OST®
CONVERGING MISSION, INNOVATION, AND TECHNOLOGY

Using Process Maturity and Agile to Strengthen Cyber Security

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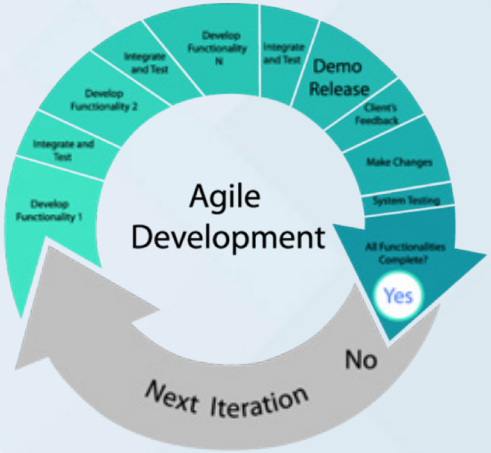
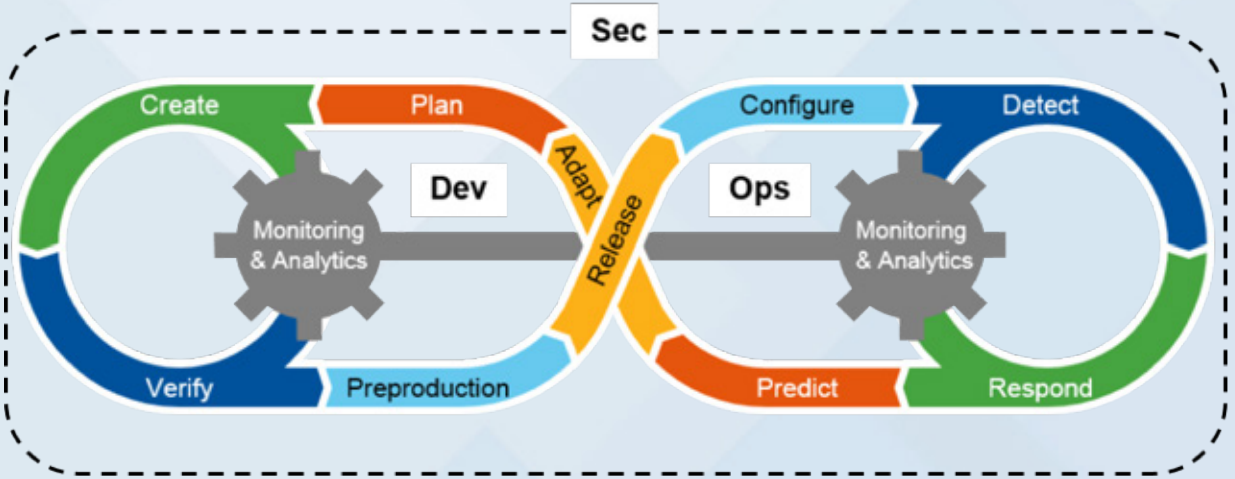
Bottom Line Up Front

Programs can meld Process Maturity, Agile Development, and DevSecOps to produce more resilient systems with reduced vulnerabilities

But it takes commitment, data, tools and process discipline





Presentation Agenda

- About OST
- Problem Statement
- “Agile5” Framework
- DevSecOps
- Case Study: Increasing Velocity and Quality with Agile5
- Application to Cyber Security
- Questions

Who is OST

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ESTABLISHED IN **1999**

OUR KEY ELEMENTS

1. A prepared & motivated workforce
2. Commitment to a vigorous quality management system
3. Commitment to our customer & a clear understanding of their needs

We Support the Air Force

51 Task Orders Awarded
180 FTEs
16 Air Force Bases
$80M Contract Values Awarded

SCALED AGILE PARTNER BRONZE

OVER 94%
Contracts are as Prime

WHO WE SERVE

80% Federal Government
20% State and Local Government

CERTIFICATIONS & APPRAISALS

ISO: 9001:2008 | CMMI Level 5 | CMMI Service Level 3
ITIL V3-1 | DCAA Approved Accounting System
ISO standards 27001, 20000, and 10002

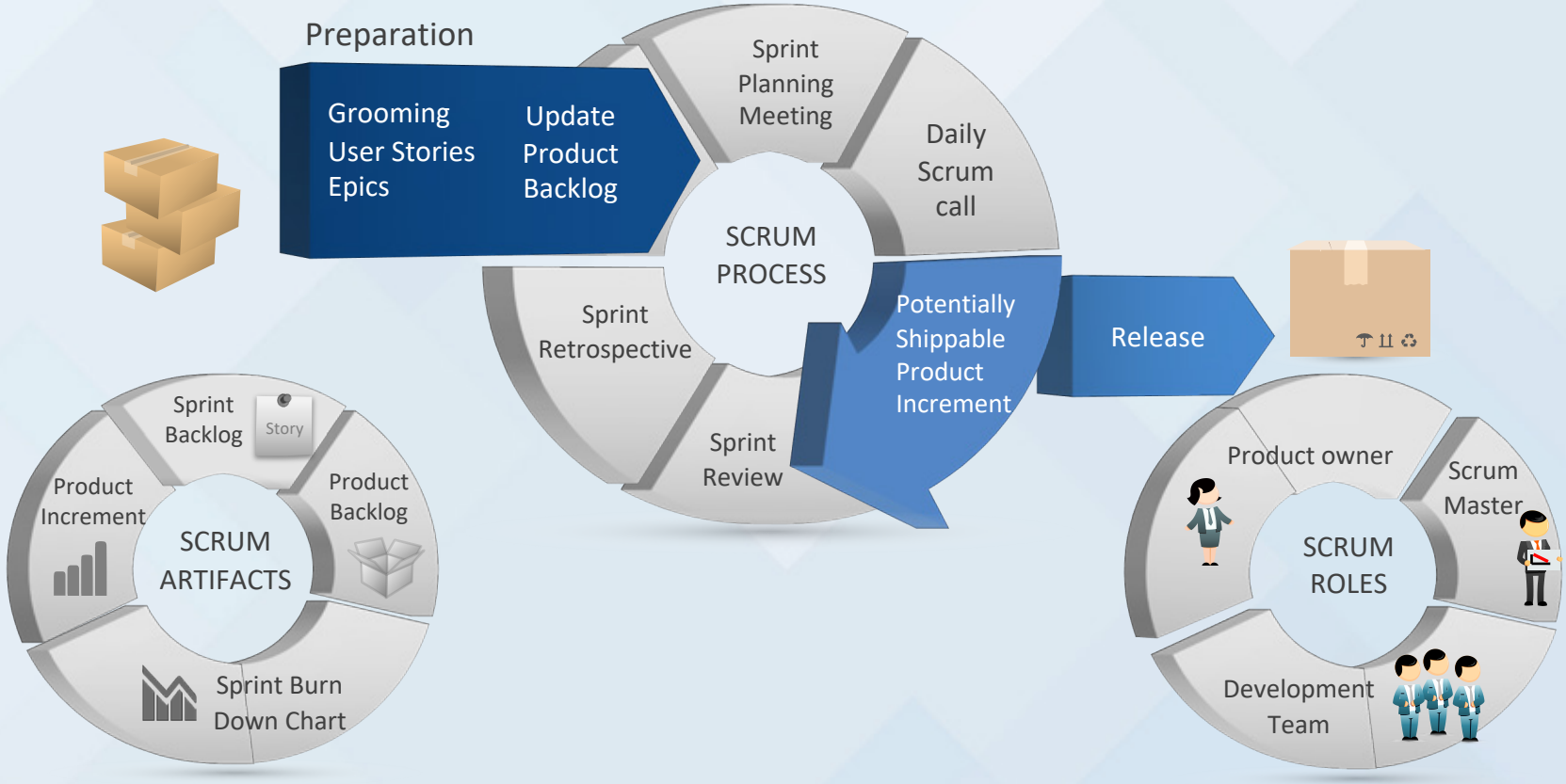
90% OF DELIVERY MANAGERS
Are PMP Certified

amazon web services | Partner Network
CONSULTING PARTNER
MANAGED SERVICE PARTNER

Problem Statement

- High maturity process discipline (CMMI 5), responsive delivery (Agile/DevSecOps) and high quality (low defect rate) are like cost, schedule and performance on a program. One constraint always binds the others…
- … Or does it?
- This presentation offers an approach that can overcome limitations of the triple constraint and avoid compromise

You Probably Know Agile



Applying CMMI Level 3 to Agile

PP – Project Planning
RM – Req. Mgt.

RD – Req. Dev
TS – Tech. Sol.
PI – Prod. Integration
VR – Verification
CM – Configuration Mgt.
DAR – Decision Analysis

Preparation

Grooming User Stories Epics

Update Product Backlog

Sprint Backlog

Sprint Planning Meeting

Daily Scrum call

CMMI L3 Process Execution

Sprint Retrospective

Sprint Review

Potentially Shippable Product Increment

Releases

PMC – Monitor & Control
RSK – Risk Mgt.
IPM – Integrated Project Mgt.
MA – Measurements

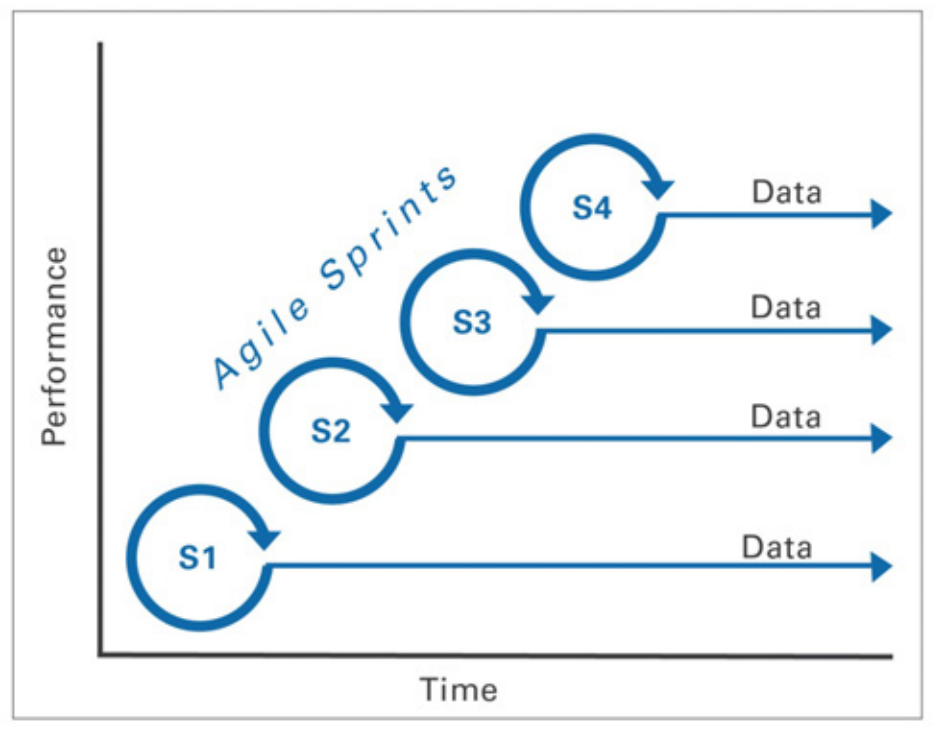
PPQA– Quality Assurance

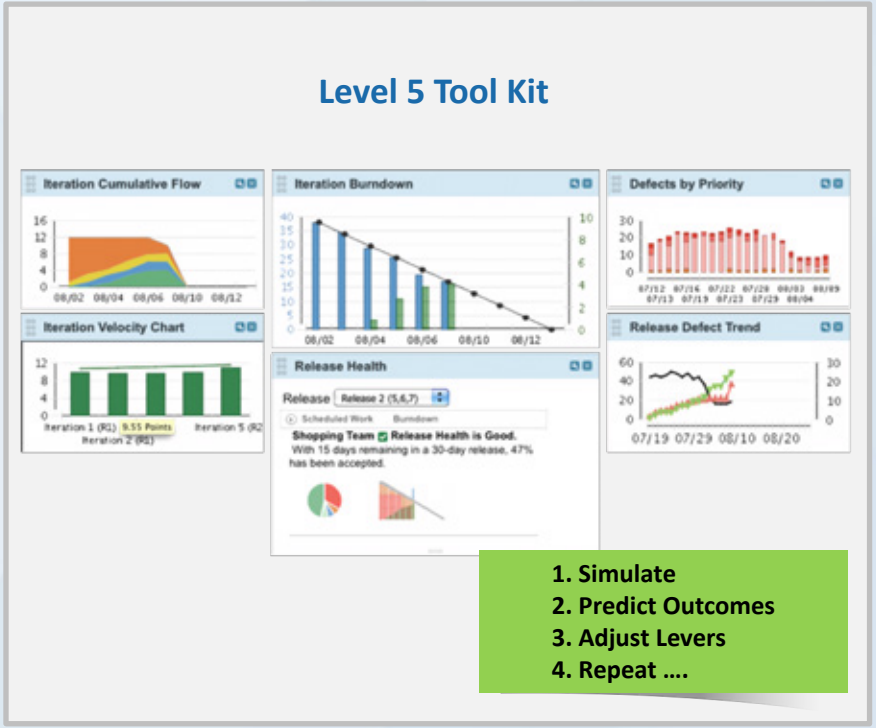
Close the Gaps & Recommendation

Institutionalize

OT – Org. Training
OPD – Process Definition
OPF – Process Focus

Applying CMMI Level 5 to Agile



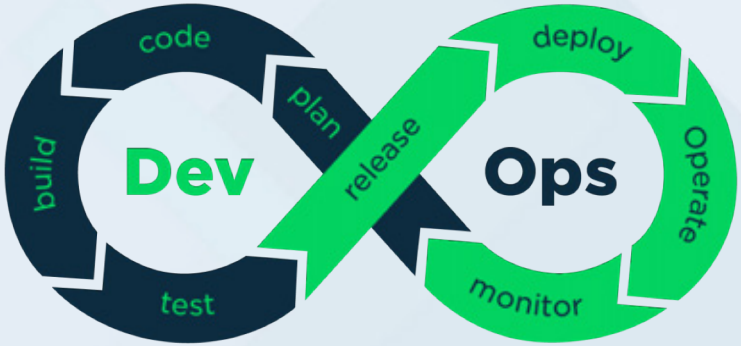


- Use data to create simulation to predict outcomes for velocity, defect density, utilization
- Adjust controllable factors to optimize performance
- Apply to “real world”

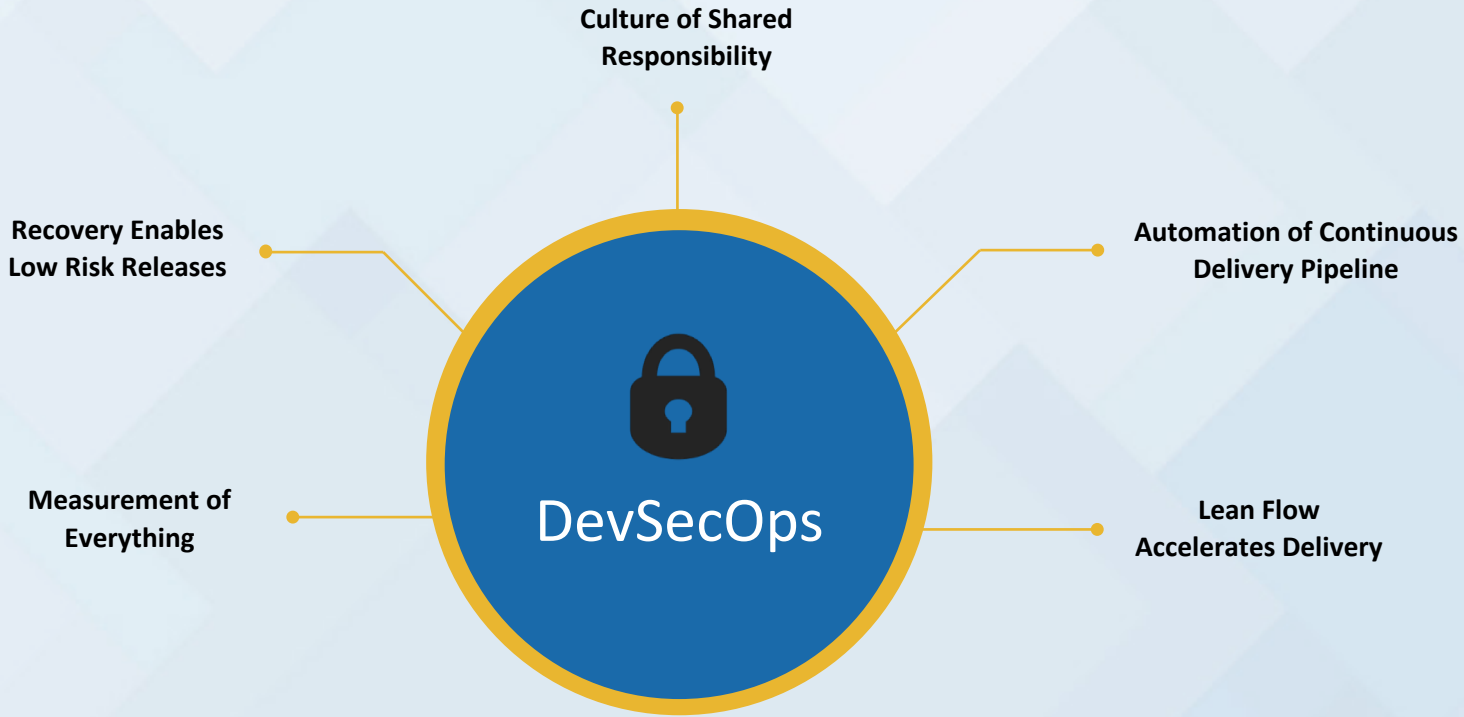
You May Know DevOps

Common goal for Organization's success

- Dev team knows what Ops team looks for
- Ops Team knows what Dev is working on
- They work hand-in-hand



DevSecOps



Continuous Security

Case Study

FAA Spectrum Engineering and Assignment Group

Customer Mission and Focus:

- Provide the safest, most efficient aviation system in the world
- Key role in the protection of the National Airspace System (NAS)
- Secures, manages, and protects all civil aviation radio frequency spectrum resources

OST's Mission and Focus:

- Sustain and Enhance the Spectrum Engineering and Automation Support
- Provide system and software engineering services to protect interference-free communications, navigation, and surveillance systems operations for all U.S. civil aviation and CONUS military aviation in the NAS
- Deliver new capabilities through Agile and CMMI Practices

Case Study – Goal Formulation

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Project Goal Based On:

- Customer Objectives
- OST Goals
- Budget – Sequestration; Reductions
- Team Satisfaction

Goal That:

- Provides FAA Spectrum Engineering optimal cost efficient services
- Improves performance of key modules

Goal

Improve the velocity from the current baseline of Mean = 0.77; Std Dev = 0.22 to Mean =2.0 and Std Dev = 0.20 without sacrificing quality* and team satisfaction**

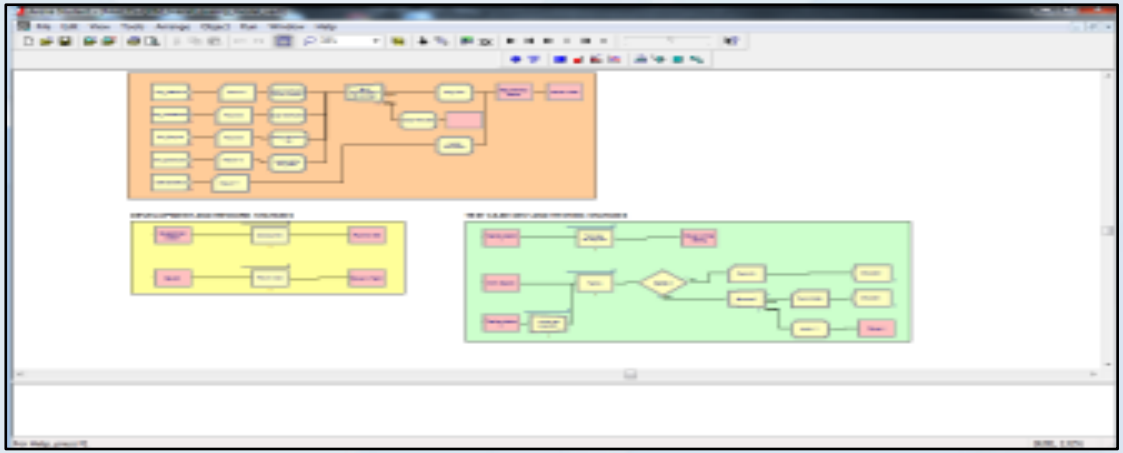
*Quality is defined as production defect density – less than or equal to 10%
** Team satisfaction is measured by the employee survey – Avg. score 22

Case Study

Process Performance Model – High Level

Model	Outcome Predicted	Frequency of Use	Created By	Used By
Agile 5 – Release Planning and Monitoring	• Number of story points that will be completed in a given release or sprint • Velocity	• Before sprint starts • Twice a week for forecast and sprint resource adjustments	SEAS Team / Corporate Process Group	SEAS PM / Scrum Master

Face of model showing “Agile Stations” including design; development; test; rework.

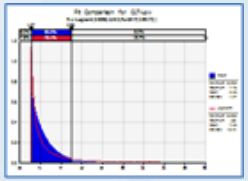


Case Study – Model Details

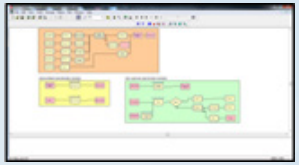
- Output = # of story points that will be completed for a given release/sprint length
- Inputs = Development times, testing times, test case development times, defect densities, no. of resources, story points & no. of user stories
- Each user story is rated by complexity:
  - Low : 02 Story Points
  - Medium : 08 Story Points
  - High: 24 Story Points
- Developer Velocity is determined using story points and hours taken to complete

Case Study – The Journey

Goal → **Data Analysis** → **Baselines (PPBs)**
- Stratification
- Hypo Tests



Model (PPMs)

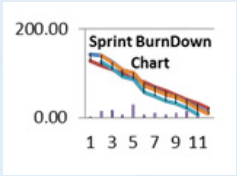


- Partitioned dataset to build and test the model
- Intuition

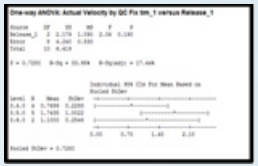
Sprint Planning

Iterative development (added “stations over time”)

Sprint Monitoring
- Burn down
- What-if’s
- Control Charts

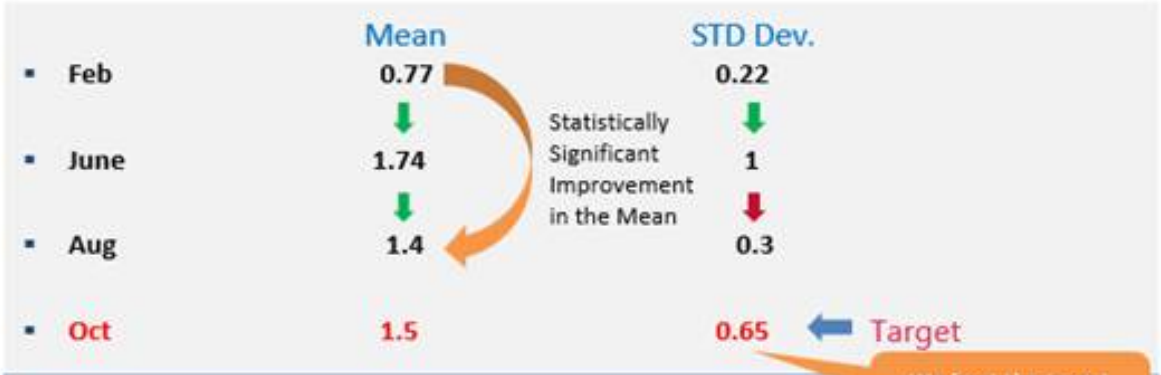


Hypo Testing Recalibration



- CAR results in changed baselines
- Model refinement

Case Study - Results



Two-Sample T-Test and CI: Velocity_3.4.0, Velocity_3.6.0

```
Two-sample T for Velocity_3.4.0 vs Velocity_3.6.0

                N   Mean  StDev  SE Mean
Velocity_3.4.0  4  0.770  0.231     0.12
Velocity_3.6.0  5  1.382  0.280     0.13


Difference = mu (Velocity_3.4.0) - mu (Velocity_3.6.0)
Estimate for difference:  -0.612
95% CI for difference:  (-1.025, -0.199)
T-Test of difference = 0 (vs not =): T-Value = -3.50  P-Value = 0.010  DF = 7
Both use Pooled StDev = 0.2605
```

Case Study – Outputs and Outcomes

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OUTPUTS

- Velocity improved from (0.77, .23) to (1.38, 0.28) with a production defect density of 3%
- Team felt a sense of accomplishment
- Made our “successes” more repeatable because of the CAR
- Opportunity for professional growth: Impacts of actions on efficiency and quality

OUTCOMES

- Productivity gain of $600K in 3 releases
- Customer received 20% more requirements than expected
- Didn't have to sacrifice stakeholder satisfaction for regulatory compliance
- Received kudos from their management
- Available for use in other business areas
- Applied the case study to:
  - Improve the Testing Process
  - Keep building upon the model
  - New team members

- Predicts interim and final release outcomes, number of stories that will be delivered, time to complete product
- Uses controllable factors – Stories, Resources assigned

- Models factor variation, allowing us to understand prediction and confidence intervals
- Connects upstream development/test activities with defect density

Application to Cyber Security

- Analysis of historical data to identify “vulnerability characteristics”
- Define response techniques for these characteristics
- Use of data and predictive models to identify where to expect the “soft spots”
- Apply response techniques as part of the sprint
- Include security enablers in product backlog
- Integrate vulnerability testing into the sprint

Summary

The combination of:

- high maturity process discipline (Data collection, analytics, predictive modeling, etc.),
- agile (Development team and business working together, quick delivery of functional code, etc.),
- and DevSecOps (Continuous delivery, heavy use of automation, etc.)

… is not only possible, but enabling

Benefits:

- Higher productivity, faster product delivery
- Lower production defect density for higher product quality
- Responsiveness to evolving/changing requirements
- And when applied to cyber security – **Reduced vulnerabilities and the ability to more quickly adjust/respond to evolving threats**

Questions?