Objectives and Results
I worked with the technical coordinator and implementation team members to develop a test plan to gather requirements for the use of a new software tool within my organization. I created, edited, and released the test plan to Windchill PDMLink and the in-house configuration management system. After release, I coordinated the execution of the test plan and captured the results. I documented the collected evidence, edited, and released the test data to PDMLink and the in-house configuration management system

TEST PLAN, DESIGN FOR MANUFACTURING AND ASSEMBLY, SAMPLE TOOL, VERIFICATION

CONTENTS

1. PURPOSE

The purpose of this document is to define the testing needed to verify the implementation of the sample tool through as a Design for Manufacturing and Assembly (DFMA) tool at Science and Technology Company (STC).

2. SCOPE

This document defines the provisions for verifying that the implementation of Sample Tool at STC meets the requirements defined in GE123456, *General Engineering Documentation, DFMA, ECAD Sample Tool, Verification and Validation Report* [1].

3. ROLES AND RESPONSIBLITIES

The implementation of this plan requires two personnel, an evaluator and a witness. They are presented with a requirement, the acceptability criteria, and a list of verification evidence possibilities (*see* Section 4).

3.1. Evaluator

The evaluator is a design engineer experienced with Sample Tool, and PDMLink as installed on both the Science Network One (SNO) and Science Network Two (SNT) at STC. Responsibilities include:

- Demonstration of Sample Tool
- Selection of appropriate models for evidence generation
- Generation and documentation of evidence (i.e., screenshots)
- Identification, generation, and documentation of alternate forms of verification evidence if the possible evidence is not attainable or complete
- Obtain concurrence from the witness that the evidence meets the intent and is understandable
- Author/co-author the test report, TD123456, *Test Data, Design for Manufacturing and Assembly, Sample Tool, Verification Test Results* [2]
- Approve the engineering authorization (EA) associated with the release of TD123456 [2]

3.2. Witness

The witness has sufficient design engineering understanding to observe the evaluator's demonstration and generation of evidence and to confirm the validity of the evidence.

Responsibilities include:

- Assist evaluator in their responsibilities
- Ensure that the evidence meets the intent and is understandable
- Author/co-author the test report, TD123456 [2]
- Approve the EA associated with the release of TD123456 [2]

4. DATA NEEDS

The following subsections list the requirements, the acceptability criteria, and possibilities of evidence.

4.1. Integration Needs

#	Requirement and Description	Priority
R1	Sample Tool shall be integrated into the software process • Source: Need N1 • Acceptability Criteria: Demonstrate execution of Sample Tool from software DFM Analysis tab	High

Possible evidence:

- Sample tool literature stating the fact
- Simple affirmation statement by evaluator and witness
- Screenshots of demonstration
  - Stand-alone application in start menu
  - DFM option under Analysis
  - DFM interface panel in software
  - DFM analysis results window in software

4.2. Unaltered Model

#	Requirement and Description	Priority
R2	Sample Tool shall not alter the geometric content of the model • Source: Derived, Surety Engineering • Acceptability Criteria: Documented evidence that execution of Sample Tool does not alter the geometry of the model (i.e., comparison of model before and after execution). • Clarification: Execution of Sample Tool may add Sample Tool related parameters to the model (i.e., confirmation that Sample Tool was run) but under no circumstance shall Sample Tool alter the model in terms of form, fit, and/or function.	High

Possible evidence:

- Comparison of model before and after Sample Tool execution
  - Software tool for comparison (i.e., can software compare models?)
  - Visual inspection of a very simple part
  - Official statement from Sample Tool vendor

4.3. Utilization of Science and Technology Company Ruleset

#	Requirement and Description	Priority
R4	At least one Sample Tool ruleset will be based on STC DFM guide • Source: Need N2 • Acceptability Criteria: STC utilizes a supplied ruleset • Clarification: This requirement pertains to the process of developing and/or using STC DFM based rulesets. This does not preclude the use of other rulesets such as commercial or STC-developed rulesets.	High

Possible evidence:

- Ruleset Configuration Management Plan, CM123456A, *Configuration Management Plan, Mechanical Computer-Aided Design and Electrical Computer-Aided Design Ruleset* [3]
- Screenshot of selectable ruleset from within Sample Tool

4.4. Configuration Managed Ruleset

#	Requirement and Description	Priority
R5	Sample Tool rulesets shall have the ability to be configuration managed at STC • Source: Need N5 • Acceptability Criteria: Documented and implemented configuration management process/procedure for select Sample Tool rulesets. • Clarification: Not all Sample Tool rulesets need to be configuration managed.	High

Possible evidence:

- Ruleset Configuration Management Plan, CM123456A [3]

4.5. Lockable Ruleset

#	Requirement and Description	Priority
R6	Sample Tool rulesets shall have the ability to be lockable (unalterable by unauthorized users) • Source: Derived, Need N5 • Acceptability Criteria: Demonstration of locking feature of ruleset • Clarification: This requirement also applies to any underlying data files or databases supporting a locked ruleset. • Clarification: Not all Sample Tool rulesets need to be locked.	High

Possible evidence:

- Affirmation statement of evaluator and witness
- Screenshots outlining demonstration
- Ruleset Configuration Management Plan, CM123456A [3]

4.6. Sample Tool on the Science Network One

#	Requirement and Description	Priority
R7	Sample Tool shall be deployed on the SNO • Source: Need N1 • Acceptability Criteria: Demonstration, Sample Tool is executable on an SNO machine	High

Possible evidence:

- Affirmation statement of evaluator and witness
- Screenshot of Sample Tool on SNO machine
- Screenshot of Sample Tool availability in Software Center

4.7. Sample Tool on the Science Network Two

#	Requirement and Description	Priority
R8	Sample Tool shall be deployed on the SNT • Source: Need N1 • Acceptability Criteria: Demonstration, Sample Tool is executable on an SNT machine	High

Possible evidence:

- Affirmation statement of evaluator and witness
- Screenshot of Sample Tool on SNT machine
- Screenshot of Sample Tool availability in Software Center

4.8. Evidence of Ruleset Violations

#	Requirement and Description	Priority
R9	Sample Tool shall generate evidence of ruleset violations • Source: Need N3 • Acceptability Criteria: Sample Tool artifact (e.g., report or screenshot) of DFM ruleset violations archived in a CM repository (e.g., PDMLink, TeamForge, etc.)	High

Possible evidence:

- Affirmation statement of evaluator and witness
- Screenshots of demonstration
- Ability to save screen shots to PDMLink and/or TeamForge

5. ACRONYMS

Title	Definition
CM	Configuration Mangement
DFM	Design for Manufacturing
DFMA	Design for Manufacturing
EA	Engineering Authorization
SNO	Science Network One
SNT	Science Network Two
STC	Science and Technology Company

6. REFERENCES

[1] GE123456, "General Engineering Document, DFMA, ECAD Sample Tool, Verification and Validation Report," Science and Technology Company, Location.

[2] TD123456, "Test Data, DFMA, Sample Tool, Verification Test Results," Science and Technology Company, Location.

[3] CM123456A, "Configuration Management Plan, Design for Manufacturing and Assembly, Mechanical Computer-Aided Design and Electrical Computer-Aided Design, General," Science and Technology Company Location.

TEST DATA, DESIGN FOR MANUFACTURING AND ASSEMBLY, SAMPLE TOOL, VERIFICATION TEST RESULTS

CONTENTS

FIGURES

1. PURPOSE

The purpose of this document is to capture the testing evidence needed to verify the implementation of Sample Tool through implementation in software as a Design for Manufacturing and Assembly (DFMA) tool at Science and Technology Company (STC).

2. SCOPE

This TD documents the test results defined in TK123456, *Test Plan, Design for Federal Manufacturing and Assembly, Sample Tool, Verification Test* [1].

3. TESTING DETAILS

Items	Details
Date of Data Collection:	June 27, 2023
Evaluators:	Joe Alpha, CAD Technologist, Org. 1234 (Sections 4.1, 4.2, 4.3, 4.6 and 4.8); Jane Delta, Systems Engineer, Org. 1213 (Sections 4.3, 4.4 and 4.5); Jane Smith, Org. 1234 (Section 4.7)
Witnesses:	Joe Gamma, Surety Engineer, Org. 3101; John Doe, CAD Technologist, Org. 1234; Joe Beta, Business Operations Analyst, Org. 5678, Jane Jones, CAD Technologist, Org. 1234
Valor NPI details:	Version 11.3
Mentor Xpedition details:	Version VX 2.8
PDMLink details:	Version 13.4 on Science Network One (SNO) and Science Network Two (SNT)
Additional Details:	• Activities performed on: ○ J. Alpha on his SNO computer (S1234567) at his STGC-approved remote site office ○ J. Delta on her SNO computer (R1234567) at her STCG-approved remote-site office ○ J. Smith on her SNT thin client, located on STGC site • J. Gamma, J. Doe and J. Beta witnessed the testing via Teams call on June 27 2023. J. Jones witnessed testing via Teams call for STGC on July 17, 2023

4. DATA COLLECTION

4.1. Sample Tool Integration Needs

#	Requirement and Description	Priority
R1	Sample Tool shall be integrated into the software process • Source: Need N1 • Acceptability Criteria: Demonstrate execution of Sample Tool from DFM Analysis tab	High

4.1.1. Evidence

J. Alpha demonstrated that Sample Tool is fully integrated via the DFM Analysis tab on the SNO.

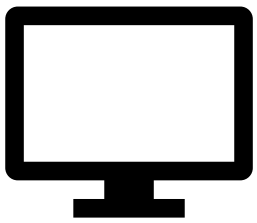

Figure 1. Sample Tool Integrated Into Software

J. Alpha executed a DFM analysis through Sample Tool. He demonstrated capture of results via the Hazard Explorer option.

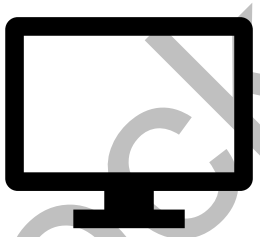

Figure 2. Perform Analysis Variables

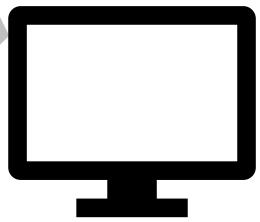

Figure 3. Hazard Explorer

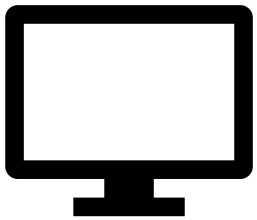

Figure 4. DFM Results

4.2. Unaltered Model

#	Requirement and Description	Priority
R2	Sample Tool shall not alter the geometric content of the model • Source: Derived, Surety Engineering • Acceptability Criteria: Documented evidence that execution of Sample Tool does not alter the geometry of the model (i.e., comparison of model before and after Sample Tool execution). • Clarification: Execution of Sample Tool may add Sample Tool related parameters to the model (i.e., confirmation that Sample Tool was run) but under no circumstance shall Sample Tool alter the model in terms of form, fit, and/or function.	High

4.2.1. Evidence

J. Alpha loaded a drawing from the shared SNO ECAD drive and ran Sample Tool. He showed the results of the DFM analysis and then showed that Sample Tool does not make any alterations to the drawing, but only indicates potential issues.

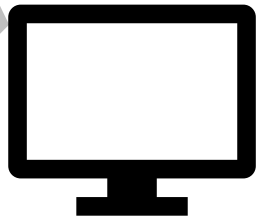

Figure 5. DFM Analysis

4.3. Utilization of Science and Technology Company Ruleset

#	Requirement and Description	Priority
R4	At least one Sample Tool ruleset will be based on STC DFM guide • Source: Need N2 • Acceptability Criteria: STC utilizes a supplied ruleset • Clarification: This requirement pertains to the process of developing and/or using DFM based rulesets. This does not preclude the use of other rulesets such as commercial or STC-developed rulesets.	High

4.3.1. Evidence

J. Delta showed the location of CM123456A, *Configuration Management Plan, Mechanical Computer-Aided Design and Electrical Computer-Aided Design Ruleset* [2] on SNO PDMLink. J. Alpha displayed the populated location of the ruleset loaded into Sample Tool.

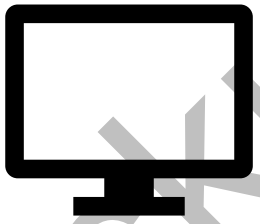

Figure 6. Configuration Management Plan for Rulesets

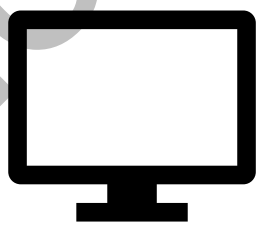

Figure 7. Embedded Ruleset in Sample Tool Via Software

4.4. Configuration Managed Ruleset

#	Requirement and Description	Priority
R5	Sample Tool rulesets shall have the ability to be configuration managed at STC • Source: Need N5 • Acceptability Criteria: Documented and implemented configuration management process/procedure for select Sample Tool rulesets. • Clarification: Not all Sample Tool rulesets need to be configuration managed.	High

4.4.1. Evidence

J. Delta showed the location of CM5123456A [2] on SNO PDMLink (*see* Figure 6). J. Delta showed that the ruleset was properly named and stored in PDMLink in accordance with CM123456A.

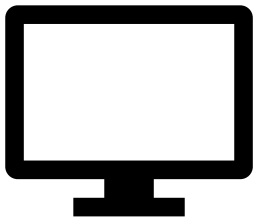

Figure 8. Ruleset on PDMLink

4.5. Lockable Ruleset

#	Requirement and Description	Priority
R6	Sample Tool rulesets shall have the ability to be lockable (unalterable by unauthorized users) • Source: Derived, Need N5 • Acceptability Criteria: Demonstration of locking feature of ruleset • Clarification: This requirement also applies to any underlying data files or databases supporting a locked ruleset. • Clarification: Not all Sample Tool rulesets need to be locked.	High

4.5.1. Evidence

The ruleset(s) can be configuration managed per CM123456A [2]. J. Delta indicated the steps had been followed to show that the ruleset used by J. Alpha had been configured to the released (REL) State on PDMLink and could not be modified. Additionally, the folders on PDMLink are access controlled as are the drawing and DFM analysis export files on the ECAD shared drive.

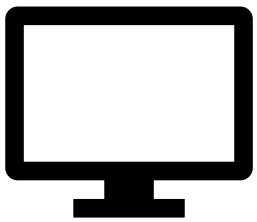

Figure 9. Ruleset Released on PDMLink

4.6. Sample Tool on the Science Network One

#	Requirement and Description	Priority
R7	Sample Tool shall be deployed on the SNO • Source: Need N1 • Acceptability Criteria: Demonstration, Sample Tool is executable on an SNO machine	High

4.6.1. Evidence

All evidence was affirmed by the evaluators and witnesses. Additionally, J. Alpha verified that Sample Tool was available in Software Center and on his SNO machine.

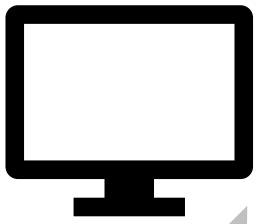

Figure 10. Sample Tool in Science Network One Software Center

4.7. Sample Tool on Science Network Two

#	Requirement and Description	Priority
R8	Sample Tool shall be deployed on the SNT • Source: Need N1 • Acceptability Criteria: Demonstration,Sample Tool is executable on an SNT machine	High

4.7.1. Evidence

J. Smith affirmed that Sample Tool is available on the SNT and all previous demonstrations could be repeated if necessary. J. Jones acted as witness.

4.8. Evidence of Ruleset Violations

#	Requirement and Description	Priority
R9	Sample Tool shall generate evidence of ruleset violations • Source: Need N3 • Acceptability Criteria: Sample Tool artifact (e.g., report or screenshot) of DFM ruleset violations archived in a CM repository (e.g., PDMLink, TeamForge, etc.)	High

4.8.1. Evidence

J. Alpha executed a DFM analysis using Sample Tool through software, and showed a comparison of no results being found in Hazard Explorer versus results found in Hazard Explorer. At this time, Sample Tool is unable to generate a report of the DFM

findings. As part of the ECAD process, designers are asked to capture a screenshot of the findings, which is demonstrated in Figure 12.

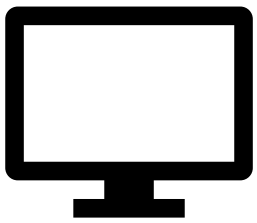

Figure 11. No Results Found in DFM Analysis

Figure 12. DFM Analysis Results in Hazard Explorer

5. RESULTS

All demonstrations were successfully performed on both the SNO and SNT by J. Alpha, J. Smith, and J. Delta and were witnessed by J. Gamma, J. Doe, J. Smith and J. Jones.

6. ACRONYMS

Title	Definition
CAD	Computer Aided Design
CM	Configuration Management
DFM	Design for Manufacturing
ECAD	Electrical Computer Aided Design
SNO	Science Network One
SNT	Science Network Two
STC	Science and Technology Government Contractor

7. REFERENCES

[1] TP123456, "Test Plan, DFMA, Sample, Verification Test," Science and Technology Company, Location.

[2] CM123456A, "Configuration Management Plan, Design for Manufacturing and Assembly, Mechanical Computer-Aided Design and Electrical Computer-Aided Design Ruleset," Science and Technology, Location.