19th Practical Software and Systems Measurement Users' Group Meeting and Workshops

"Fundamental Measurement Principles: The Basis for Advanced Engineering Decision Information"

September 10-14, 2108
Arlington, Virginia

Meeting and Workshops Agenda

Time	Monday	Tuesday	Wednesday[1]	Thursday	Friday
7:30 – 8:30	Continental Breakfast	Continental Breakfast	Continental Breakfast	Continental Breakfast	Continental Breakfast
Morning Session* 8:30 – 12:30	PSM Training	Welcome & Introductions; Keynotes; Presentations	Presentations	Keynote; Presentations	Workshop Outbriefs Wrap-up
Lunch 12:30 – 1:30	Lunch	Lunch	Lunch	Lunch	
Afternoon Session* 1:30 – 5:00	PSM Training	Concurrent Workshops 1-3	Concurrent Workshops 4-6	Concurrent Workshops 7-9	

* Morning and afternoon breaks included

Other Agenda Items and Schedule

Monday, 10 September 2018

7:30am - 8:30am On-Site Conference Registration

8:30am – 5:00pm **PSM Training**: This course is an introduction to PSM for those who are new to PSM or who want a refresher course on the PSM principles and information-driven measurement process. The new DAU lesson on agile measurement will also be presented as part of this training course.

Tuesday, 11 September 2018

7:30am - 8:30am On-Site Conference Registration

Wednesday, 12 September 2018

10:40am PSM Picture
5:00pm PSM Dinner: Teds Montana Grill

Friday, 14 September 2018

10:00am - 12:00pm Workshop Outbriefs
Each workshop lead will summarize the results of their workshop and discuss future goals.

12:00am - 12:20pm Conference Wrap-Up

[1] **Group picture Wednesday AM - location will be announced.**

Presentations: Tuesday - Friday

Presentation Abstracts are provided starting on page 13

Time	Tuesday	Wednesday	Thursday	Friday
8:30 - 8:40	***Welcome and Announcements***	***Announcements***	***COSYSMO 3.0 Dr. Jim Alstad***	***Announcements***
8:40 - 9:20	***Introductions (20 minutes)***	***Using Army Software Sustainment Cost Estimating Results*** ***Cheryl Jones, James Doswell***	***Keynote: DoD's Digital Engineering Strategy and Implementation: Measurement Challenges*** ***Philomena Zimmerman***	***Workshop Outbriefs***
9:20 - 10:00	***Keynote: Monitoring Agile Projects (50 minutes)*** ***Matt Kennedy***	***Complications with Using Affordability Efficiency Measures – $/FH Tells You How Much a Flight Hour Costs, Not What You Get For It*** ***Dr. Mike Yokell***	***Integration of Parametric Cost Estimation with System Architecture – It's a dirty job but someone has to do it!*** ***Barry Papke, Gan Wang***	***Workshop Outbriefs***
10:00 - 10:40	***Keynote: DSB Task Force on Design and Acquisition of Software for Defense Systems (50 minutes)*** ***Bill LaPlante***	***Managing Capability Evolution in Complicated Engineering Environments Through Measurement*** ***Jo Ann Lane***	***Measurement of Software Throughout the Lifecycle Using SRDRs*** ***James Doswell***	***Workshop Outbriefs***
11:00 - 11:40	***An Approach to Fixed Price Agile*** ***Michael Harris***	***Software and Systems Engineering Measurement Challenges in Integrating Software Assurance into Defense Systems*** ***Kenneth Nidiffer***	***Analysis and Quality in Measurement Reporting*** ***Sal Bruno***	***Conference Wrap-up***
11:40 - 12:20	***Extended Case Study of Causal Learning within Architecture Research*** ***Robert Stoddard, Rick Kazman, David Danks, Mike Konrad***	***Words and Numbers*** ***Anthony Powell***	***Cybersecurity in the Cloud*** ***Arlene Minkiewicz***	
12:20 - 12:30	***Workshop Introductions***	***Workshop Introductions***	***Workshop Introductions***	

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PSM Users' Group 2018 Workshops

Descriptions on following pages

Workshops: Tuesday – Thursday

Workshops: 1:30 to 5:00		
Tuesday	**Wednesday**	**Thursday**
1. *Measurement for Agile Programs* Facilitators: Matt Kennedy, US Treasury, Bill Golaz and Greg Niemann, Lockheed Martin, Paul Janusz, US Army ARDEC	***4. Measures for Iterative Software Development and Acquisition*** Facilitators: Geoff Draper, Harris Corp; Joe Elm, L3T Technologies; Cheryl Jones, US Army ARDEC ; Greg Niemann, Lockheed Martin	**7. *Measurement in Digital Engineering*** Facilitators: Judith Dahmann, MITRE; Chris Schreiber and Garry Roedler, Lockheed Martin; Peter Korfiatis, Brian Soeder, and Ryan Jacobs, MITRE
2. *Causal Search in Observational Data* Facilitators: Mike Konrad and Robert Stoddard, SEI	***5. Resolving Complications with Using Affordability and Affordability Efficiency Measures*** Facilitators: Dr. Mike Yokell and Bill Golaz, Lockheed Martin	**8. *Measurement on Sustainment Programs*** Facilitators: Dr. Brad Clark, Software Metrics, Inc., James Doswell, US Army DASA-CE, Paul Janusz, US Army ARDEC
3. *Improving Software Maintenance & Sustainment Cost Estimation in Practice* Facilitator: Dr. Robert N. Charette, ITABHI Corporation, Cheryl Jones, US Army ARDEC	***6. COCOMO III Workshop: Refining the COCOMO III Model*** Facilitator: Dr. Brad Clark, USC Center for Systems and Software Engineering	**9. *COSYSMO 3.0: The Final Model for Estimating Systems Engineering Costs*** Facilitators: Dr. Jim Alstad and Dr. Barry Boehm, USC Center for Systems and Software Engineering

Workshop #1: Measurement for Agile Programs

Facilitator: Matt Kennedy, US Treasury, Bill Golaz and Greg Niemann, Lockheed Martin, Paul Janusz, US Army ARDEC

Prerequisites:

- Participants should have a general understanding of the Agile development process.
- Participants should review the strawman Information Category - Measurement Concept - Measure (ICM) table on measurement
- Participants should review the SRDR-M for agile programs

Materials to Bring:

- Bring examples of any measures you have used on agile programs
- Bring recommended changes to the agile ICM Table

Discussion:

More and more DoD programs are using agile methodologies for development and sustainment of systems. In this workshop, we will discuss what is different about measurement for agile programs. We will discuss measures at different levels, including:

- Team measures: what is used during increments (also called sprints)
- Program measures: what do you measure at the program level
- Enterprise measures: what can you use across agile programs

We will also discuss the new SRDR for agile programs, and the required data from that CDRL.

In preparation for this workshop, the facilitators have developed a strawman ICM table for agile measurement. The intent of this is to focus discussions, and allow us to develop a reasonable set of practical measures that provide useful data to decision makers. The intent is to finalize an agile ICM table, and provide sample measurement guidance.

We will discuss the possibility of producing a white paper that provides measurement specifications for the identified measures.

Goals/Products:

- ICM Table for agile measurement that is ready for use
- Outline and writing assignments for agile measurement guidance

Workshop #2: Causal Search in Observational Data

Facilitators: *Mike Konrad, SEI; Robert Stoddard, SEI*

Prerequisites:

Basic understanding of statistical correlation and regression.

Materials to Bring:

(1) Attendance in the morning presentation "Extended Case Study of Causal Learning within Architecture Research" by Bob Stoddard and Mike Konrad will set the stage for this workshop

(2) Optional: pre-read a *book review* of "The Book of Why: The New Science of Cause and Effect." https://www.nytimes.com/2018/06/01/business/dealbook/review-the-book-of-why-examines-the-science-of-cause-and-effect.html

The whole book is easy to read but is about 500 pages. The book review does a good job of summarizing takeaways from the book.

(3) Optional: for those interested in exercising causal search algorithms: a laptop with Windows to receive and exercise the Tetrad causal discovery tool on a practice data set.

Discussion:

A three year research project led by the Software Engineering Institute (SEI) seeks to apply modern advances in causal learning (search and estimation) along with Tetrad tooling to go beyond traditional correlation and regression analyses and more accurately identify the causal relationships among software process factors and product outcomes. Early use of causal learning suggests that many (up to 80%) of statistically-significant factors do not confirm as causally-related to outcomes. This workshop seeks to enlighten the practical measurement community and encourage joint collaboration in the early adoption of causal learning to improve the quality (and toolkits) of systems engineering and software cost estimation research.

Goals/Products:

The workshop will produce the following:

1) Workshop group statement to the PSM community on next steps to further enlighten the full community on causal learning and encourage adoption,
2) A working discussion in small groups followed by a final large group summary of:
    a. Next steps and discussion of participants data sets
    b. Research questions and hypotheses worthy of causal learning
    c. Data sources helpful in causal learning research

Bottom-line: a clearer understanding of the role that causal search can play in enhancing understanding beyond the more widely known and utilized regression-based studies using observational data.

Workshop #3: Improving Software Maintenance & Sustainment Cost Estimation in Practice

Facilitator: Dr. Robert N. Charette, ITABHI Corporation, Cheryl Jones, US Army ARDEC

Prerequisites:

- An interest in improving software cost estimation for software maintenance and sustainment.
- Recommend you review:
  - Defense Science Board. Design and Acquisition of Software for Defense Systems, Department of Defense, February 2018, at http://www.dtic.mil/dtic/tr/fulltext/u2/1048883.pdf
  - National Academies. "Critical Code: Software Producibility for Defense," National Academies Press, 2010, at https://www.nap.edu/catalog/12979/critical-code-software-producibility-for-defense

Materials to Bring:

Good ideas

Discussion:

Recent DoD directives demand that affordability and supportability become as important decision considerations as meeting acquisition cost and schedule when deciding whether to invest in a defense program. Software maintenance and sustainability costs are increasingly becoming a major determinant in whether a defense project will be affordable or supportable in the future due to software's *sine qua non* in whether a defense system meets its military objectives. Accurate software cost estimates, be they for acquisition or sustainment and maintenance, are of paramount importance in assessing a program's affordability and supportability.

However, software maintenance and sustainment cost estimation has long lived in the twilight, perceived as not particularly important to get right. As a result, software maintenance and sustainment cost estimation and sustainment models are not as accurate as they should or need to be. This will only change when cost estimation for this part of the software life cycle is treated truly with equal importance as DoD software acquisition cost estimation.

This workshop will examine the current state of software maintenance and sustainment cost estimation practice, and what need to be done—both technically as well as politically—to place it on equal footing with software acquisition cost estimation. The current ongoing effort in the US Army to improve software maintenance and cost estimation practice for today and into the future certainly highlights what is needed to be improved on the technical front. However, getting the visibility and political support required is not so clear-cut.

Workshop #3: Improving Software Maintenance & Sustainment Cost Estimation in Practice (cont.)

One idea to raise the visibility, importance and practice that software sustainment and maintenance cost estimation requires is to eventually establish a Software Maintenance & Sustainment Cost Estimation (SMSCE) Council, similar to the CIO and ERM councils. Both the CIO and ERM councils started out as informal groups that have evolved into formal organizations that today influence both government and DoD policy and practice. The workshop discussion will center how a SMSCE community of practice could be started (e.g., within the PSM community) which could then be evolved into something more formal, like SMSCE Council, that could influence DoD/government software maintenance and sustainment policy and practice.

Part of the workshop discussions focus on what would be the objectives of a future SMSCE Council (e.g., how to improve software maintenance and sustainment cost estimation practice throughout DOD, or how to require software maintenance and sustainment data be captured on contracts), what would be needed in both the short-term and long-term to achieve these types of objectives, who should be on such a council and how to convince them to join, and what other infrastructure requirements need to be defined in order to make it successful.

Other ideas on how to make software sustainment and maintenance cost estimation on equal footing with software acquisition cost estimation sooner than later without the need for forming such a community of practice or council will be highly welcomed.

Goals/Products:

- Concepts on how to make software sustainment and maintenance cost estimation as important as software acquisition cost estimation
- Ideas on how to create a SMSCE Council or community of practice from which a Council could emerge
- Suggestions on how to improve software sustainment and maintenance cost estimation policy and practice today and into the future

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Workshop #4: Measures for Iterative Software Development and Acquisition

Facilitators: Geoff Draper, Harris Corp, Joe Elm, L3T Technologies, Cheryl Jones, US Army ARDEC, Greg Niemann, Lockheed Martin

Prerequisites:

- Recommended reading:
  - DSB Report on the Design and Acquisition of Software for Defense Systems (https://www.acq.osd.mil/dsb/reports/2010s/DSB_SWA_Report_FINALdelivered2-21-2018.pdf
  - Defense Innovation Board metrics for software development https://media.defense.gov/2018/Jul/10/2001940937/-1/-1/0/DIB_METRICS_FOR_SOFTWARE_DEVELOPMENT_V0.9_2018.07.10.PDF)
- Recommend attending DSB keynote on Tuesday morning
- Read-ahead materials will be provided; please review prior to the workshop

Materials to Bring:

- Ideas for measures

Discussion:

A recent Defense Science Board (DSB) looked at the question of whether the defense industry is capable of meeting future needs. The task force concluded that the Department needs to change its internal practices to encourage and incentivize new practices in its contractor base. The assessment of the Task Force is that the Department can leverage commercial best practices and iterative development even in its mission critical software systems. One of the key findings is that "the Task Force strongly believes greater adoption of continuous iterative development and its associated best practices will result in significantly improved acquisition performance. The assessment of the Task Force is that an iterative approach to software development and sustainment is applicable to the DoD and should be adopted as quickly as possible."

In addition, the Defense Innovation Board has released their "Ten Commandments of Software" and proposed new measures for assessing DOD software development.

As a result of these actions, the NDIA Systems Engineering Division and INCOSE are establishing a working group to provide industry recommendations for DoD consideration to advance the use of iterative software development methods and associated measures in defense acquisition. These recommendations may also be applicable to advance the state of the practice in other application domains. The working group charter is to:

- Provide industry recommendations and resources to advance the use of continuous iterative software methods in DoD programs and acquisition
- Address recommendations of DSB Software Design and Acquisition Task Group and Defense Innovation Board

During this workshop, attendees will discuss these reports and recommendations, and begin discussions on this work.

Goals/Products:

Recommendations for going forward.

Workshop #5: Resolving Complications with Using Affordability and Affordability Efficiency Measures

Facilitator: Dr. Mike Yokell and Bill Golaz, ESEP (Lockheed Martin)

Prerequisites:

- Review the presentation: Complications with Using Affordability Efficiency Measures
- Review the results of the 2016 workshop on measuring affordability

Materials to Bring:

- Any examples you may have that worked around or resolved complications using affordability efficiency measures

Discussion:

We will use the presentation to prime some discussion about measuring affordability and value, then look at the results of the 2016 affordability workshop. The goal is to Resolve Complications with Using Affordability and Affordability Efficiency Measures.

We will discuss:

- How do we help folks use affordability efficiency measures responsibly and fairly?
- When and how should these measures be used and where do they get us in trouble?
- What can we do about it?

Goals/Products:

- Guidance to resolve complications with using affordability and affordability efficiency measures.

Workshop #6: COCOMO III Workshop: Refining the COCOMO III Model

Facilitator: Dr. Brad Clark, USC Center for Systems and Software Engineering

Prerequisites:

An understanding of how a software cost estimation model is used in creating software development cost estimates. Knowledge of the COCOMO II Software Cost Estimation Model would be helpful but not absolutely necessary.

Materials to Bring:

Bring pen and paper. Handouts will be provided if needed.

Discussion:

This workshop will begin with a brief overview of the proposed COCOMO III model. The focus will then shift to the model parameters, called Cost Drivers. The main purpose of the workshop is to discuss the impact of each Cost Driver in the model estimate.

Participants should come to the workshop prepared to discuss, rank and judge the range of influence each cost driver has in a COCOMO III estimate. The COCOMO II Cost Driver's range of influence will be used for guidance.

Goals/Products:

A draft ranking and influence range for each COCOMO III cost driver.

Workshop #7: Measurement in Digital Engineering

Facilitators: Judith Dahmann, MITRE; Chris Schreiber and Garry Roedler, Lockheed Martin; Peter Korfiatis, Brian Soeder, and Ryan Jacobs, MITRE

Prerequisites:

- An understanding of general measurement approaches and current approaches to measurement, along with an understanding of the move to digital engineering
- Recommended reading:
  - Video on digital engineering (https://www.acq.osd.mil/se/initiatives/init_de.html)
  - The recently released DoD Digital Engineering Strategy the DoD Digital Engineering Strategy (https://www.acq.osd.mil/se/docs/2018-DES.pdf).
  - An article in Defense News where Michael Griffin lays out the rationale behind the strategy (http://www.defensedaily.com/griffin-releases-dod-digital-engineering-strategy-new-weapons-projects/
  - Brochure on digital engineering (https://www.acq.osd.mil/se/docs/2018-DES-Brochure.pdf)
  - DE Fundamentals (https://www.acq.osd.mil/se/docs/DE-Fundamentals.pdf)
- Recommend attending Digital Engineering keynote in the morning of the workshop

Materials to Bring:

- Measures and measurement approaches for digital engineering

Discussion:

The Department of Defense is putting new emphasis on 'Digital Engineering". This workshop will present an overview the key tenets of digital engineering as the basis for examining the key measurement issues and challenges systems engineering can expect to face as we transform the practice of application of systems engineering.

Goals/Products:

Clear understanding of the impact of digital engineering on measurement

Workshop #8: Measurement on Sustainment Programs

Facilitators: Dr. Brad Clark, Software Metrics, Inc., James Doswell, US Army DASA-CE, Paul Janusz, US Army ARDEC

Prerequisites:

- Participants should have a general understanding of software sustainment.
- Participants should review the strawman Sustainment Information Category - Measurement Concept - Measure (ICM) table
- Review the SRDR-M
- Review the software sustainment questionnaire

Materials to Bring:

- Bring examples of any measures you have used on sustainment programs
- Bring recommended changes to the sustainment ICM Table

Discussion:

More and more of DoD funding is spent on sustainment. In this workshop, we will discuss what is different about measurement for sustainment. We will discuss measures at different levels, including:

- Measures for cost and schedule estimation
- Measuring size
- Data availability and evaluation

We will also discuss the new SRDR for sustainment, and the required data from that CDRL.

In preparation for this workshop, the facilitators have developed a strawman ICM table on sustainment measurement. The intent of this is to focus discussions, and allow us to develop a reasonable set of practical measures that provide useful data to decision makers. The intent is to finalize a sustainment ICM table, and provide sample measurement guidance.

We will discuss the possibility of producing a white paper that provides measurement specifications for the identified measures.

Goals/Products:

- ICM Table for sustainment measurement that is ready for use
- Outline and writing assignments for sustainment measurement guidance

Workshop #9: COSYSMO 3.0: The Final Model for Estimating Systems Engineering Costs

Facilitators: Dr. Jim Alstad, Dr. Barry Boehm, USC Center for Systems and Software Engineering

Prerequisites:

Those with experience with systems engineering projects, either as project lead, estimator, or engineer, are recommended to attend. Those experienced in other types of cost estimation are also welcome.

Materials to Bring:

Experience estimating, leading, or working on systems engineering projects. Experience on other types of cost estimation. If possible, data from completed systems engineering projects.

Discussion:

Thanks in part to previous PSMUG Workshops, the final version of the COSYSMO 3.0 Systems Engineering Cost Estimating Model is newly available. This Workshop will go over the content of the Model, and a cost estimating spreadsheet.

Goals/Products:

- Feedback on the Model and its auxiliary material
- Interest in providing actual project data to check the Final COSYSMO 3.0 model

Presentation Abstracts
Tuesday

Keynote Presentation

Title: Monitoring Agile Projects

Presenter: Mr. Matt Kenndy, Comptroller of the Currency (OCC), US Treasury

Abstract: This presentation will discuss various measures used to monitor agile projects at both the team and project level. We will review what each measure does and does not indicate about the team's/project's performance. We will also discuss how some measures, depending on their application, may either positively or negatively influence program outcomes.

Keynote Presentation

Title: DSB Task Force on Design and Acquisition of Software for Defense Systems

Presenter: Dr. William LaPlante, MITRE

Abstract: A recent Defense Science Board (DSB) looked at the question of whether the defense industry is capable of meeting future needs. The task force concluded that the Department needs to change its internal practices to encourage and incentivize new practices in its contractor base. The assessment of the Task Force is that the Department can leverage best practices of iterative development even in its mission critical software systems. One of the key findings is that "the Task Force strongly believes greater adoption of continuous iterative development and its associated best practices will result in significantly improved acquisition performance. The assessment of the Task Force is that an iterative approach to software development and sustainment is applicable to the DoD and should be adopted as quickly as possible." This presentation will provide an overview of the DSB study and recommendations.

Title: An Approach to Fixed Price Agile

Presenter: Michael Harris, PREMIOS

Abstract: This presentation will describe an approach to measuring Agile development that allows for an approximation to fixed price contracts. Why is this important? The industry has justifiably bought into the benefits of Agile development for, primarily, improving customer satisfaction and, secondarily, for improving value delivery and shorter time to market. However, there is a group of people who find Agile development hugely frustrating – the business managers, program managers, business owners, venture capitalists, etc. – collectively, the "investors." This group has gone from being frustrated that estimates of cost and duration for waterfall projects were invariably wrong or, at least, very fragile in the face of change, to being frustrated that Agile teams will not even provide estimates of cost and duration to allow them to incorporate change. The presentation describes an approach for cost and duration predictability, developed by the author and his colleagues in numerous workshops with a major financial services client, as an alternative to paying for all Agile development from outsourced software development vendors on a T&M basis. The approach has subsequently been refined through work with other clients and experts in the field.

Key lessons or concepts that will be conveyed:

- A better way to measure Agile development to help manage investor expectations
- Transition from paying for Agile development as T&M to fixed price
- Implementation issues that might arise and how to manage them

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Title: Extended Case Study of Causal Learning within Architecture Research

Presenter: Robert Stoddard, SEI; Rick Kazman, SEI, David Danks, CMU, and Mike Konrad, SEI

Abstract: The SEI has been conducting software architecture research projects for 20+ years, including this particular project focused on evaluating the effects of 5 software architecture pattern violations as measured in 7-8 open source software products. Initial research publications summarized traditional correlations of the violations with cost, schedule and quality. Subsequent use of causal learning shown in this presentation contrasts traditional analysis with causal learning results. This example reinforces the need for causal search before unilaterally employing traditional statistical correlation and regression. Attendees will become more aware of the benefits of causal search in their subsequent analytical studies, and be informed of some of the preparation necessary to carry out such studies.

Presentation Abstracts
Wednesday

Title: Using Army Software Sustainment Cost Estimating Results

Presenters: Cheryl Jones, U.S. Army ARDEC; James Doswell, U.S. Army DASA-CE

Abstract: The Army has completed an initial analysis of software sustainment cost and performance data collected from ~250 Weapons, C4ISR, and ERP systems. The analysis addresses primary resource distributions and cost estimating relationships across multiple functional domains, and establishes a foundation for efficient resource allocation decisions across the Army systems portfolio, and projected policy and process changes. The results, including the detailed statistical analysis, will be made available for use by participants.

Title: Complications with Using Affordability Efficiency Measures – $/FH Tells You How Much a Flight Hour Costs, Not What You Get For It

Presenter: Dr. Mike Yokell, ESEP, Lockheed Martin

Abstract: Affordability efficiency measures are supposed to help us make informed decisions about buying things. For example, we can compare unit acquisition costs, annualized sustainment costs, or even miles per gallon. This presentation uses publicly available data about cars to explore some complications in using these kinds of measures. Using simple models, we'll look at a typical "next generation" analysis of alternatives. You'll see how a 5th generation truck can be worse than a 4th generation car on all affordability efficiency measures, while actually being much cheaper at completing the mission when all factors are considered.

Title: Managing Capability Evolution in Complicated Engineering Environments Through Measurement

Presenter: Jo Ann Lane, San Diego State University, Computer Science Department, Emeritus professor

Abstract: Managing the engineering and development of new system capabilities has been following a Moore's Law path for hardware, software, and data over the last few decades. Software is ubiquitous and integrated into "everything"—as of 2014/2015, there are over 100M lines of code in today's cars, 24M lines of code in the DoD Joint Strike Fighter, and 2B lines of code across the Google products. In addition, "big data" underpins much of this software. To support the rapid development and evolution of complex products, engineering and development processes are becoming more agile, "reuse" is the name of the game, "everything" is connected to "everything else", and along with this comes significant program management and technical challenges. This presentation will overview some of these key challenges and how measurement can support integrated program management in a system of systems or enterprise-wide environment to meet these challenges.

Key Lessons: This presentation focuses on understanding key challenges to evolving software-intensive capabilities in an SoS (or enterprise-wide) environment using agile processes and how measurement can be focused to support integrated program management and decision making in this environment.

Title: Software and Systems Engineering Measurement Challenges in Integrating Software Assurance into Defense Systems Throughout the System Acquisition Lifecycle

Presenter: Dr. Kenneth Nidiffer; Software Engineering Institute Carnegie Mellon University

Abstract: This presentation presents systems engineering measurement challenges for integrating software assurance into defense systems throughout the system acquisition lifecycle. It focuses on current Government and Industry efforts to provide program managers with a guidebook for system engineering-in software assurance into defense systems during the entire system acquisition lifecycle. Software assurance (SwA) is the "level of confidence that software functions as intended and is free of vulnerabilities, either intentionally or unintentionally designed or inserted as part of the software, throughout the life cycle." The latest January 2017 change to DoD Instruction (DoDI) 5000.02, Operation of the Defense Acquisition System, includes a new enclosure on cybersecurity that outlines several actions DoD acquisition Program Managers (PMs) should (but not must) implement to ensure system security and related program security across the acquisition, sustainment, and operation life cycle.

Program managers face intense challenges from complex and changing requirements, technology, and agency and stakeholder dynamics with few meaningful software and systems engineering measures. Furthermore, there is a basic threat associated with development and sustainment of software intensive systems in that a nation-state, terrorist, criminal, or rogue developer may be able to: (1) gain control of systems through supply chain opportunities and/or (2) exploit vulnerabilities remotely. Software vulnerability and exploitation are the root cause of a majority of computer security problems due in part to the increasing complexity and usage of software in our nation's defense systems and the increasing amount of latent defects and vulnerabilities contained in the aggregate software. Unfortunately due to the dynamics of their job, program managers often do not fully comprehend the magnitude of the threat/risks associated with software assurance issues in their systems or for either the legacy or modern systems their system will interface to achieve mission effectiveness. This situation is compounded by a lack of meaningful engineering or programmatic measures.

The effort began as a request by DASD/SE in 2015 to obtain an industry perspective regarding opportunities to improve the practice of software engineering. The response to the request centered on five phases: Phase1 - engaging the NDIA System Engineering Division's Software and Security Engineering Committees to research and cull out candidate technical areas of interest and selecting eligible candidates; Phase 2 - ranking selected candidate technical areas in terms of payoff and ease of Implementation, and presenting results to NDIA and DASD/SE; Phase 3- DASD/SE deciding to focus on the software assurance technical area and to develop a DoD Program Manager's Software Assurance Guidebook (Guide); Phase 4 – researching aspects of software assurance acquisition lifecycle activities including Joint Federated Assurance Center (JFAC) activities and deciding on a development framework for the Guide and Phase 5 - development and transitioning the Guide.

Title: Words and Numbers

Presenter: Anthony Powell, YorkMetrics

Abstract: This year's PSM User Group theme is Fundamental Measurement Principles. This presentation revisits these fundamentals and their role in managing complexity. It will use experiences of several real-world systems and software measurement programs to demonstrate how careful attention to words and numbers is the secret to delivering advanced engineering decision information.

Presentation Abstracts
Thursday

Title: COSYSMO 3.0: The Final Model for Estimating Systems Engineering Costs

Presenter: Dr. Jim Alstad, University of Southern California

Abstract: The final version of the COSYSMO 3.0 Systems Engineering Cost Estimating Model is newly available. This presentation will go over the content of the Model.

Keynote Presentation

Title: DoD's Digital Engineering Strategy and Implementation: Measurement Challenges

Presenter: Ms. Philomena Zimmerman, Deputy Director, Engineering Tools and Environments (ODASD/SE)

Abstract: The Under Secretary of Defense for Research and Engineering, Michael Griffin, released the Department of Defense Digital Engineering Strategy in June. Currently, the Department is transitioning from strategy to implementation. This presentation provides an overview of the Digital Engineering Strategy's five strategic goals. It will also include an overview the Department's implementation approach and the challenges associated with measuring digital engineering progress and impact.

Title: Integration of Parametric Cost Estimation with System Architecture – It's a dirty job but someone has to do it!

Presenters: Barry Papke, No Magic, Inc. and Gan Wang, BAE Systems

Abstract: The rapid adoption and advancement of Model Based Systems Engineering (MBSE) methods and tools opens up new avenues of systems engineering practices. One of them is cost estimation. As a key enabler for affordability analysis and budgetary decision making, cost estimation is an essential component for all system development and sustainment efforts. However, cost estimation is typically a separate endeavor from the design and development effort, creating a professional "chasm" between the worlds of systems designers and of cost analysts, causing a disconnect between the system as designed and the cost and effort required to build it.

This paper describes an approach to "tightly" integrate the existing practice of parametric cost estimation with the system architecture development process, by leveraging MBSE and SysML to enable repeatable and efficient estimation of system development cost, and to allow system cost and affordability to be incorporated into the "digital thread" of the design while improving the efficiency and effectiveness of the cost estimation process. By expanding our previous work (Papke, Wang and Pavalkis 2017), this paper describes a new concept of operation (CONOP) for system development, enabled by the integrated SysML and COSYSMO modeling environment, that effectively connects the cost baselines to the technical baselines throughout the project life cycle. This new CONOP presents another step towards "pulling the digital thread" by making affordability and economic analysis an integral part of the system architecture.

Title: Measurement of Software Throughout the Lifecycle Using SRDRs

Presenter: James Doswell, US Army DASA-CE

Abstract: As a part of modernizing data collection across the DoD, OSD CAPE has recently published updated guidance and collection forms for CSDR reporting. The updates include additional Software Resource Data Report's (SRDR) to include the SRDR-M for Maintenance and an ERP specific SRDR to attempt to capture the nuances of data reporting specific to ERP programs. This workshop will introduce the new SRDRs as discuss how to best utilize the information being reported in development as well as maintenance. Discussions will include types of data captured, reporting timelines (SRDR-Dev vs SRDR-M), Army implementations, Agile reporting, and challenges regarding CSDR plan structure and ensuring data quality.

Title: Analysis and Quality in Measurement Reporting

Presenter: Sal Bruno, Lockheed Martin

Abstract: The program measurement coordinator has a critical and serious role in performing activities and tasks within the world of analytics that can greatly benefit the program management team with their ability to manage the development and delivery of their contractual obligation. The program measurement coordinator can effectively understand this if they understand their subspace of Measurements within the world of Analytics and with the inclusion of a QPI (Quality Performance Index). Thus, this presentation will 1) define the elements and components of Measurements and the role of the program measurement coordinator and 2) introduce a new indicator known as QPI (Quality Performance Index) to demonstrate and illustrate how the theoretical concepts of effectively measuring the quality component of the delivery work product is critical for this success. Audience participation is encouraged and expected with questions and lively discussions to edify the overall experience of the presentation to pursue new studies and for future presentations.

Title: Cybersecurity in the Cloud

Presenter: Arlene Minkiewicz, PRICE Systems, LLC

Abstract: Cybersecurity and software assurance issues dominate the news these days. As software solutions become ubiquitous and highly interconnected, via networking, the internet, cloud solutions, remote computing, etc., the chance for breaches increases at an alarming rate. Many organizations are adapting cloud solutions, generally relying on a hybrid model for cloud adoption. With a hybrid cloud, organizations use a combination of public, private, and on-premise solutions which are then intermingled sensibly to provide seamless operations. This model makes it possible for organizations to take advantage of benefits of private and public clouds where this is sensible while still offering protection for sensitive data and applications.

There are, however, some issues with this intermingling that could create chinks in the armor if not properly addressed. This paper begins with a general description of cybersecurity and software assurance. Cloud computing and hybrid clouds will be defined and discussed. Following this, there will be a deep dive into the potential cybersecurity challenges that may be exacerbated by this intermingling. Mitigation strategies will be presented and discussed, along with the cost implications and considerations surrounding these strategies.
