



Where Imaging and Clinical Informatics Meet: Software Development Life Cycle Methodologies & Terminology Review: Waterfall, Spiral, and Agile Approaches Applied to Use Cases

Les Folio, DO, MPH, ACHIP, CIIP, Imaging Informatics Section Chief, Radiology Services, James A. Haley Veterans Hospital Gregg Cohen, PhD, CIIP, CPHIMS; Nathan Bumbarger, MD, CIIP; Kenda Fessock, MS, RT(R), CIIP

Background/Problem Being Solved

The Certified Imaging Informatics Professional (CIIP) certification provides a foundational understanding of clinical informatics (CI), but practical applications often involve complex software development life cycle (SDLC) methodologies. Imaging informatics professionals may encounter terms like Waterfall, Extreme Programming (XP), scrum, spiral, or agile methods, which are not deeply covered in the CIIP curriculum, leading to challenges in selecting the appropriate approach.

Intervention(s)

This article introduces SDLC basics to burgeoning imaging informatics professionals, focusing on methodologies such as Waterfall, scrum, spiral, and agile. Key terminologies like Product Owner, Scrum Master, Sprint, and Daily Scrum are explained. Use cases from various institutions highlight the importance of engaging radiology and clinical stakeholders early in the process to ensure successful product development or procurement.

Barriers/Challenges

A critical barrier is poorly defined user requirements at project onset, leading to costly "scope creep" and resource wastage. Success depends on clearly defined project scopes and active involvement of all stakeholders, including PACS and EI administrators, to prevent costly delays and misaligned project goals. Additionally, a lack of familiarity with SDLC methodologies and terminology can negatively impact project outcomes.

Outcome

The article offers a comparative overview of software development methodologies, supplemented by real-world use cases. For example, one center's agile training enabled rapid development with participants assuming scrum master roles, while another leveraged grassroots development to integrate protocoling into a RIS vendor system. These experiences illustrate practical applications of SDLC approaches in imaging informatics.

Conclusion/Statement of Impact/Lessons Learned

Providing SDLC terminology and reviewing methodologies equips imaging informatics professionals with critical baseline knowledge. Sharing experiences from diverse institutions highlights practical challenges and strategies, preparing CIIPs to navigate the complexities of clinical informatics from their first day on the job.

Figure(s)

Waterfall development is the traditional sequential approach with inflexible cascading steps occurring linearly with each stage leading to the next in a consistent order (e.g. requirements, analysis, design, development, testing, deployment, then maintenance).
On the contrary, Agile development approaches focus on smaller steps with frequent loops that include Extreme Programming (XP) and Scrum that provides frequent stakeholder feedback. This allows flexibility, as many users change their minds on the original requirements as the project matures.
Scrum (Systematic Customer Resolution Unraveling Meeting) is an iterative approach in two to four week "sprints" with daily scrum meetings led by a scrum master. This approach leverages stakeholder involvement with frequent inputs.
Spiral is sometimes referred to as "risk oriented" or "risk driven" development that is also phase iterated and often applied when functional requirements are poorly understood. The development is

iterated and often applied when functional requirements are poorly understood. The development is often broken into smaller efforts with subprojects applied to large, complex, and expensive projects. Spiral combines elements of iterative, waterfall, and prototyping methodologies and is flexible, hence adaptable that helps manage risk by assigning resources to those first, get them out of the way early.

Figure 1. defines the SDLC approaches starting with the traditional cascading waterfall development, followed by agile, XP, scrum and spiral.



Figure 2. (example low-to mid wireframe) shows notes from a scrum standup on a secure phone app to access imaging data during ICU rounds. This novice associate (after six hours of scrum master training) actually scrolled paper through an old phone case to show a desired end state. When put on the spot in a sprint, some of the craziest ideas (and the best) emerge.

Keywords

Applications; Artificial Intelligence/Machine Learning; Emerging Technologies