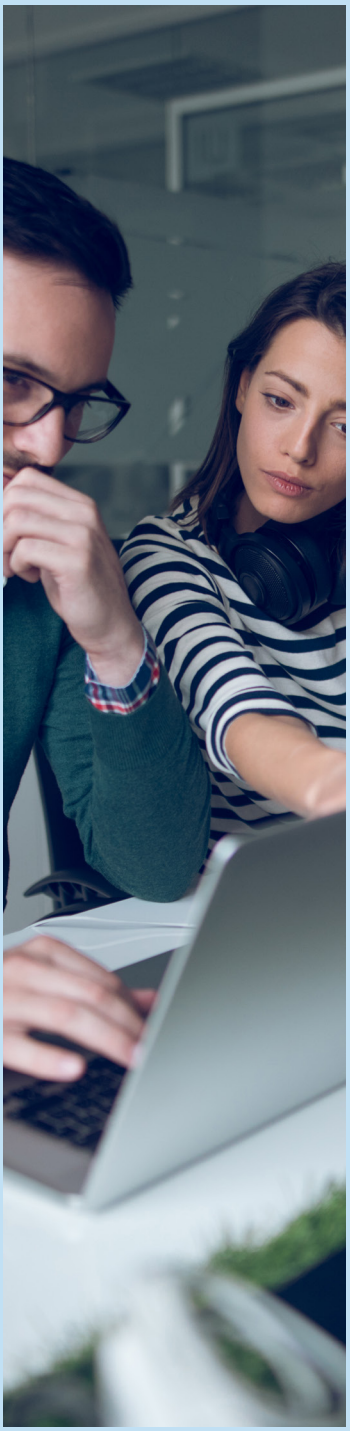
VIEW POINT



COMPUTER SOFTWARE ASSURANCE (CSA) – EMBRACING THE NEW APPROACH TO COMPUTER SYSTEM VALIDATION (CSV)

Abstract

The fourth industrial revolution popularly known as 'industry 4.0' Has gained momentum in transforming the manufacturing and operations practices with the usage of digital infrastructure and computerized systems. Life science is one of the most regulated industry domains and would need an optimal approach to adopt the technology trends. We need to consider if we can deal adequately with the pace and complexity of the industrial revolution by applying current methodologies for validating the computerized system. To support the vision of industry paradigm shifts, computer system validation (csv) practices/frameworks should certainly need drastic changes to comply with the pace and overcome the current csv hurdles.

Infosys®
Navigate your next

The quality initiative undertaken by the US FDA in 2011 intended on enhancing the quality of medical devices and their usability in terms of patient safety. At the request of the FDA's CDRH department, a team was established for Computer Software Assurance (CSA) to improve upon the current approaches being followed under Computer System Validation.

What was the impression?

- Manufacturers are reluctant to invest in technology
- Burden on Computer System Validation (CSV) for the sake of audit

FDA's Focus:

- On quality, remove non-value add activities and testing high-risk areas
- Overcome barriers in the current Validation of Software

What is CSV, what is its importance and why do we need a change in CSV practices?

FDA considers software validation to be "confirmation by examination and provision of objective evidence that software specifications conform to user needs and intended uses, and that the particular requirements implemented through software can be consistently fulfilled."

Why is Computer System Validation important for the Life Science Industry?

Considering the safety of the people, the computerized systems used in the process of developing, analyzing, and manufacturing the product falls under the lens of regulatory requirements as it relates to human health.

Enforcement of the regulatory requirements and its impact on patient safety makes CSV an important activity. Concerning the US FDA's General Principles of Software Validation "computer systems used to create, maintain electronic records, and manage electronic signatures are also subject to the validation requirements. Such computer systems must be validated to ensure accuracy, reliability, consistent intended performance, and the ability to discern invalid or altered records."

Current challenges encountered in the present CSV approach

The FDA when publishing its guidelines for software validation had said, "We believe we should consider the least burdensome approach in all areas of medical device regulation." Alas, 20 years since, CSV has still ended up with too much documentation and has restricted manufacturers to use complex systems (automation tools) due to the requirement of high validation efforts, time, and cost. Let us dive deeper to understand the existing problems.

- **Traditional Methodology:** CSV documentation is more aligned with the waterfall methodology that believes in document creation and review at each step of SDLC (Software Development Life Cycle). In other words, more documentation is considered key for validation. In this process, unnecessary documentation and testing are being done to adopt the safe approach and not to take any risk, henceforth reducing the utilization of resources and processes. Hence, leading to the need for a novel approach in place of Computer System Validation.
- **Numerous Standards and Varied Interpretations:** Each organization uses different standards. These standards are interpreted in .multiple ways by each stakeholder. To ensure that the interpretations remain the same across organizations, there is a requirement to bring forth a common framework. This will bring smoothness to implementation.
- **Tools:** There is a pressing need for life sciences organizations to start adopting the latest tools and technologies. In the era of cloud and IoT (Internet of Things), the industry is still struggling to get fixed templates for documentation and align on centralized guidance.

To help the industry to overcome current CSV challenges, the US FDA CDRH department is introducing the guidance on "Computer Software Assurance for Production and Quality System Software" widely called CSA – Computer Software Assurance, which will be a redesigned approach to the CSV.

Computer Software Assurance (CSA)

CSA is a risk-based approach for establishing and maintaining confidence that software is fit for its intended use. The new approach is being witnessed as a paradigm shift from the traditional approach, which was highly focused on documentation, to an approach that emphasizes critical thinking and a risk-based testing approach for assurance activities.

Possible framework for Computerized Systems - CSA

Below is our perception of the risk-based framework recommended by the FDA in CSA guidance:

1. Identify the **purpose** of the system
    - FDA intends to differentiate between **direct impact** system and **indirect impact** system – as defined in the FDA draft guidance "software that is used directly as part of production or the quality system, and software that supports production or the quality system."
    - This will allow manufacturers to begin with the identification of the purpose of the system and its features and determine the extent of validation activities.
2. Risk-based approach
    - FDA recommends using risk-based analysis to determine appropriate assurance activities. CSA approach should be unlike traditional risk analysis where probability and likelihood of occurrence of failures are considered instead of identifying reasonably foreseeable software failure. Focusing on critical thinking, the FDA intends to derive the risks based on the factors that may impact or prevent the software function from performing as intended and compromise patient safety and product quality. FDA is proposing the risks categorization as 'high process risks' and 'intermediate risks (not high)'. However, manufacturers can categorize the risks at their discretion, but the intention should be on testing the high-risk functions/feature.
    - Understand the **high/intermediate/low** risk of features/ functions by analyzing them critically with a focus on their impact on product quality and patient safety.

Risk	Software Feature/Function
High	Failure of feature directly impacts patient safety or product quality
Intermediate (Not high)	Failure of features does not impact patient safety or product quality. Features required for regulatory compliance.
Low (Not High)	Good to have a feature with no impact on safety or product quality and may not necessarily require regulatory compliance.

3. Implement **risk-based** assurance activities **(Scripted, Unscripted)**

- An area that the new CSA guidance will address is testing using a risk-based approach. With the traditional approach, high-risk systems and lower-risk systems go through the same level of analysis but with the application of the CSA approach, the FDA intends to focus testing on high-process risk features. Our understanding to select the assurance activity commensurate with the risk, intended use, and feature implementation is stated below:

- FDA recommends that for software features, functions, and operations that are not high-risk, manufacturers may consider using unscripted testing methods such as ad-hoc testing, error-guessing, exploratory testing, or a combination of methods that is suitable for the risk of the intended use.
- Leverage vendor documentation/vendor assurance record: Leveraging documentation from the supplier allows for a time reduction in the assurance process, companies must ensure that vendor documentations are at par with user standards.

Intended use	Risk	Feature Implementation	Assurance Activity
Direct	High	Custom	Scripted – Robust
		Configured	Scripted – Robust
		OOTB (Out of the Box)	Scripted – Limited
	Intermediate	Custom	Scripted – Limited
		Configured	Unscripted
		OOTB (Out of the Box)	Vendor Assurance (vendor validation record)
Indirect	Low	Custom	Scripted – Limited
		Configured	Unscripted or Vendor Assurance (vendor validation record)
		OOTB (Out of the Box)	Vendor Assurance (vendor validation record)

4. **Objective evidence - Establishing the assurance record**

It is necessary to capture the objective evidence of the assurance activity conducted to ensure the software feature and function performs as intended. The expectation is to at least capture the intended use of software features, risk analysis, testing description, deviations encountered, conclusion, date of testing, and tester details.

Transitioning to the new approach

- Plan to train personnel to support their transition to CSA risk-based approach
- Engage to find out the intended use of your current computer system(s)
- Determine CSA risk-based framework
- Revision to current approach and templates
- Leverage agile methodologies

Conclusion

In cricket, a batter wearing a helmet against a seamer is justifiable as the risk of getting hit and direct impact to the batter is high, but in the case of a spinner, the batter may play without a helmet as the risk of getting hit is low and can play more freely without any additional burden of the helmet.

Along similar lines, when deciding on an approach for validation, the CSA guidance will focus on identifying critical factors and high, intermediate, and low-risk business functions and reducing the additional burden of documentation by using vendor assurance activities and using a scripted or unscripted test design concept.

CSA will not be a new regulation from the FDA, rather it will be a guideline that will help the life science company to align their current procedures and policies effectively and shift the focus of CSV processes towards the quality of the computer software, critical thinking, patient safety, and data integrity. This paradigm shift to CSV will encourage the industry to adopt automated solutions and digitize their business process.

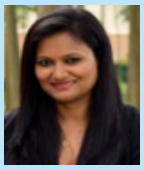
Definitions:

Term	Definition
Scripted Testing	FDA defines - "Dynamic testing in which the tester's actions are prescribed by written instructions in a test case. Scripted testing includes both robust and limited scripted testing." Robust – Scripted testing efforts in which the risk of the computer system or automation includes evidence of repeatability, traceability to requirements, and auditability. Limited - A hybrid approach of scripted and unscripted testing that is appropriately scaled according to the risk of the computer system or automation.
Unscripted Testing	FDA defines - "Dynamic testing in which the tester's actions are not prescribed by written instructions in a test case. It includes Ad-hoc testing, Error guessing, Exploratory testing."

References

- Computer Software Assurance for Production and Quality System Software | Sept 2022
- Industry Perspective: Validation 4.0 - Shifting Paradigms | Nov-Dec 2020
- GAMP RDI Good Practice Guide: Data Integrity by Design | ISPE | International Society for Pharmaceutical Engineering
- Part 11, Electronic Records; Electronic Signatures - Scope and Application | Sept 2003
- General Principles of Software Validation; Final Guidance for Industry and FDA Staff | Jan 2002
- 13 Common Issues in CSV: Let's Start Solving Them, Part 2 of 3 | Jan 2020
- What Is Computer System Validation, and How Do I Do It Right? | Oct 2020
- Computer System Validation: Eight Challenges on the Way to the Target State | Aug 2011
- An Engineering Disaster: Therac-25 by Joanne Lim | Oct 1998
- The Origins of Computer System Validation | June 2021
- What is Computer Software Assurance (CSA) and why are the FDA transitioning from traditional Computer System Validation? | Sept 2020
- Why is Computer System Validation Required and What Happens if You Don't Comply? | April 2018
- Pharma 4.0: Industry 4.0 Applied to Pharmaceutical Manufacturing | Oct 2018
- Understanding FDA's CSA Guidance in the Context of Current Regulations and GAMP® | March 2021
- Pharma Best Practices Webinars

About the Authors



Divya Jaiswal

Senior Consultant at Infosys Consulting having rich experience in the Life Sciences Domain specializing in Computer System Validation (CSV), Regulatory Compliance, Business Analysis, Pharmaceutical Regulatory Submission Management, and Health Outcomes and Research (HEOR).

Sohan Ghodake

Senior Consultant at Infosys Consulting with experience in the field of Computer System Validation, Compliance, Quality Assurance & Control.

Surbhi Sinha

Analyst at Infosys Consulting having experience in the Life Sciences domain specializing in Computer System Validation (CSV).

For more information, contact askus@infosys.com

Infosys®
Navigate your next