AGILE Project Management

NSF Research Infrastructure Workshop, September 2022

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Introduction

As Research Infrastructure projects increase in complexity and budgeted cost, higher levels of project management acumen will be required,

Project Management is the process of leading the work of a team to achieve a projects goals, described in project documentation, created at the beginning of the development process. The primary constraints are scope, time, and budget,

WHY AGILE? If done properly, it provides faster feedback cycles, Identifies problems early, enhances ability to manage changing priorities, Improves project visibility/transparency, Increases productivity, and decreases the risk of failure.
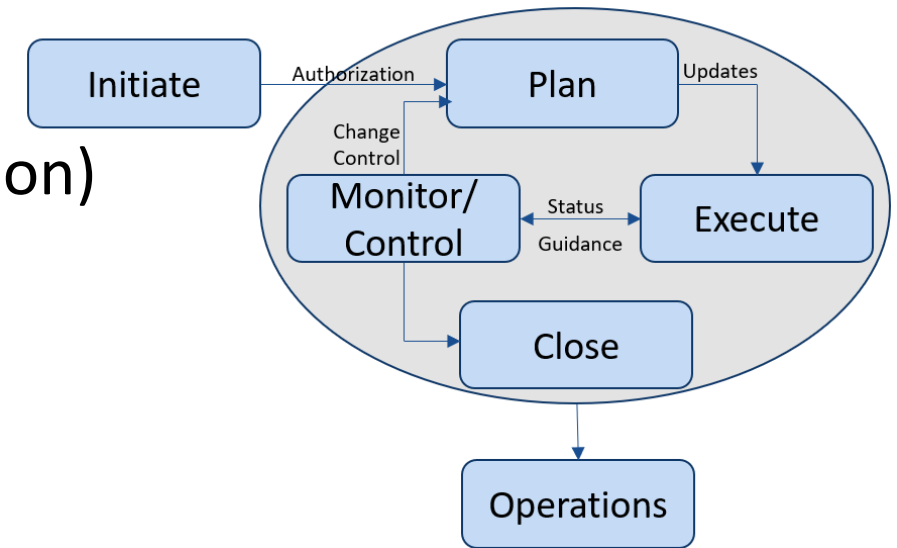
National Science Foundation
WHERE DISCOVERIES BEGIN

RESEARCH INFRASTRUCTURE GUIDE

NSF guidance for full life-cycle oversight of
Major Facilities and Mid-Scale Projects

NSF Large Facilities Office
Office of Budget, Finance and Award Management

NSF 21-107
December 2021

Credit: Scientific contact by Ed Seidel (eseidel@aei.mpg.de); simulations by Max Planck Institute for Gravitational Physics (Albert-Einstein-AEI); visualization by Werner Benger, Zuse Institute, Berlin (ZIB) and AEI. The computations were performed on NCSA's It.

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Learning Objectives*

1. Project Management (PM): Basic Waterfall compared to Agile

2. Agile Philosophy

3. Agile Frameworks (SCRUM)

4. PM principles of initiation, planning, executing, monitoring and closing in an Agile manner

5. Establishment of a Performance Measurement Baseline (PMB) between an Agile Project and a project managed with a traditional waterfall framework,

6. Some thoughts on Agile Earned Value Management (EVM) Systems in the reporting against an Agile project PMB

7. incorporating both traditional waterfall and Agile project Management in a coherent single baseline; blended project management.

* Why, yes you can claim PDUs toward PM and Agile certifications just by staying awake for the next forty-five minutes!

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Waterfall Project Methodologies

- "Traditional" Project Management (PMI-default)
- Extensive upfront planning (requirements definition)
- Tasks Organized linearly in time and space
- Tasks are executed sequentially
- Engineer and construction friendly
- Effective for building a conventional 'thing'
- Lends itself to straight-forward monitoring and control
- Critical path
- Planning out projects without rushing through the process, helps to avoid errors or mistakes in the development process
- The value comes from successful completion of the deliverable

Initiate → Authorization → Plan → Updates → Execute

Change Control → Monitor/Control ← Status / Guidance → Execute

Monitor/Control → Close → Operations

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Agile Project Methodologies

- **It's 'Not Waterfall'….**
- Iterative and incremental processes
- Continuous iteration of development and testing activities
- Software
- More/better communication between customers, developers, managers, and testers

It was born because project staff were looking for something that would avoid the traditional Waterfall steps (gathering and documenting requirements, designing, coding and unit testing, initiating system testing, performing user acceptance testing, fixing issues, and delivering then finally at the end of all of that, the finished product. The process was long, top-down, management heavy, and didn't deliver.

Agile Is An Umbrella Term

- '*Heavy weight*' project management (Waterfall) not optimized for software development
- '*Light weight*' development methods were explored 1970's- 1990's
- The *Manifesto for Agile Software Development* was published in 2001
- Manifesto crystallized values and practices
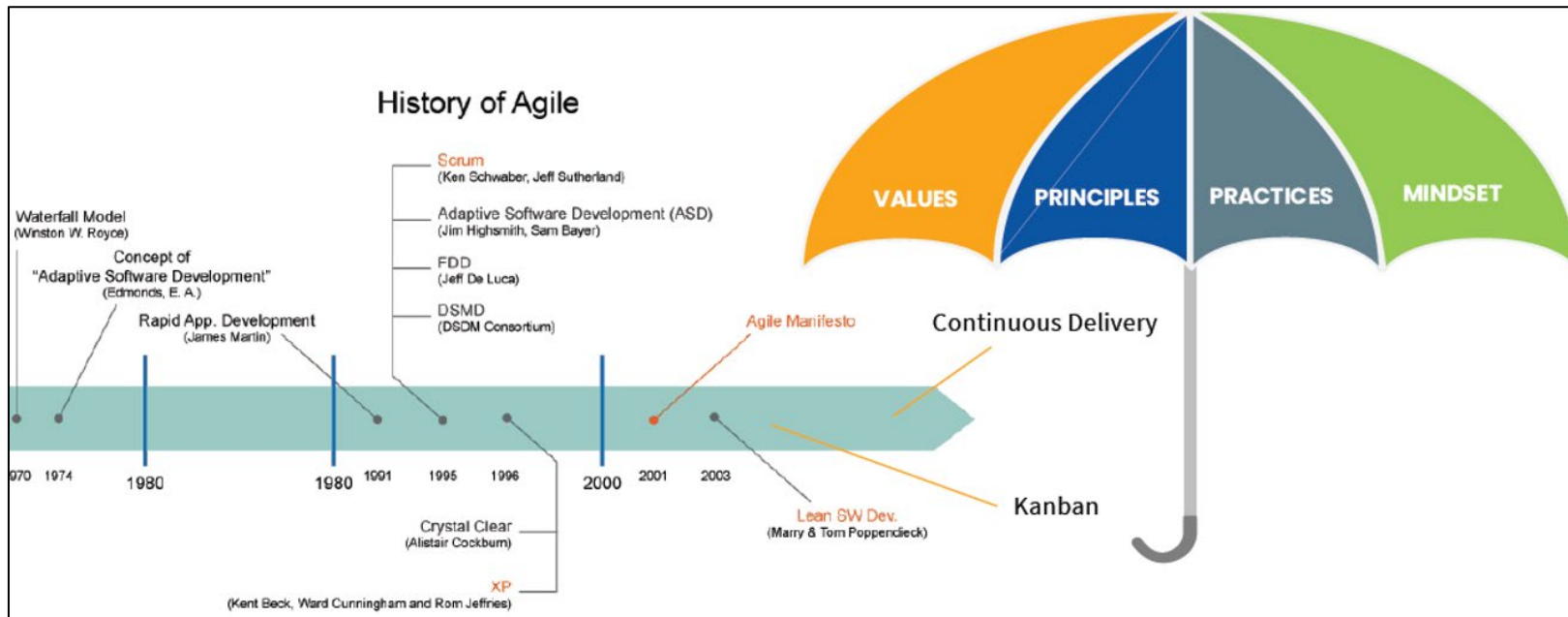
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Agile Project Management Take-aways

- Agile is a *mindset*, not a specific methodology or defined framework
- When managed by a small disciplined group of people, working together (self regulating), a project is likely to be of high-quality
- 'Agile' by itself doesn't adequately describe how the work will be managed, there are many AGILE frameworks,
- SCRUM (in some form) is a common 'AGILE' methodology

Many AGILE Frameworks

- It is common for teams to just call their PM methodology 'AGILE', but this is really a mindset and not necessarily a discreet methodology
- SCRUM, SAFE, (prescriptive)
- KANBAN (Free-form, 'the board', limits)
- SCRUMBAN (Scrum with KANBAN board)

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Scrum Agile Project Management

Scrum (n): a lightweight framework that helps people, teams and organizations generate value through adaptive solutions for complex problems.

The Three Pillars

Observing and experimenting enables product delivery through process control that depends on **transparency**, **inspection**, and **adaptiveness**

The Five Values

- **Commitment**
- **Courage**
- **Focus**
- **Openness**
- **Respect**

There are four main **artifacts**, (documents) provide information for scrum team and stakeholders

There are four Scrum Team roles, each with discreet **Accountabilities**

Scrum has five **events**

Timeboxing is used by teams to decrease the amount of time that it would take to complete a project.

SRUM Accountabilities

The SCRUM Team (3-10 people)

- **Product Owner** (customer representative) responsible for explaining the scope and value of each item in the Backlog; prioritizes backlog items, consistently re-focusing on and refining the rundown, should have an active role throughout the Sprint

- **Scrum Master** (coach, mentor, cheerleader) Scrum champion within the organization, remove impediments to the development team, facilitate Scrum events

- **Developers,** Engineer (or other experts in different fields and specializations) deliver the product

- **Stakeholders, I**ndividuals and organizations who are constantly interfacing with the Product Owner

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SRUM Events

The basic timeboxed activity is the Sprint, which consists of;

- **Sprint Planning,** Plans out the Sprint increment to be completed
- **Daily Scrum,** Meeting to plan for the day's activities
- **The Sprint,** where the actual work is done
- **Sprint Review,** a review of the work that was completed
- **Sprint Retrospective,** a review of the way the work was completed

SRUM Artifacts

Scrum Artifacts can be described as information that a Scrum Team uses to outline the development of software.

- The **Product Backlog** is to meet the Product Goal.

- The **Sprint Backlog** is the Sprint Goal

- The **Increment** is the Definition of Done.

Other documentation:

User Stories: The team divides up the work to be done into functional increments called **User Stories,** which can be grouped into **Epics,** or broken out into **Story Points**

Definition of Done (DoD) An agreed-upon list of criteria which must be met before a product increment (often a user story) is considered complete.

Burn Down Chart will show what has been completed in your sprint, **Velocity** is the rate at which you're completing story points.

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Agile Project Management for Software- SCRUM
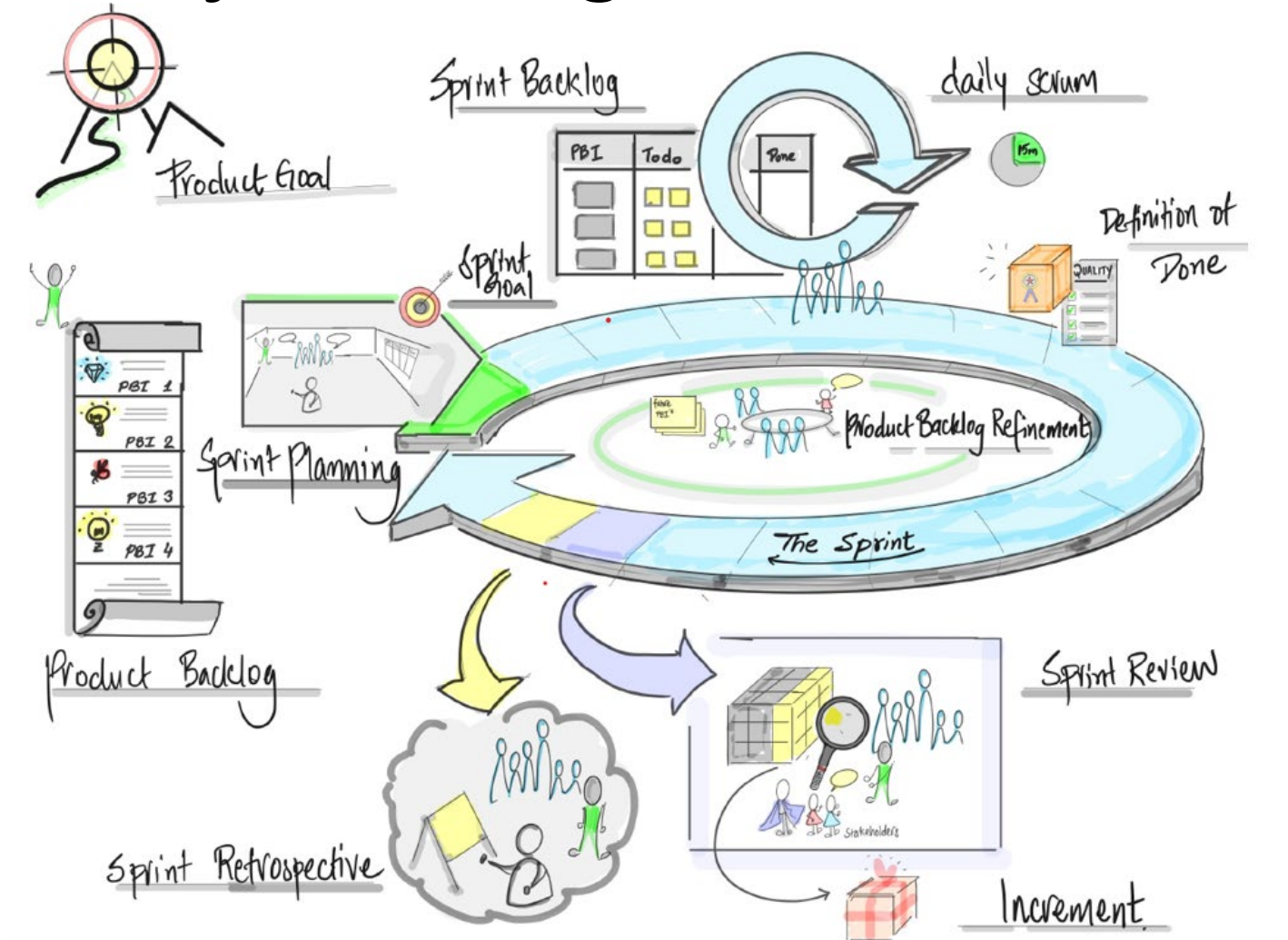
SCRUM Takeaways

- SCRUM is a discreet AGILE Methodology
- SCRUM is **Iterative** (developing software through continuous repetitive cycles) and **incremental** (developing small collections or units at a time that are delivered throughout product development)
- A negative could be that customers become too involved in the development
- Requires each team member is fully committed to the product development
- Requires Management Support

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Planning Waterfall and AGILE

Initiate → Plan → Execute

Monitor/Control ↔ Execute

Plan → Monitor/Control → Close

Close → Operation

Established by stakeholders, independent of technology

Stakeholder prioritization of User Stories

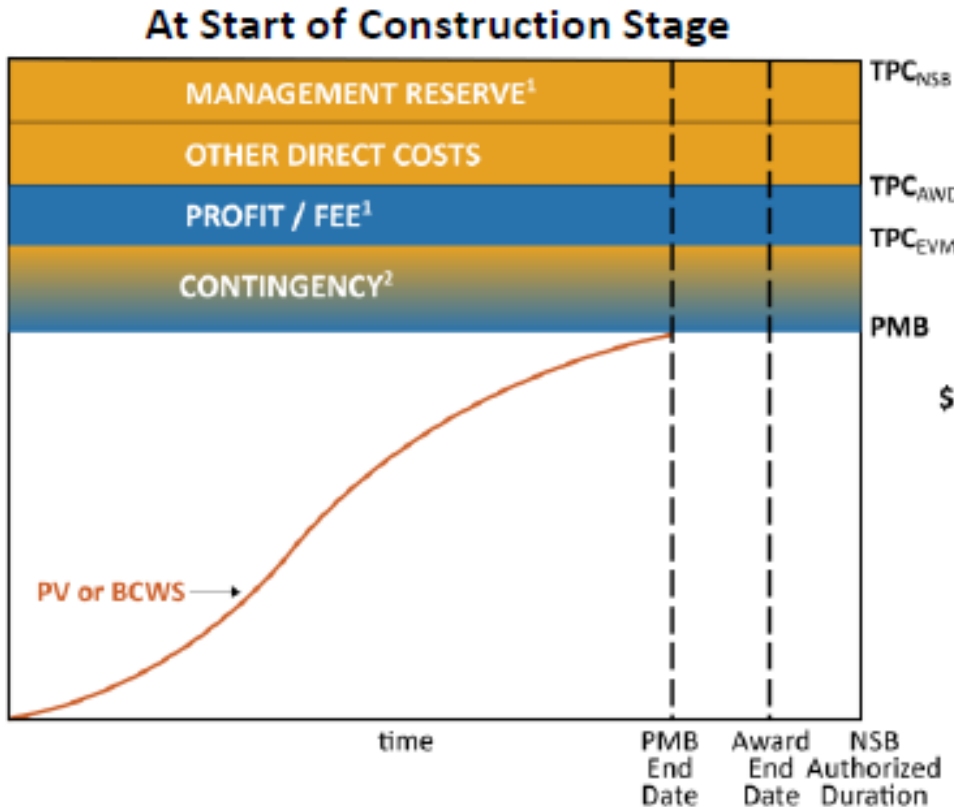Created by Product Owner and stakeholders using (What is being done)

Product Vision → Release Plan → Product Backlog → Sprint Plan → Delivery

Work targeted for completion in one iteration

Usable, and potentially releasable product
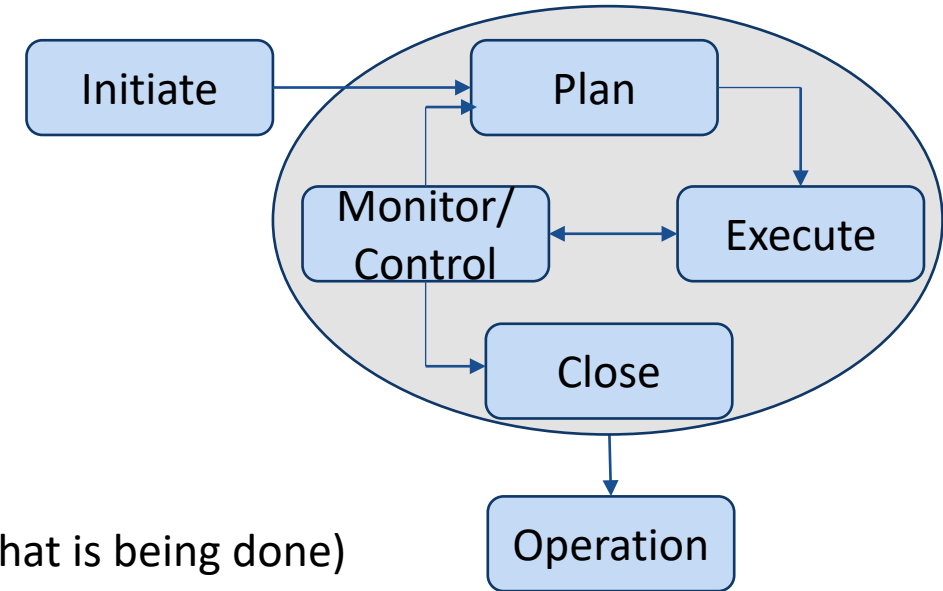
Project Management using EVM

At Start of Construction Stage

MANAGEMENT RESERVE[1]

OTHER DIRECT COSTS

PROFIT / FEE[1]

CONTINGENCY[2]

PV or BCWS →

time | PMB End Date | Award End Date | NSB Authorized Duration

TPC_{NSB}
TPC_{AWD}
TPC_{EVM}
PMB
$

A project will establish a **performance measurement baseline** (PMB) in the project plan. The PMB outlines the scope, schedule and budget of a project. (budget is allocated over time, to accomplish the scope of work against which progress can be measured);

- Define the work,
- Schedule the work,
- Allocate budgets (resource loaded schedule),

AGILE projects, where the code base is less well defined, and you frankly don't know exactly how many lines of code will be written, one uses estimating tools.

But this is extremely difficult to establish up front in a PMB.

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Performance Measurement Baseline (PMB)

In the PMB you must first Define the work, then schedule the work, then allocate budgets to the work,

- Develop a Product Break down structure (PBS), this defines "what are we trying to build?", a PBS and Work Breakdown Structure are similar, but rather than activities, you focus on just the 'stuff',

- Develop a Work Breakdown Structure (WBS), this takes the *stuff* (discreet deliverables), and then adds all other activities required (PM, PMCS, Safety, etc) to execute the scope
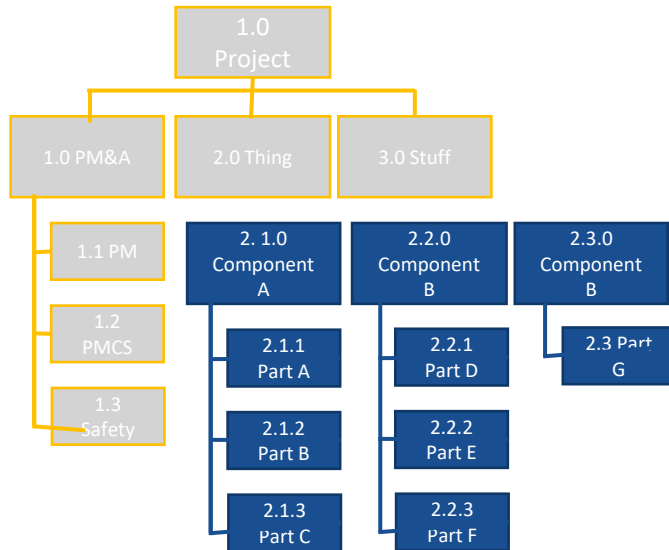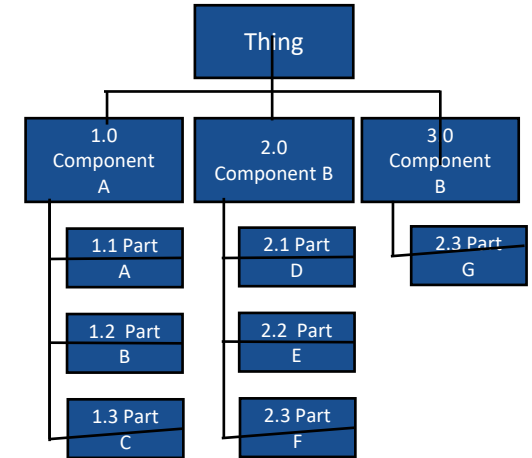
- Develop an Organizational Breakdown Structure (OBS), for org and subs,
- The Intersection Between the WBS and OBS is a Control Account,
- Control Accounts are managed by a 'Control Account Manager' (CAM),
- Can further break down to Work Package, WPM
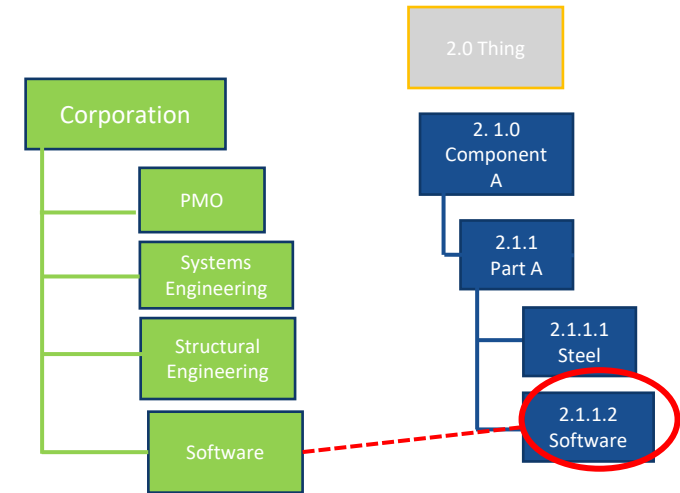
Agile PMB Development
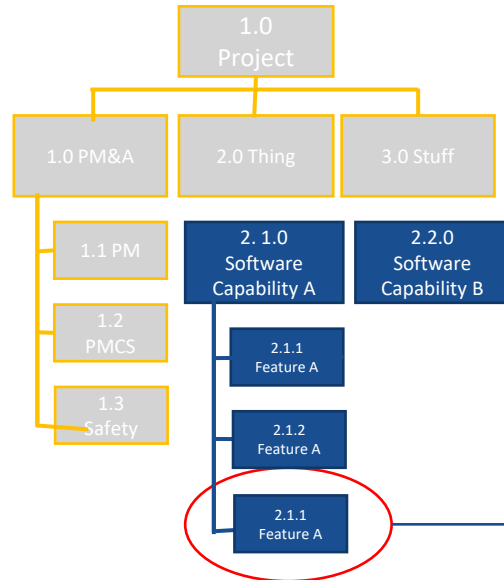
This could be a control account, but will probably be too big to assign meaningful earned value to, but it is made up of components that can be measured.

So, how value will be assessed? (BCMP)
- Discreet (weighted milestones, percent complete, 50/50 or 0/100)
- Apportioned
- Level of Effort

Earned Value is still 'value' ... so look for the commonalities between a standard waterfall and an Agile methodology,

Define the scope, build the WBS, in parallel build your Agile 'machinery'. Agile has hierarchies of work: Epic/Features/User Stories/Story Points/Sprints.

Need a *lingua fanca* for 'value' in order to incorporate waterfall elements and Agile elements within the same PMB.
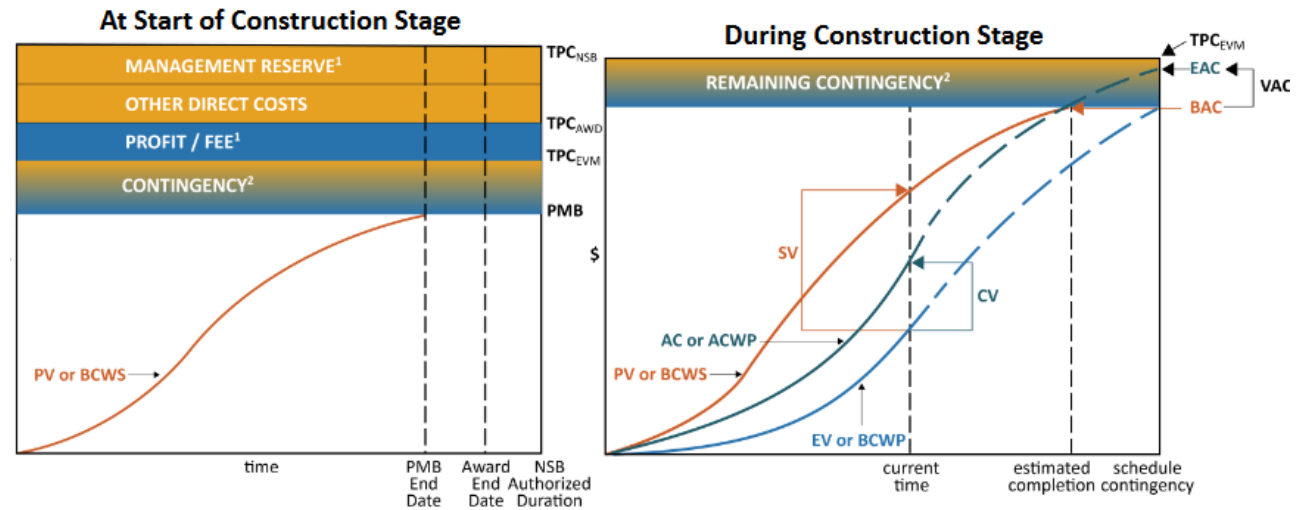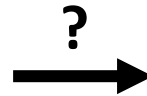
Performance Measurement Baseline (PMB)

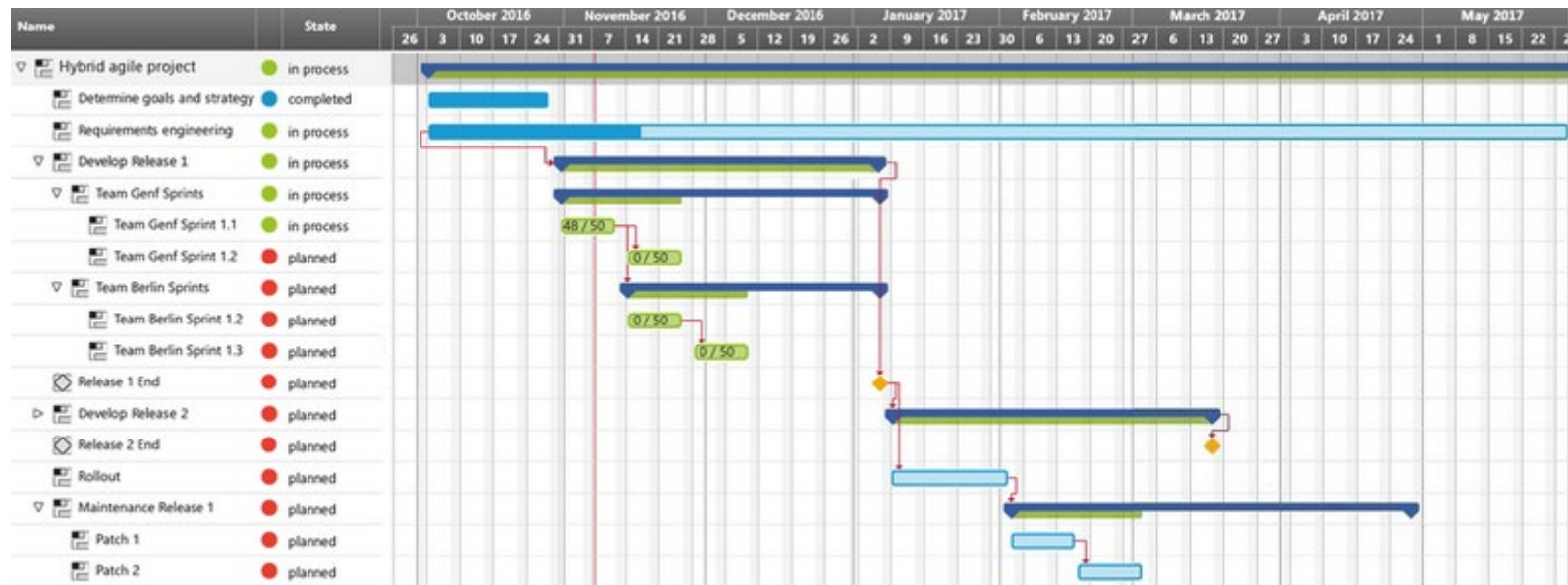Given that you've decided to execute your project using an Agile methodology, how will you establish a PMB?

- Estimating techniques:
  LOE
- Lines of Code?

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EVMS in an AGILE Space

Blended or Hybrid Project Management

It is unlikely we will have an LFO project that is exclusively AGILE. Blended or Hybrid approaches are gaining momentum

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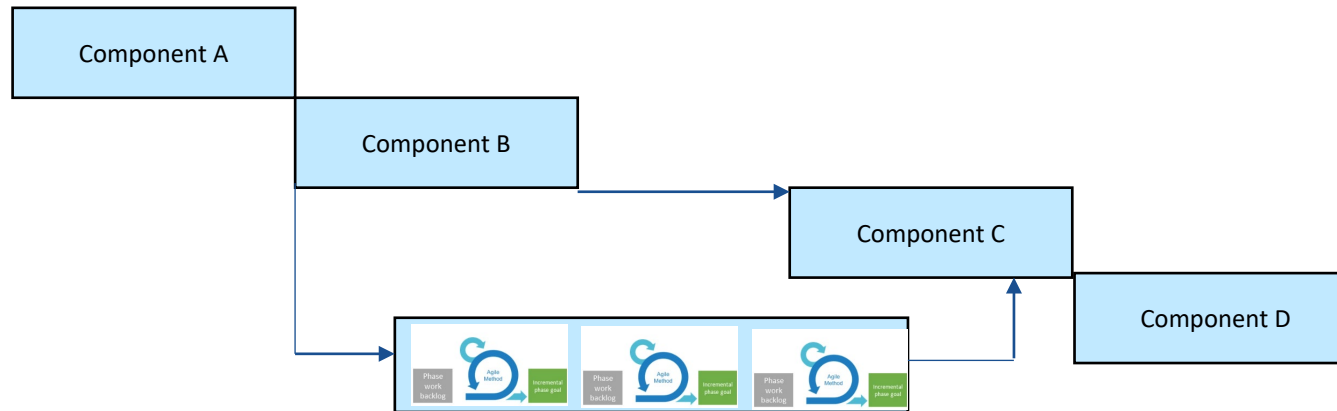# Blended or Hybrid Project Management

It is unlikely we will have an LFO project that is exclusively AGILE. Blended (Hybrid) approaches are gaining momentum

Back-Up Slides

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Agile software development in an earned value world: a survival guide

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ABSTRACT

Agile methodologies are current best practice in software development. They are favored for, among other reasons, preventing premature optimization by taking a somewhat short-term focus, and allowing frequent replans/reprioritizations of upcoming development work based on recent results and current backlog. At the same time, funding agencies prescribe earned value management accounting for large projects which, these days, inevitably include substantial software components. Earned Value approaches emphasize a more comprehensive and typically longer-range plan, and tend to characterize frequent replans and reprioritizations as indicative of problems. Here we describe the planning, execution and reporting framework used by the LSST Data Management team, that navigates these opposite tensions.

Keywords: Project Management, Software Engineering, Agile Process, Earned Value

1. INTRODUCTION

The Large Synoptic Survey Telescope (LSST)[*] project is a proposed large-aperture, wide-field, ground-based telescope that will survey half the sky every few nights in six optical bands. The 8.4-meter telescope will be located in the Andes mountains near La Serena, Chile.[1]The 3.2 Gpixel camera will take 6.4 GB images every 15 seconds, resulting in 15 TB of new raw image data per night. The focal plane consists of 189 science CCDs with 16 channels each to achieve a readout of all data in 2 seconds. After taking into account unusable nights, slew time, and other factors, this will produce 7 PB of new data each year to be processed.[2]

Five Stages of a Project*