execute requirements backlog tracking; and ***use agile development metrics***"

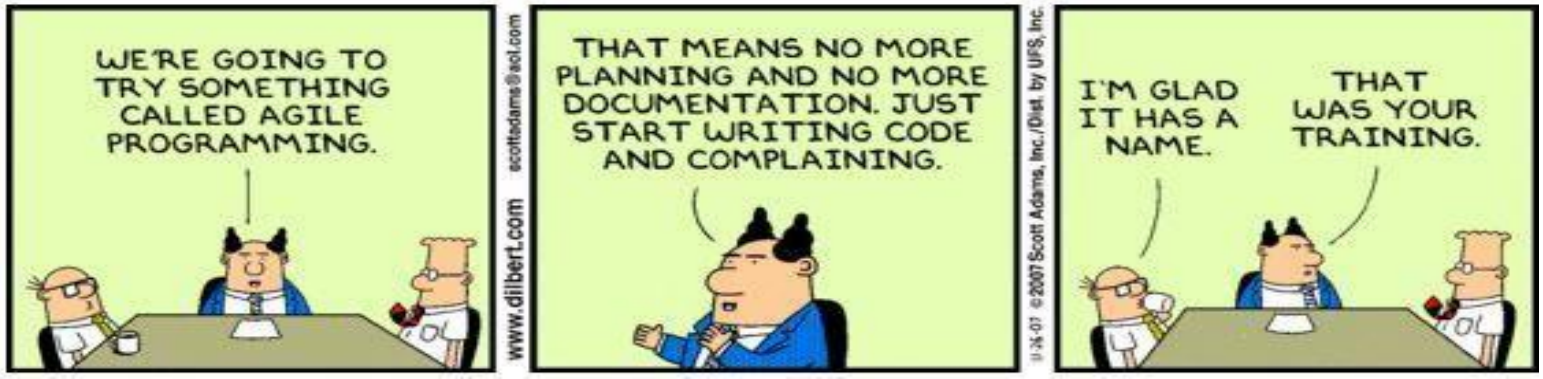
The right metrics can provide valuable insight to the right audience to support critical decisions with relevant data

AE2A in C2ISR: Right Metrics for the Right Audience
Outline

- Command Control Intelligence Surveillance Reconnaissance (C2ISR) – DCGS-AF Background
- Key Agile and Scaled Agile Framework (SAFe) Terminology
- Integrating with the Teams & Understanding Their System Usage
- Metrics & Analysis for Software Development Teams
- Metrics & Analysis for User Organizations & Operators
- Metrics & Analysis for Decision Makers / Senior Leadership
- Successes & Key Lessons Learned
- Way Forward

AE2A in C2ISR: Right Metrics for the Right Audience
C2ISR - DCGS Background

- DCGS Transformation is a large Government led effort implementing Agile Software development practices across the Portfolio starting in 2015
- Over 30 individual teams (60+ contracts) within the organization populate information within Confluence and JIRA that our analysts collect and analyze
- This data and analysis allows us to maximize the value we can provide to our teams, users, and decision makers within our agile programs



AE2A in C2ISR: Right Metrics for the Right Audience
Key SAFe/Agile Terminology

- **DI2E**: Defense Intelligence Information Enterprise; provides software development tools and resources to DoD personnel, including JIRA
- **JIRA**: Agile program management tool designed to assign and track issue progress
- **Issue**: A work ticket (unit of scope) within the progress tracking tool JIRA; includes Stories, Bugs, Tasks, etc.
- **Agile Development Team**: A team of software developers working issues
- **ART**: Agile Release Train; a group of agile development teams focused on a larger, specific mission domain
- **Users**: User Organizations (ACC) and System Operators who establish requirements and objectives that decompose into issues
- **PI**: Program Increment; a time box (3 months) cadence for agile software development activities
    - Users and Developers establish and prioritize Issues for each ART at the beginning of every PI at Planning Events and evaluate outcomes at the end of every PI at Retrospectives
- **Senior Leadership**: Decision Makers allocating resources and making trade-off decisions

Getting Integrated with Teams & Understanding Their System Usage

AE2A in C2ISR: Right Metrics for the Right Audience

Understanding The Team's System Usage

Before I get started…

What tracking tools are we using to monitor program progress? How do I get access?

What are the correct search parameters to apply to get data for the right team(s)? Did I capture it all?

Should I check to ensure the system is being used effectively? Will the analysis be beneficial?

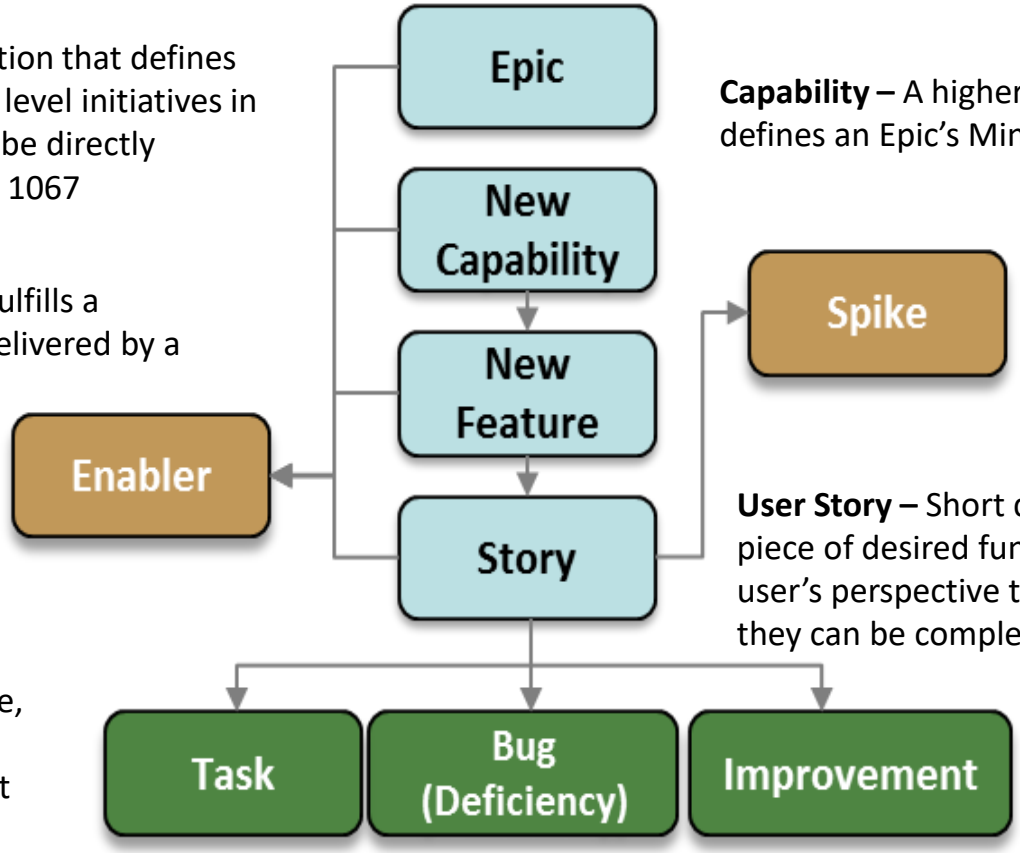
AE2A in C2ISR: Right Metrics for the Right Audience

Complexity of Working with JIRA

Epic – A higher-level solution that defines and manages the highest level initiatives in a portfolio. These should be directly translated from incoming 1067 requirements.

Feature – A service that fulfills a stakeholder need to be delivered by a single ART in a single PI

Enabler – Activities needed to extend the Architectural Runway to provide future business functionality including exploration, infrastructure, compliance, and architecture development



Capability – A higher-level solution that defines an Epic's Minimum Viable Product

Spikes – A type of exploration Enabler Story that represent activities such as research, design, investigation, exploration, and prototyping

User Story – Short descriptions of a small piece of desired functionality (written in the user's perspective to convey value) sized so they can be completed in a single iteration

Task – An objective that must be achieved Tasks are smaller work items (can be completed in a day or so) that build a story and by itself, is devoid of business benefit

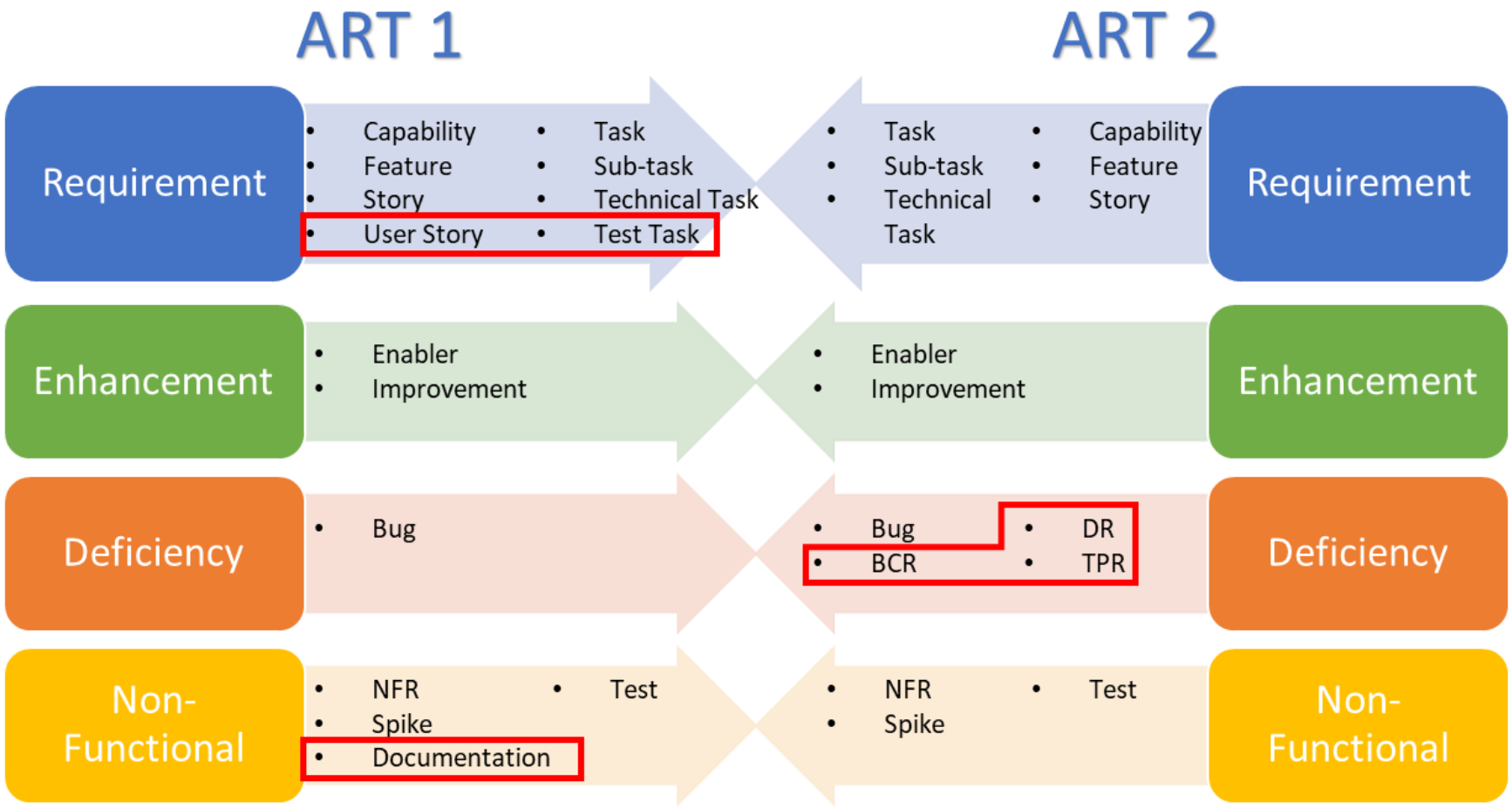
Bug – Problem the impairs product or service functionality

Improvement – An enhancement to an existing feature

- **JIRA is customizable and can be unique to the individual team**
- **Need to understand how each team / area uses their progress tracking tool**

AE2A in C2ISR: Right Metrics for the Right Audience

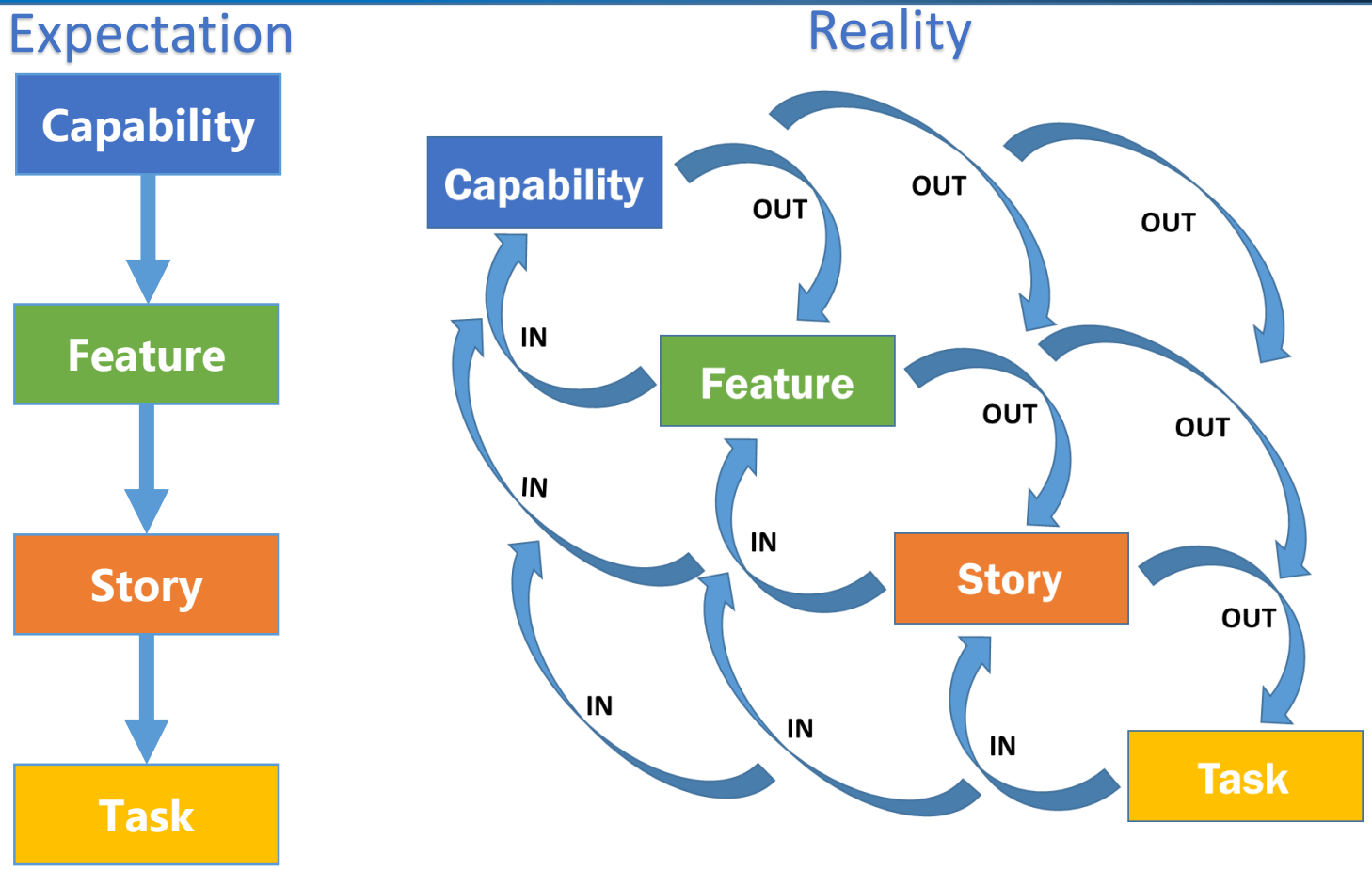
System Usage Evaluation



- **ARTs within AF DCGS use many of the same main issue types, but low-level issue types can still vary from ART to ART**
- **For our analysis we have consolidated these definitions into overarching themes**

AE2A in C2ISR: Right Metrics for the Right Audience

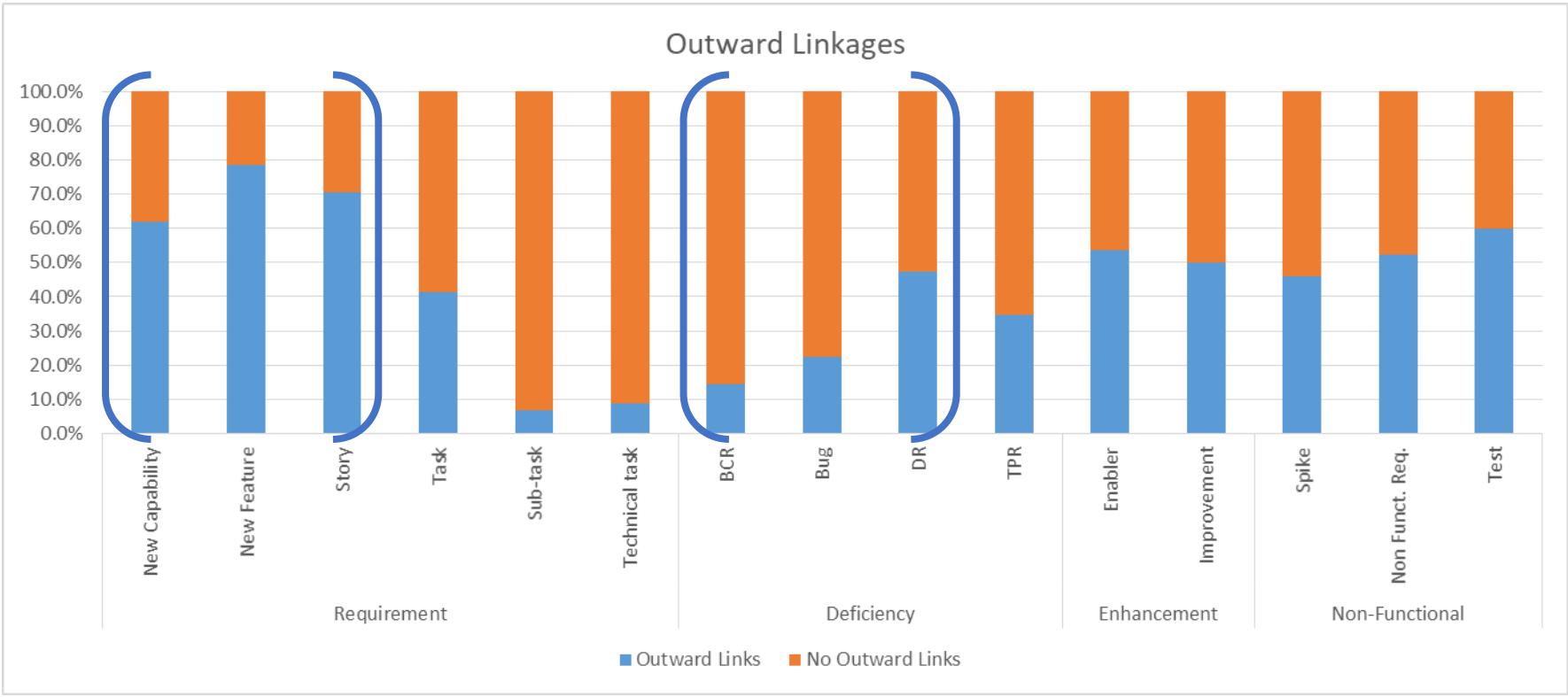
Complexity of Working with JIRA



- **Requirements decompose into smaller work packets – the expectation is that this is easily traceable; however, in implementation, it is not – Need to evaluate Requirements Traceability**
- **Higher level issues should have "outward links" whereas lower level issues should only have "inward links"**

AE2A in C2ISR: Right Metrics for the Right Audience

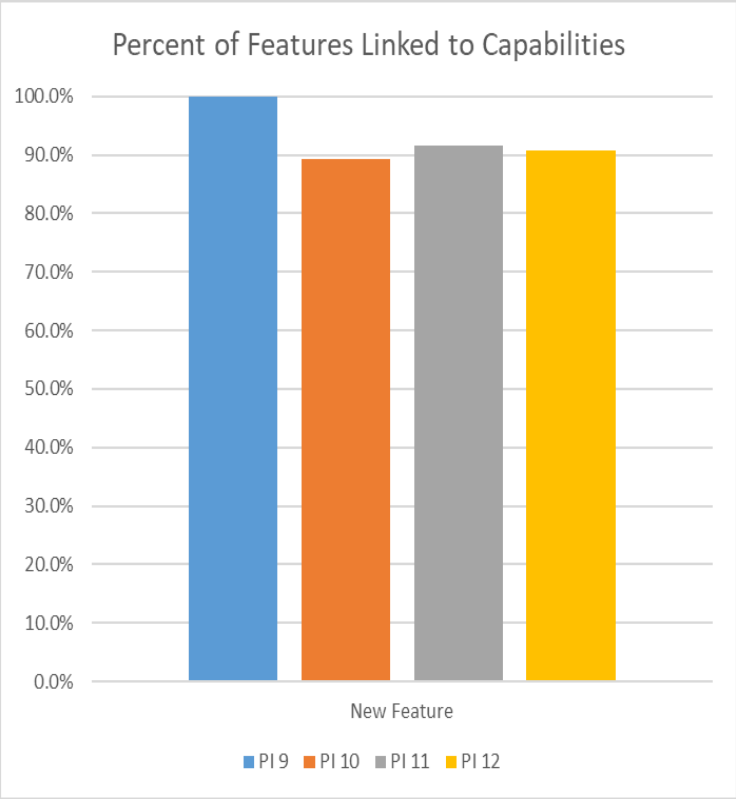
System Usage Evaluation



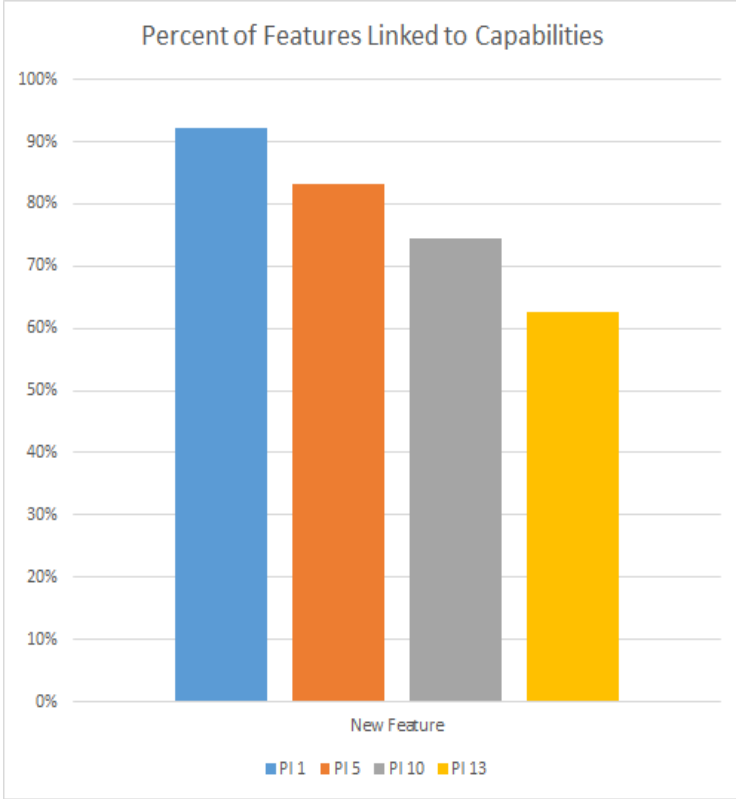
- **Higher percentages of unlinked issues is not always negative**
- **For instance, we would expect higher percentages of unlinked Bugs than we would expect for Capabilities, Features, or Stories**

AE2A in C2ISR: Right Metrics for the Right Audience
System Usage Evaluation

ART 1



ART 2



- **Almost all features are linked to a higher capability; when linked % of features starts to decline, this might be an indicator of improper system usage**
- **Critical to monitor requirements traceability rigor**

Audience: The Software Development Teams

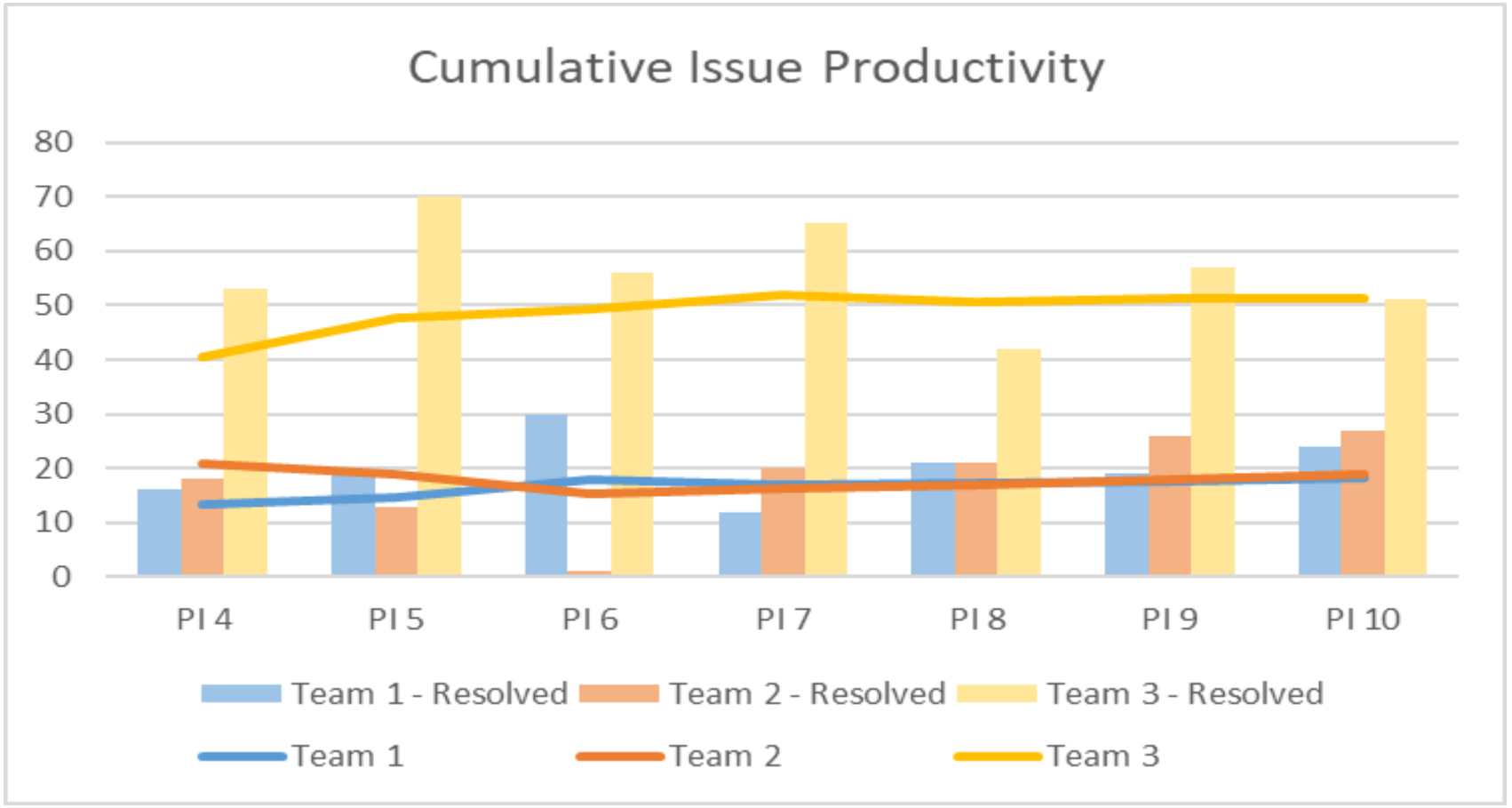
AE2A in C2ISR: Right Metrics for the Right Audience

Metrics for Agile Development Teams

- All development teams within an ART join together at PI Planning Events to work together towards the objectives identified and commit to scope they can accomplish over the next PI
  - Historical data and analysis can help the teams throughout their planning cycles
- Key Metrics for Development Teams:
  - Team Planning Health and Stability
  - Cumulative Issue Resolution by Team

AE2A in C2ISR: Right Metrics for the Right Audience

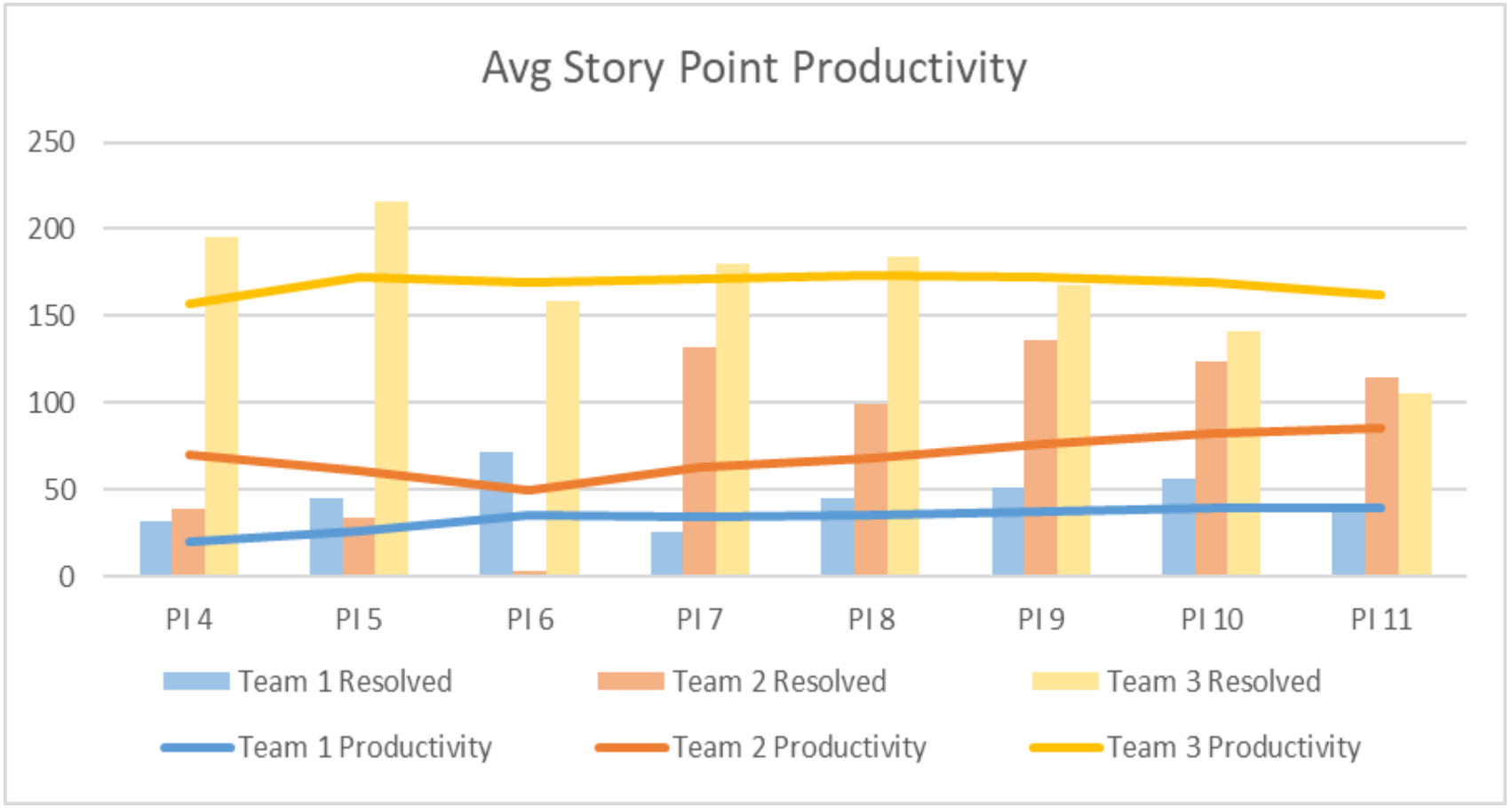
Metrics for Agile Development Teams – Overall Issue Productivity



- **Teams can use this data to ensure they are forecasting capacity appropriately**
- **Cumulative issue productivity shows the average number of issues a team is able to complete in a PI and can be used to inform planning health and stability**
- **For more experienced teams, we would expect the productivity to be stable over time**

AE2A in C2ISR: Right Metrics for the Right Audience

Metrics for Agile Development Teams – Story Point Productivity

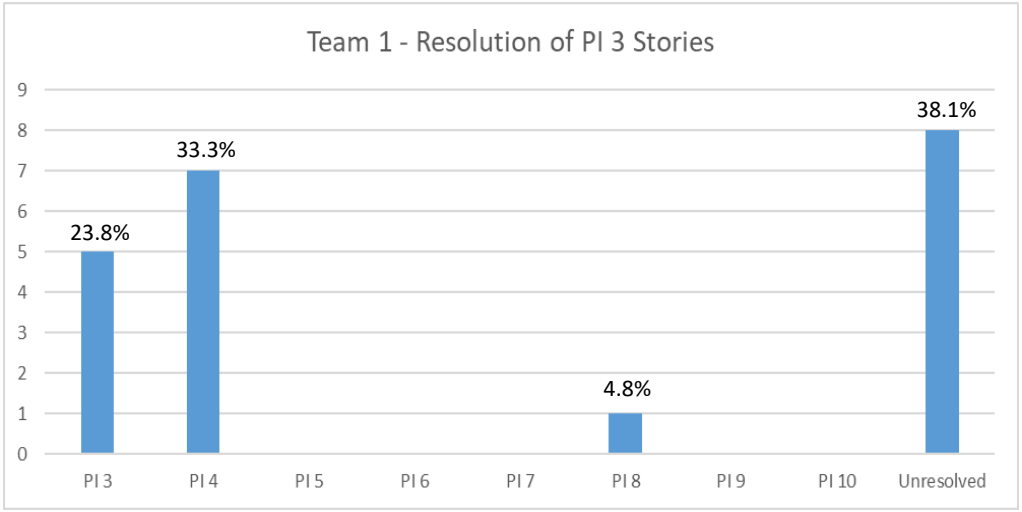


- **Teams can use this data to ensure they are forecasting capacity appropriately**
- **Average Story Point Productivity shows the average number of story points a team is able to complete in a PI and can be used to inform planning health and stability**
- **For more experienced teams, we would expect the productivity to be stable over time**

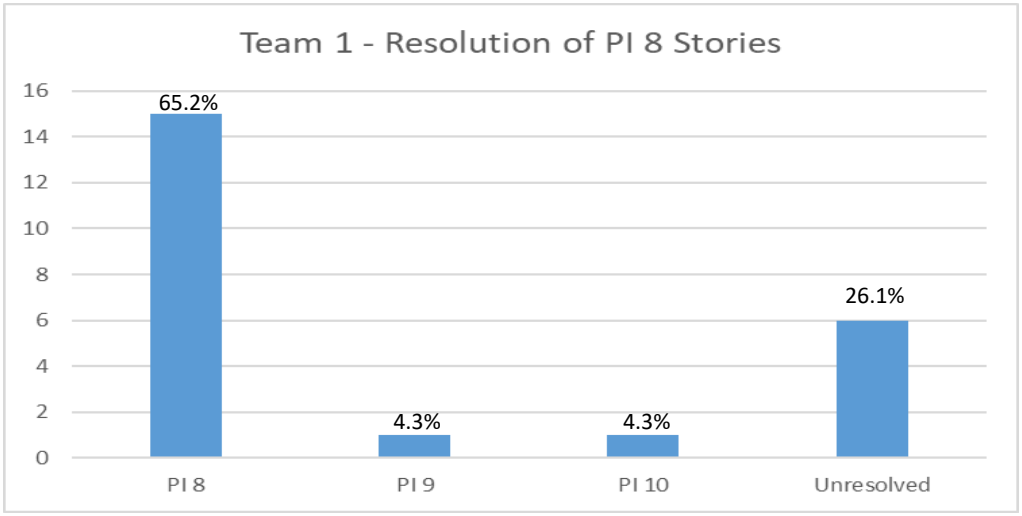
AE2A in C2ISR: Right Metrics for the Right Audience

Team Planning Health Trend Analysis: Stories

Data from Early PI



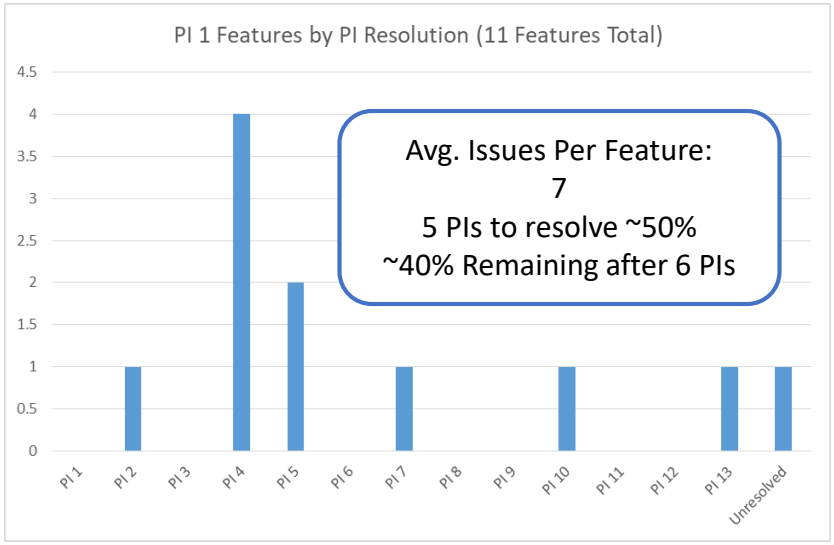
Data from Late PI

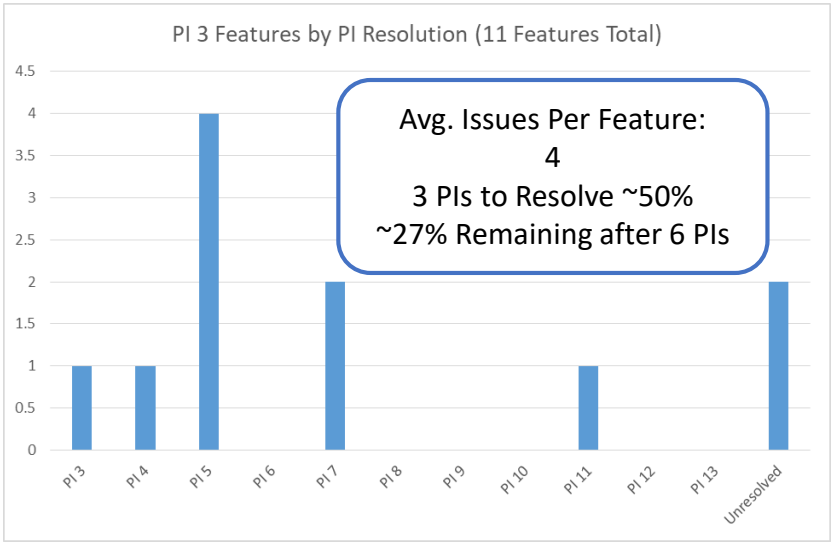


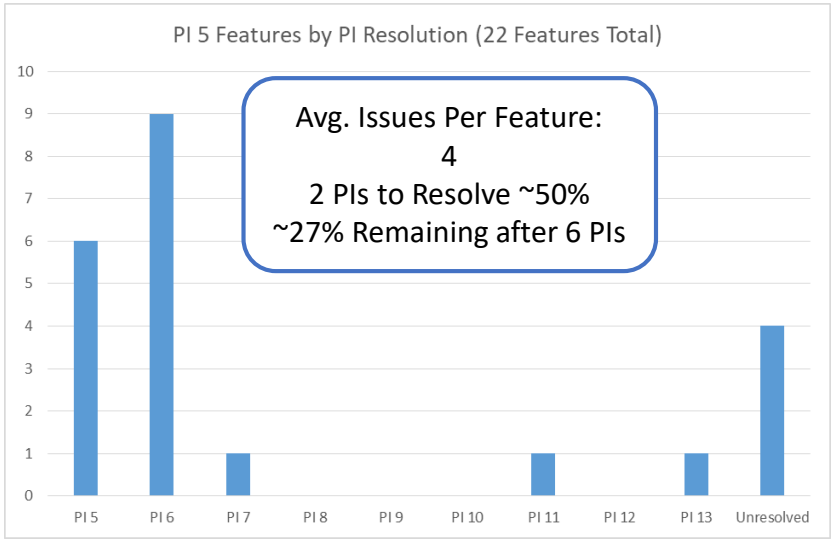
- **User Story delivery is a good measure of planning health and ability to complete all Stories planned within a given PI**

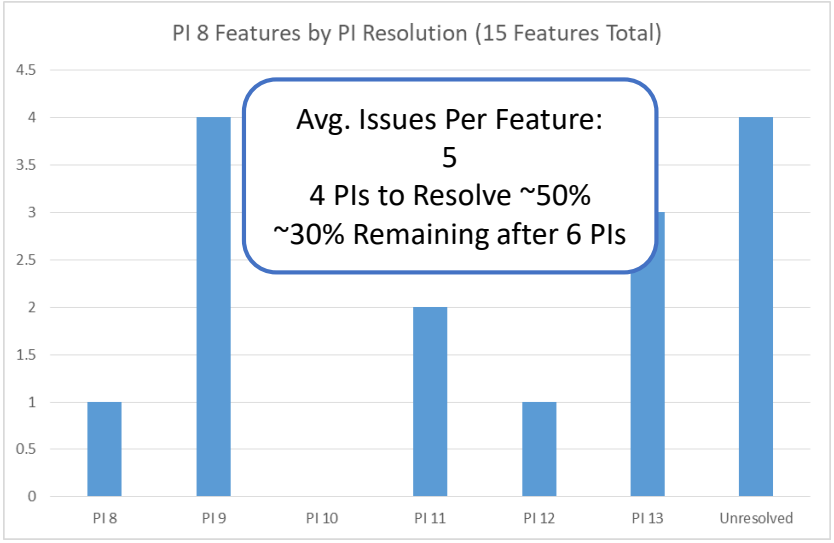
AE2A in C2ISR: Right Metrics for the Right Audience

Team Planning Health Trend Analysis: Features





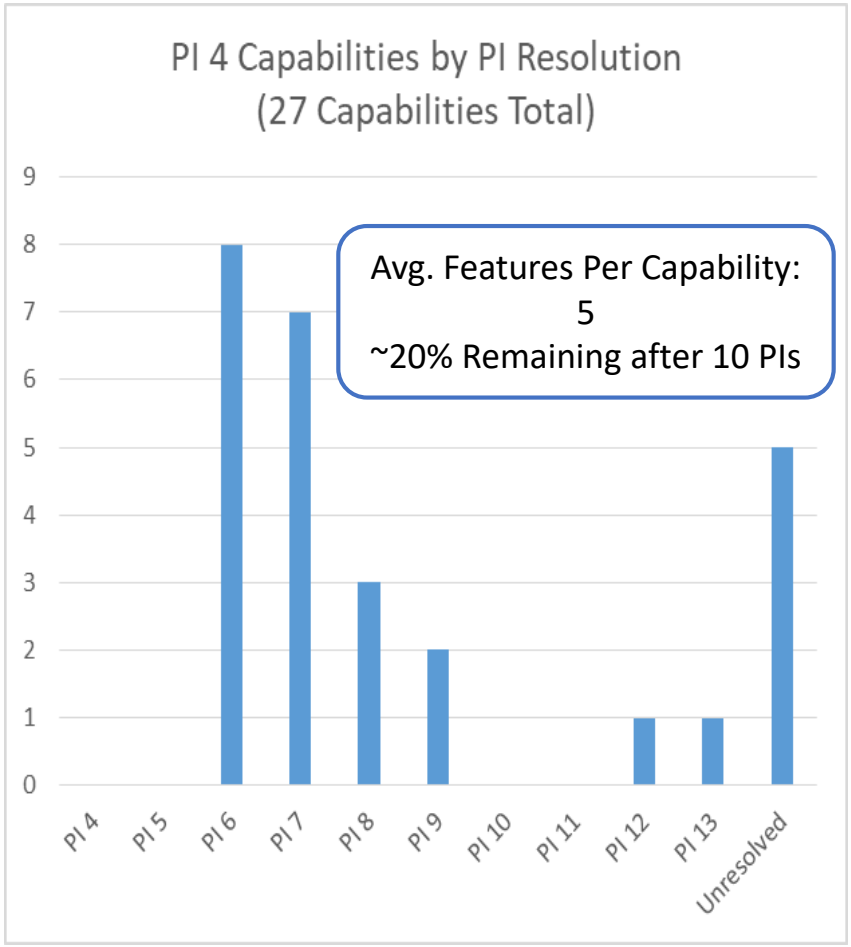


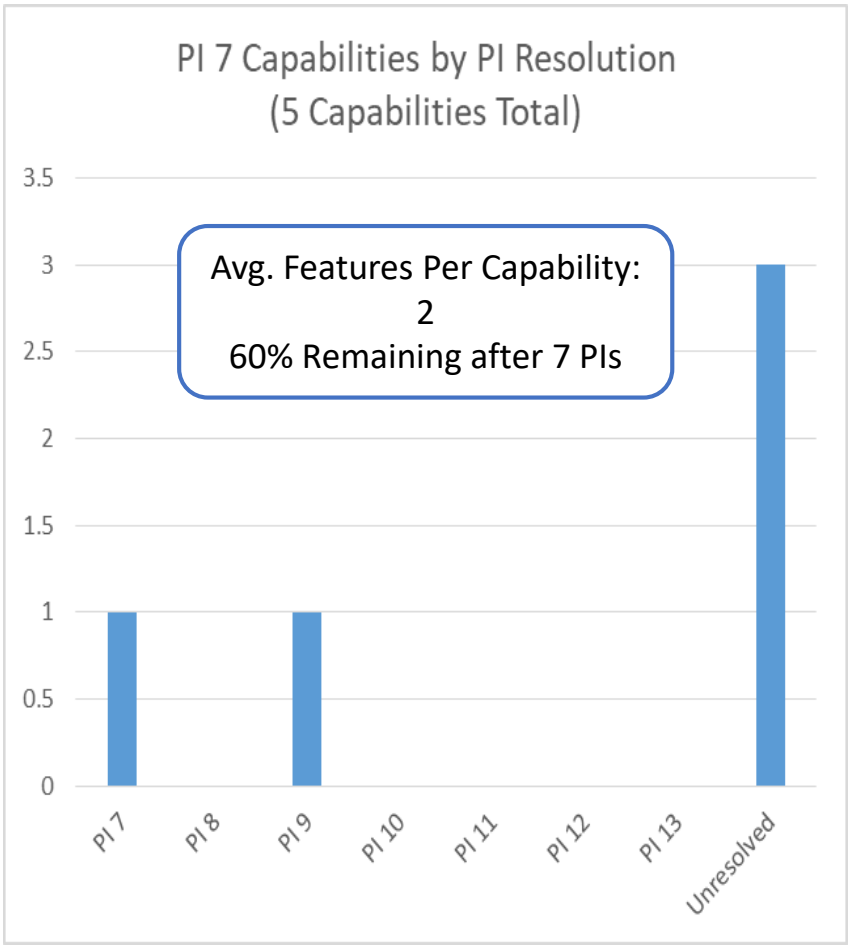


- **Agile theory that a Feature should be sized to complete within a single PI**
- **Understanding historic resolved Features helps assess appropriate sizing and resolution projections**

AE2A in C2ISR: Right Metrics for the Right Audience

Team Planning Health Trend Analysis: Capabilities





- **Capabilities are larger and can span multiple PIs**
- **Assist teams by assessing planning velocity and identifying disconnects / accounting for Non-Requirements scope in planning capacity (Deficiencies, Enhancements, Non-Functional)**

Audience: User Organizations and System Operators

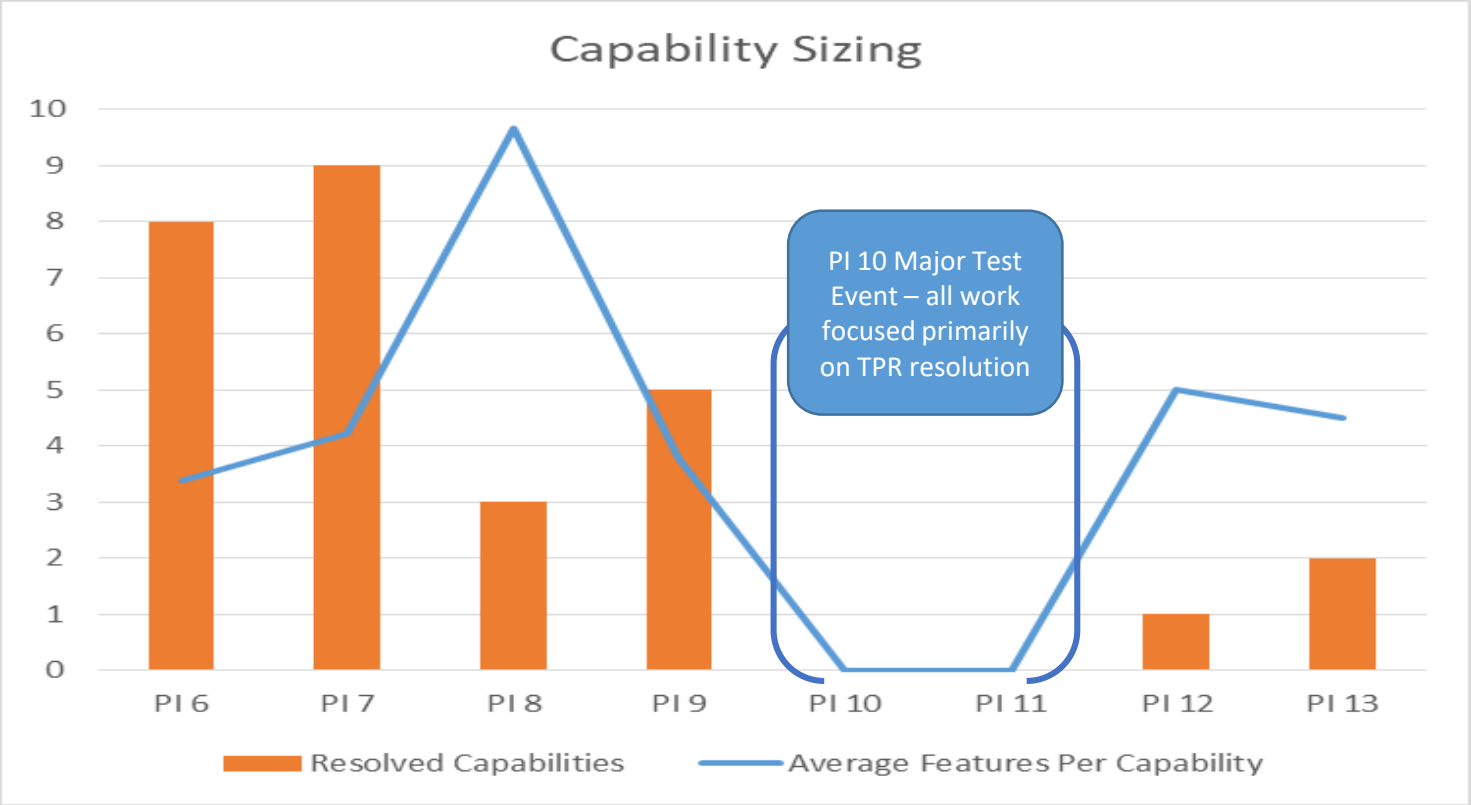
AE2A in C2ISR: Right Metrics for the Right Audience

Metrics for User Organizations & System Operators

- Users set the objectives for each PI and care about when they will have capabilities and features resolved
- Key Metrics for Users:
  - Capability Sizing
  - Capability Resolution / Productivity
  - Feature Resolution / Productivity

AE2A in C2ISR: Right Metrics for the Right Audience

Metrics for Users: Capability Sizing

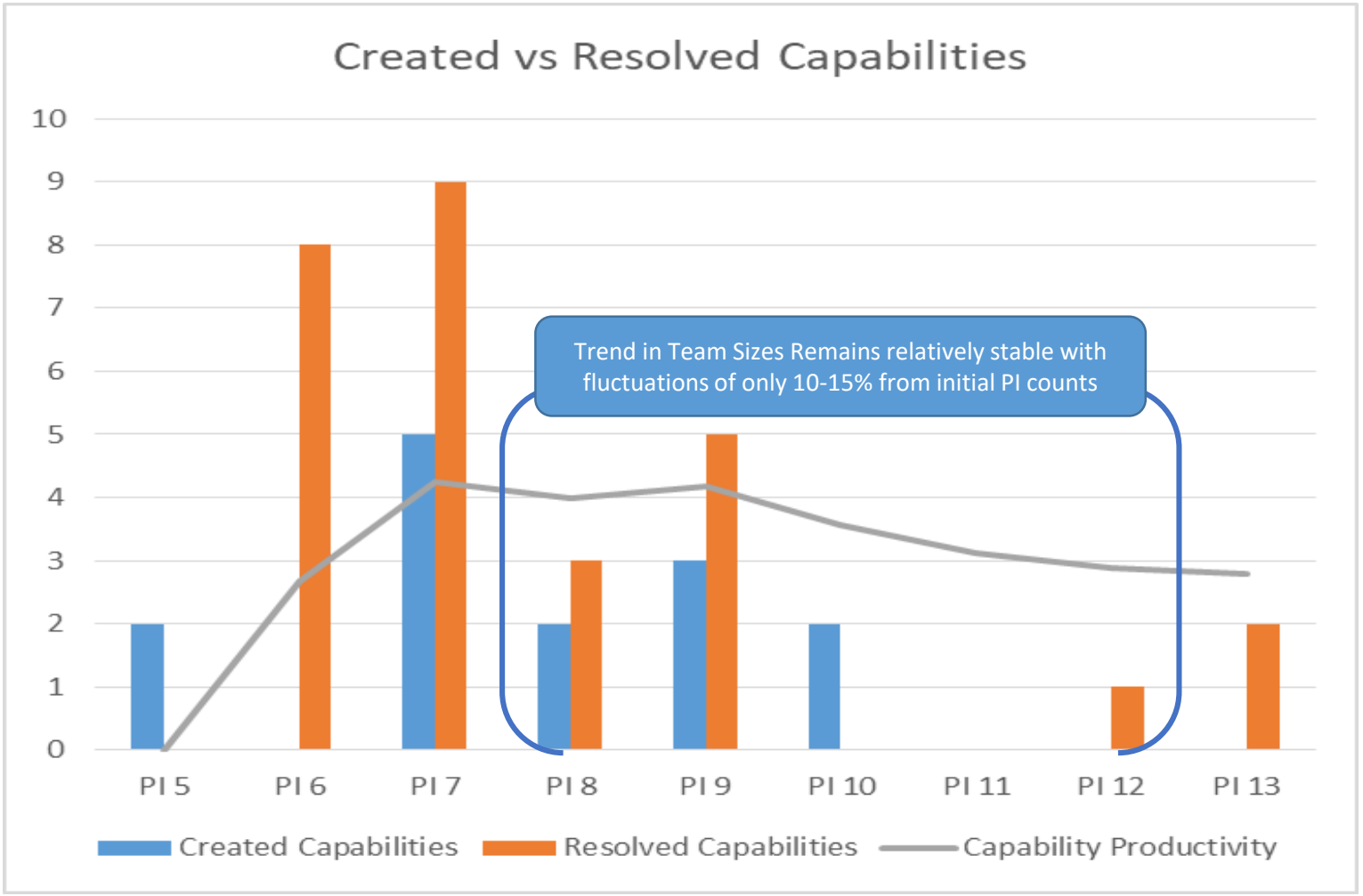


	PI Resolution	Summary	Size - Features Per Capability
Capability 2800	PI 6	Ingests Sensor 1 Imagery	4
Capability 2814	PI 7	Store and Catalog Secondary Product	3
Capability 2808	PI 8	Geospatial Visualization and SA	24

- **Important to understand Size and Complexity for historic Capabilities when considering Capability Resolution**

AE2A in C2ISR: Right Metrics for the Right Audience

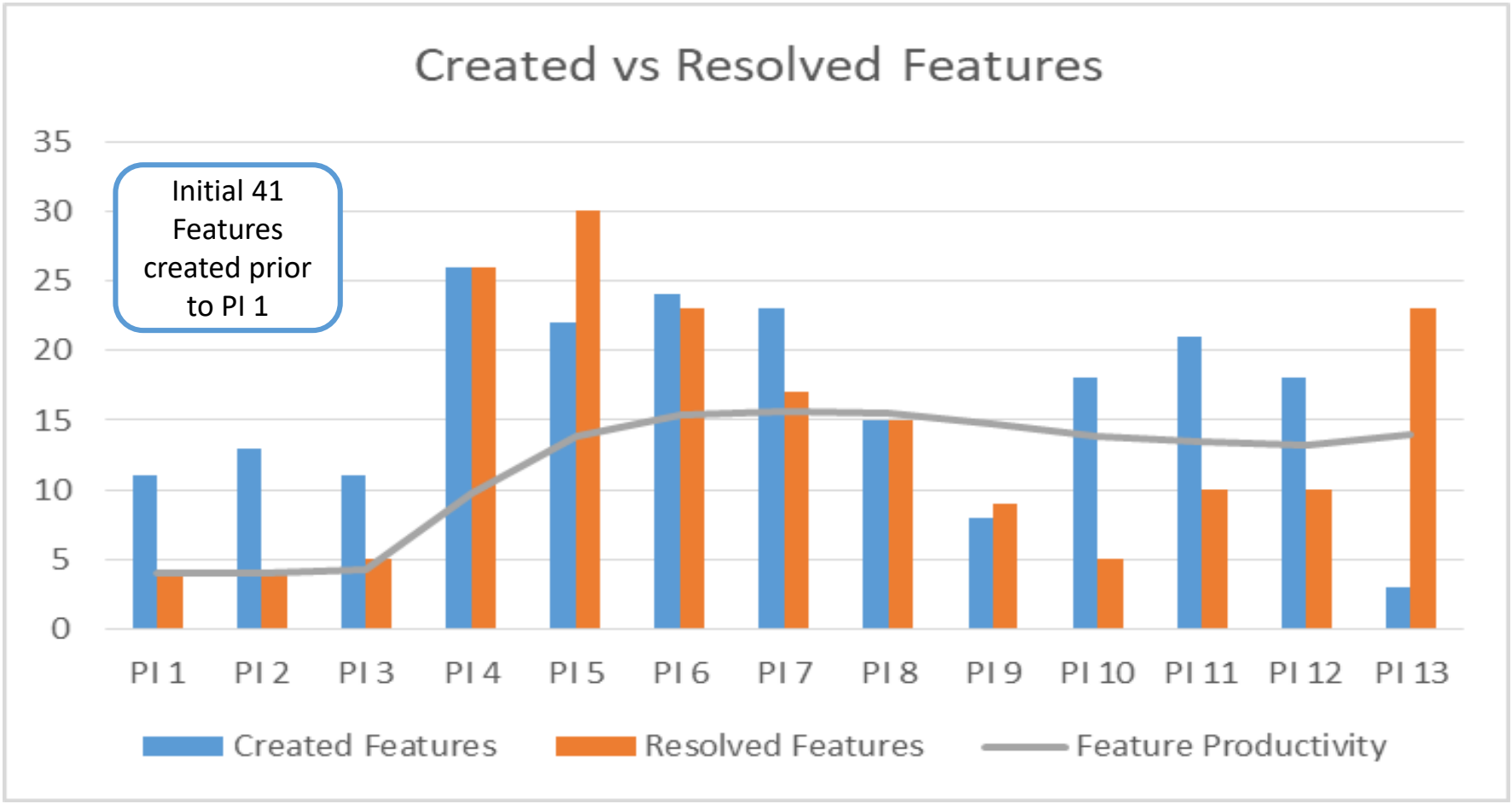
Metrics for Users – Capability Delivery



- **Resolution of Capability is the most important metric**
- **Understanding workload prioritization and effort towards Non-Capability scope (Deficiencies, Enhancements, Non-Functional) is critical to assessing Capability Resolution timelines**

AE2A in C2ISR: Right Metrics for the Right Audience

Metrics for Users – Feature Delivery



- **Feature productivity is also critical**
- **Feature productivity is also dependent on prioritization of Non-Feature scope (Deficiencies, Enhancements, Non-Functional)**

AE2A in C2ISR: Right Metrics for the Right Audience

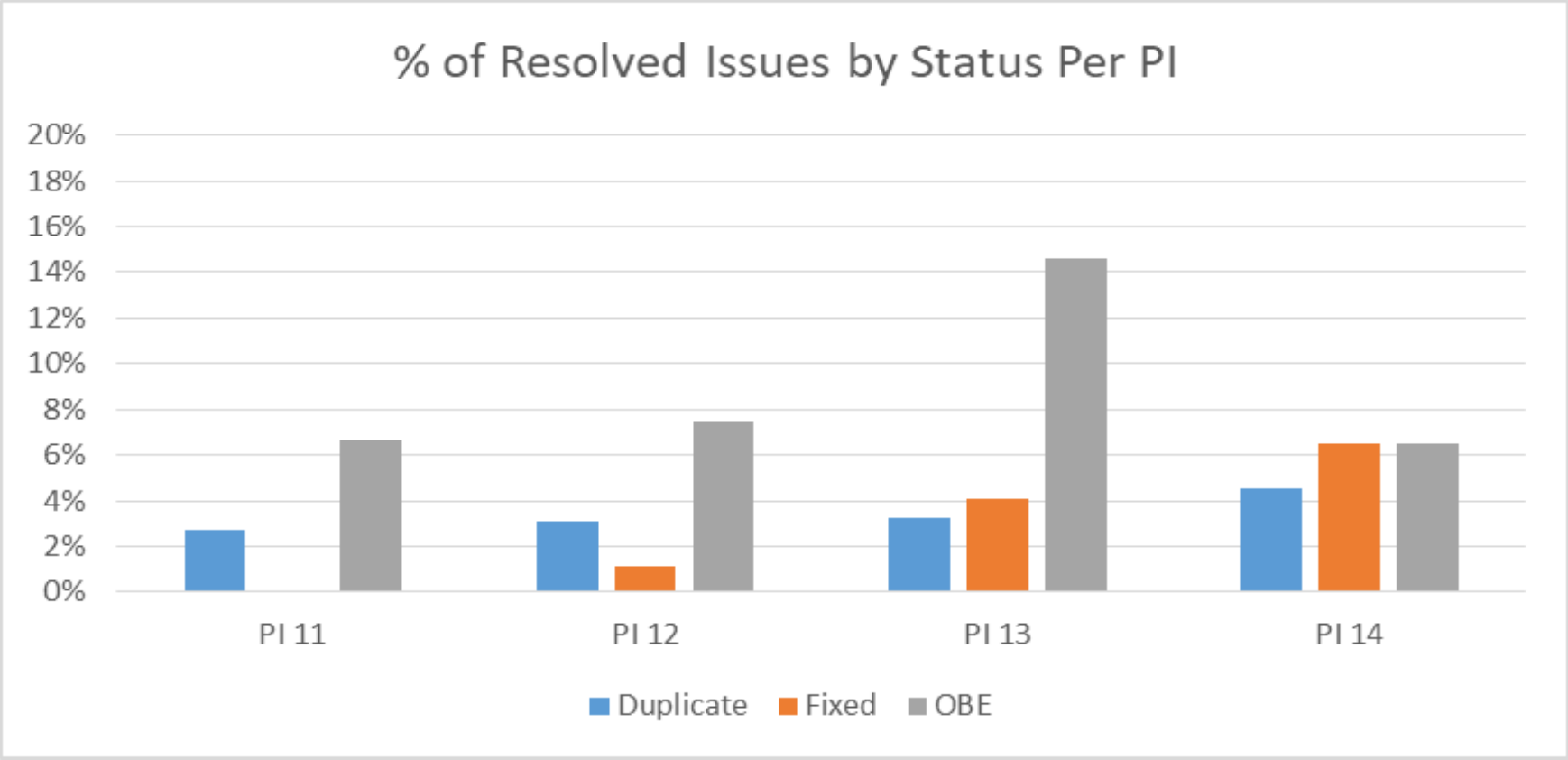
"Definition of Done" JIRA Resolution Types

Done	The issue has met all criteria defined in a programs definition of done; in most cases this means that tests have been completed, the solution has been demonstrated, and solution was accepted
Duplicate	The issue and its purpose are duplicated by another issue in JIRA, common when multiple teams are working towards a common issue
Fixed	Any issue that has been marked as "ready for integration test" and has been resolved; most common in Bugs and Features
OBE	Overcome By Events, the particular issue will no longer have effort expended to resolve and deliver a result

- **Issues in JIRA that have been resolved can be placed in multiple categories of Resolution Status**
- **Important to not misinterpret "resolved" as "delivered" or "operationally fielded"**

AE2A in C2ISR: Right Metrics for the Right Audience

"Definition of Done"



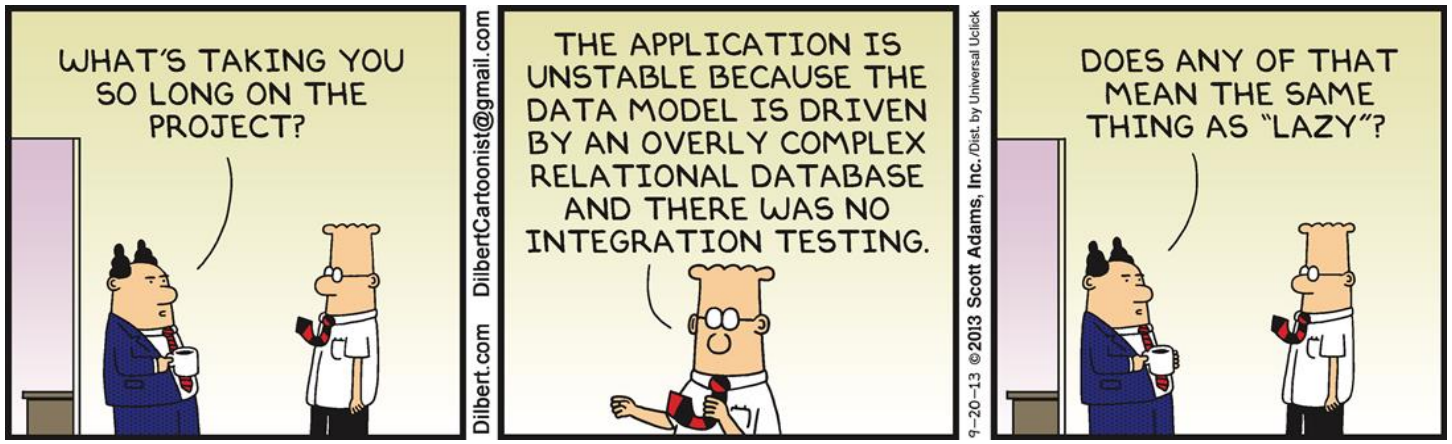
- **Although there has been an increase in issues resolved as Duplicate, OBE, and Fixed, current cumulative percentage is minimal at ~6%**
- **The key is to keep Users informed and aware that small percentages of issues are being resolved but not delivered**

Audience: Senior Leadership

AE2A in C2ISR: Right Metrics for the Right Audience

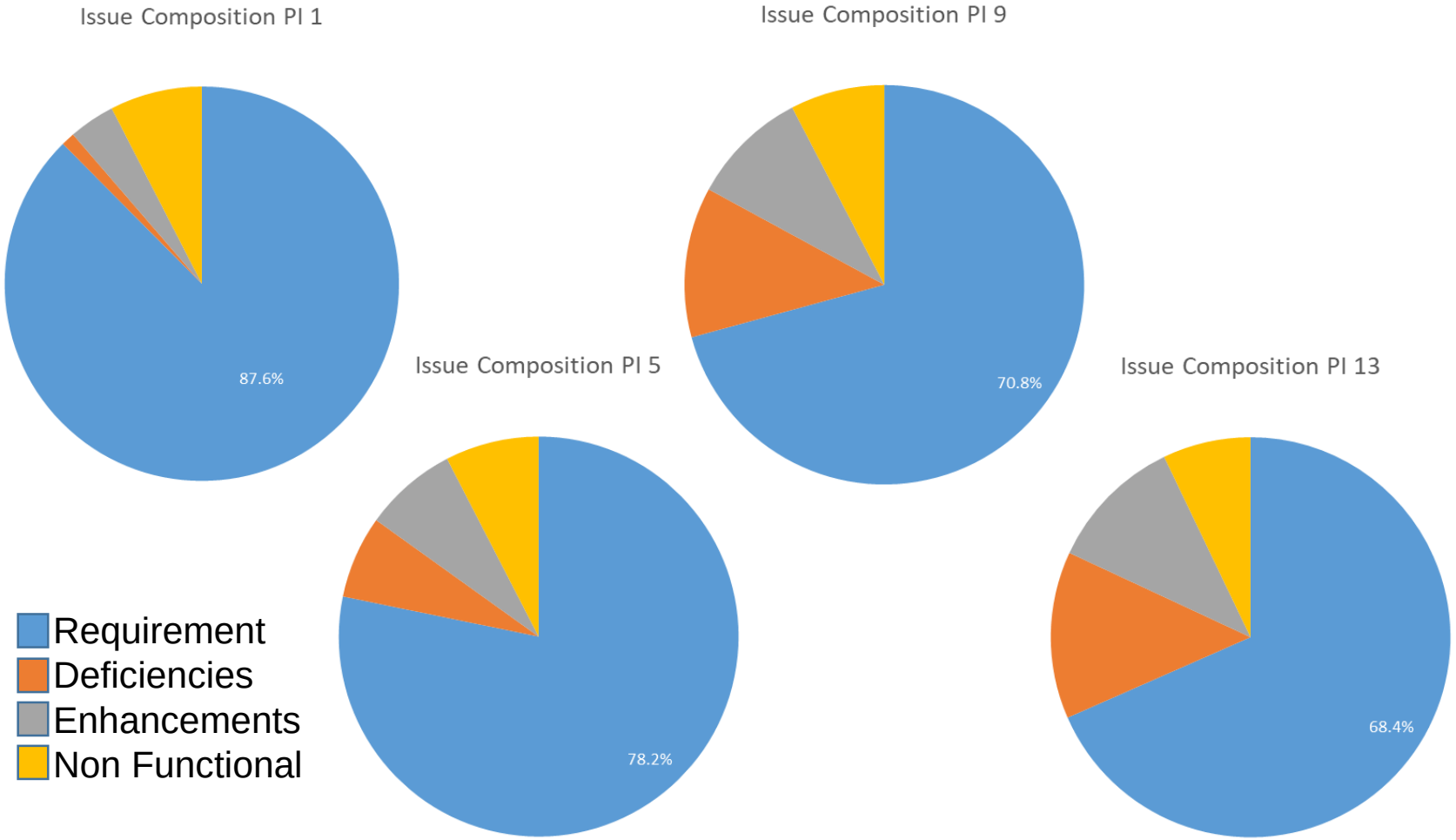
Metrics for Senior Leadership

- Senior Leaders need to understand allocation of work and how user requirements are being balanced with technical debt; this is especially important in situations where Gov't is the Lead Integrator and manage risks such as
  - Maintaining Requirements Traceability Rigor / System Usage
  - Shifting work allocation without Senior Leader weigh-in
- Key Metrics for Senior Leadership
  - Work Allocation – Requirements/Functions vs Technical Debt
  - Cost Effort Associated with Delivered Capability/Feature



AE2A in C2ISR: Right Metrics for the Right Audience

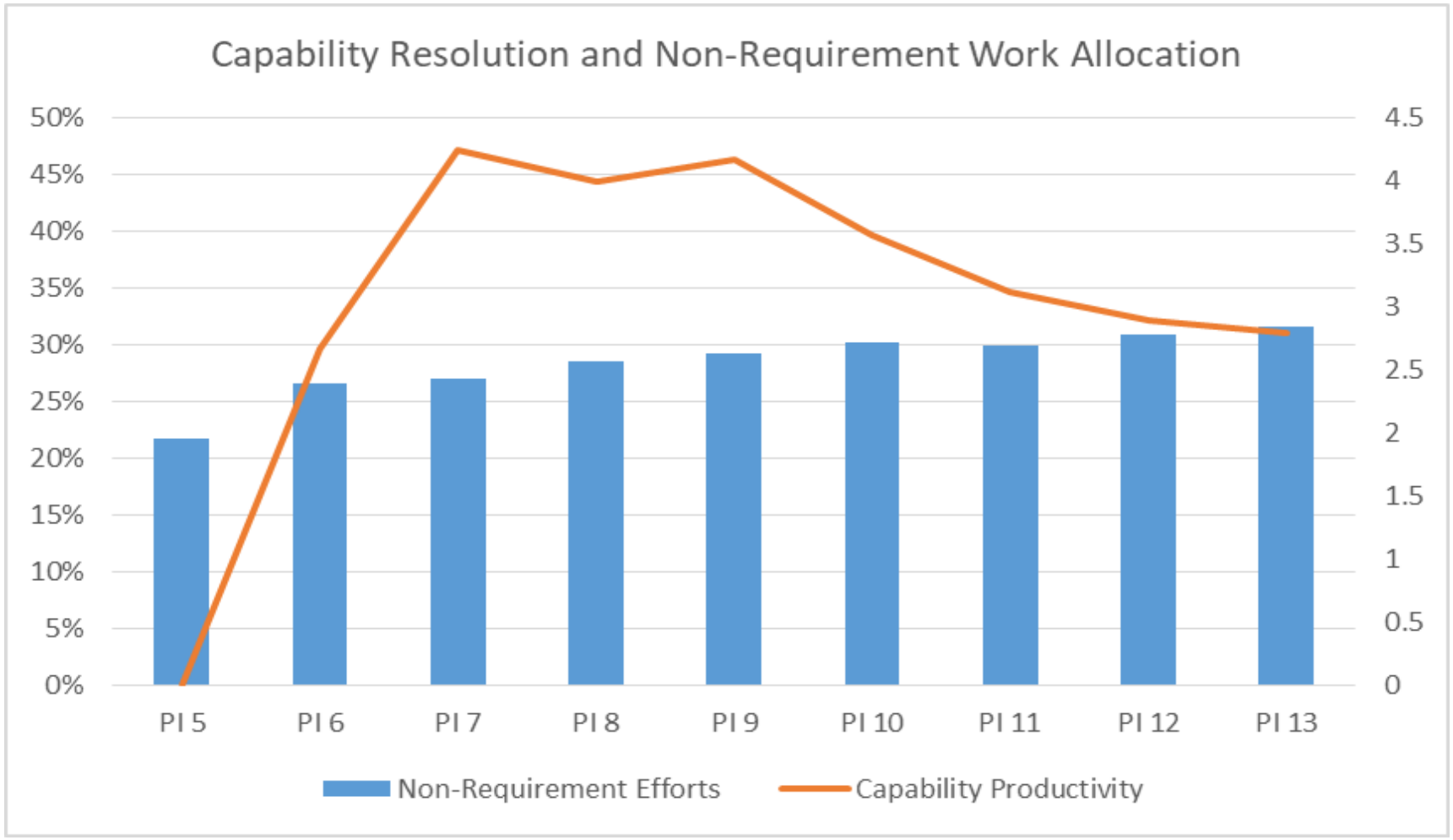
Data Analysis For Senior Leadership – Work Allocation



- **Work Allocation Analysis – providing Leadership insight into WIP towards Requirements vs. WIP towards other necessities**
- **Accounting for productivity towards Non-Requirement scope is critical when establishing Capability / Feature timelines and allocating resources**

AE2A in C2ISR: Right Metrics for the Right Audience

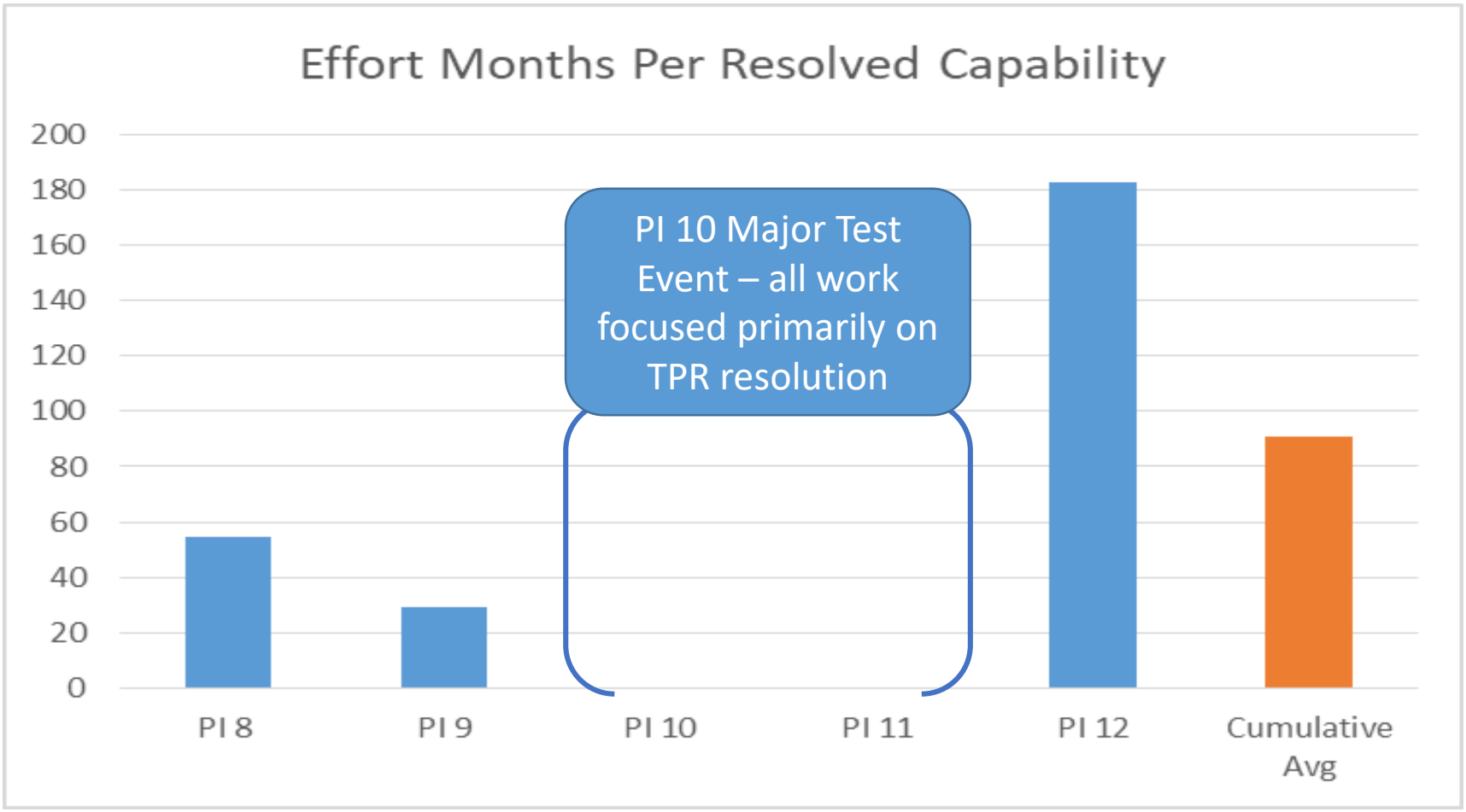
Data Analysis For Senior Leadership – Work Allocation



- **Accounting for productivity towards Non-Requirement scope is critical when establishing Capability / Feature timelines and allocating resources**

AE2A in C2ISR: Right Metrics for the Right Audience

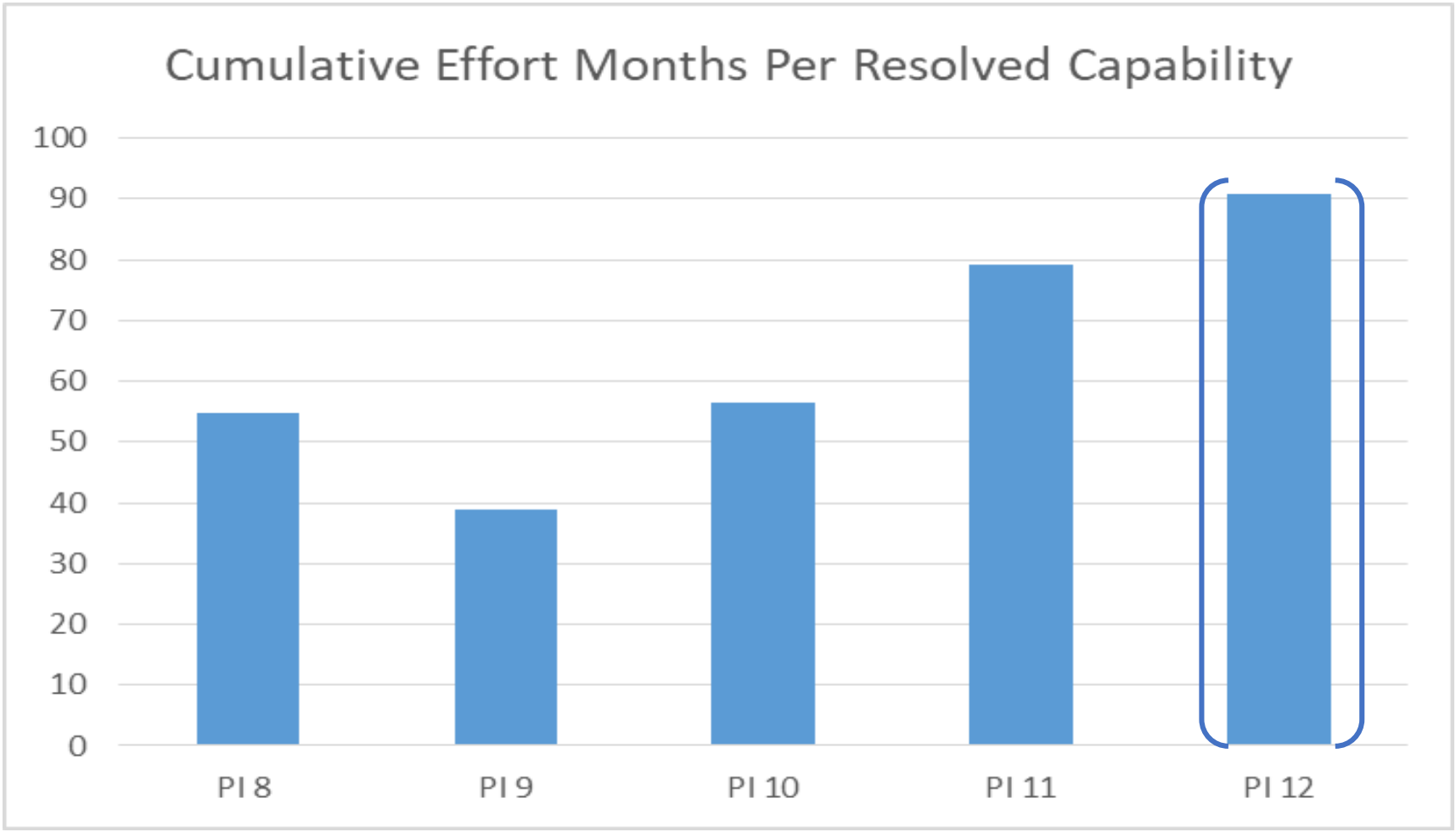
Data Analysis For Senior Leadership – Capability EM



- **Traditional cost metrics still apply! Understanding Capability Sizing and Effort Months required for a Capability allows Decision Makers to make trade-offs based on Value of a Capability**
- **CAUTION: This view can be misleading as all effort months for a Capability are attributed to only one single PI rather than capturing progress made in prior PIs**

AE2A in C2ISR: Right Metrics for the Right Audience

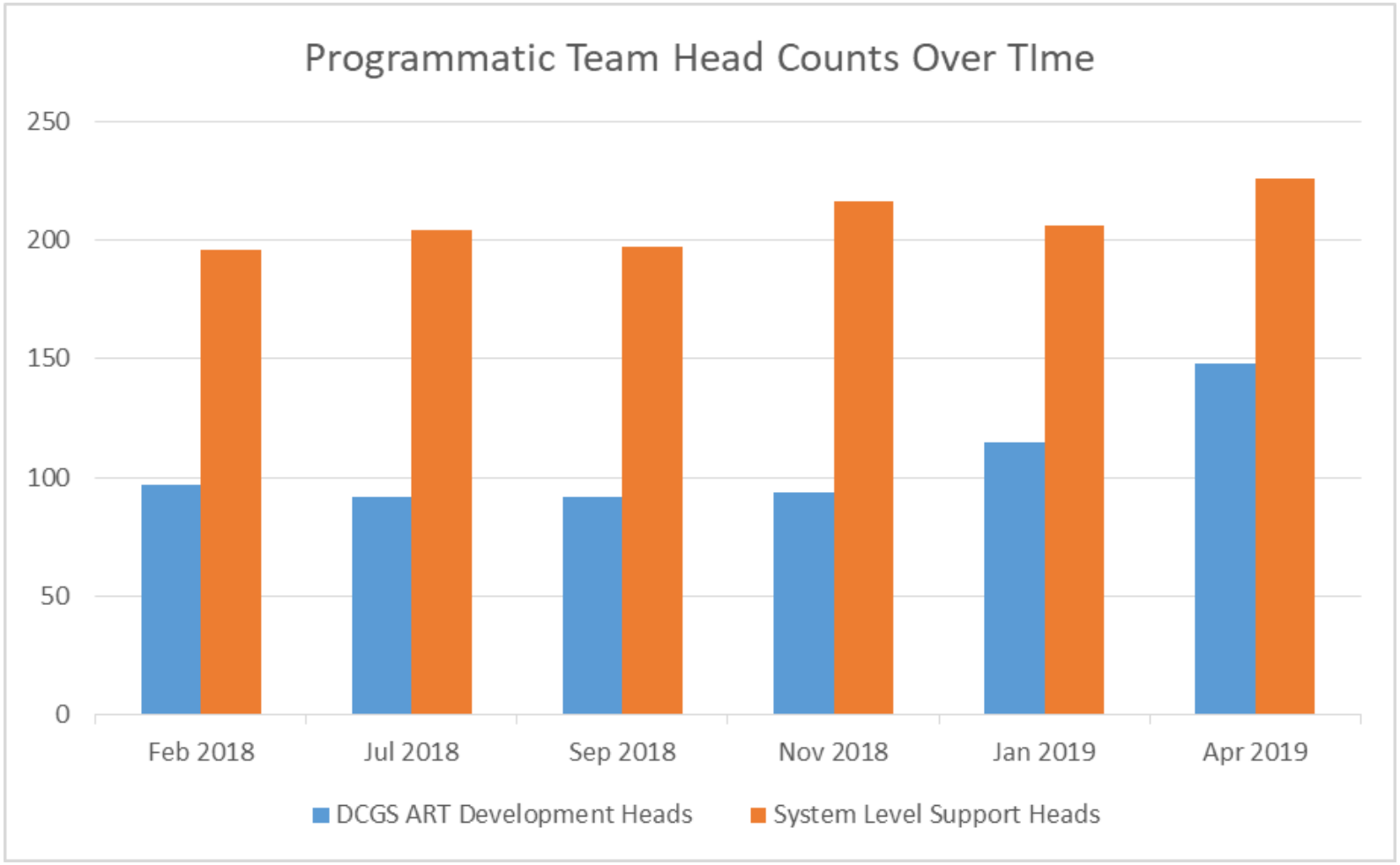
Data Analysis For Senior Leadership – Capability EM



- **As additional data is collected each PI the Cumulative Effort Months Per Resolved Capability will become steady and reflect the amount of work necessary from inception to completion**
- **Traditional cost metrics still apply! Understanding Capability Sizing and Effort Months required for a Capability allows Decision Makers to make trade-offs based on Value of a Capability**

AE2A in C2ISR: Right Metrics for the Right Audience

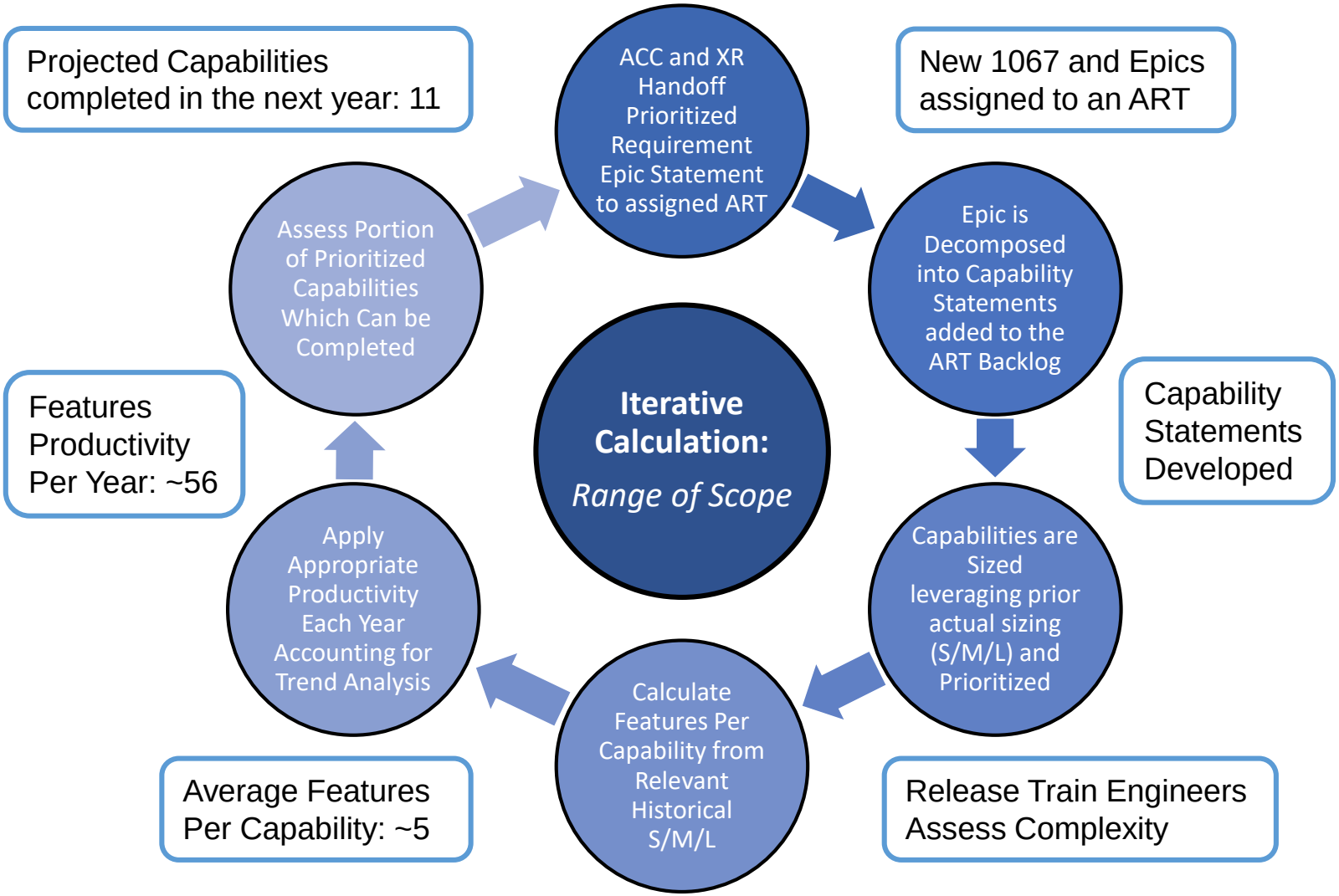
Data Analysis For Senior Leadership – Acquisition Support



- **Don't forget about all of the other costs; System Level Support is inclusive of Program Management, Systems Engineering, Test Teams, etc.**
- **More budget allocated here will reduce budget available for capabilities…**

AE2A in C2ISR: Right Metrics for the Right Audience

Data Analysis For Senior Leadership



- **This process can be applied to assess capability resolution after accounting for work allocation towards Non-Requirements scope**

Successes & Key Lessons Learned

AE2A in C2ISR: Right Metrics for the Right Audience

Successes and Key Lessons Learned

- Successful integration is crucial to ensuring effective system usage and providing critical information to teams, users, and leadership and can lead to:
  - Recurring time slots at PI Planning Events to brief latest metrics
  - System usage rigor through Rules of Engagement implementation

Rules of Engagement	Required or Best Practice	Product Owner/SM responsible	QC before opening a sprint	QC before closing a sprint	QC at creation of issue	Cost Analysis Requirement
User the "Story" ticket with the book as an icon not the "User Story" ticket with a green plus for user stories. The Green Plus is also the icon for "Features" and this cannot be changed. Stories should be linked to corresponding Features as "Child Tasks". NOTE: This would be a good area for ART standardization.	Required	Product Owner	Yes	Yes		
Make sure all the user Stories are in priority order in the backlog and in the sprint. The top ticket should be the most important. Last ticket should be least important.	Best Practice	Product Owner	Yes			
Make sure the team decides on the number of user story points for each user story or spike. Use 1,2,3,5 or 8 points per ticket. If a ticket is larger than 8 points it should be broken into smaller user stories or spikes.	Required	Scrum Master	Yes			Yes (Critical)
Always do a good scrub of the backlog and the sprint prior to starting the sprint.	Required	Product Owner	Yes			
Once a sprint has started try to limit scope change (adding new tickets) to the sprint as much as possible.	Best Practice	Scrum Master				
When adding new user stories always fill in: • **Value Stream(s):** GEOINT • **Release Train(s):** High Altitude • **Epic**: Pick from list • **Tasked Team:** Pick from list	Required	Product Owner			Yes	Yes (Critical) All 4 elements are critical

AE2A in C2ISR: Right Metrics for the Right Audience

Way Forward

Data Analysis	Reporting Findings	Capability Roadmap	Continue Integration
• Collect and analyze new data every 3 months in step with DCGS ART cadence	• Continue to provide data and visualization to each key focus area (Teams, Users, Leadership) to inform decision making	• Use applicable data to forecast Capability Delivery timelines • Account for strategic focus changes over time	• Integrate additional information identified as beneficial and continue integration into additional ARTs

AE2A in C2ISR: Right Metrics for the Right Audience

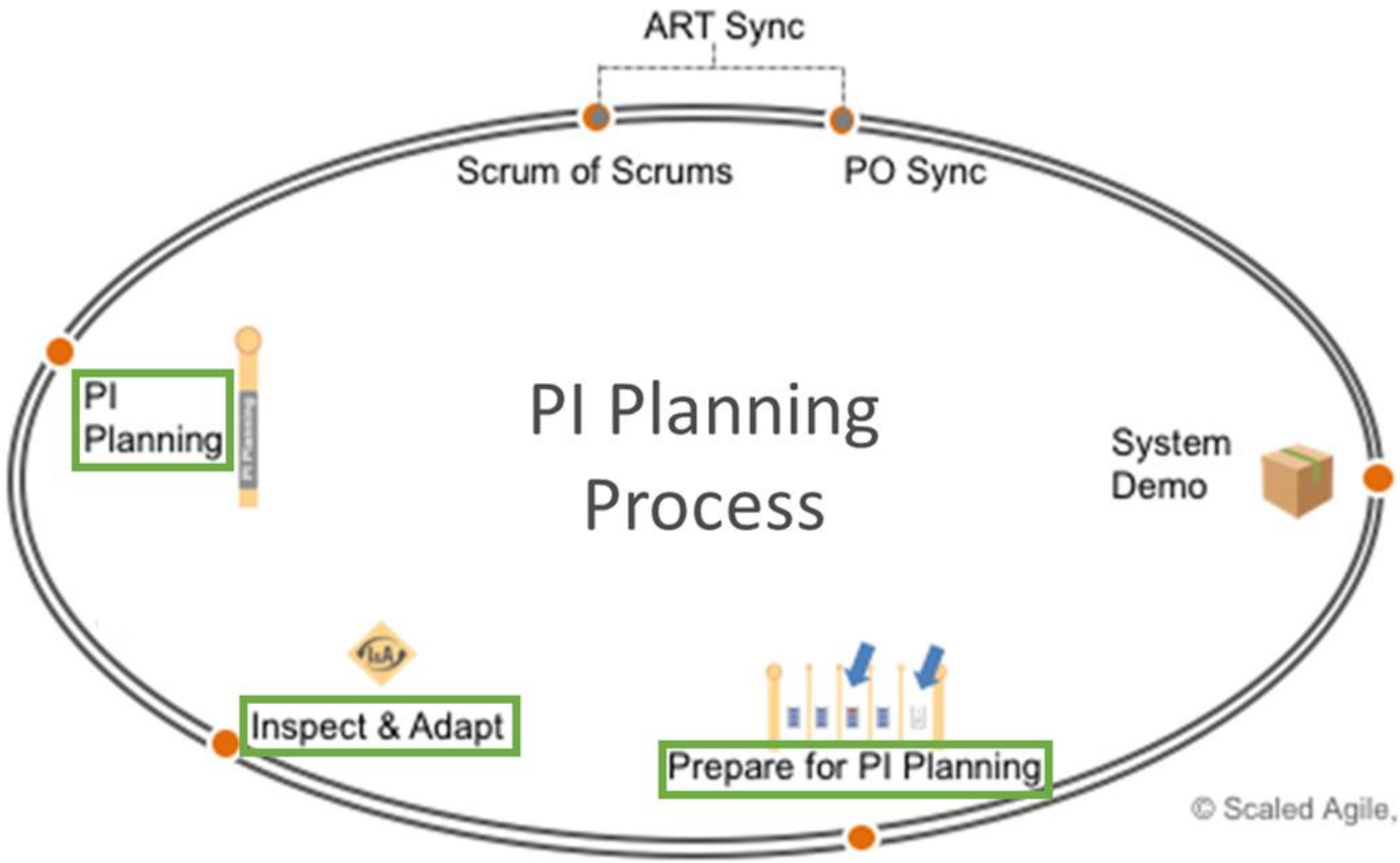
Way Forward

- **Fail fast, fail often – but learn, adapt and forecast accurate capability delivery timelines based on all available data**

Back Up

AE2A in C2ISR: Right Metrics for the Right Audience

Getting Integrated with the Team



- **PI Planning Events – critical starting point; allows for understanding of User-defined requirements / objectives and how the Teams decompose work into smaller action items**
- **Prepare for PI Planning – collect and analyze data from JIRA to share with teams as necessary**
- **Inspect & Adapt – hear and understand how progress went during the PI from the teams**

AE2A in C2ISR: Right Metrics for the Right Audience

Understanding The Team's System Usage

DIZE DevTools

Jira Dashboards Projects Issues Boards Tests Portfolio Links Insight Queues eazyBI Create

New search

Find filters

FILTERS

My open issues
Reported by me
All issues
Open issues
Done issues
Viewed recently
Created recently
Resolved recently
Updated recently

FAVORITE FILTERS

GVM "ART" Data

Search Save as

project = afdcgs AND "Release Train(s)" = FMV ORDER BY Component ASC, key ASC Search Basic

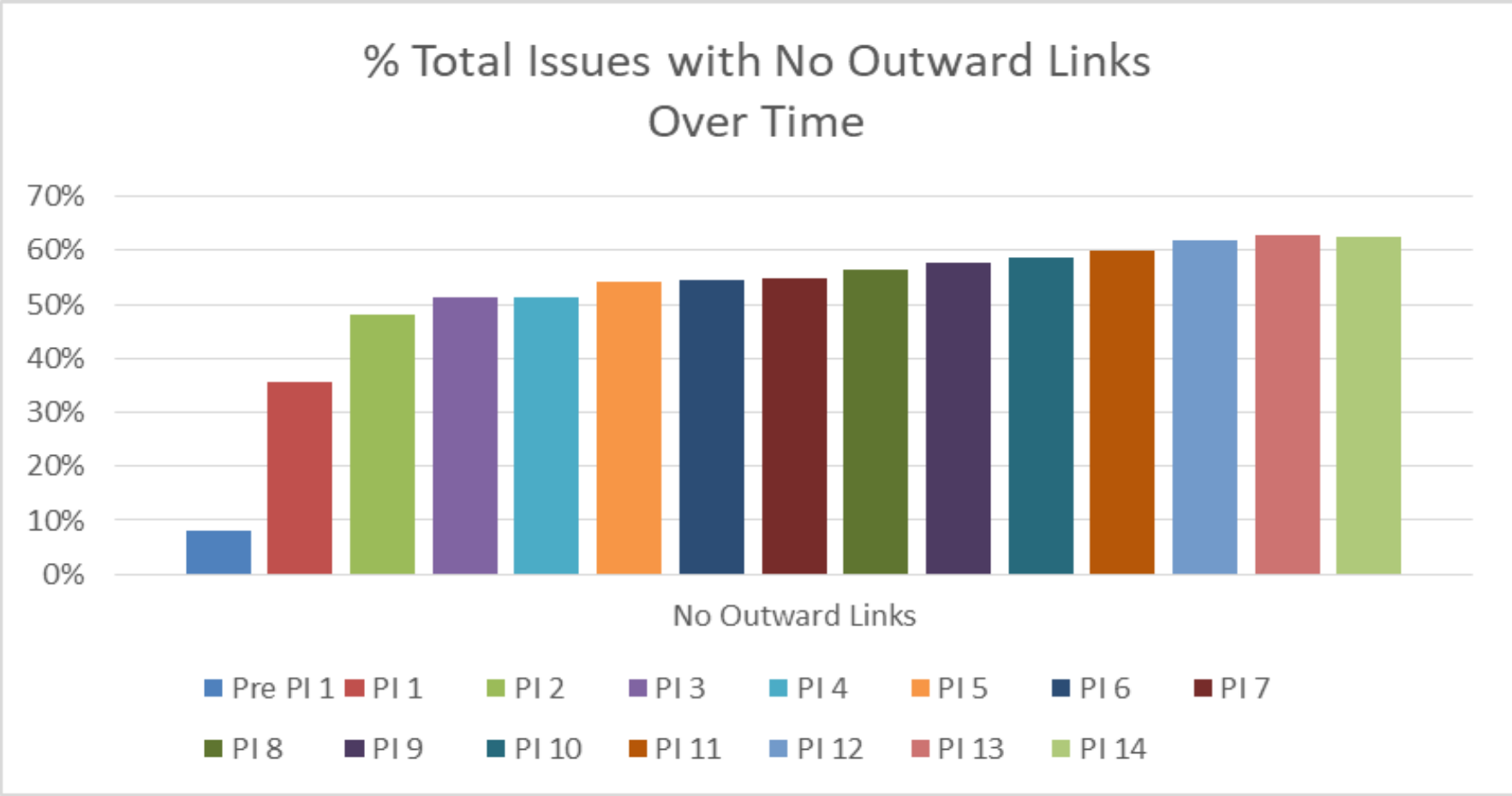
1–50 of 1348

T	Key	Summary	P	Status	Resolution	Created	Updated	Resolved	Components	Release Train(s)
	AFDCGS-6303	Chat Monitor sends multiple requests to start chat bot		OBE	Done	Dec 12, 2017	Jul 31, 2018	Jul 31, 2018	Leidos - Chat Monitor	FMV
	AFDCGS-7820	Fortify Scan Fixes for Chat Monitor		DONE	Done	Apr 13, 2018	Jun 25, 2018	Apr 24, 2018	Leidos - Chat Monitor	FMV
	AFDCGS-7823	Auto Increment Build Number for ChatMonitor		OBE	Done	Apr 13, 2018	Aug 16, 2018	Aug 16, 2018	Leidos - Chat Monitor	FMV
	AFDCGS-7873	Chat Monitor: Update features.xml to include missing features found at DSIL		DONE	Done	Apr 19, 2018	May 18, 2018	May 18, 2018	Leidos - Chat Monitor	FMV
	AFDCGS-5373	SIRIS does not display PNC-SA data in DMS format		DONE	Done	Sep 21, 2017	May 03, 2018	Apr 02, 2018	SIRIS	FMV
	AFDCGS-14030	AFDCGS-13958 / Product Owner Documentation		DONE	Done	Jun 11, 2019	Jul 22, 2019	Jul 22, 2019	SOA ESB	FMV
	AFDCGS-14031	AFDCGS-13958 / ICD Updates		DONE	Done	Jun 11, 2019	Jul 22, 2019	Jul 22, 2019	SOA ESB	FMV

- **JIRA is used for progress tracking in C2ISR (and throughout PEO Digital)**
- **Issues Navigator, depicted, is where programmatic tickets for Epics, Capabilities, Features, and Stories are able to be exported for detailed analysis**

AE2A in C2ISR: Right Metrics for the Right Audience

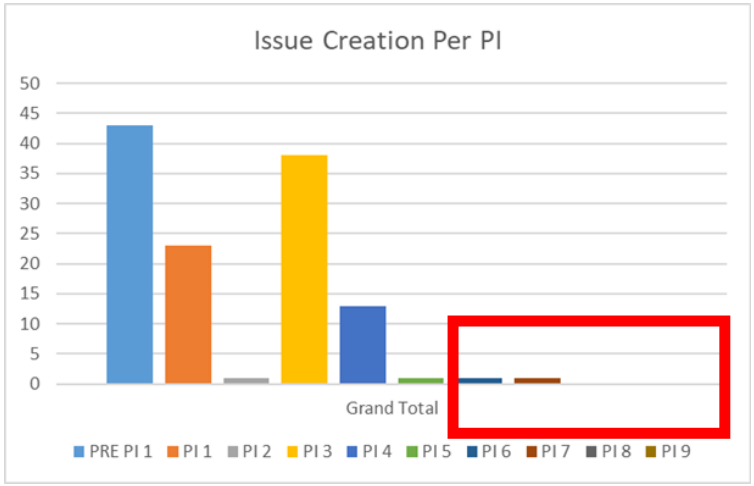
System Usage Evaluation

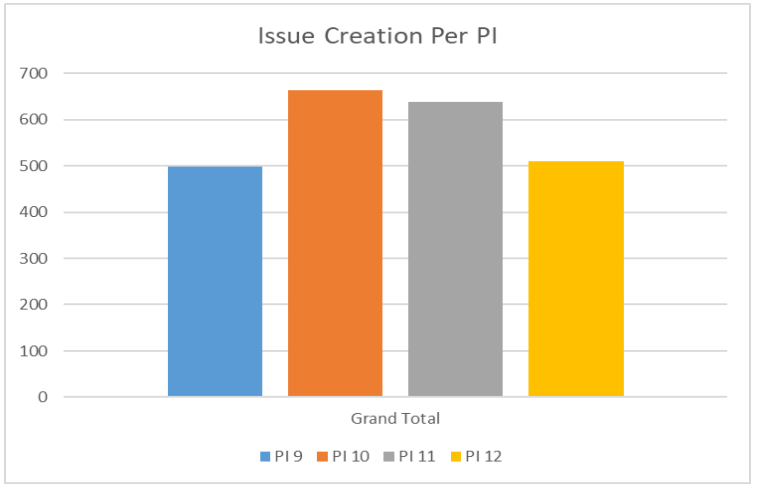


- **If the tool is not utilized correctly and links are not properly created…then insight into traceability of work decomposition (Capability -> Feature -> Story -> Task) may be lost**

AE2A in C2ISR: Right Metrics for the Right Audience
Need to Stay Integrated with the Team

- Initial research in one DCGS ART led us to believe that our teams had stopped utilizing JIRA



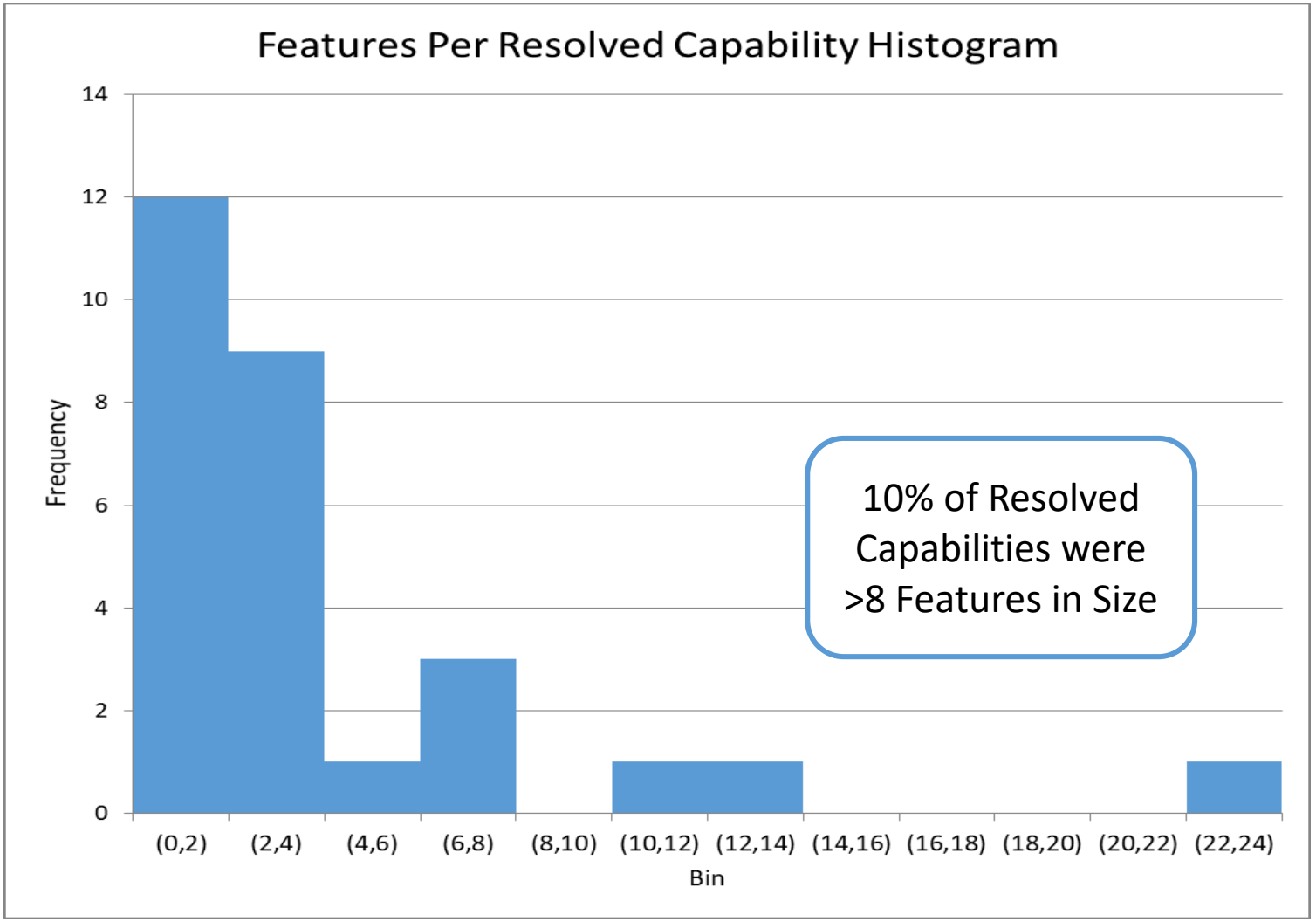


- What Happened?
  - Team began complete re-structure of epics in PI 6-8
  - Proper Epics were not communicated and work done was not being captured
- Integration with the team was crucial for understanding what happened and what new project boards and keys were in use

- **Need to know what information you're looking for and how to find it…not as easy as one simple dashboard**

AE2A in C2ISR: Right Metrics for the Right Audience

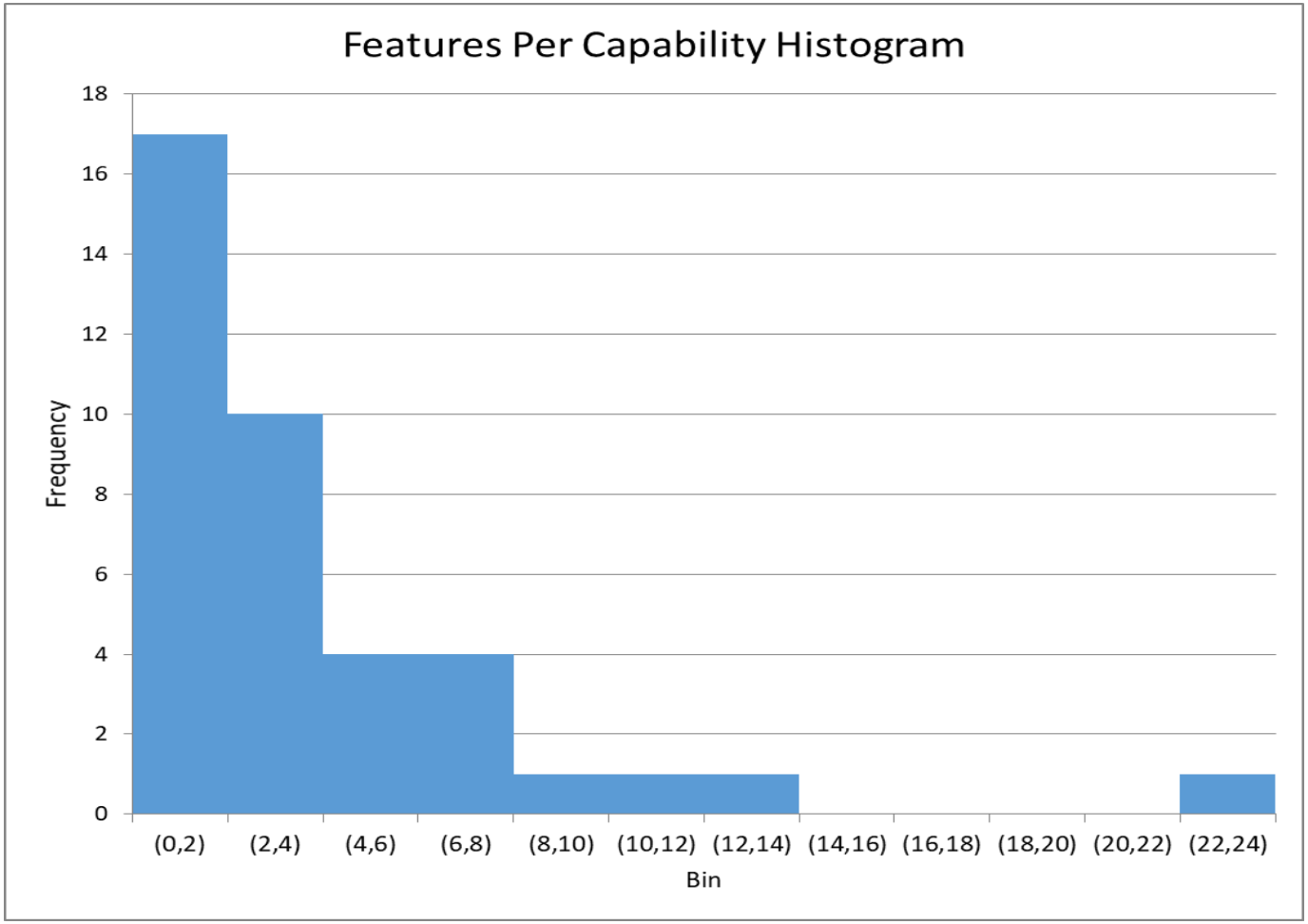
Metrics for Users: Capability Sizing



- **Important to understand Size and Complexity for historic Capabilities when considering Capability Resolution**

AE2A in C2ISR: Right Metrics for the Right Audience

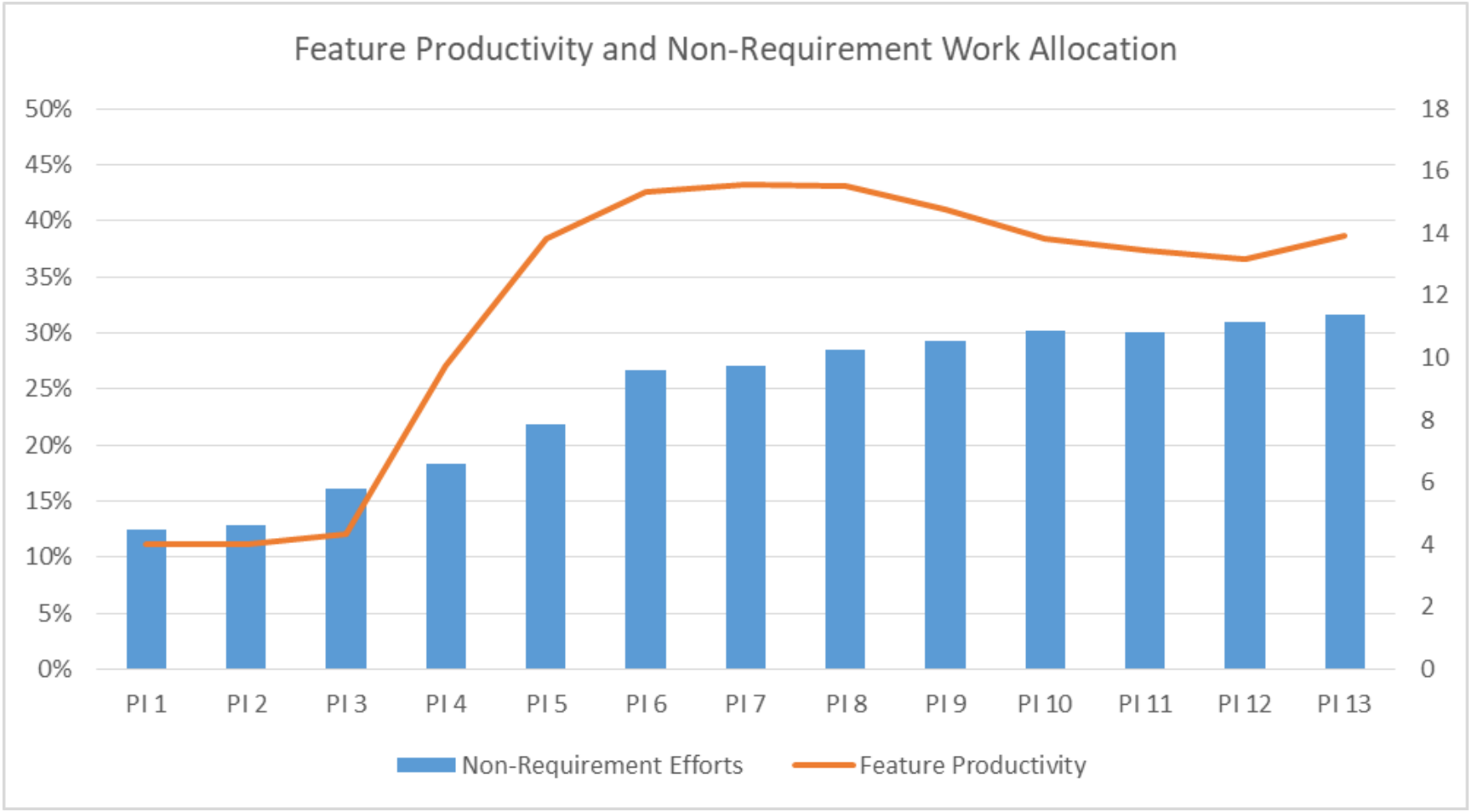
Metrics for Users: Capability Sizing



- **We are in the process of collecting metrics to provide leadership with a database of resolved Capabilities, with which analogies can be drawn for future Capabilities**
- **Shown above are all Capabilities within ART 2; inclusive of those remaining Unresolved**

AE2A in C2ISR: Right Metrics for the Right Audience

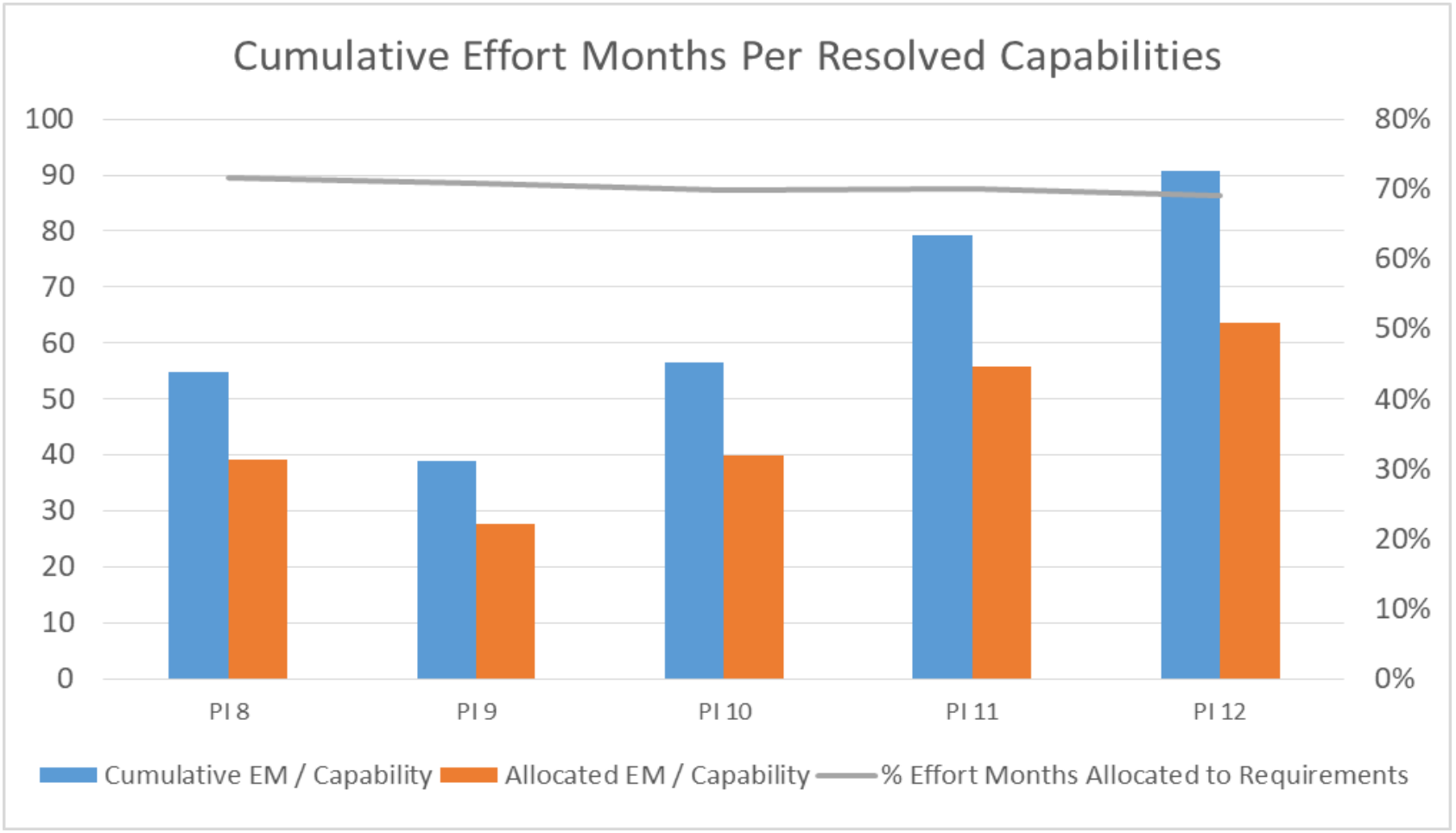
Data Analysis For Senior Leadership – Work Allocation



- **Accounting for productivity towards Non-Requirement scope is critical when establishing Capability / Feature timelines and allocating resources**

AE2A in C2ISR: Right Metrics for the Right Audience

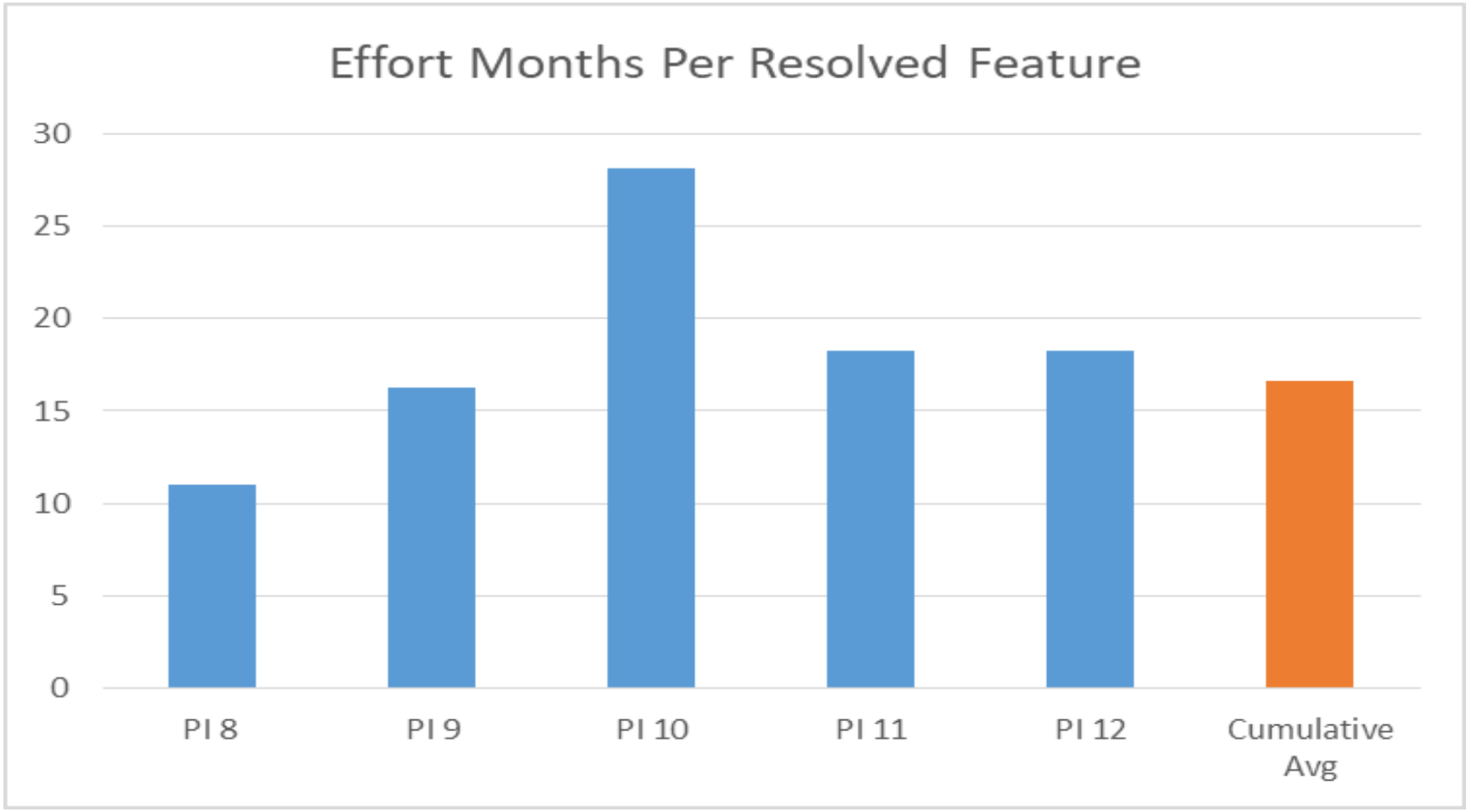
Data Analysis For Senior Leadership – Capability EM



- **As additional data is collected each PI the Cumulative Effort Months Per Resolved Capability will become steady and reflect the amount of work necessary from inception to completion**
- **An understanding of work allocation also allows for understanding of EM Scaled to encompass only Requirement satisfying efforts**

AE2A in C2ISR: Right Metrics for the Right Audience

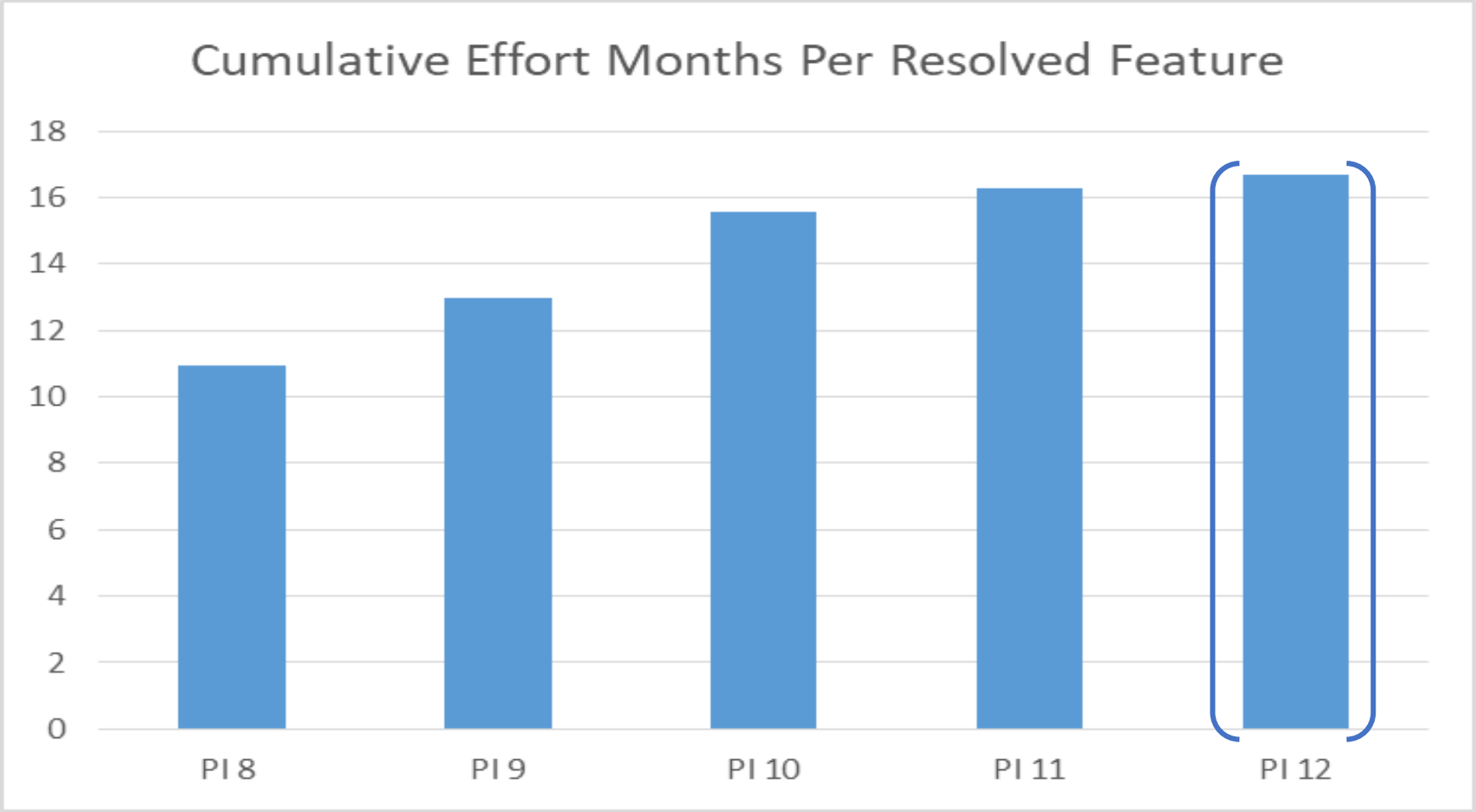
Data Analysis For Senior Leadership – Feature EM



- **Traditional cost metrics still apply! Understanding Feature Sizing and Effort Months required for a Feature allows Decision Makers to make trade-offs based on Value of a Feature**
- **CAUTION: This view can be misleading as all effort months for a Capability are attributed to only one single PI rather than capturing progress made in prior PIs**

AE2A in C2ISR: Right Metrics for the Right Audience

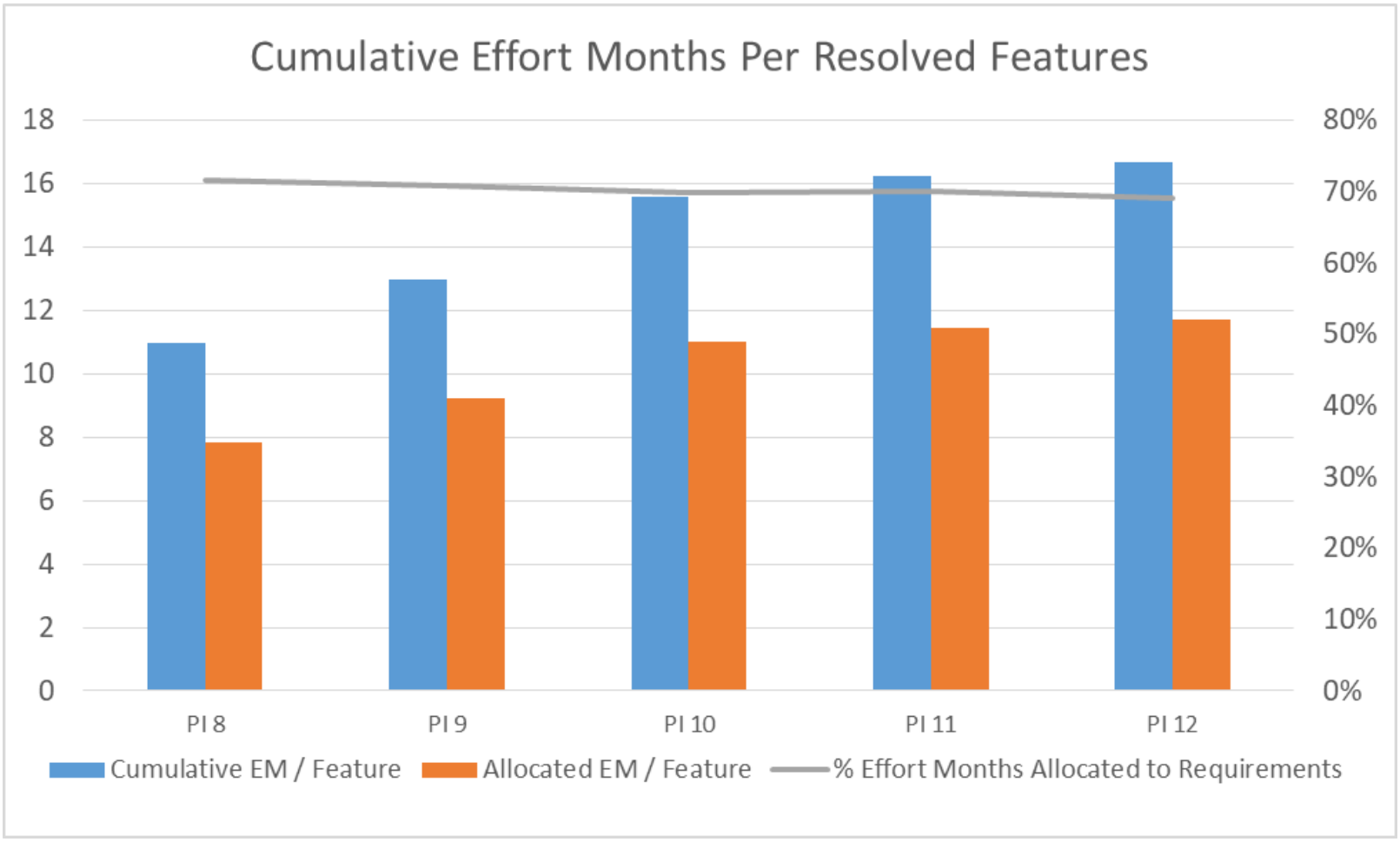
Data Analysis For Senior Leadership – Feature EM



- **As additional data is collected each PI the Cumulative Effort Months Per Resolved Feature will become steady and reflect the amount of work necessary from inception to completion**
- **Traditional cost metrics still apply! Understanding Feature Sizing and Effort Months required for a Feature allows Decision Makers to make trade-offs based on Value of a Feature**

AE2A in C2ISR: Right Metrics for the Right Audience

Data Analysis For Senior Leadership – Feature EM



- **As additional data is collected each PI the Cumulative Effort Months Per Resolved Feature will become steady and reflect the amount of work necessary from inception to completion**
- **An understanding of work allocation also allows for understanding of EM Scaled to encompass only Requirement satisfying efforts**