Agile Methodologies Redux

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Better Scientific Software tutorial @ SC21

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- **The requested citation the overall tutorial is: David E. Bernholdt, Anshu Dubey, Patricia A. Grubel, Rinku K. Gupta, and Gregory R. Watson, Better Scientific Software tutorial, in the International Conference for High-Performance Computing, Networking, Storage, and Analysis (SC21), St. Louis, MO, USA and online, 2021. DOI: 10.6084/m9.figshare.16556628**
- Individual modules may be cited as *Speaker, Module Title*, in Better Scientific Software tutorial…

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IDEAS productivity

ECP EXASCALE COMPUTING PROJECT

Outline

- Refining our Epic
- PSIP: Productivity and Sustainability Improvement Planning

More on Epic, Story, Task

- Definition of Done
- Refining Issues
- Agile Estimation

Epic, Story, Task Review

- Break down and refine when and as needed
  - Close to when the work will be done
  - Only for work that will take place
  - Can be valuable for estimating
  - There is no “correct” level of granularity
- Epics are very high level objectives
- Stories should represent an increment of value to the customer
  - “Definition of Done” – understandable to user
- Tasks are the steps necessary to complete a story
  - May not individually provide value to the customer

Definition of Done

- Simplified definition: When all acceptance criteria are met
- Acceptance criteria
  - “Conditions that a software product must satisfy to be accepted by a user, customer or stakeholder.” – Microsoft Press
  - “Pre-established standards or requirements a product or project must meet.” – Google
  - Can include functional, non-functional, and performance requirements.

Definition of Done

- Important to establish for a story before estimating or beginning a task
- Defined by the team, acceptable to customer
  - Customer language
- Should not specify an implementation unnecessarily

Refining Our Epic

- Epic: Refactor code for enhanced modularity
  - Description: The heat equation code needs refactoring to improve modularity. Specifically, there are utilities that could be generalized and used with for other applications. Also, the integration function is currently hard-coded. In the future, we want to use alternative integration functions, so we should generalize the interface for this function.
  - Story 1: Separate out utilities
    - Definition of Done
    - Task list
  - Story 2: Separate out integration function
    - Definition of Done
    - Task list

Refining Our Epic

- Story 1: Separate out utilities
  - Definition of Done
    - Unit tests pass
    - Code review completed
    - Integration/system tests pass
    - Utility performance is at least 95% of pre-separation performance
    - Utility usability demonstrated outside of heat equation application

- Story 2: Separate out integration function
  - Task 1: Add testing for integration function to protect functionality during refactor
    - Needed testing should be specified
  - Task 2: Generalize interface to allow alternative implementations
  - Task 3: Expose current integration function through the new interface & run tests

Agile Estimation

- Estimating is hard
  - Requires practice
  - With practice, it is still hard
- Stories are estimated using “story points”
  - Relative estimate
  - Many estimating techniques
  - Should NOT map to hours, days, etc
  - Definition of done needed, tasking not required
- Tasks are estimated in hours
  - Absolute estimate
- Useful for planning schedules

Key concept:
It is easier to accurately estimate many small tasks than to estimate a large epic.

Epic: Huge refactor effort

Tasks:
- Add tests
- Generalize interface
- Expose existing interface

How To Get Better

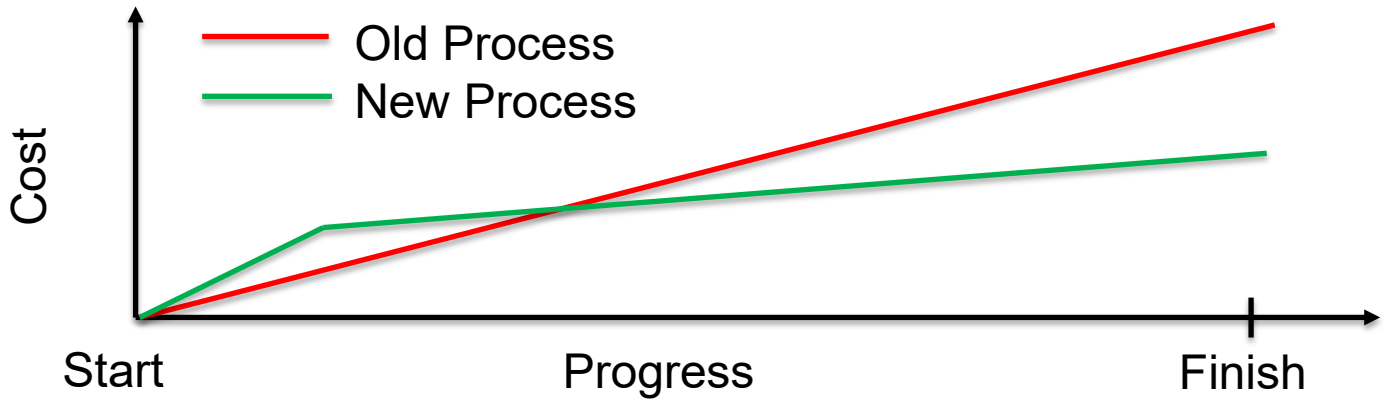
“Use iteration and incrementation only for projects you want to succeed.”

- *Adaptation of Martin Fowler quote*

Strategy for Incremental Productivity Improvements

- Identify, analyze, prototype, test, revise, deploy. Repeat.
- Realistic: There is a cost.
  - Startup: Overhead
  - Payoff: Best if soon, clear

Productivity and Sustainability Improvement Planning (PSIP): https://bssw.io/psip



- Working model:
  - Reserve acceptable time/effort for improvement.
  - ***Improve how you do your work on the way to getting it done.***
  - Repeat.

Productivity and Sustainability Improvement Planning (PSIP) Examples: EXAALT & MPICH

PSIP workflow helps a team create user stories, identify areas for improvement, select a specific area and topic for a single improvement cycle, and then develop those improvements with specific metrics for success.

MPICH PSIP: Onboarding new team members

Practice: Create Centralized Training Resources		
Score (0 – 4)	Description	Tracking
0	Initial Status : No training process in place.	
1	Understand MPICH requirement for developers and typical challenges for new hires	✓
2	Review and gather specific training materials	✓
3	Design "MPICH Training Base" website	✓
4	Solicit feedback, improve, add and prune content to ensure effectiveness	2019

EXAALT PSIP: Continuous integration (CI) testing

BSSw blog article: Adopting Continuous Integration for Long Timescale Materials Simulation, Rick Zamora (Sept 2018)

PSIP Process: Continuous Integration (CI)

Target: Implement and document a basic CI pipeline to act as the foundation for automated build and functionality testing.

0. **Initial Status.** No comprehensive CI framework in place
1. Develop a minimal docker image, with EXAALT dependencies ✓
2. Implement a minimal 'yml' script for the CI pileine ✓
3. Update EXAALT docker image to leverage CMake, and create a ParSplice-specific image for build testing ✓
4. Generate step-by-step "how-to" Docker-image documentation ✓
5. Extend CI to automate build and functionality testing with both CMake and Boost. ✓

Score (0-5): 4

PSIP Process: Testing

Target: Implement and document practical testing examples for ongoing EXAALT development.

0. **Initial Status.** No comprehensive testing framework in place
1. Add 1–3 example tests using the existing CMake infra-structure (CTest) ✓
2. Add 1–3 example tests using the 'Boost Test' library ✓
3. Integrate the CTest infrastructure with the new Boost tests ✓
4. Integrate the Boost-enabled CTest framework into the CI pipeline ✓
5. **Bonus:** Work with EXAALT team to add more advanced tests to improve code coverage ☐

Score (0-5): 3

RateYourProject assessment tool: https://rateyourproject.org/

More tracking card examples: https://bssw-psip.github.io/ptc-catalog/catalog