SURF Process Summary & Initial Findings: A Deeper Focus on Software Data Quality

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ABSTRACT

As a result of the 2015-2016 joint Software Resource Data Report Working Group (SRDRWG) led by Ms. Ranae Woods, several recommendations to revise the existing Software Resource Data Report (SRDR) Data Item Description (DID) and existing data quality assessment process were generated by the multi-agency SRDRWG team to the Department of Defense (DoD) Cost Leadership Forum (CLF). One of which led to the development of the first joint-agency SRDR Validation and Verification (V&V) guide as well as the SRDR User Review Function (SURF) subgroup.

This subgroup was specifically comprised of several Government cost community team members who have been actively involved in the review, analysis, and tracking of DoD software data over the past decade and who will be responsible for supplementing Defense Cost and Resource Center (DCARC) SRDR submission quality reviews. Prior to officially initiating the SURF process with the DCARC, the SURF team conducted several dry-run reviews on actual, DCARC-provided, SRDR submissions from June to December 2015. As a result of this effort, the SURF team supported the review of 39 separate SRDR submissions and generated 319 V&V comments that were ultimately provided back to the submitting organization for comment resolution. Throughout this process and as SURF members' generated V&V comments, each one was "tagged" or linked back to a specific section of the supporting SRDR V&V guide's Table of Contents (TOC) to help identify what specific set of SRDR variables were generating the most data-quality concerns.

This study summarizes the proposed modifications to the existing SRDR data quality review process, which includes the inclusion of SURF review efforts, as well as highlights the V&V comment trends generated by the SURF team's 319 V&V comments. In addition, this paper helps to raise attention to the specific SRDR variables, and types of comments, where

data quality concerns were most frequently observed.

Dan Strickland is the Software Subject Matter Expert for the Cost Analytics and Parametric Estimation Directorate of the Missile Defense Agency (MDA). MDA's mission is to develop, test, and field an integrated, layered, ballistic missile defense system (BMDS) to defend the United States, its deployed forces, allies, and friends against all ranges of enemy ballistic missiles in all phases of flight. Mr. Strickland graduated from The University of Alabama with Bachelor's and Master's degrees in Computer Science. He worked as a government contractor for 13 years, supporting the THAAD, GMD, and Sensors Project Offices of MDA. His work focused on software cost estimation, software metrics analysis, and software acquisition. In 2010, Mr. Strickland became a government civil servant, helping to start up MDA's Software Acquisition Management office, the organization responsible for improving and standardizing software acquisition across the over 100 million lines of code of the BMDS. In 2012, Mr. Strickland moved into his current position at MDA/CP, authoring the MDA Software Cost Estimation Handbook and the interactive Software Estimation Flowchart.

KEYWORDS

Software cost estimation, Data Quality, Process Improvement, SRDR User Review Function, SURF, Data Quality Improvement, Government Process Improvement, Software Resource Data Report, SRDR, 2630.

1.0 INTRODUCTION

1.1 Problem Statement

Over the past decade, individual DoD service cost agencies and System Command (SYSCOM) cost organizations have attempted to implement V&V efforts specific to SRDR data submitted by either contracting organizations or Government software development activities. While these efforts have yielded very positive results in terms of helping to expand the department's understanding of common SRDR data quality trends, the issues identified within these submissions have historically been very difficult to correct. This difficulty typically arises due to the organizations who submit SRDR data frequently referencing the receipt of the DCARC-provided SRDR submission acceptance letter prior to V&V analysis being conducted.

While inconsistencies and V&V concerns were noted within existing SRDR submissions, it is also important to note the extremely challenging responsibility assigned to each DCARC analyst who is responsible for reviewing each SRDR submission—as the DCARC analyst's software specific knowledge-base can vary significantly. In order to reiterate the previous point, the DCARC review team frequently identifies data inconsistencies, data quality issues, and incomplete data submissions that result in significantly higher-quality datasets as well as higher accuracy estimating relationships. In addition, prior DCARC reviews often require up to 10-15 resubmissions by the submitting organization prior to resolving DCARC-generated data quality concerns. Even with a very talented and dedicated group of DCARC analysts reviewing the SRDR submissions, it became apparent through the SRDRWG discussions that nearly all participating DoD service representatives could cite instances or specific submissions that include existing data quality concerns—or were considered "not useable" within future cost analysis efforts.

These data quality issues were discussed in great detail as part of the SRDRWG effort. As a result of this discussion, the need for a joint software V&V guide was established. In addition to the joint V&V guide, the need for modifications to the existing SRDR data review and acceptance process was also recognized by senior DoD cost community members. The proposed modification to the existing SRDR data quality review process was simple yet very effective in helping to ensure that consistent SRDR data quality review efforts were being completed prior to DCARC officially accepting the submission into the Defense Automated Cost Information Management System (DACIMS) repository. From this proposal, the SRDR User Function (SURF) team was created. This team was specifically

comprised with software focused Government analysts from the DoD cost community who would be assigned with the task of reviewing each SRDR submission using the SRDR V&V guide prior to DCARC issuing an official acceptance letter. In addition, the SURF team's problem statement centered upon developing and distributing the joint SRDR V&V guide that was to include a simple list of software specific questions, organized by SRDR reporting variable, for the DoD cost estimating community to consistently and accurately assess the quality of a provided SRDR submission.

1.2 Purpose of Study

This study expands the DoD's existing knowledge of SRDR V&V data quality concerns and highlights the benefits of an improved SRDR data quality review process. In addition, this paper explains the purpose of the SRDR V&V guide, the SURF government review team, as well as highlights a portion of the common SRDR V&V comment trends generated by the SURF team. These comments were generated during June to December of 2015 on actual, DCARC and/or service-requested SRDR submissions during an effort to help train newly added SURF members on "how to" conduct a V&V review. This "how to" training effort included the review of 39 separate SRDR submissions and resulted in 319 V&V comments that were provided to DCARC and then resolved/incorporated into the provided SRDR submissions.

These comments were also tracked and linked back to a specific section within the SRDR V&V guide in order to highlight the areas and types of comments most frequently generated within the resulting 319 V&V comments. After the comments were compiled, analyzed, and grouped by specific SRDR V&V section, the resulting comment text was then used to ascertain the types of comments that were most frequently being highlighted by the SURF team when using the SRDR V&V Guide.

With a better understanding of the types of issues and concerns generated by the SRDR V&V questions, the DoD cost community now has the ability to better isolate the specific areas of SRDR submissions that require increased review in order to confirm the quality of the data included within the submission.

2.0 Related Work

Since 2014, Mr. Lanham has been very active in the data quality review process specific to SRDR submissions as well as the development of numerous routines that allow for the DoD cost community to "pair" initial and final submissions in a manner that allows for analysis focused on the percent-change "i.e. growth" of software development hours, development duration, requirement counts, peak staffing, Source Line of Code (SLOC) and much more.

During 2013 to 2014, Mr. Lanham worked with M. Popp from the Naval Air Systems Command (NAVAR 4.2) as an analyst focused on reviewing and assessing the quality of each SRDR submitted to the DACIMS database hosted by the DCARC. These efforts supported the recurring review and upload of each SRDR submission to the frequently referenced SRDR dataset posted within the DACIMs web-portal and which are available for all Government analysts to reference when developing future software development estimates.

During 2015-2016, Mr. Lanham has had the opportunity to work with Dr. Corinne Wallshein and Dr. Wilson Rosa to continue the analysis of DoD-specific software development trends. These efforts have led to significant expansions of the existing SRDR "Paired" dataset and allowed for a much lower level of analysis specific to individual initial "SRDR" variables used to better predict the relationship between those initial SRDR variables to final hours, requirement counts, and development duration.

During the 2015 International Cost Estimating and Analysis Association (ICEAA) conference, Mr. Lanham presented a portion of the aforementioned effort (e.g. hours) and development duration percent-change relationships in the *Exploring DoD Software Effort Growth: A Better Way to Model Future Software Uncertainty* presentation. Dr. Corinne Wallshein also presented a portion of these

software sizing relationships within the 2015 ICEAA presentation entitled *Software Size Growth.* In addition, Mr. Lanham and Dr. Wallshein were included as part of Dr. Wilson Rosa's 2015 ICEAA best paper entitled *Early Phase Cost and Schedule Estimation Models* which also provided another perspective using the available SRDR dataset and supporting "paired" software information.

As part of the 2015 Air Force Cost Analysis Agency (AFCAA)-led SRDR Working Group (SRDRWG), the Naval Center for Cost Analysis (NCCA) analyzed each Computer Software Configuration Item (CSCI) in the latest Naval Air System Command Cost Department (NAVAIR 4.2)-developed SRDR dataset, as of April 2014. Mr. Lanham then expanded on the existing CSCI Pairing Algorithm; he processed each CSCI submission and grouped "Pairs" by matching an Initial (2630-2) record with its corresponding Final (2630-3) record. The resulting dataset has 219 paired records. These records also passed a detailed quality screening process during data entry.

Questions and guidelines used to complete this quality screening process were then outlined in Mr. Lanham and Mr. Popp's SRDR Verification and Validation (V&V) guide. It includes specific questions and checklists to aid analysts performing a quality assessment of SRDR data records to be included in the final dataset. This SRDR V&V guide also includes AD, SD, and OE definitions developed by Dr. Wilson Rosa, Cheryl Jones, et al[1] as well as the data quality review questions developed by numerous other DoD cost community team members.

3.0 RESEARCH METHOD

3.1 Research Questions

While considering this paper's abstract, problem statement, and purpose, the following questions help structure the topics this paper will address:

At what point in time will a SURF representative review an SRDR submission and how does this review improve future SRDR data quality?

What document includes a consistent set of guidelines for each service to reference when attempting to assess the quality of an SRDR submission?

Did the initial SURF findings highlight any data quality concern or comment trends? If so, what SRDR variables and what types of comments were generated?

What is the need for improved SRDR data quality and some type of SURF review?

The following paper and SRDR data quality review efforts will allow for the DoD cost community to significantly improve the overall quality of SRDR data accepted into the DoD's cost repository system. In addition, the primary focus on this study is to ensure that consistent software-specific data quality reviews occur prior to the official DCARC acceptance letter being sent to the contractor – an event that typical signifies the completion of the development effort and closure of the supporting Contract Data Requirement List (CDRL) item. This modification to the existing DoD SRDR process will also help ensure that the software data frequently referenced within the DoD cost community is of the highest quality. This process improvement and supporting SRDR V&V guide represents an effort that will also help to ensure future estimates that have been developed by referencing the DACIMs-hosted SRDR dataset are also based on the highest quality software data.

4.0 SRDR DATA REVIEW PROCESS IMPROVEMENT

As part of the previously-mentioned SRDRWG effort conducted during 2015, Mrs. Ranae Woods recommended for four primary areas of improvement to the CLF—a group that includes

[1] SRDRWG Data Collection Brief on CSCIs by Application Domain (2014)

several senior leaders from the DoD service and System Command (SYSCOM) cost organizations. As a result of this discussion, the SRDRWG was segmented into specific areas that were focused on accomplishing several specific tasks necessary to complete the latest SRDR DID update and establish a revised SRDR data quality review process. One of these recommendations included a crucial adjustment to the existing SRDR submission data quality review and acceptance process that would allow the Government to significantly enhance the quality of the software performance and cost data begin submitted to DCARC.

As one of the primary members of the "data quality" subgroup, Mr. Lanham was also responsible for helping to develop the first-ever, joint SRDR V&V guide coupled with the establishment and training of a small group of Government personnel who would be focused on reviewing SRDR submissions prior to DCARC providing the submitting organization with an official acceptance letter.

Prior to developing the V&V guide, discussed in section 5.0 of this paper, and training the Government team of SURF reviewers, the data quality subgroup conducted an analysis of the existing SRDR data quality review and acceptance process currently implemented by the DCARC. After conducting this analysis and holding several discussions with various DoD cost organizations regarding the quality of existing SRDR data, it became very apparent that the existing process included little Government review prior to DCARC acceptance. In addition, the data quality subgroup also determined that organization's submitting SRDR data were receiving DCARC acceptance letters prior to Government cost analysts conducting such a review.

Appendix A helps illustrate the existing process of the SRDR data quality review and acceptance process as well as multiple data-storage locations used by various DoD cost organizations. While keeping in mind that existing SRDR data submissions are highly inconsistent in terms of format, reporting detail, and reported data elements, the DCARC review process did attempt to ensure that data being accepted into the Government's cost information management systems were of the highest quality. However, due to the aforementioned inconsistent formatting combined with a general lack of populated SRDR performance/cost metrics as well as the general complexity of DoD software development data – the need for additional review became very evident as most of the SRDR data already paid for by the Government did not pass the existing SRDR V&V process.

As a result of this issue and in an attempt to conduct comprehensive SRDR data quality review efforts, this subgroup developed a new SRDR data quality review and acceptance process that is highlighted within Appendix B. The primary change between the two processes is that a consistent, service-wide, and software-specific V&V guide would be used by a small group of Government cost community members to assess the quality of a SRDR submission prior to the report receiving an official acceptance letter from the DCARC.

This small change adds significant value to the DoD by ensuring the data that is being paid for by the Government, is of the highest quality and is useable to support future estimating efforts. Again, this proposed adjustment is critical to ensuring that future software development estimates, that frequently reference this SRDR dataset, are based on the highest quality data submissions.

5.0 SRDR VERIFICATION AND VALIDATION GUIDE

As mentioned within Section 4.0, one of the primary tasks assigned to the SRDR data quality subgroup was the development of a joint SRDR V&V guide. This document was intended to provide a consistent set of DoD specific software data quality questions that could be referenced by any Government or contractor organization seeking to conduct data quality review efforts on a given SRDR submission. From this initial tasking, the SRDR data quality group worked closely with several Government and contractor Points Of Contact (POCs) to develop a simple,

quick-reference list of software V&V questions that were tied back to a specific section of the Government's SRDR DID documentation.

After completing numerous discussions with Government and contractor POCs who were experienced in conducting SRDR data quality reviews, the SRDR data quality subgroup released the initial draft of the SRDR V&V guide during 2015. The V&V guide included several questions specific to each section of the DoD SRDR DID documentation and allowed for any user to conduct a comprehensive data quality review using a consistent set of data quality questions relevant to DoD software development efforts.

Figure 1 illustrates the initial sections of the V&V guide and helps highlight the specific software reporting variables referenced within the guide:

1.0 Review of an SRDR submitted to DCARC
1.1 Reporting Event
1.2 Demographic Information
1.3 Software Char. and Dev. Process
1.3.1 Super Domain and Application Domains
1.3.2 Operating Environment (OE) Designation
1.3.3 Development Process
1.4 Personnel
1.5 Sizing and Language
1.5.1 Requirements
1.5.2 Source Lines of Code (SLOC)
1.5.3 Non-SLOC Based Software Sizing
1.5.4 Product Quality Reporting
1.6 Effort
1.7 Schedule
1.8 Estimate at Completion (EAC) Values
2.0 Quality Tagging
3.0 Solutions for Common Findings
3.1 Allocation
3.2 Combining
3.3 Early Acquisition Phase Combining
4.0 Pairing Data
5.0 Possible Automation
Appendix A – SD and AD Categories
Appendix B – Productivity Quality Tags
Appendix C – Schedule Quality Tags
Appendix D – SRDR Scorecard Process

Figure 1: SRDR V&V Guide Table of Contents

As part of the SRDR data quality subgroup's effort to implement continuous product improvement and deliver quality data assessment solutions, the team entered the next phase of their effort by conducting approximately 7 months of review while using the SRDR V&V guide to review actual, DCARC-provided SRDR submissions. This effort served as an opportunity to help train newer SURF team members on "how to" conduct a SRDR V&V review as well as serve as a forum for more experienced members to share their knowledge.

Not only did this phase significantly enhance the SRDR V&V review capability of each team member, it also allowed for a revised version of the V&V guide to be released—which included numerous lessons-learned and improvements uncovered by the SURF team's review efforts. The latest version of the guide is currently being processed through the OSD CAPE Public Affairs Office (PAO) document release process and will be provided to all Government and contractor organizations working to conduct SRDR data quality review efforts once properly approved.

Another primary goal of the SRDR data quality subgroup was to ensure the release of the latest SRDR V&V guide to the contracting organization's responsible for submitting SRDR data. By providing the SRDR V&V guide to our industry teammates, the Government will significantly decrease the amount of rework, review, and interaction with submitting organizations by simply providing examples of the data quality questions that are being used to review each of their submissions. This strategy will also help significantly reduce the types of SRDR data quality concerns found and highlighted within section 6.0.

6.0 SURF V&V COMMENT INITIAL FINDINGS

As previously noted, the SURF team conducted recurring team training meetings during June to December 2015. These sessions were designed to ensure that each SURF member had the opportunity to use the SRDR V&V guide while reviewing actual SRDR submissions prior to officially kicking off the effort later in 2016. During this time, the team reviewed 39 separate SRDR submissions that resulted in 319 V&V comments. These comments were generated by reviewing actual, DCARC and/or service-requested SRDR submissions. In addition, the comments were then sent to the supporting DCARC analyst who worked directly with the submitting organization for comment resolution.

After sending comments to the supporting DCARC analyst, the SURF team then linked each individual comment back to the specific section of the V&V guide in order to better understand common areas of concern within existing SRDR submissions. After compiling the results, the team then used "word clouds" to depict the most

frequently occurring words included in the SURF team's comments.

The purpose of each word cloud is to isolate frequently occurring words, or comments, from the 319 V&V comments. The word cloud text increases in size as more occurrences of the word or comment occurs within the total dataset. This process was then completed for each section of the SRDR V&V guide and results have been summarized within the following sections.

6.1 Summary-Level SRDR Metadata V&V Comments

The comments specific to V&V guide sections 1.1 Reporting Event, 1.2 Demographic Information, and 1.3 Software Characterization and Development Process led to development of 118 comments which were used to construct the following word cloud representation.

Figure 2: Summary-Level SRDR Metadata V&V Comment Word Cloud

This analysis highlighted that the V&V comments specific to the summary-level metadata were due to submitting organizations not frequently including Contract Type (CT), funding appropriation type, Period of Performance (PoP), and program phase information—even though the latest version of the SRDR DID requires these data items to be included on each SRDR submission.

Another frequently identified concern was specific to software reporting elements included on the master Cost and Schedule Data Report (CSDR) plan not aligning with the lower-level CSCIs included within the SRDR submission.

For example, several SRDR submissions included effort (e.g. hour) data that was not linked back to a specific software development Cost Work Breakdown Structure (CWBS) element included on the master CSDR plan. Several SRDR submissions included indirect labor hours that were included within each lower-level CSCI that actually mapped back to different Systems Engineering (SE) or Program Management (PM) CWBS elements included on the master CSDR plan.

6.2 Personnel, Effort, and Schedule V&V Comments

The comments specific to V&V guide sections 1.4 Personnel, 1.6 Effort, and 1.7 Schedule led to development of 76 comments which were used to construct the following word cloud representation.

Figure 3: Personnel, Effort, and Schedule V&V Comment Word Cloud

This portion of the analysis highlighted that the V&V comments specific to personnel, effort, and schedule were due to submitting organizations not including consistent labor elements that included the phases identified within the IEEE 12207 labor standard—also referenced within the latest SRDR DID. For

example, many reports included different software development activities or labor elements for several of the CSCIs included within the report.

Another frequent occurrence was the inclusion of large portions of the total reported hours being included within the "Other" category. This issue significantly decreases the ability of the DoD cost community to understand the dispersion of hours as the effort matures through each software development activity—and does not align with the latest SRDR DID guidance.

The schedule portion of the SRDR submissions included several instances where the actual "start" and/or "end" dates were simply copy/pasted throughout the report for every supporting CSCI. In addition, several comments specific to "Agile" software development processes were also included within the resulting SURF comments.

These comments highlighted inconsistencies with effort and schedule data being reported at the "Sprint" or "Scrum" level vice reporting separate software development activities. While this reporting methodology appears to be very detailed, without additional supporting information included within the SRDR data dictionary it is very difficult, sometimes impossible, for the reviewing analyst to determine if the "Scrum" or "Sprint" totals include all the software development activities identified within the IEEE 12207 guidance.

6.3 Software Requirement Count V&V Comments

The comments specific to V&V guide sections 1.5.1 Software Requirement Counts and Volatility Ratings led to development of 39 comments which were used to construct the following word cloud representation.

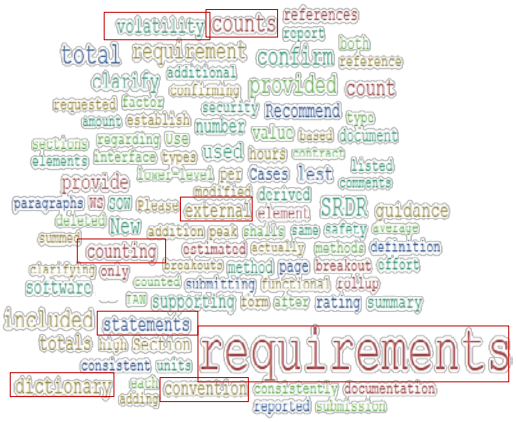

Figure 4: Software Requirement Count and Volatility Rating V&V Comments

This portion of the analysis highlighted that the V&V comments specific to software requirement counts were due to submitting organization's not including the definition and/or methodology used to derive the provided software requirement volatility rating, not separately reporting new and existing internal and external software requirement count totals, or the counting convention used to derive the provided totals—again, which are all items required to be included according to the latest SRDR DID guidance.

For example, several reports did not include values for new or existing software requirement count totals. These reports often also included internal and external software requirement counts within the "New" category that did not also correlate with the corresponding "low" software requirement volatility rating. In addition, the software requirement V&V comments also emphasized concerns regarding the lack of traceability of the provided requirement counts to a specific program document or software specification.

6.4 Source Line of Code and Product Quality (e.g. Defect) V&V Comments

The comments specific to V&V guide sections 1.5.2 Source Line of Code (SLOC) and 1.5.4 Product Quality Reporting led to development of

77 comments which were used to construct the following word cloud representation.

Figure 5: SLOC and Product Quality Reporting V&V Comment Word Cloud

This portion of the analysis highlighted that the V&V comments specific to SLOC totals and software product quality were due to submitting organization's not including large portions of SLOC development specific to "firmware" or "VHDL" language types, failing to include the counting convention used to derive the provided totals, defining whether the provided SLOC totals reflected physical or logic code counts, and/or failing to provide software quality (e.g. defect) performance metrics—all of which are required within the latest SRDR DID guidance.

The SURF V&V comments specific to SLOC also highlighted a trend that submitting organizations frequently used the same percent allocation between New, Modified, Reuse, and Auto code categories vice reflecting actual values within final (e.g. 2630-3) submissions and/or lower-level estimates included as part of the initial estimated values (e.g. 2630-2).

Other submissions were labeled as a "New" development effort however included significantly higher code counts within the "Reuse" and "Modification" code categories. A similar occurrence would frequently occur when submitting organization's would label a development effort as "Upgrade" and also include a significantly larger portion of "New" SLOC for that same element.

7.0 NEED FOR GOVERNMENT SRDR DATA REVIEW

The prior sections of this paper highlight the importance for SRDR cost and performance data as well as the need for improving the Government's software data quality—especially when considering the Government is paying for the generation, analysis, and storage of this information. With the continued reliance of software intensive DoD weapon systems, the importance of having high-quality, historical cost and performance metrics specific to DoD development environments is paramount to the department's ability to accurately estimate future software efforts.

The SRDR V&V guide and SURF team help the DoD software cost data repository to better align with OSD CAPE initiatives that are focused on improving data quality as well as support the Better Buying Power (BBP) principles outlined within Mr. Frank Kendall's February 2016 Acquisition, Technology, and Logistics (AT&L) magazine article. In addition, the process improvements discussed in this paper also will generate significant cost and schedule savings to the DoD cost community by ensuring the data used to generate future DoD cost estimates is of the highest quality.

By making simple adjustments to the existing SRDR data review and assessment process coupled with developing a consistent set of questions that can be used by all DoD organizations, the cost community is much better poised to evaluate and assess the quality of future SRDR submissions. Considering that these SRDR files typically represent critical and/or significant cost elements, or have been used to derive cost estimating relationships that are included within numerous DoD Government cost estimates, the assessment of the SRDR data itself is paramount to the DoD's ability to generate realistic estimates of future software development efforts.

Appendix C also helps highlight the need for improved data quality as the trends for software development effort, schedule, and requirement

growth from initial (2630-2) to final (2630-3) reporting events does not indicate increased accuracy over time. In fact, this subset of cost-plus Contract Types(CT) data represents 171 "paired" data points considered "Good" for data analysis from the master SRDR dataset hosted in the DACIMS web portal.

The 171count includes both an "Initial" and "Final" report within a single "Paired" record, and results in 342 individual records from the master SRDR dataset. The resulting 342 records may seem significant when developing future estimating relationships however the figure helps demonstrate the lack of data quality when considering that only 342 records out of the 2,900+ records are considered "good" for data analysis.

The V&V guide, SURF, and DCARC remain focused on improving the quality of SRDR data in order to better ensure that the data already paid for by the Government, can be used to help inform future cost estimating efforts.

8.0 FUTURE WORK

With the SURF team planned to officially kickoff within the DCARC CSDR S-R portal during 2nd QTR FY16, the SRDR data quality subgroup continues to evaluate software data quality trends and concerns. As part of this analysis, the SURF team plans to revise the existing SRDR V&V guide and supporting MS Excel quick-reference question template after the first 6 months of officially conducing SRDR V&V reviews.

In an attempt to further expand the software growth analysis and regression relationships discussed in previous papers authored by Mr. Lanham, Dr. Wallshein, and/or Dr. Rosa, NCCA will continue to analyze the percent change specific to total SLOC, new SLOC, development hours, duration, requirements count, and peak staffing by identified subsets such as super domain, application domain, operating environment, language type, Capability Maturity Model Integrated (CMMI) level, platform type, and contract type in order to provide the cost community with a more robust set of estimating relationships when working to derive final development hours using estimates of initial hours and/or total requirement counts.

Appendix A – Current SRDR Data Quality Review and Acceptance Process

This appendix illustrates the current SRDR data review and acceptance process. The flowchart helps highlight that minimal Government data quality review occurred prior to the DCARC authorization letter being issued to the submitting organization. This acceptance letter frequently represented the final approval that a given SRDR submission met the data requirements included within the associated contractor's Contract Data Requirements List (CDRL) documentation. The DCARC SRDR acceptance letter also was found to be the primary document that allowed for the submitting organization to closeout efforts specific to the defined software development or maintenance tasking, as well as closeout accounting or billing elements.

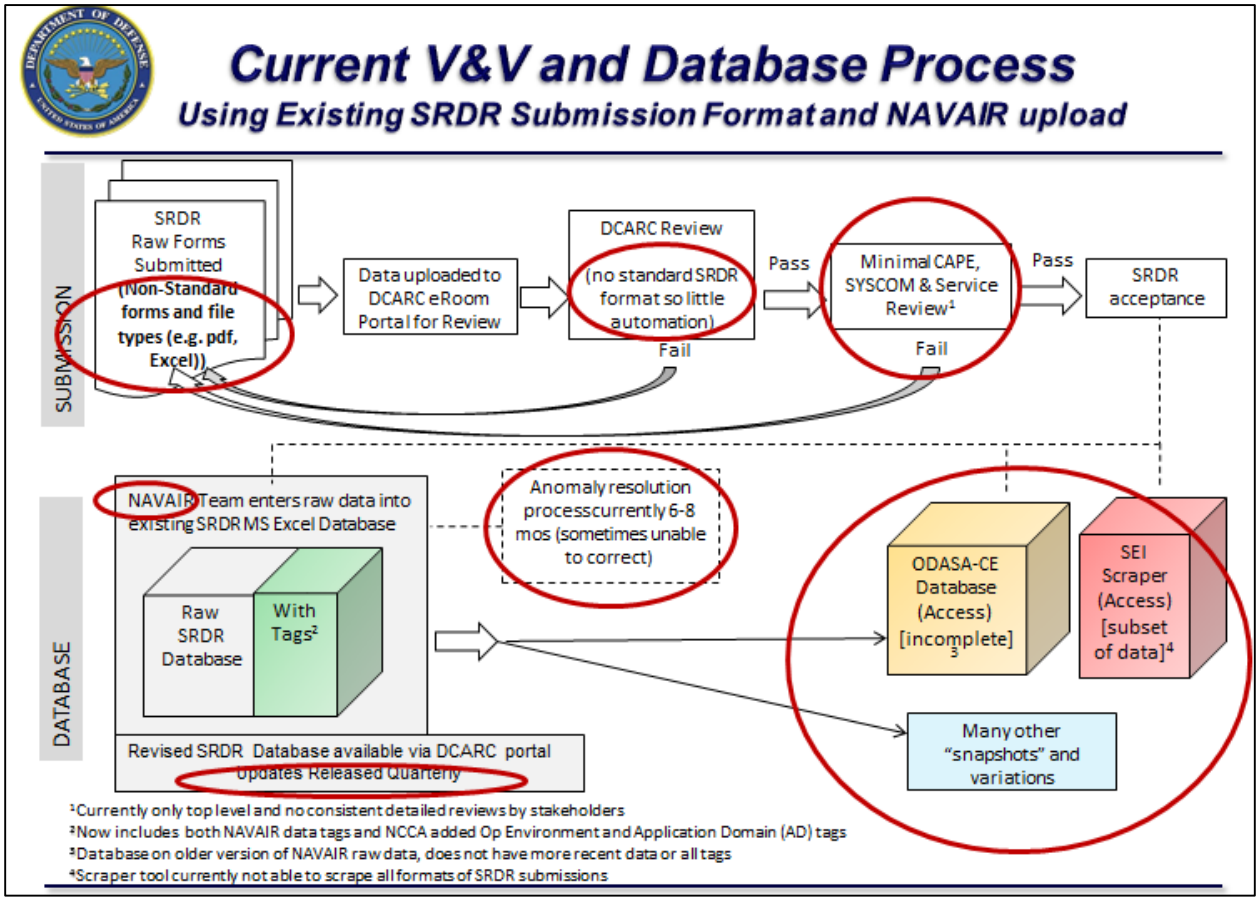

Figure 6: Current V&V and Data Review Process

Appendix B – Proposed SRDR Data Quality Review and Acceptance Process

This appendix contains a new approach to the existing SRDR data review and acceptance process. The flowchart shown in Figure 7 introduces the review of SRDR data by a group of joint-DoD government personnel (known as the SURF team) who utilize the SRDR V&V guide to consistently assess the quality of SRDR submissions. The primary adjustment to the existing process is the inclusion of this review prior to the SRDR being officially accepted into the DACIMS database by DCARC personnel. With the revised process, the submitting organization will only receive an official DCARC acceptance letter once the submitting organization has adequately responded to the V&V comments generated by the SURF and DCARC teams.

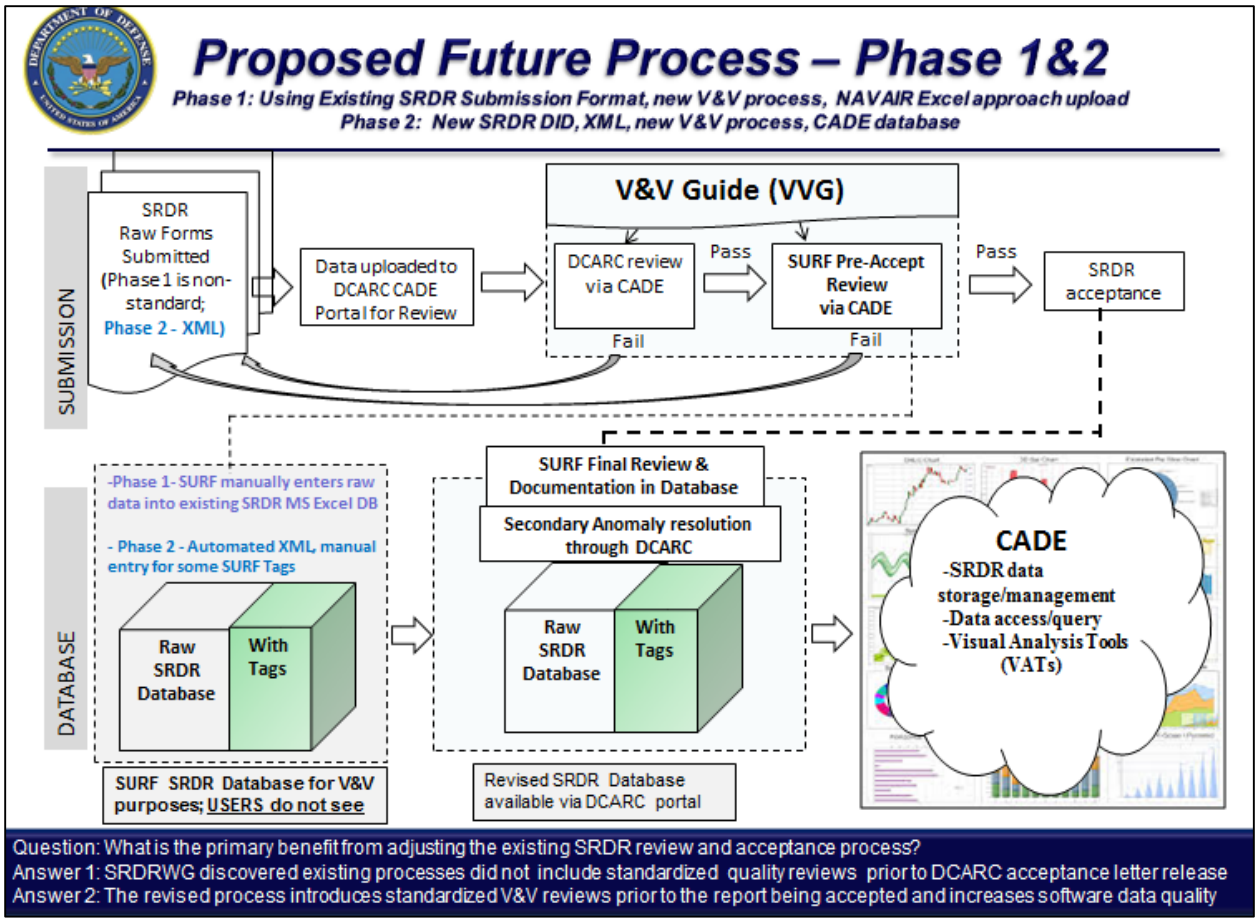

Figure 7: Proposed V&V and Data Review Process

Appendix C – Historical DoD Software Development Effort, Schedule, and Requirement Growth by Contract Type Over Time

This appendix contains an illustration of historical DoD software development effort, schedule duration, and requirement count growth specific to cost-plus Contract Types (CT) over time. Figure 8 depicts the percent change from initial (2630-2) to final (2630-3) reporting events specific to effort (e.g. hours), schedule (e.g. duration), and requirement count which are then grouped by cost-plus contract types and Procurement Instrument Initiation or Award Date (PIIA). The variation in percent change from initial to final reporting events does not indicate a significant decrease overtime—especially when analyzing requirement counts and development duration. Most of the subcategories illustrated within Figure 8 illustrate constantly large percent-change variations year to year.

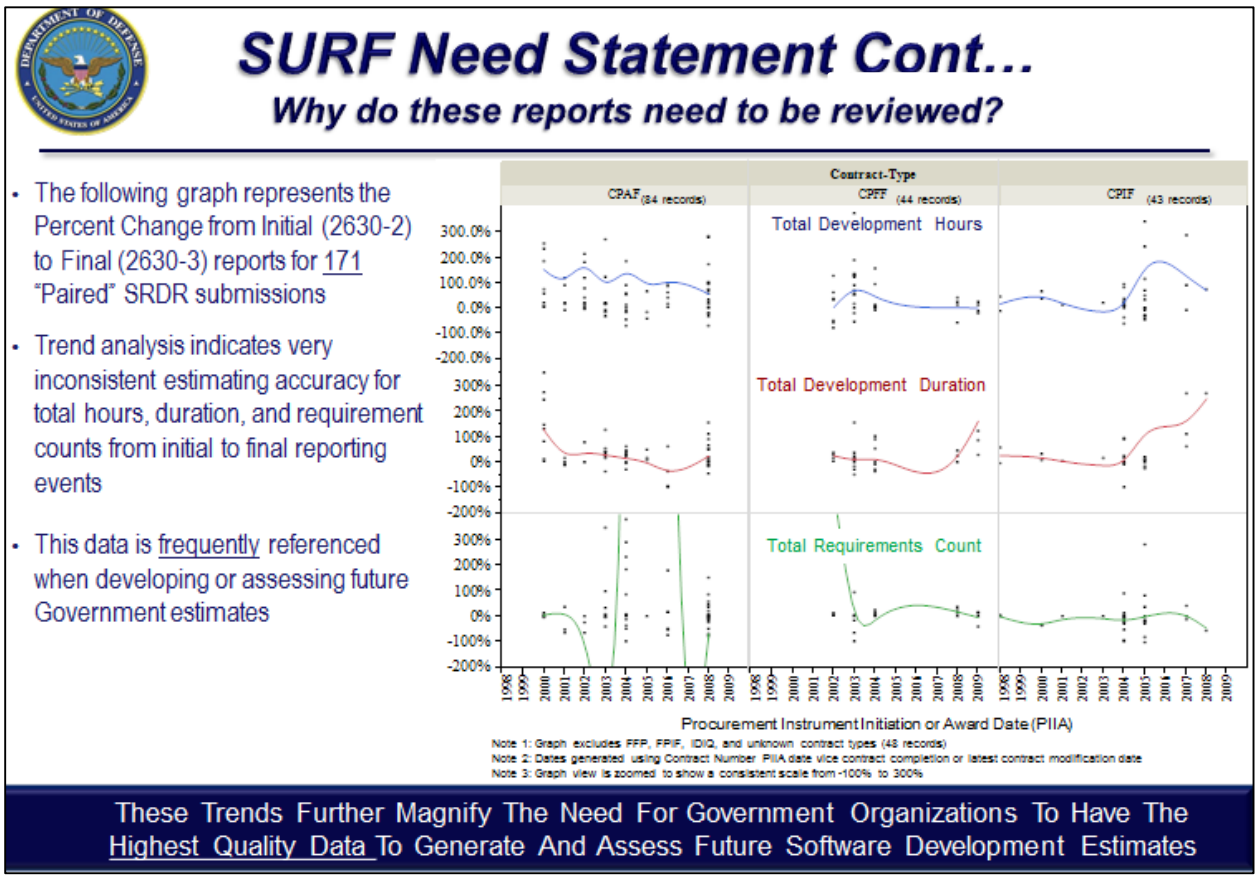

Figure 8: Historical DoD Software Development Effort, Schedule, and Requirement Growth by Contract Type Over Time