The Importance of Software Cost Estimating Standards Among a Diverse Community

Kyle Thomas
Jenny Woolley
Will Black

SCEA 2012 – Orlando, FL

Scitor Corporation

Table of Contents

- **Cost Analysis in the Intelligence Community (IC)**
- **Introduction & Objectives**
- **Current Challenges**
- **Participants**
- **Establishing Areas of Interest**
- **Approach**
- **Industry Participation**
- **Summary**
- **Next Steps**

- **Cost estimating organizations support the budgeting and planning process for agencies and the total IC**
  - Provide estimates for many types of acquisitions, systems, and missions
- **Historical data is critical to the process but often difficult to obtain**
  - Large volumes of data exist, but generally not in a form conducive to cost estimating
  - Data needs emphasize the necessity for a broad, IC-wide approach to data collection
- **Software development is a prime candidate for this data collection as it is performed at almost every agency**

Introduction & Objectives

- **IC Software Standards Study is an on-going study to further develop sound and robust software cost estimating methods and data collection policies**

- **Objectives of the Software Standards study include:**

  - Instituting IC software data standards to facilitate IC wide data collection, methods, and tools

  - Increasing understanding within the IC of software estimating practices, data, analyses, and policies

  - Developing, validating, and expanding software analyses and estimating methods

Current Challenges

- **Differences in business rhythms and data collection methods across the IC and industry limits data consolidation and IC-wide statistical analysis**
  - Industry
    - Different contractual requirements
    - Varying practices based on Program Manager, Work Breakdown Structure (WBS), politics, etc.
  - IC Agencies
    - Use established datasheets vs. contracts without data reporting requirements
    - Focus on CERs and factors based on Source Lines of Code (SLOC) vs. Function Points
  - Oversight estimating methods are dependent on the data available, which is driven by other Agencies' ability to collect usable data

> **The IC SW Standards Study will help address these challenges**

Participants

- **Study receives support from Agencies across the Intelligence Community**
  - ◦ All of the largest agencies are participants
  - ◦ Study members interfaced with Department of Defense (DoD) representatives

- **Industry involvement in the process is critical to the success of the study**
  - ◦ Input from companies helps the IC to
    - • Identify data needs we may have missed
    - • Consider new approaches that other organizations currently use
    - • Determine applicability of data requests
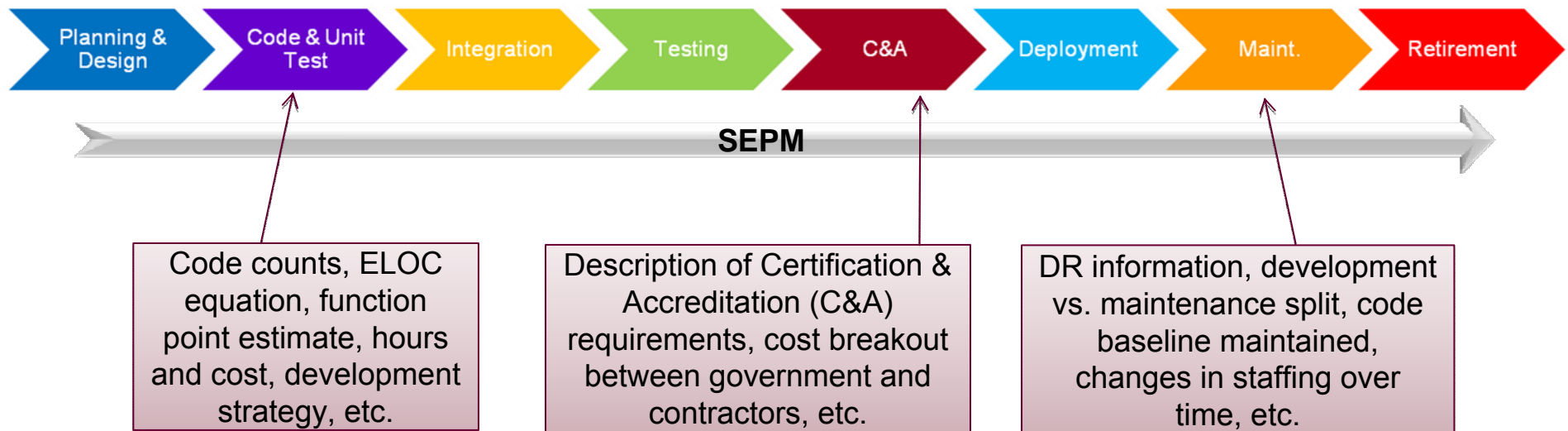   - • Recognize unreasonable expectations to ensure reasonable, more standardized data requests in the future

Establishing Areas of Interest

Presented at the 2012 SCEA/ISPA Joint Annual Conference and Training Workshop - www.iceaaonline.com

- **Discussions with Agencies led to research requirements that are pervasive throughout the IC**
- **Areas of inquiry submitted by IC cost groups include:**
  - Potential relationships between developer productivity and language, skill level, purpose of code, etc.
  - Cost of migration to cloud computing and software as a service
  - Application of risk in software development estimates
  - Estimating time and phasing for development efforts
  - Variation in the number of software maintainers over time
  - Cost impact of deciding to only address Discrepancy Reports (DR) of a certain level
  - Effect of different Protection Levels (PL) on development, integration and testing, certification and accreditation, etc.
- **Determined data needed to support each area of research**

Approach

Presented at the 2012 SCEA/ISPA Joint Annual Conference and Training Workshop - www.iceaaonline.com

- **In order to determine a strategy for addressing IC data needs, the research group**
    - Categorized required information by software development phase
    - Consolidated overlapping data requirements and ensured no items were overlooked

| Planning & Design | Code & Unit Test | Integration | Testing | C&A | Deployment | Maint. | Retirement |

SEPM

Code counts, ELOC equation, function point estimate, hours and cost, development strategy, etc.

Description of Certification & Accreditation (C&A) requirements, cost breakout between government and contractors, etc.

DR information, development vs. maintenance split, code baseline maintained, changes in staffing over time, etc.

Note: Figure is notional; while not all development efforts are linear, the listed activities typically occur at some point in the software development lifecycle

Approach (cont'd)

Presented at the 2012 SCEA/ISPA Joint Annual Conference and Training Workshop - www.iceaaonline.com

- **Developed a potential order for research efforts**
  - Structure allows for more manageable execution
  - Determined through an iterative process based on
    - Research dependencies
    - Agency priorities and needs
    - Influence on cost
    - Ability to collect data

- **Currently finalizing order for research**

Primary Research Efforts
1) Code Writing
   - Code Growth
   - Productivity
   - Total schedule estimation
   - Schedule phasing
   - Schedule compression
   - Design and planning
2) Maintenance
   - Cost and phasing
   - Maintenance vs. development

Secondary Research Efforts
3) **SEPM**
   - Relationship and phasing
4) **Integration**
   - Relationship and phasing
5) **Testing**
   - Relationship and phasing
6) **C&A**
   - Relationship and phasing
   - Impact of PLs
7) **Deployment**
   - Initial and recurring deployment costs
8) **Retirement**

Industry Participation

- **After completion of the IC review, industry provided inputs on data currently collected at each company**
  - Participation from five large defense contractors
  - Overarching takeaways from inputs and meeting:
    - Only seven of the 84 data collection areas are not collected by any contractor
    - Data collection depends greatly on the WBS in use
    - Less focus on Function Point Analysis (as compared to SLOC)
    - Varying responsibilities for data (e.g., SW development vs. SEPM)
    - Limited focus on skill mix, but average number years of experience increasing with fewer new hires
    - Code counts collected in a variety of ways (e.g., top level, by language, by type, by purpose of code, etc.)
    - IC does not receive some information industry collects

- **Discussions with industry highlighted**
  - Data that should be easy to collect
  - Data that industry will not be able to provide
  - Areas that the IC had previously overlooked

Summary

- **Study will result in**
  - More complete data sets for use in estimates
  - Updated, more holistic factors, CERs, and estimating methods to be shared within the community
    - Future presentations at cost conferences (e.g., Annual IC Cost Symposium, SCEA, etc.) of general results
  - Standardized data collection requests sent to contractors

- **Effort offers many benefits**
  - Improve estimating methods by allowing Agencies to pool resources
  - Pool data from a greater number or sources, increasing the validity of data analysis (as well as the number of potential outcomes)
  - Shape future data reporting requirements to
    - Address needs highlighted through this study
    - Increase consistency in data requests sent to development contractors
  - Improve ICEs and National Intelligence Program (NIP) analysis at the oversight level based on data points that transcend Agency boundaries

Next Steps

- **Finalize data collection strategy for translation into policy**

- **Develop comprehensive definitions for data collection**

- **Create complete detailed data collection template**

- **Continue industry involvement**

- **Begin data collection effort**

- **Analyze data that is received through the collection effort**

    ◦ Conduct analysis on historical data to improve estimating methods

    ◦ Identify areas in current data that are insufficient in order to shape data reporting requirements in future contracts

> **If you are interested in participating in the IC Software Standards Study, please let us know!**

Contact Information

Presented at the 2012 SCEA/ISPA Joint Annual Conference and Training Workshop - www.iceaaonline.com

- **Brian Wells (Government Lead): davidbw2@dni.gov**
- **Kyle Thomas: Kyle.D.Thomas@dni.gov**
- **Jenny Woolley: jennifgw@dni.gov**

Acknowledgements

- **Industry partners**
- **IC partners**
- **Sandra Williams, Scitor Corporation**
- **Tom Van Horn, Quaternion Consulting, Inc.**