



BITS Pilani

Pilani Campus



BITS Pilani presentation

K.Anantharaman
Faculty CS Department
kanantharaman@wilp.bits-pilani.ac.in



SE ZG544 S1-22-23 , Agile Software Processes
SE ZG544 S1-22-23
Lecture No. 1, Module-1 - Agile Methods - An Introduction

Introduction

1. Faculty introduction
2. Email Id : kanantharaman@wilp.bits-pilani.ac.in
3. e-learn portal: <https://elearn.bits-pilani.ac.in/>
4. [Course Handout](#)
5. Recorded Video Lectures in e-learn/Taxila portal
 - According to the course handout, grouped by module
 - You MUST go through each module before coming to the online session

Poll

-
- <https://forms.gle/wRadsyQREA3BpkE26>

Module-1 – Topics

- Traditional software development practices
- Need for Agile Methods
- Benefits of Agile Methods

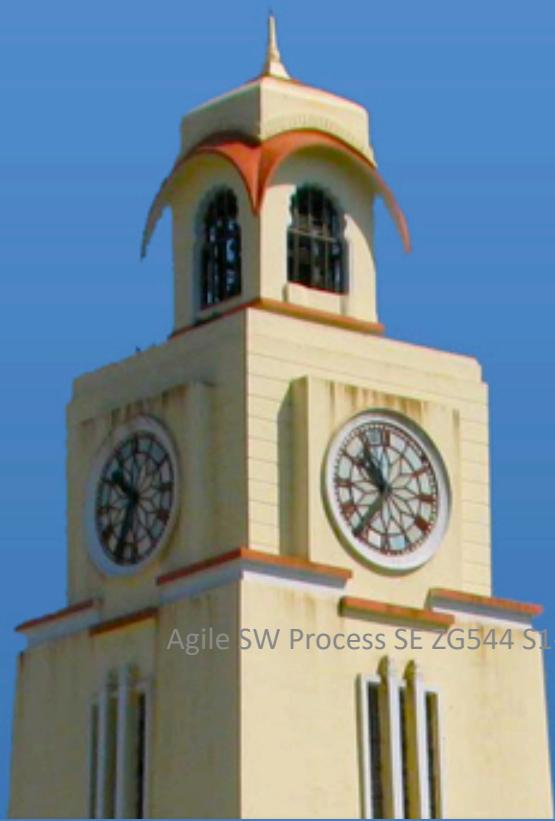
Basic Project Management concepts



- What is a Project?
 - Definite Start-End date, Temporary, Scope(Produce Specific result) , Budget/Effort – Example: Building a house
- Project Management Life Cycle Phases
 - Initiation, Planning, Execution, Closeout, Monitoring & Control
- System Development Life Cycle/phases (SDLC)
 - Requirements, Design, Construction, Implementation

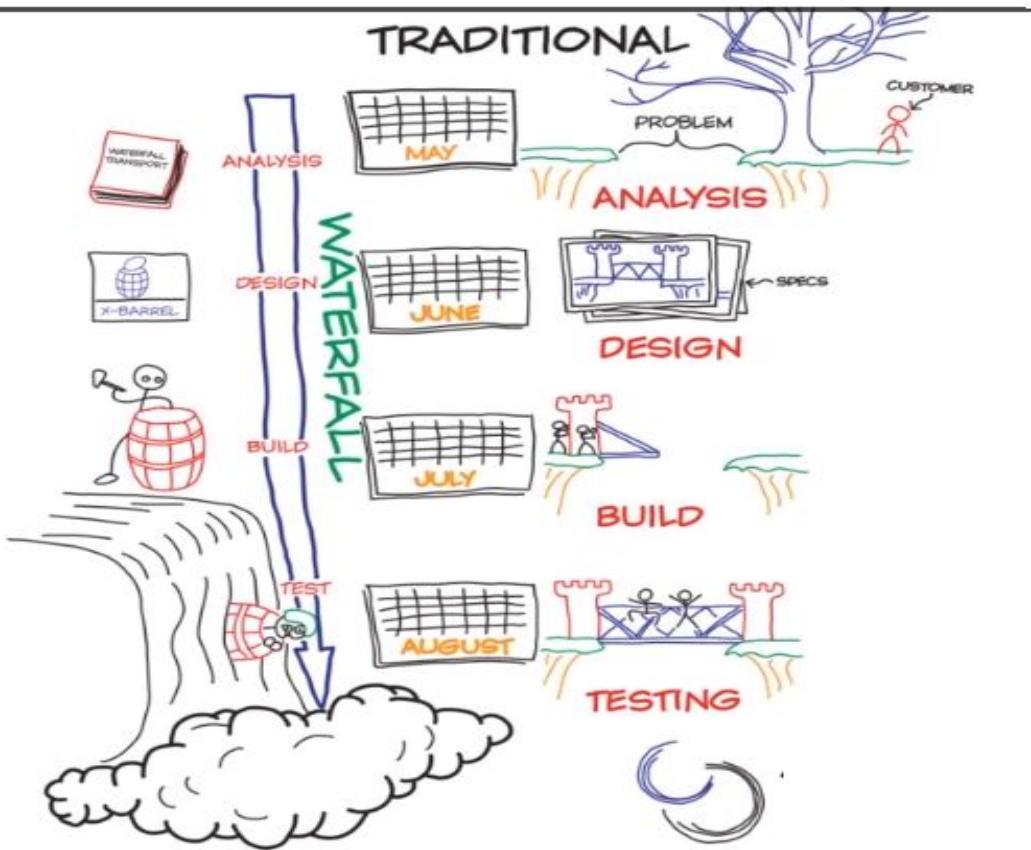
Questions?

- Q1,Q1_1,Q1_2
- <https://forms.gle/onYWuBBy8TAJ6QVAA>
- <https://forms.gle/oC9BhYDVc2EvsD5N9>
- <https://forms.gle/pocBLb1fA7RjdYYU7>



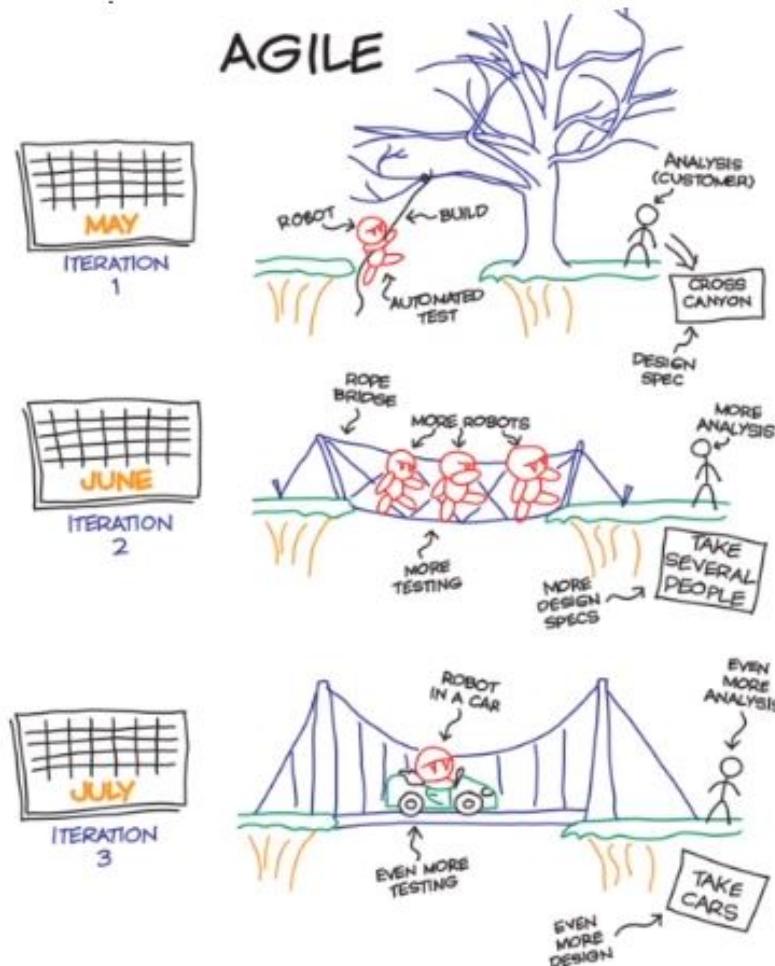
Project Management Model Water Fall Model and Agile

Traditional /Waterfall Development Approach(Rigid)



Reference : The Agile Sketchpad By [Dawn Griffiths](#), [David Griffiths](#), O'reilly media

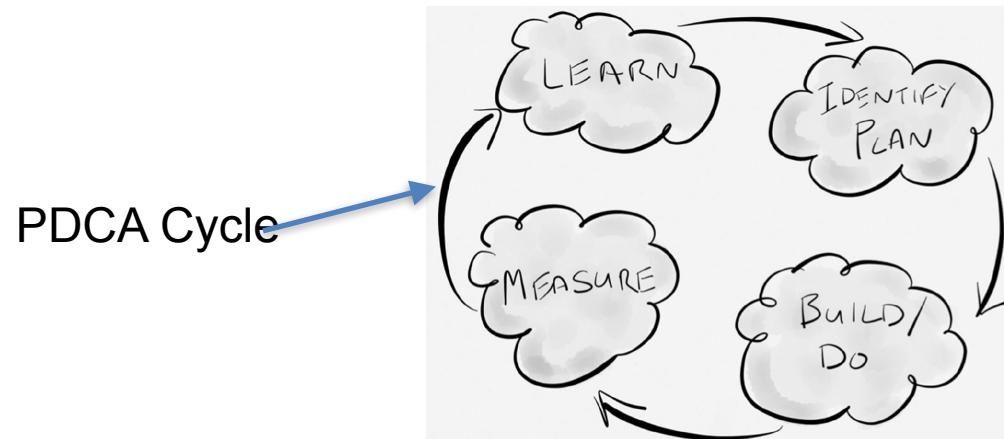
Agile Software Development Approach (Empirical)



Reference . The Agile Sketchpad By [Dawn Griffiths](#), [David Griffiths](#), O'reilly media

Empirical Process Control

- Inspection
 - inspect the product being created and how it is being created
- Adaption
 - adapt the product being created or the creation process if required
- Transparency
 - ensure everyone can easily see what is happening



Questions?

- Q2, Q3
- <https://forms.gle/gaqQUVnLeB1uoCpT9>
- <https://forms.gle/pKRRh3cFn6xCJrdj6>

Advantages and Disadvantages of Waterfall

Advantages:

- Sequential, Upfront planning

Disadvantages:

- Error propagation

- Good Documentation

- Missing requirements

- Scope of work is generally fixed

- Error correction is costly

- Late customer feedback

Advantages and Disadvantages of Agile Model



Advantages:

- Early delivery of business value
- Continuous improvement
- Scope flexibility
- Team input
- Delivering well-tested products

Disadvantages:

- Poor Resource planning
- Less Documentation
- Fragmented output

Application of Waterfall Model



- Most common Project Management approach
- Surpassed by Agile approach after 2008.
- Simple and small systems.
- Enhancements to software systems
- Mission critical systems.

Application of Waterfall and Agile Model



- Fast Changing deliverables - New Technology Emerging projects
- Projects without clear requirements in the beginning
- New Product Development Projects
- Early Visibility, Quality, Risk identification



Need for Agile Methods

Software Project Success and Failure



- In 2015, Standish Group did a study of 10,000 projects in USA. The results showed that:
- 29% of traditional projects failed outright
- 60 percent of traditional projects exceeded the budget
- 11 percent of projects succeeded.

Questions?

- Q4, Q5
- <https://forms.gle/hNGMkyCTuXdXHTP86>
- <https://forms.gle/N2diLqfF994mi7ZR7\>



Benefits of Agile Methods

Corporate World - Challenges and Inefficiencies



- Missed (or rushed) deadlines.
- Budget blow-outs
- Overworked and stressed employees.
- Knowledge silos.
- Technology innovations and Agile approaches that have enabled to overcome these challenges (IT and Manufacturing industries)

Benefits of Agile Methods/Approaches/ Practices/Techniques

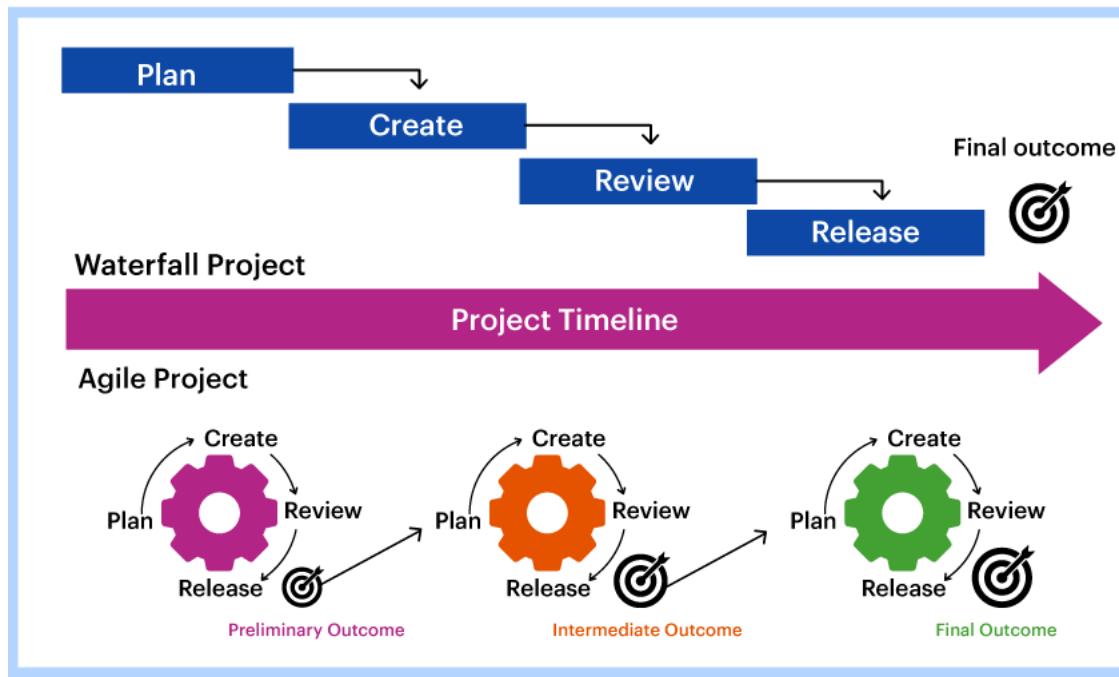
- Responsive planning
- Business-value-driven work
- Hands-on business outputs
- Direct stakeholder engagement
- Immovable deadlines
- Management by self-motivation
- ‘Just-in-time’ communication
- Immediate status tracking
- Waste management
- Constantly measurable quality
- Continuous improvement



Module-1-Additional Notes

Topics Module-1

- Traditional software development practices
- Need for Agile Methods
- Benefits of Agile Methods



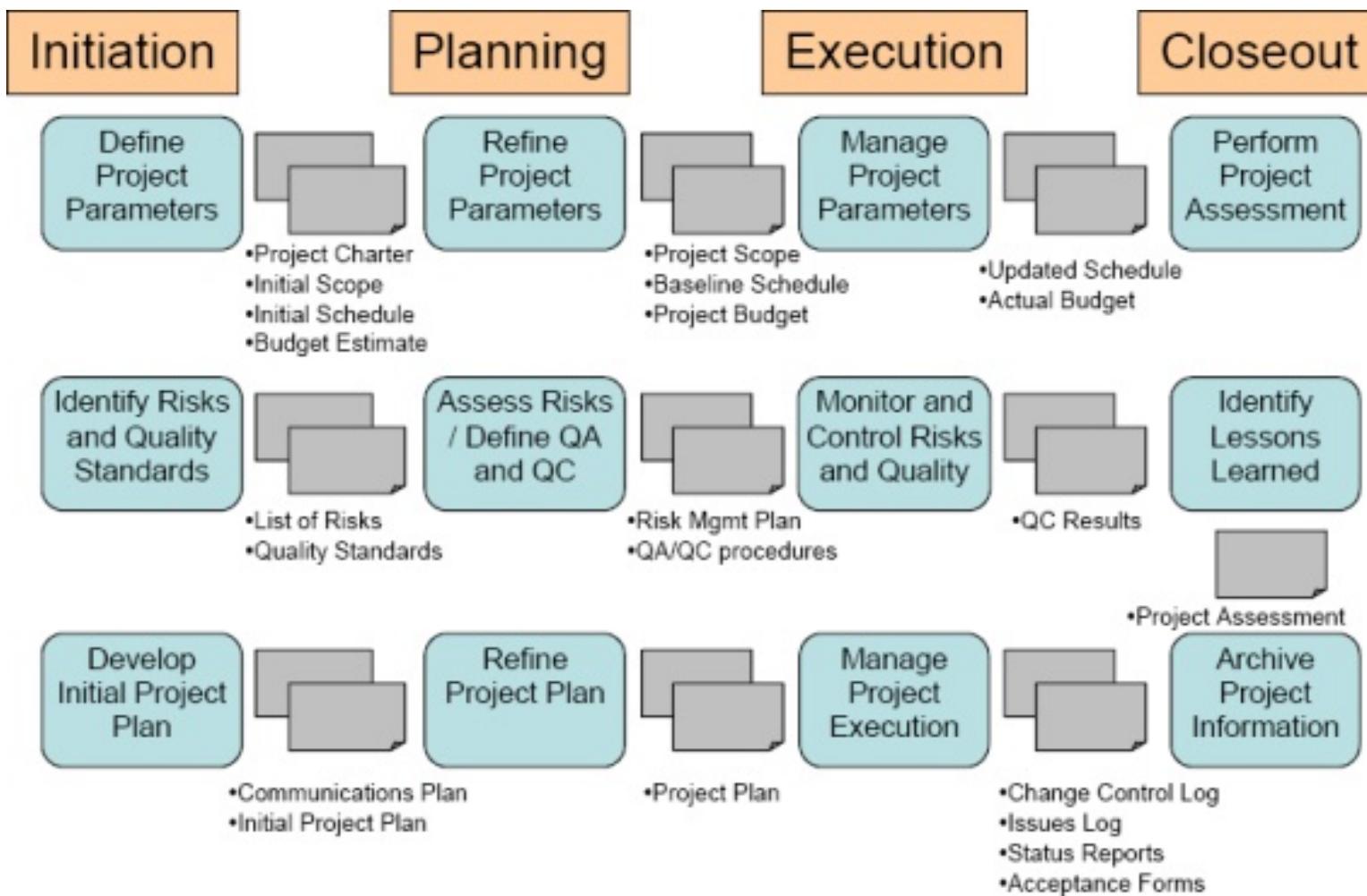
<https://kissflow.com/project/agile/traditional-vs-agile-project-management/>

What is a Project?

- A project is a planned program of work that requires a **definitive amount of time, effort, and planning** to complete.
- Projects have **goals and objectives** and often must be completed in **some fixed period of time and within a certain budget**.

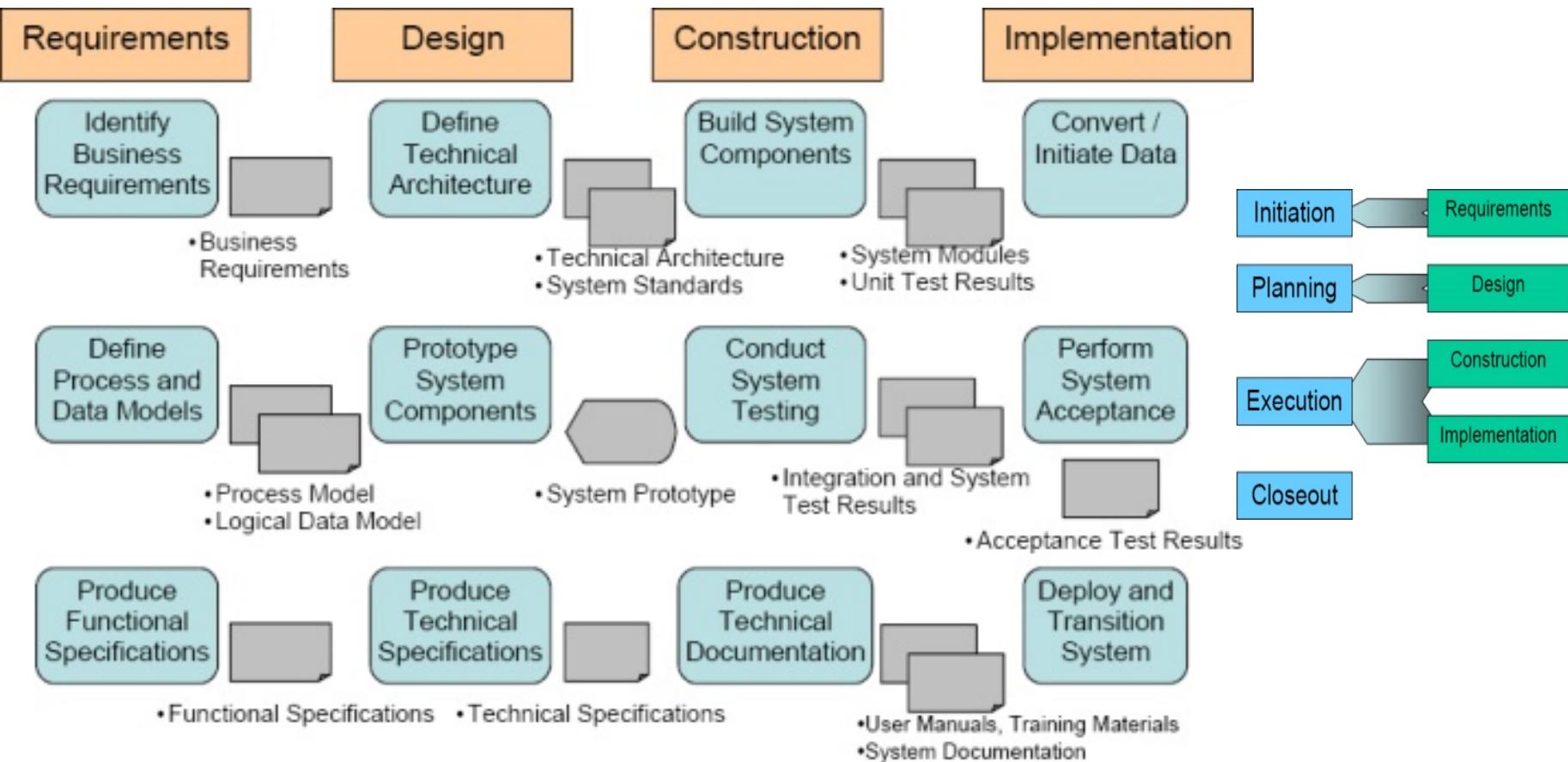
- Development Project
- Maintenance or Support Project (Operational work)

Project Management Phases



<https://www.pmi.org/learning/library/project-managing-sdlc-8232>

System Development Phases (Engineering activities)



<https://www.pmi.org/learning/library/project-managing-sdlc-8232>

Traditional Software Development Approaches

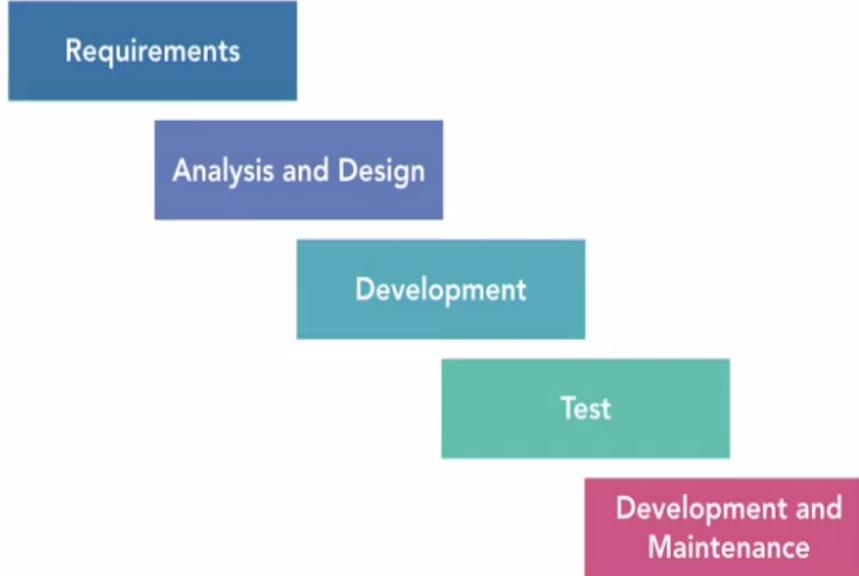
BITS Pilani

Pilani Campus



Traditional Software Development Model – Waterfall Model

Waterfall Approach

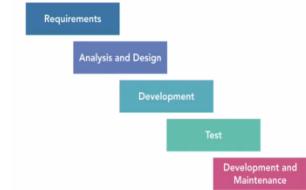


- Move to the next phase only when the prior one is complete — hence, the name waterfall.
- Origin from manufacturing like production plant
- **Upfront Planning**
- **Detailed documentation**
- **Scope of work is generally fixed.**
- Output of a phase becomes input to next phase
- Include well defined checklists, process and tools

<https://www.lynda.com/Developer-tutorials/Software-Development-Life-Cycle-SDLC/5030981-2.html>

Issues with Waterfall approach

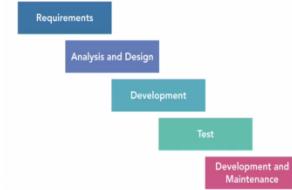
- **Error in one phase will propagate to next phase**
- **Missing requirements will result in missing software feature**
- **Error correction is costly** if it is detected at later phase
- **Customer does not get to see the product** before the early testing phase which is usually two-thirds the way through the product time line.



<https://www.lynda.com/Developer-tutorials/Software-Development-Life-Cycle-SDLC/5030981-2.html>

Issues with Waterfall approach ...

- You could be in the Deployment and Maintenance phase when you could realize that the product you are building was **no longer viable** due to **change in market conditions, or organizational direction**, or changed computer landscape
- (OR) You could realize that the product had a major **architectural flaw** that prevented it from being deployed.
- In other words, your product development initiative **could completely fail** after a lot of money and time had been spent on it.



<https://www.lynda.com/Developer-tutorials/Software-Development-Life-Cycle-SDLC/5030981-2.html>

Impact of Waterfall

- Project failures
 - Many organizations treated this failure as if there was a failure in a production factory. So they tried to fix their waterfall approach, by adding more comprehensive documentation.
 - Comprehensive documentation
 - Having a well documented software system is good. But the documentation by itself adds no value to the stake holders.
 - Checklists and Coding standards
 - Many software teams resorted to maintaining comprehensive checklist, to make sure they were producing systems of high quality. Checklist such as coding standards and architectural reviews are helpful. But you cannot produce a single recipe book for building software
- More time should be spent on delivering working software features early and often. And enlisting customer feedback

<https://www.lynda.com/Developer-tutorials/Software-Development-Life-Cycle-SDLC/5030981-2.html>

Application of Waterfall Model

- **Simple and small systems.**
 - **Enhancements to software systems** — specifically applicable if the development team has good domain knowledge.
 - **Mission critical systems.** Where you need gated checks to avoid catastrophic failures. An example is a software system where a defect can cause human causality. Comprehensive documentation is also very applicable here.
- *Waterfall model is the **most common project management approach** in software development until it was surpassed by improved approaches based on agile techniques around 2008.*

Application of Waterfall Model

- **Simple and small systems.**
 - **Enhancements to software systems** — specifically applicable if the development team has good domain knowledge.
 - **Mission critical systems.** Where you need gated checks to avoid catastrophic failures. An example is a software system where a defect can cause human causality. Comprehensive documentation is also very applicable here.
- *Waterfall model is the **most common project management approach** in software development until it was surpassed by improved approaches based on agile techniques around 2008.*

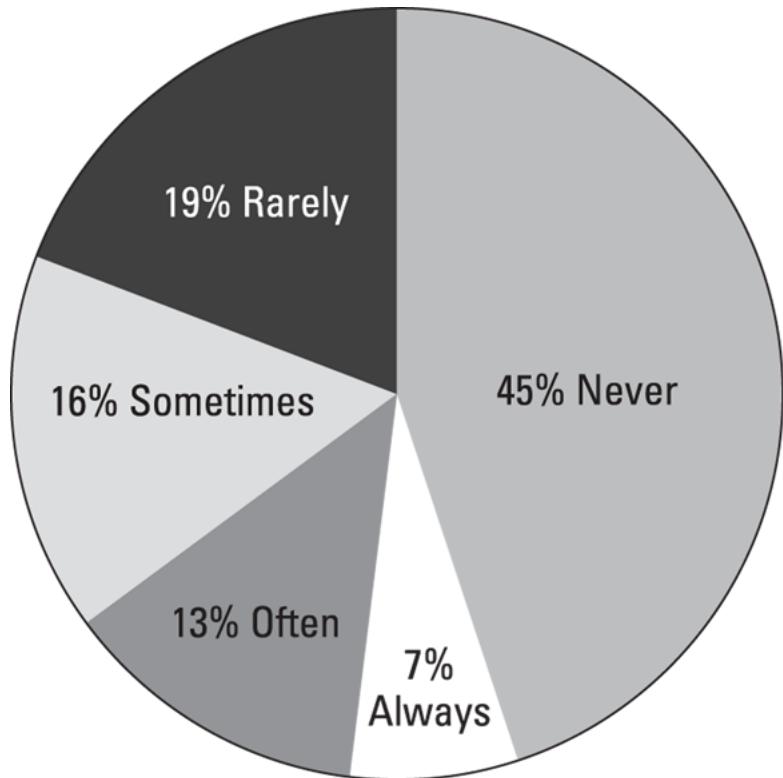
Software Project Success and Failure



- In 2015, Standish Group did a study of 10,000 projects in USA. The results showed that:
- 29% of traditional projects failed outright
 - The projects were cancelled before they finished and did not result in any product releases. These projects delivered no value whatsoever
- 60 percent of traditional projects exceeded the budget
 - The projects were completed, but they had gaps between expected and actual cost, time, quality, or a combination of these elements. The average difference between the expected and actual project results — looking at time, cost, and features not delivered — was well over 100 percent.
- 11 percent of projects succeeded.
 - The projects were completed and delivered the expected product in the originally expected time and budget.

The problem with Status Quo

- Traditional projects that do succeed often suffer from scope bloat.



- The numbers in Figure illustrate an enormous waste of time and money.
- Direct result of traditional project management processes that are unable to accommodate change.
- Project managers and stakeholders at the start of a project ask for :
 - Everything they need
 - Everything they think they may need,
 - Everything they want,
 - Everything they think they may want

Actual use of requested software features.

Project management Needed Makeover

- In software development, **everything changes**. Requirements, skills, people, environment, business rules, et cetera.
- As **time progresses, you learn better** techniques of doing things.
- Your stakeholders need to change requirements to match changing **organizational strategy or Technology trends or changing market conditions**.
- In other words, the only **guaranteed thing is change** and the shown process to refine our work.
- Software development is **inherently an iterative process** and does not work like a Waterfall cycle.
- **Over emphasis on checklists and controls does not help** because software development is human centric and is heavily dependent on judgment and creativity.
- Software is not a product designed to be built by assembly lines.



Need for Agile Methods

Software Project Success and Failure using Traditional Approach

- In 2015, Standish Group did a study of 10,000 projects in USA. The results showed that:
- 29% of traditional projects failed outright
- 60 percent of traditional projects exceeded the budget
- 11 percent of projects succeeded.
- Also, projects that do succeed often suffer from scope bloat. – Only 20% of features is often used, 80% - Sometime/Rarely/Never used.

Project management Needed Makeover

- **In software development:**
- Everything changes.
- As time progresses, you learn better techniques of doing things.
- Organizational strategy changes or Technology trends or changing market conditions. (e.g. Covid19 Situation)
- Software development is inherently an iterative process
- Over emphasis on checklists and controls does not help.
- Software is not a product designed to be built by assembly lines.

Definable Work

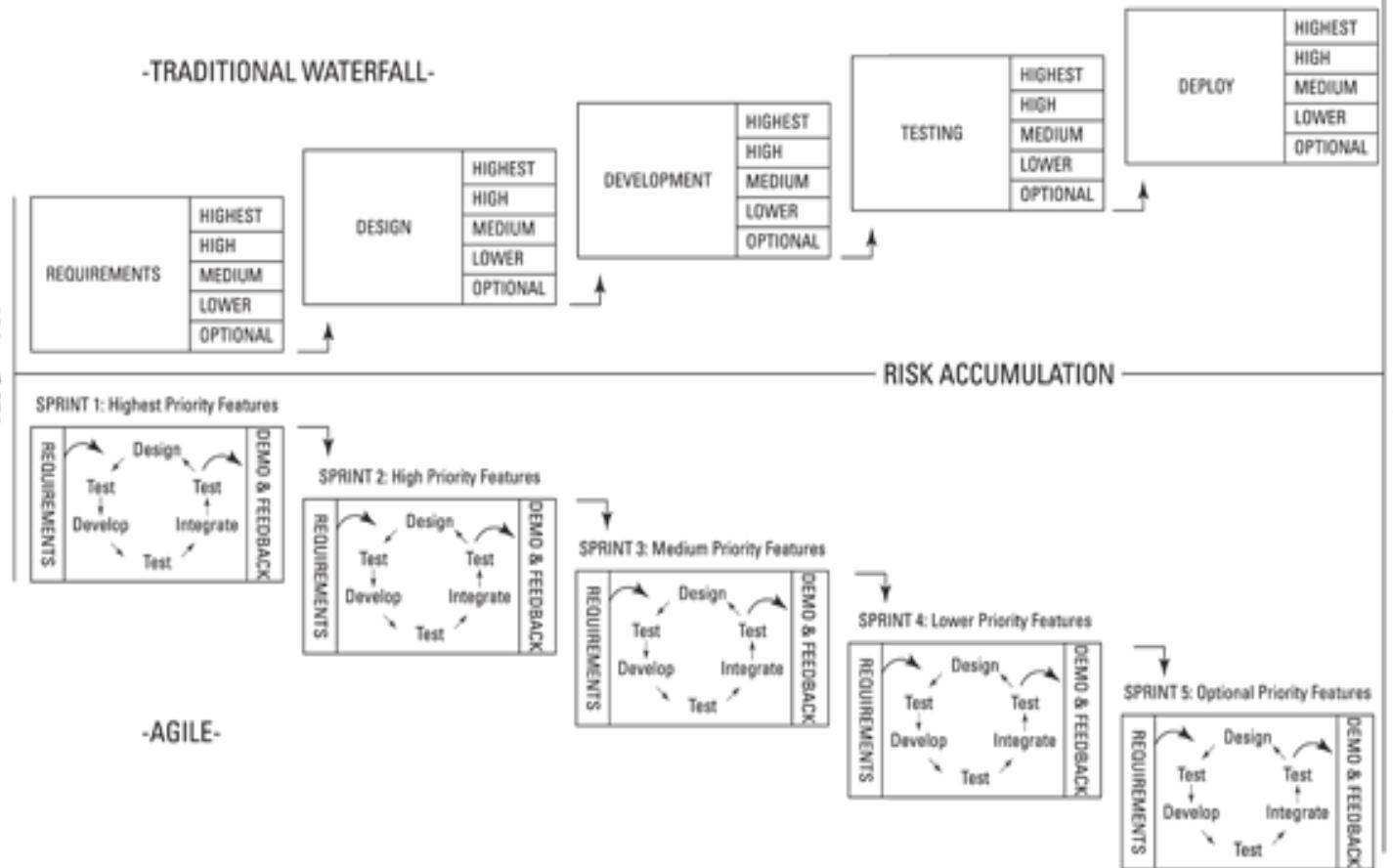
- Definable work projects are characterized by **clear procedures** that have proved successful on similar projects in the past.
- The production of a **car, electrical appliance, or home** after the design is complete are examples of definable work.
- The production domain and processes involved are usually **well understood** and there are typically low levels of execution uncertainty and risk.
- Definable work is **automated**.

High Uncertainty Work

- **New design, problem solving**, and not-done-before work is **exploratory**. It requires subject matter experts to collaborate and solve problems to create a solution.
 - Examples of people encountering high-uncertainty work include software systems engineers, product designers, doctors, teachers, lawyers, and many problem-solving engineers.
- High-uncertainty projects have **high rates of change, complexity, and risk**.
 - These characteristics present problems for traditional predictive approaches that aim to determine the bulk of the requirements upfront and control changes through a change request process.
- **Instead, agile approaches were created to explore feasibility in short cycles and quickly adapt based on evaluation and feedback.**

Waterfall vs agile project

-TRADITIONAL WATERFALL-



Ref: Agile Project Management for Dummies - Mark C. Layton John Wiley & Sons - 2012

23-Aug-22

Agile Software Process SE SG544 S1-22-23

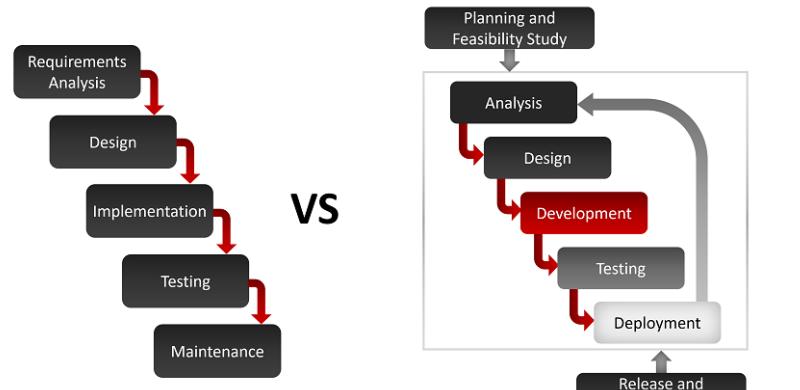
43

BITS Pilani, Pilani Campus

Mixing traditional project management methods with agile approaches:

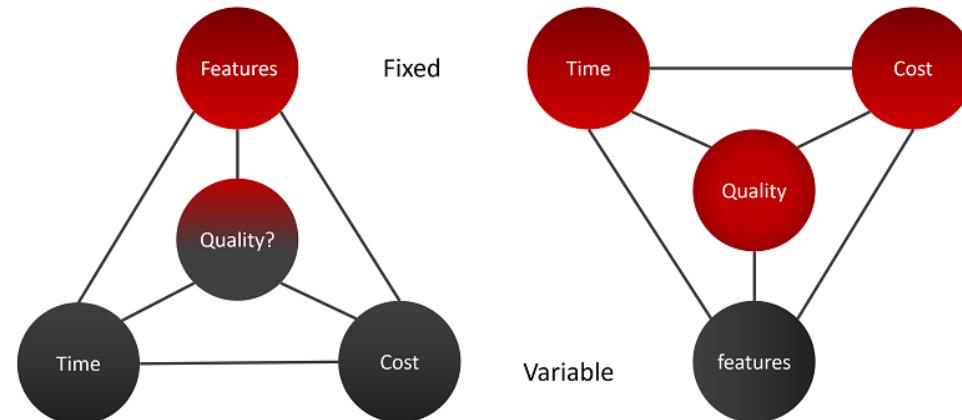
The answer, of course, is **you can't**. If you fully commit to an agile approach, you will have a better chance of deriving benefits of Agile project

Summary:Difference between Traditional and Agile Project Management



Traditional Approach

Agile Approach



1. Flexibility (Rigid Vs Adaptive)
2. Ownership & Transparency (Project Manager vs Team ownership)
3. Problem Solving (Unexpected obstacles- Escalation vs Team take decision)
4. Checkpoints and Monitoring progress: (No Frequent check-ins vs Quicker Iteration delivering value)

Ref: <https://www.kpipartners.com/blog/traditional-vs-agile-software-development-methodologies#:~:text=The%20main%20difference%20between%20traditional,in%20Agile%2C%20it%20is%20iterative.>



Evolution of Agile Project Management

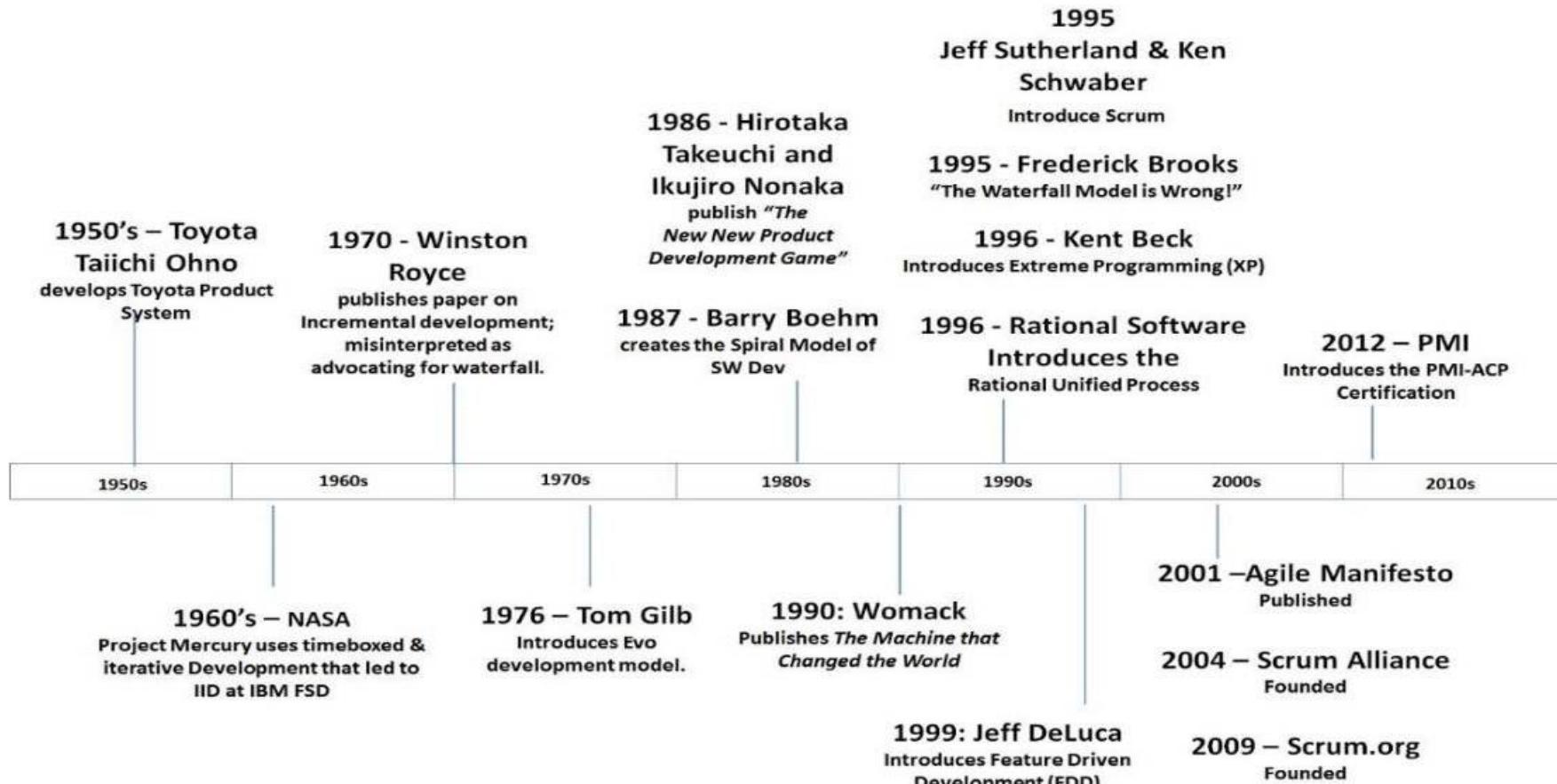
Agile Project Management

- *Agile project management* is a style of project management that focuses on :
- **Early delivery of business value**
- **Continuous improvement** of the project's product and processes
- Scope **flexibility**
- Team **input**
- Delivering well-tested products **frequently** that reflect customer needs.

Evolution of Agile Frameworks



A Brief History of Agile



Source Material e-learn(Recorded)

Evolution of Agile Frameworks ...

- In 1986, Hirotaka Takeuchi and Ikujiro Nonaka published an article called **“New New Product Development Game” in the Harvard Business Review.**
- Takeuchi and Nonaka’s article **described a rapid, flexible development strategy** to meet **fast-paced product** demands.
- This article first paired the term **scrum** with product development. (Scrum originally referred to a player formation in **rugby**.)
- **Scrum** eventually became one of the **most popular agile** project management frameworks.

Evolution of Agile

- In 2001, a group of software and project experts got together to talk about what their successful projects had in common.
- This group created the *Agile Manifesto*, a statement of values for successful software development:
- ***We will see more details about Agile Manifesto in the next Module***



How Agile Project Work

How agile projects work

- Agile approaches are based on an ***empirical control method*** — a process of making decisions **based on the realities observed in the project**.
- In the context of software development methodologies, an empirical approach can be **effective in both new product development and enhancement and upgrade** projects.
- By using **frequent and firsthand inspection** of the work to date, you can make immediate adjustments, if necessary.

Why Agile Projects Work Better



- The Standish Group study, mentioned earlies slide “Software project success and failure,” found that while **29 percent of traditional projects failed outright, that number dropped to only 9 percent** on agile projects.
- The decrease in failure for agile projects is a result of agile project teams making **immediate adaptations** based on **frequent inspections** of progress and **customer satisfaction**.

Why Agile Projects Work Better ...



- Some key areas where agile approaches are superior to traditional project management methods:
 - **Project success rates:** The risk of catastrophic project failure falls to almost nothing on agile projects. Agile approaches of prioritizing by business value and risk ensure early success or failure. Agile approaches to testing throughout the project help ensure that you find problems early, not after spending a large amount of time and money.
 - **Scope creep:** Agile approaches accommodate changes throughout a project, minimizing scope creep. On agile projects, you can add new requirements at the beginning of each sprint without disrupting development flow. By fully developing prioritized features first, you prevent scope creep from threatening critical functionality.
 - **Inspecting and adaptation:** Agile project teams — armed with frequent feedback from complete development cycles and working, shippable functionality — can improve their processes and their products with each sprint.



Benefits & Challenges of Agile Methods

Corporate World - Challenges and Inefficiencies



- Most organizations (Small/Large/Public/Private/Startup) share the same core challenges and inefficiencies, including:
 - Missed (or rushed) deadlines.
 - Budget blow-outs
 - Overworked and stressed employees.
 - Knowledge silos.
- Technology innovations and Agile approaches that have enabled them: (IT & Manufacturing industries)
 - Genuinely create more efficient work environments, to consistently manage their work within allocated budgets, and to regularly deliver high business-value (and high-quality) outputs on time.

Benefits of Agile Methods/Approaches/ Practices/Techniques

- ***Responsive planning***: involves breaking down long-term objectives into shorter delivery cycles; and then *adapting* ongoing work (and funding) based on the outcomes of each delivery cycle.
- ***Business-value-driven work***: involves prioritizing work in accordance with the amount of primary and secondary business value that each activity is likely to bring to the organization.

Benefits of Agile Methods/Approaches/ Practices/Techniques ...

Hands-on business outputs: involves regularly inspecting outputs firsthand in order to determine whether business requirements are being met – and whether business value is being delivered for the organization.

Direct stakeholder engagement: involves actively engaging internal and external customers throughout a process to ensure that the resulting deliverables meet their expectations.

Benefits of Agile Methods/Approaches/ Practices/Techniques ...



Immutable deadlines: are fixed time commitments that encourage staff members to deliver regular ongoing value to the organization.

Management by self-motivation: involves using the power of self-organized teams to deliver outcomes under the guidance and oversight of the customer.

'Just-in-time' communication: replaces traditional corporate meetings with techniques for more effective communication and knowledge transfer (**Differ Commitment**)

Benefits of Agile Methods/Approaches/

Practices/Techniques ...

Immediate status tracking: provides tools that enable staff to keep others in the organization continuously aware of the status of the work that they are doing.

Waste management: involves maximizing the value of the organization's resources by reducing and, where possible, eliminating low business-value activities.

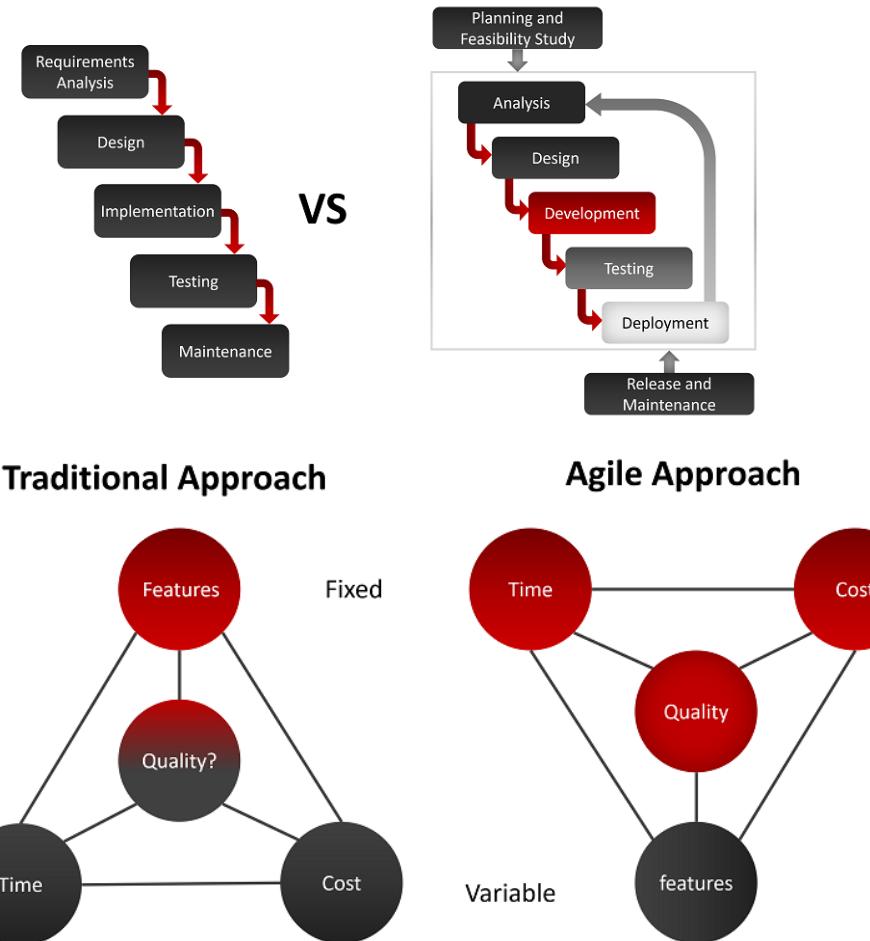
Constantly measurable quality: involves creating *active checkpoints* where organizations can assess outputs against both qualitative and quantitative measurements.

Benefits of Agile Methods/Approaches/ Practices/Techniques ...

Rearview mirror checking: provides staff with tools for regularly monitoring and self-correcting their work.

Continuous improvement: involves regularly reviewing and adjusting business activities to ensure that the organization is continuing to meet market and stakeholder demand.

Summary – Agile Methods (Module-1)



Difference between Traditional and Agile Project Management:

1. Flexibility (Rigid Vs Adaptive)
2. Ownership & Transparency (Project Manager vs Team ownership)
3. Problem Solving (Unexpected obstacles-Escalation vs Team take decision)
4. Checkpoints and Monitoring progress: (No Frequent check-ins vs Quicker Iteration delivering value)

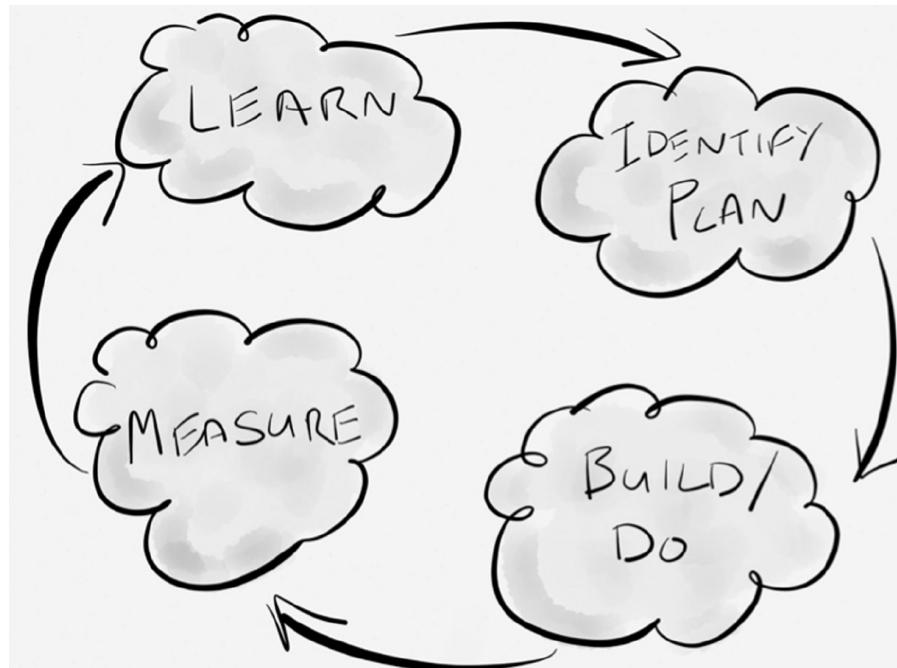
<https://www.kipartners.com/blog/traditional-vs-agile-software-development-methodologies#:~:text=The%20main%20difference%20between%20traditional,in%20Agile%2C%20it%20is%20iterative.>

How agile projects work

- Agile approaches are based on an ***empirical control method*** — a process of making decisions **based on the realities observed in the project**.
- In the context of software development methodologies, an empirical approach can be **effective in both new product development and enhancement and upgrade** projects.
- By using **frequent and firsthand inspection** of the work to date, you can make immediate adjustments, if necessary.

Empirical Process

- Empirical processes (see Figure) incorporate repeated inspection and adaptation of a product to ensure the right product is delivered in the right way. This is especially important in **environments** that **experience high variability** and are therefore **most suited to Agile** working.



Ref: Agile Foundations - Principles, practices and frameworks by Peter Measey

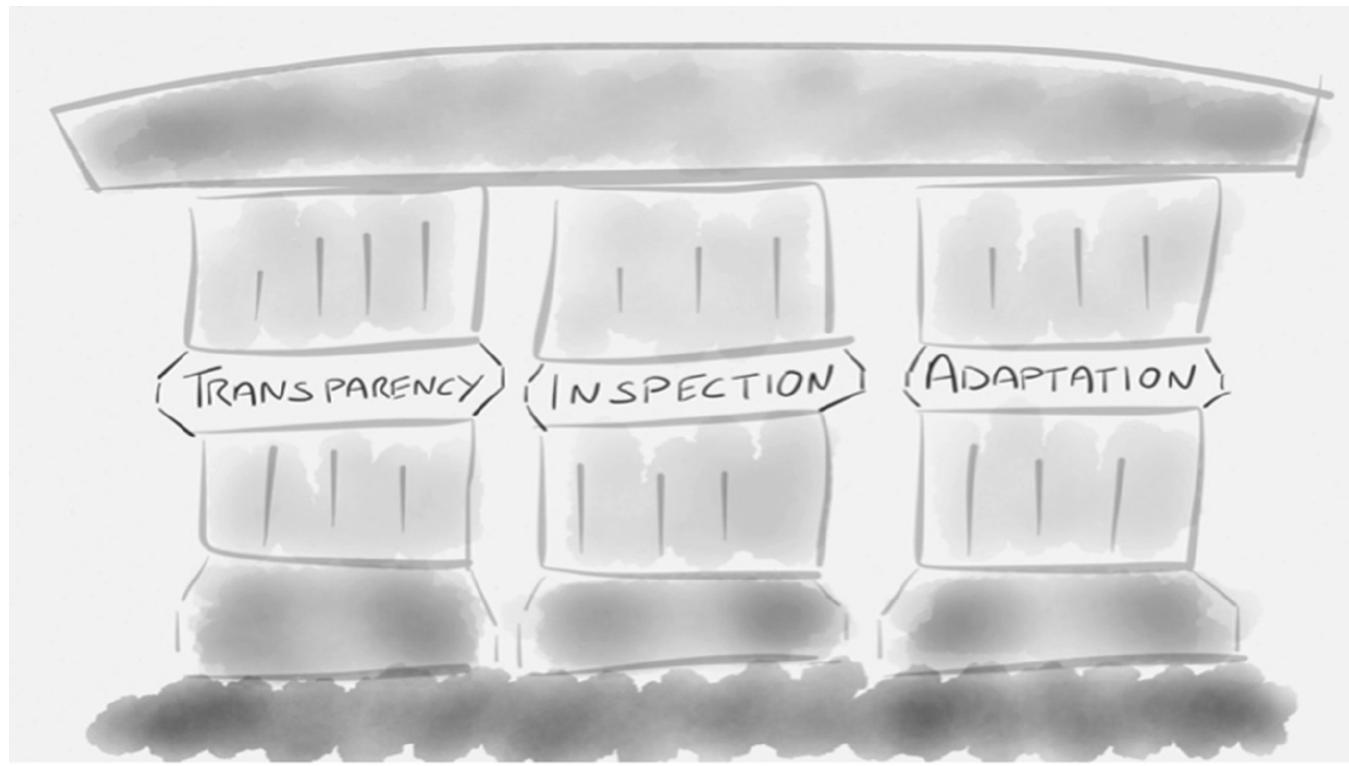
23-Aug-22

Agile Software Process SE SG544 S1-22-23

63

BITS Pilani, Pilani Campus

Pillars of Empirical control Method



Inspection – inspect the product being created and how it is being created **Adaptation** – adapt the product being created or the creation process if required
Transparency – ensure everyone can easily see what is happening

Frequent Iterations

- To accommodate frequent inspection and immediate adaptation, agile projects work in ***iterations*** (smaller segments of the overall project).
- An agile project involves the **same type of work** as in a **traditional waterfall** project:
 - You create **requirements and designs**, **develop the product**, **document it**, and if necessary, integrate the product with other products. You test the product, fix any problems, and deploy it for use.
 - However, instead of completing these steps for all product features at once, as in a waterfall project, you **break the project into iterations**, also called **sprints**.

Examples of Empirical models

- **PDCA** Plan, Do, Check, Act – Edward Deming (Deming, n.d.).
- **POOGI** Process of On-Going Improvement – Theory of Constraints (Goldratt and Cox, 1984).
- **OODA** Observe, Orient, Decide, Act – John Boyd (Boyd, n.d.).
- **BML** Build, Measure, Learn – Lean Start-up (Ries, 2011).
- **DMAIC** Define, Measure, Analyse, Improve, Control (Six Sigma, 2006).
- **TAC** Thought, Action, Conversation – DSDM Agile Project Framework (DSDM Consortium, 2014b).
- **Kaizen** A Japanese word which means ‘good change’, used to describe a philosophy of continuous improvement (Liker, 2004).

Thank you

Thank you



BITS Pilani
Pilani Campus

BITS Pilani presentation

K.Anantharaman
Faculty CS Department
kanantharaman@wilp.bits-pilani.ac.in



SE ZG544 , Agile Software Process Lecture No. 2 – Module-2 : Agile Software Development

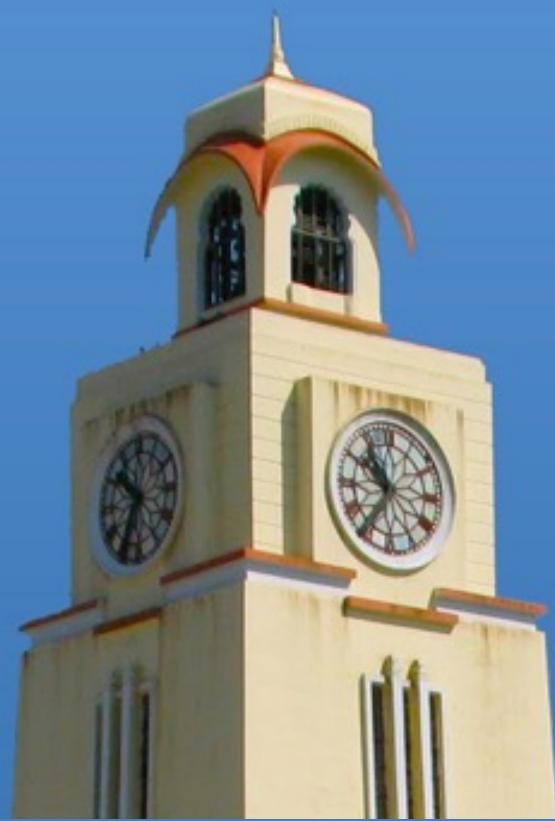
Module-2 Topics

1. Project Life Cycle Models

- Iterative, Incremental and (Adaptive or Agile) Approaches

2. Early Agile Models

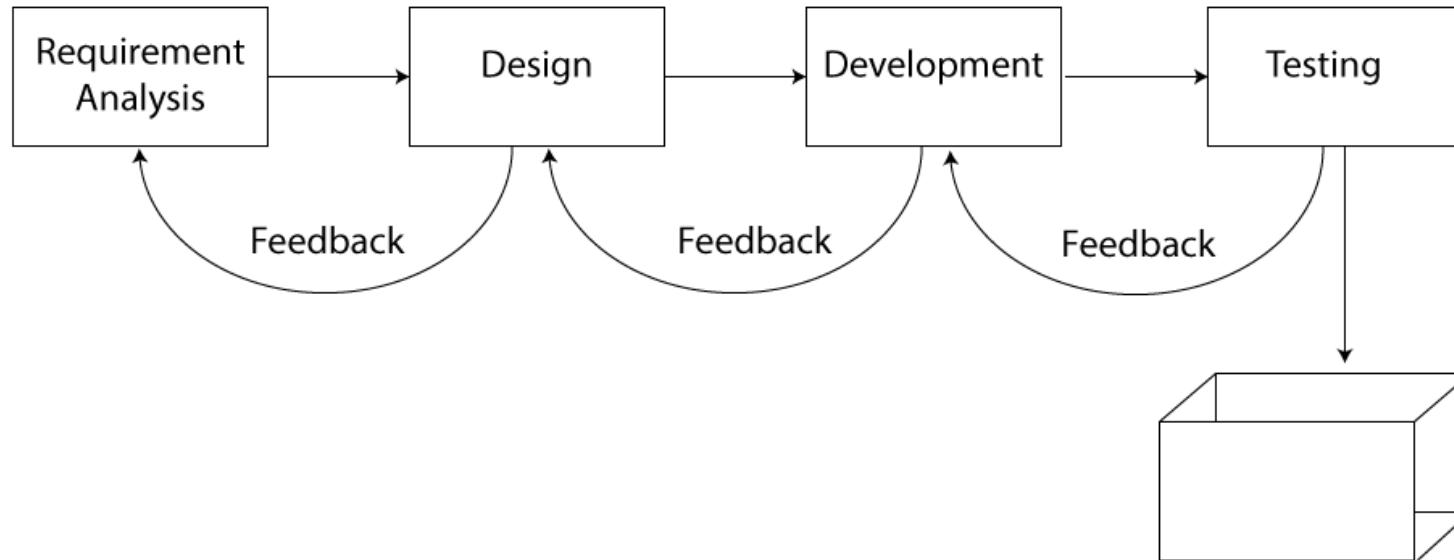
3. Popular Agile Methods



Project Life cycle models

Predictive Project Development Life Cycle

- Fully Plan-Driven aka Waterfall - Risky Invite Failure



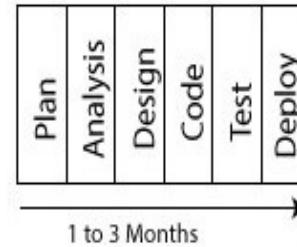
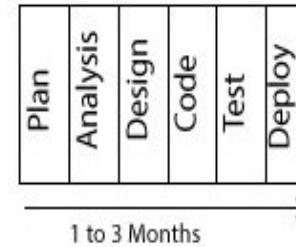
- Goal, Characteristics: Cost, Requirements-Fixed, Single Delivery

Iterative & Incremental Project Development Life Cycle



Plan

Iterative



- Goal, Characteristics:
- Iteration Model: Accuracy/Correctness, Single Delivery
- Incremental: Speed, Multiple Deliveries
- Requirements-Dynamic
- **Iteration life cycle:** Product Increment/output may **not** be usable
- Example: Customized outfit/coat, Website
- **Incremental life cycle:** Product Increment/output is usable
- Example: Visit to a restaurant

Source: <https://www.izenbridge.com/>

Q&A

Q1,Q2

<https://forms.gle/E8rdswFxp6B2pWfD9>

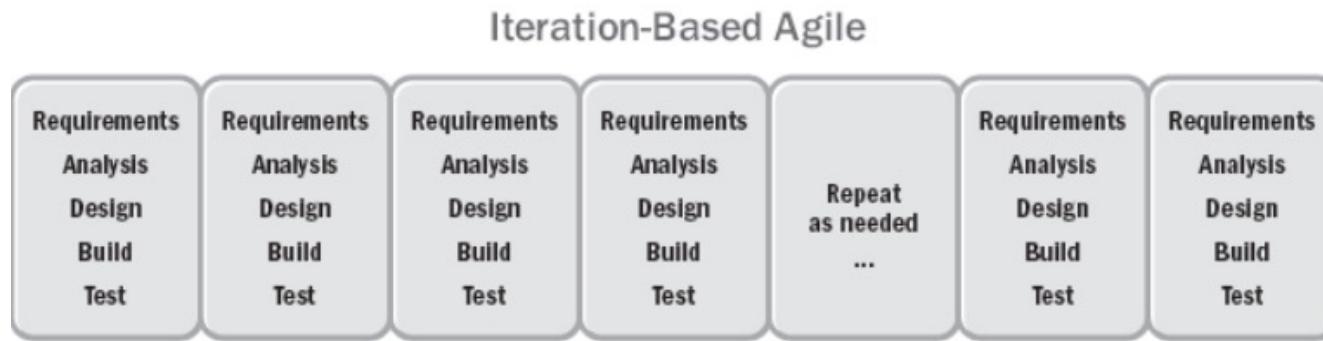
<https://forms.gle/A9W5ikfCJPaT5tbg8>

Agile Life Cycle Models

- Iterative
- Flow-Based

Agile/Adaptive Life Cycle- Iteration Based Agile

Plan



NOTE: Each timebox is the same size. Each timebox results in working tested features.

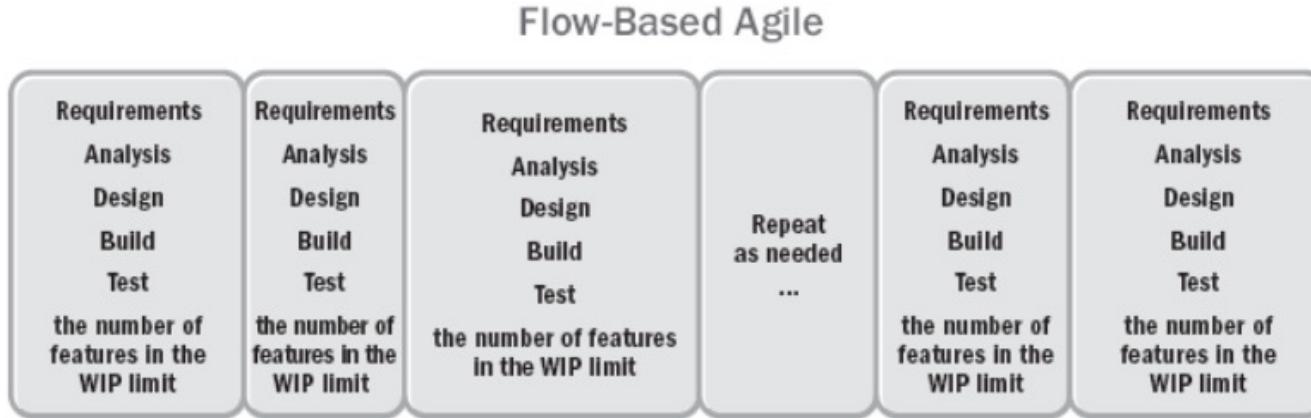
Fixed Time box : 1-4 weeks equal duration for each iteration

Goals and Characteristics: Value, Multiple deliveries

Agile/Adaptive Life Cycle- Flow-based Based Agile

- The project life cycle that is **iterative and incremental**

Plan



NOTE: In flow, the time it takes to complete a feature is not the same for each feature.

Variable Time Box :

Goals and Characteristics: Value, Multiple deliveries

Popular Early* Iterative and Agile Models



* Year ~2000 before

- Iterative
 - Spiral
 - RUP
- Agile
 - DSDM
 - FDD
 - Crystal

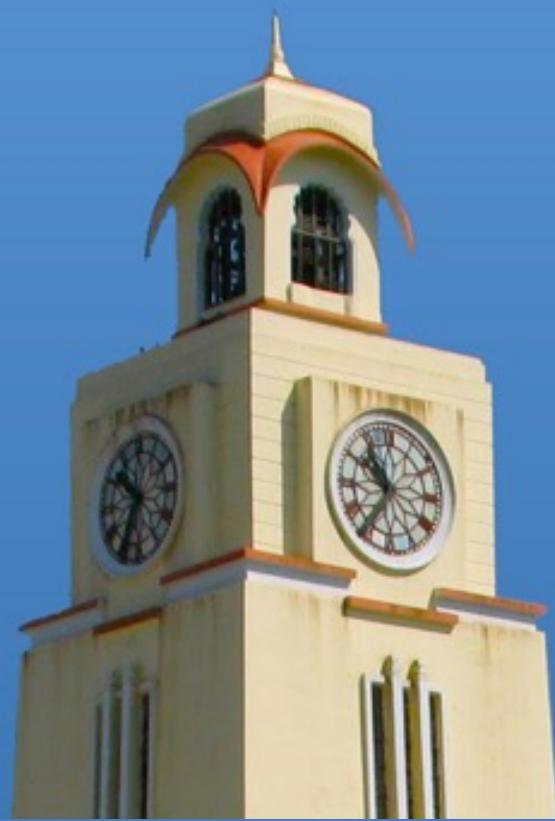
Q&A

Q3,Q4,Q5

<https://forms.gle/bz3784DRQYHD5BnN9>

<https://forms.gle/TZpHt55eRhKjnZT9>

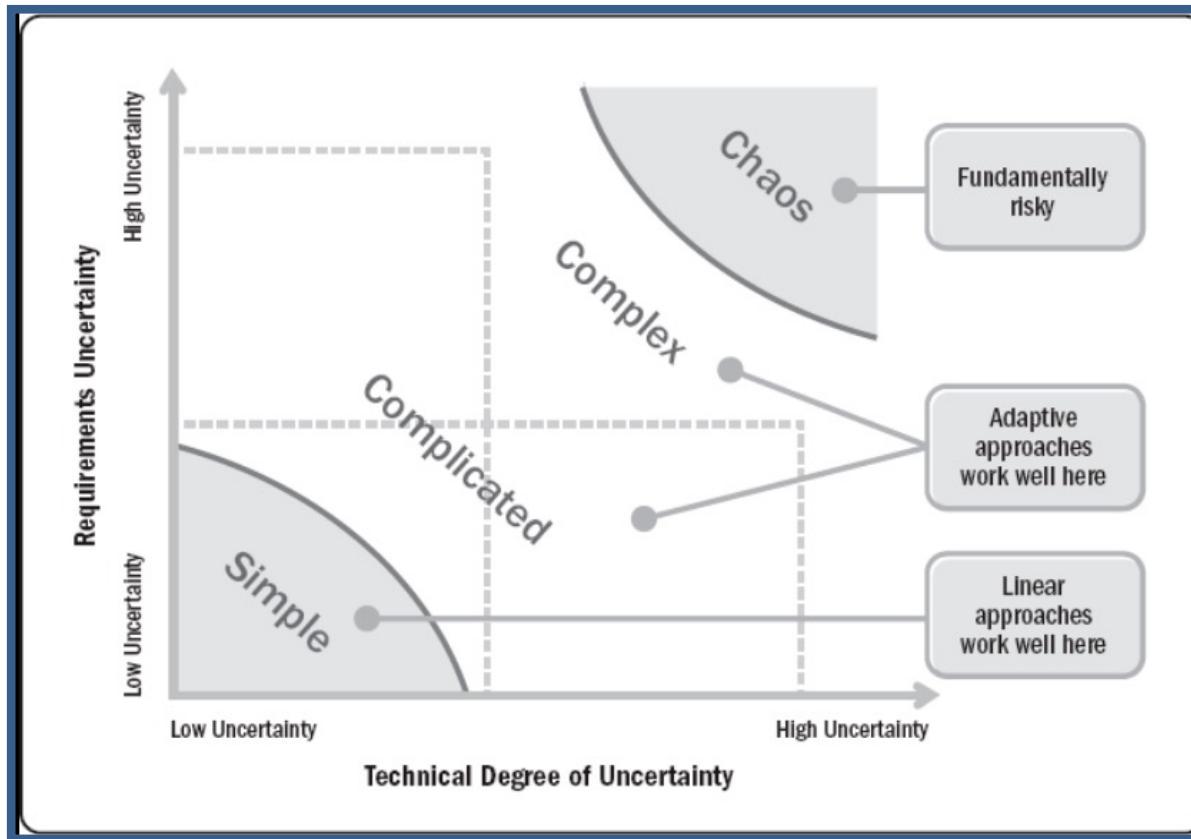
<https://forms.gle/7XCdp9E7yr9ABG2r8>



Project Classifications/Decision making models

Agile Suitability - Project Environment

Stacey's Complexity Model



Ref: Agile Practice Guide (ENGLISH) by Project Management Institute Published by Project Management Institute, 2017 (Agile methodologies)

Cynefin framework - A Leader's Framework for Decision Making



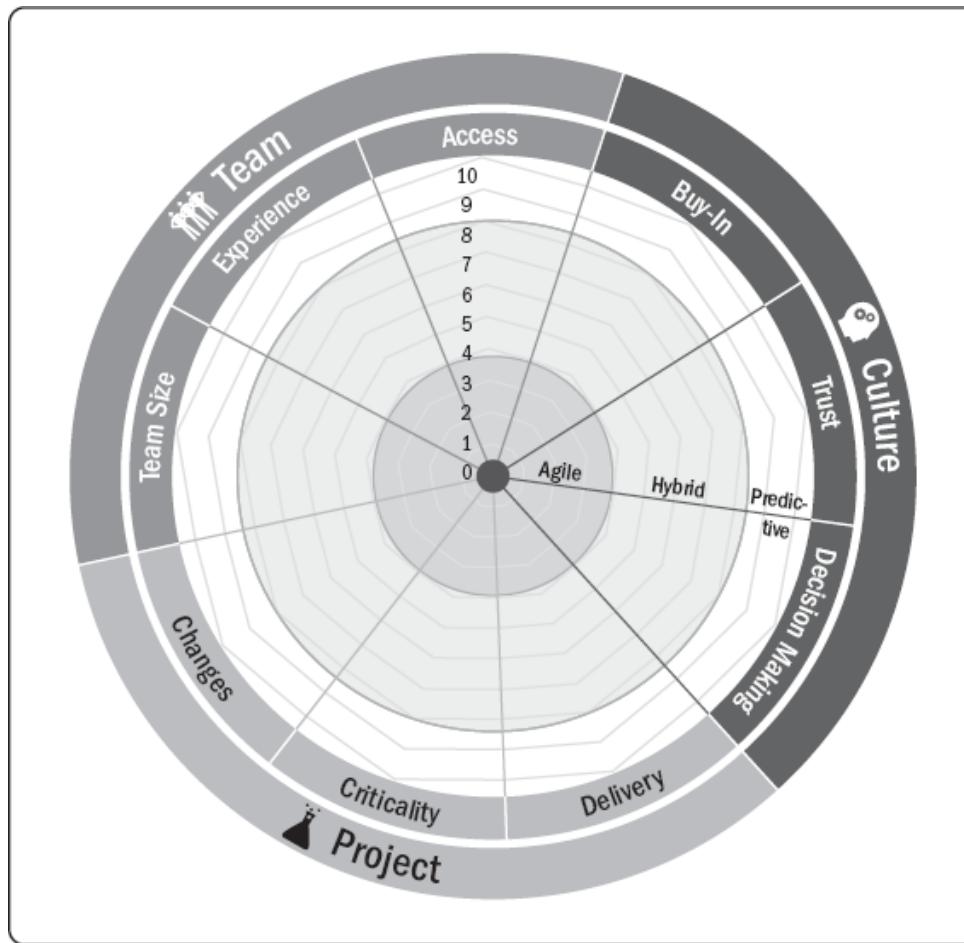
Pronounced as: kun-ev-in

Emergent

Developed in the early 2000s by David Snodown

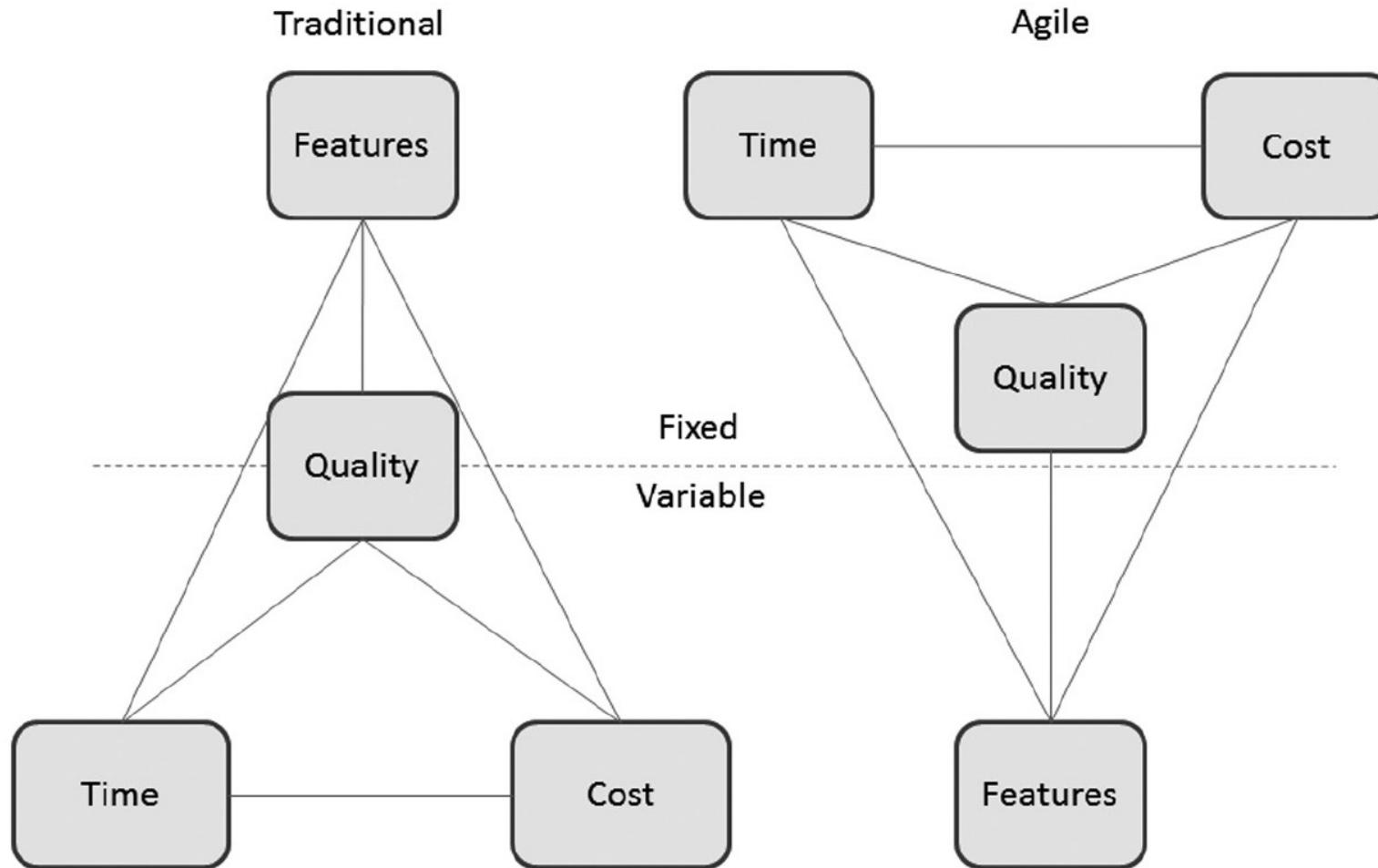


Agile Suitability Filter



Attributes	Assessment
Buy-In	0-Yes, 5-Partial, 10-No
Trust	0-Yes, 5-Probably, 10-No
Decision Making	0-Yes, 5-Probably, 10-Unlikely
Incremental Delivery	0-Yes, 5-Maybe/Sometimes, 10-Unlikely
Criticality	0-Low, 5-Medium, 10-High
Changes	0-High, 5-Medium, 10-Low
Team Size	1-Small (<10), 5-Medium (>80), 10- Large (>200)
Experience	0-Yes, 5-Partial, 10-No
Access to business Info/Project Info	0-Yes, 5-Partial, 10-No

The “IRON” Triangle – Triple Constraints



Ref: Agile Foundations - Principles, practices and frameworks by Peter Measey

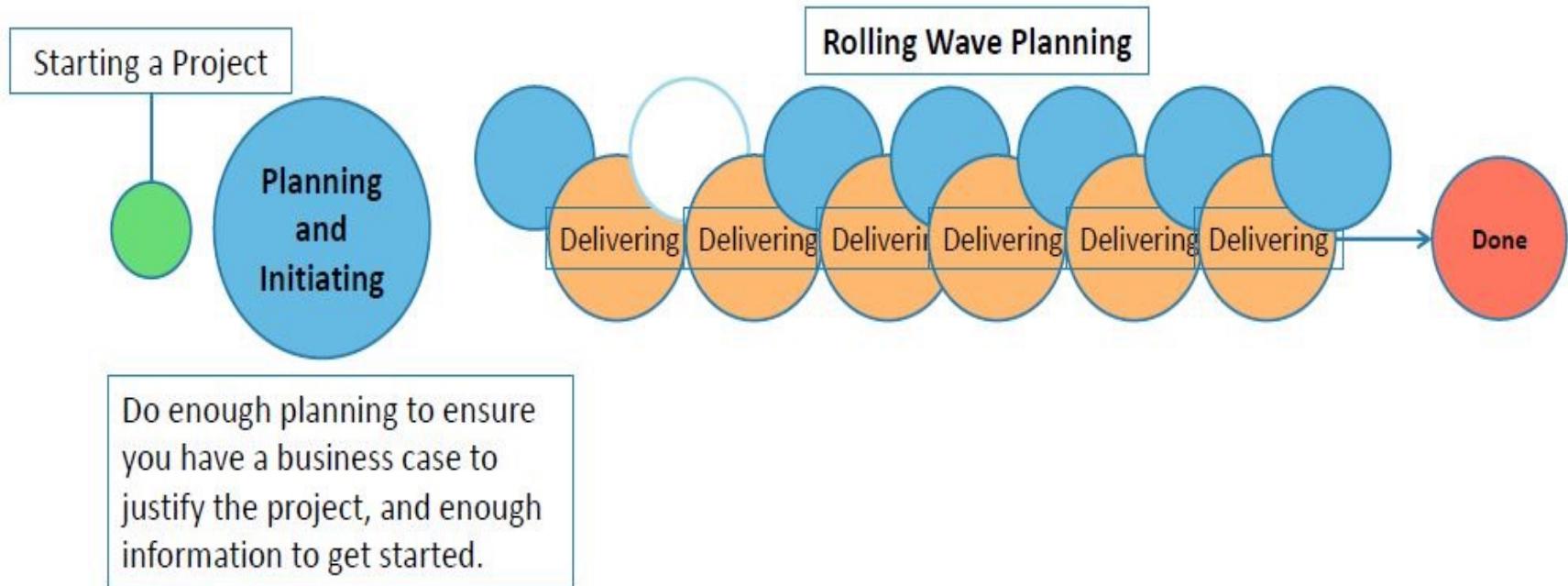
30/8/22

Agile Software Process SE ZG544 S1-22-23

17

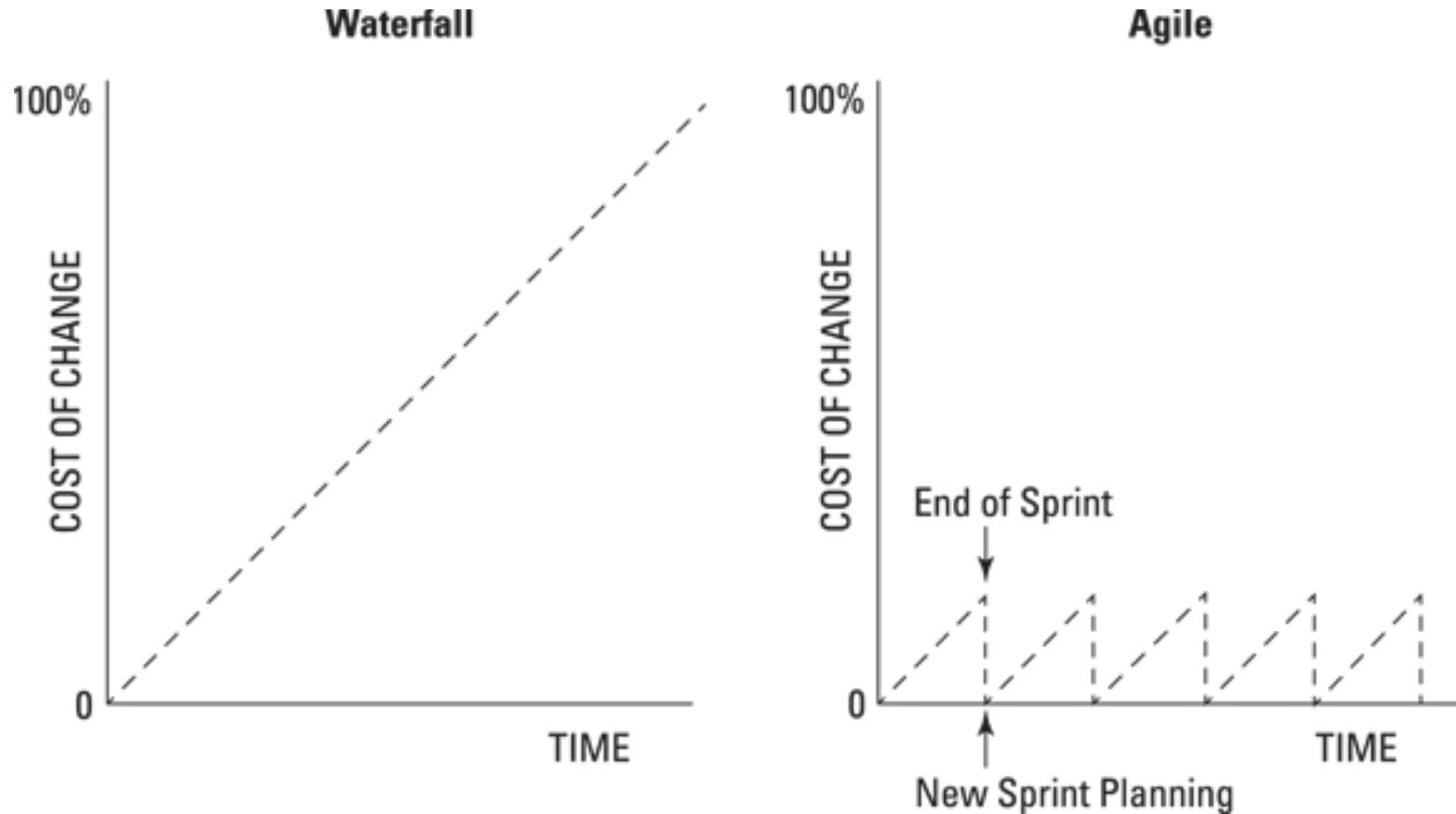
BITS Pilani, Pilani Campus

Rolling Wave Planning or Progressive Elaboration



<https://www.simplilearn.com/adaptive-planning-part-1-tutorial>

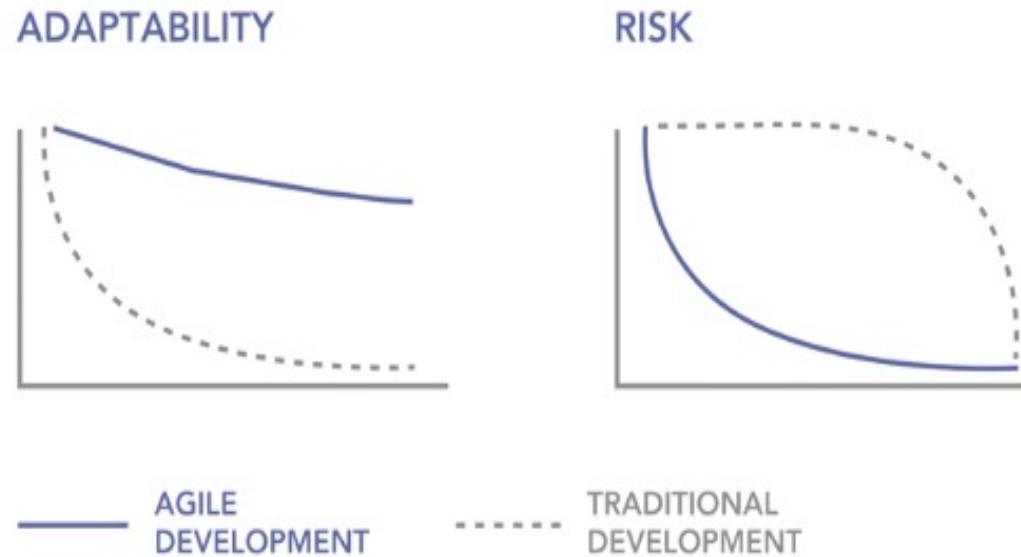
Cost of Changes: Agile vs Traditional Development



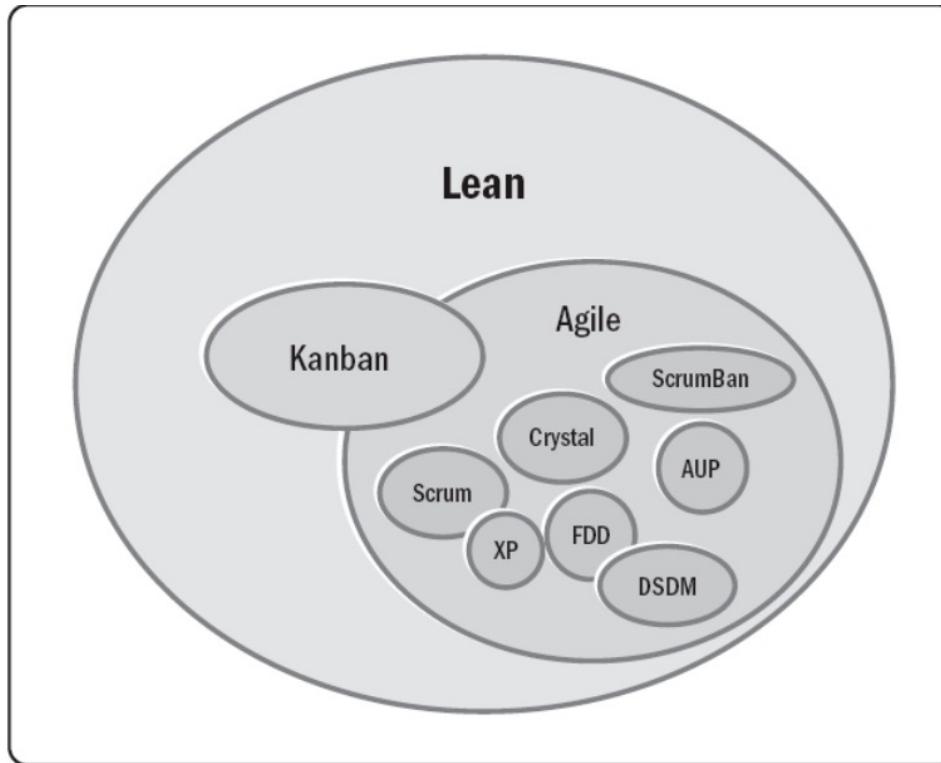
Adaptability and Risk Agile vs Traditional Development



Agile vs. Traditional Development



Popular Agile Methods



- They all have one important thing in common:
- they focus on changing your team's **mindset**.

Mindset

	The Agile mindset	The bureaucratic mindset
Goal	The <i>Law of the Customer</i> —an obsession with delivering steadily more value to customers.	<i>The Law of the Shareholder</i> : A primary focus on the goal of making money for the firm and maximizing shareholder value.
How work gets done	The <i>Law of the Small Team</i> —a presumption that all work be carried out by small self-organizing teams, working in short cycles, and focused on delivering value to customers	<i>The Law of Bureaucrat</i> : A presumption that individuals report to bosses, who define the roles and rules of work and performance criteria.
Organizational Structure	The <i>Law of the Network</i> —the presumption that firm operates as an interacting network of teams,	<i>The Law of Hierarchy</i> : the presumption that the organization operates as a top-down hierarchy, with multiple layers and divisions.

Source: <https://www.forbes.com/sites/stevedenning/2019/08/13/understanding-the-agile-mindset/?sh=5a66a5545c17>

Q&A

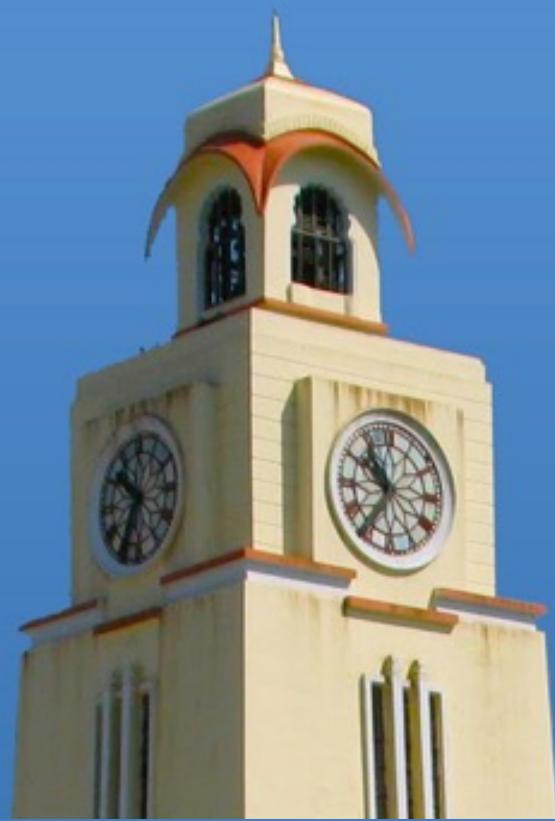
Q6,Q7,Q8

<https://forms.gle/9SUn7mtfuxcZ3kZUA>

<https://forms.gle/2f6AqYXnGMyNbKdA>

<https://forms.gle/3USQSAg2vKScGPZf7>

End Contact Session-2



Module-2 Additional Notes

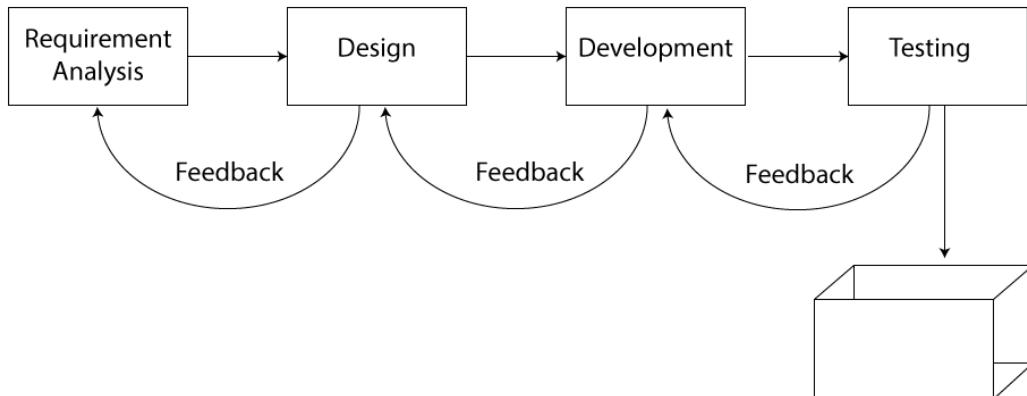
Life Cycle

- The **sequence of actions** that must be **performed** in order to **build a software** system
- **Ideally** thought to be a **linear** sequence: **plan, design, build, test, deliver**
 - This is the waterfall model
- **Realistically** an **iterative process**
 - Iterative, Incremental, Agile Process

Predictive Project Development Life Cycle (Fully Plan-Driven aka Waterfall)

- A more **traditional approach**, with the bulk of **planning** occurring **upfront**, then executing in a **single pass**; a **sequential** process

Plan



- Requirements/Scope is fixed
- Single delivery
- Goal: Manage Cost
- Minimal feedback changes
- Team is matured in estimation, technology etc..
- Project governance model exists
- **Don't expect long feedback cycle**, If this happens, this lifecycle not suitable for the project

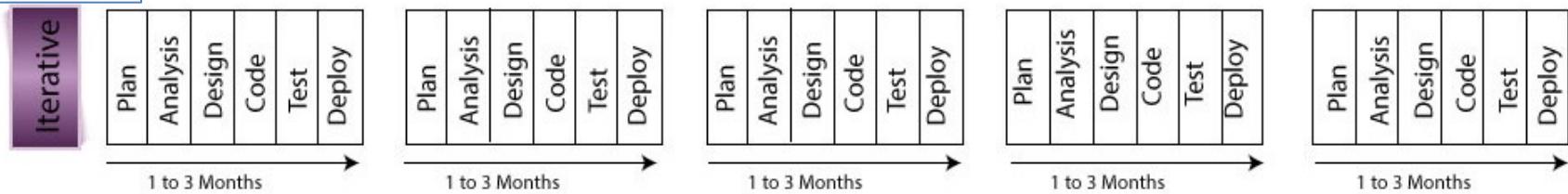
Source : <https://www.izenbridge.com/blog/project-management-life-cycle-iterative-adaptive/>

Iterative Project Development Life Cycle



- Iterative development is when an attempt is made to **develop a product with basic features**, which then goes through a **refinement process** successively to **add to the richness** in features.

Plan



- Goal: **Correctness** of Solution
- Repeat** until Correct
- Show and **receive feedback**
- Add richness or features**
- Single Final Delivery**

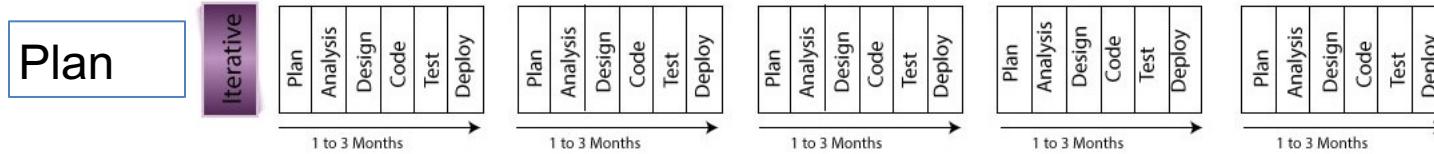
- Deliver result** at the end of each iteration.
- Result may **not be usable**
- E.g. 1 year project divided into 3 to 4 iterations

Examples of Iterative Development

- When you are getting a customized coat made
 - You may be required to go for a trial to check for the fitting.
 - Even though the you may find the coat fitting well, you may not be able to use it as it has not been finished.
 - The fitting test was to give you an idea of the final product, which may not be ready for your consumption.
 - This is an example of iterative prototyping.
- Developing a Website
 - Develop a prototype of the Website with basic functionality
 - Demo to Customer and receive feedback
 - Add to the richness or feature to the product in subsequent iteration

Incremental Life Cycle

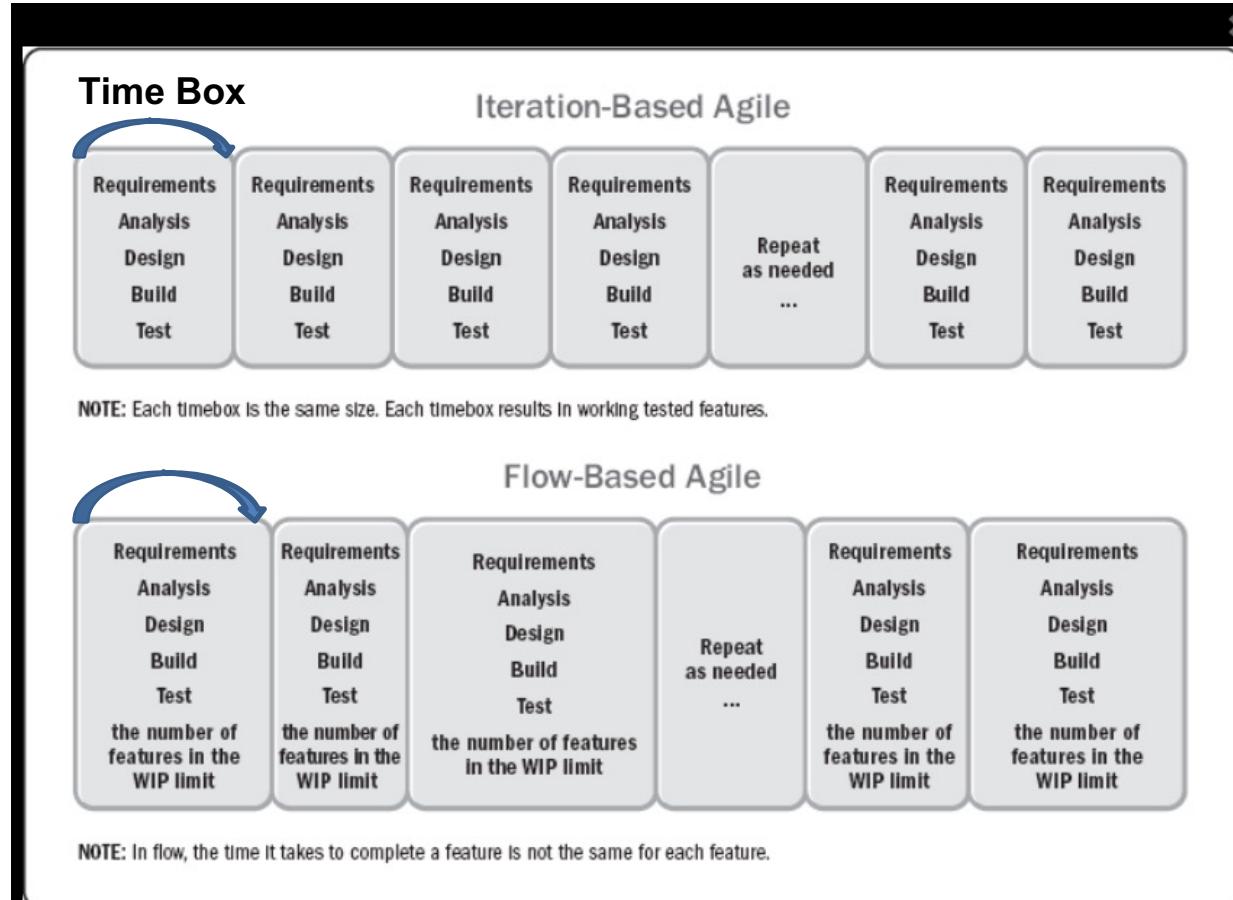
- In an incremental approach, one aims to build pieces of program/product that is complete in features and richness. Product **increment** is usable.
- In this case, each functionality is built to its fullest and **additional functionalities are added in an incremental fashion.**



Example: You can compare this to a visit to restaurant. You get served starters first and on completion of its main course and then dessert. You get served incrementally and you consume it.

Agile/Adaptive Life Cycle

- The project life cycle that is **iterative and incremental**



Fixed Time box : 1-4 weeks equal duration for each iteration

Limit WIP (work in Progress)
Optimize the flow

Ref: Agile Practice Guide (ENGLISH) by Project Management Institute Published by Project Management Institute, 2017 (Agile methodologies)

Project Life Cycles Characteristics

Characteristics				
Approach	Requirements	Activities	Delivery	Goal
Predictive	Fixed	Performed once for the entire project	Single delivery	Manage cost
Iterative	Dynamic	Repeated until correct	Single delivery	Correctness of solution
Incremental	Dynamic	Performed once for a given increment	Frequent smaller deliveries	Speed
Agile	Dynamic	Repeated until correct	Frequent small deliveries	Customer value via frequent deliveries and feedback

- It should be emphasized that **development life cycles are complex and multidimensional.**
- Often, the **different phases in a given project employ different life cycles**, just as distinct projects within a given program may each be executed differently.

Ref: Agile Practice Guide (ENGLISH) by Project Management Institute Published by Project Management Institute, 2017 (Agile methodologies)

Delivery Environments and Agile Suitability

BITS Pilani

Pilani Campus

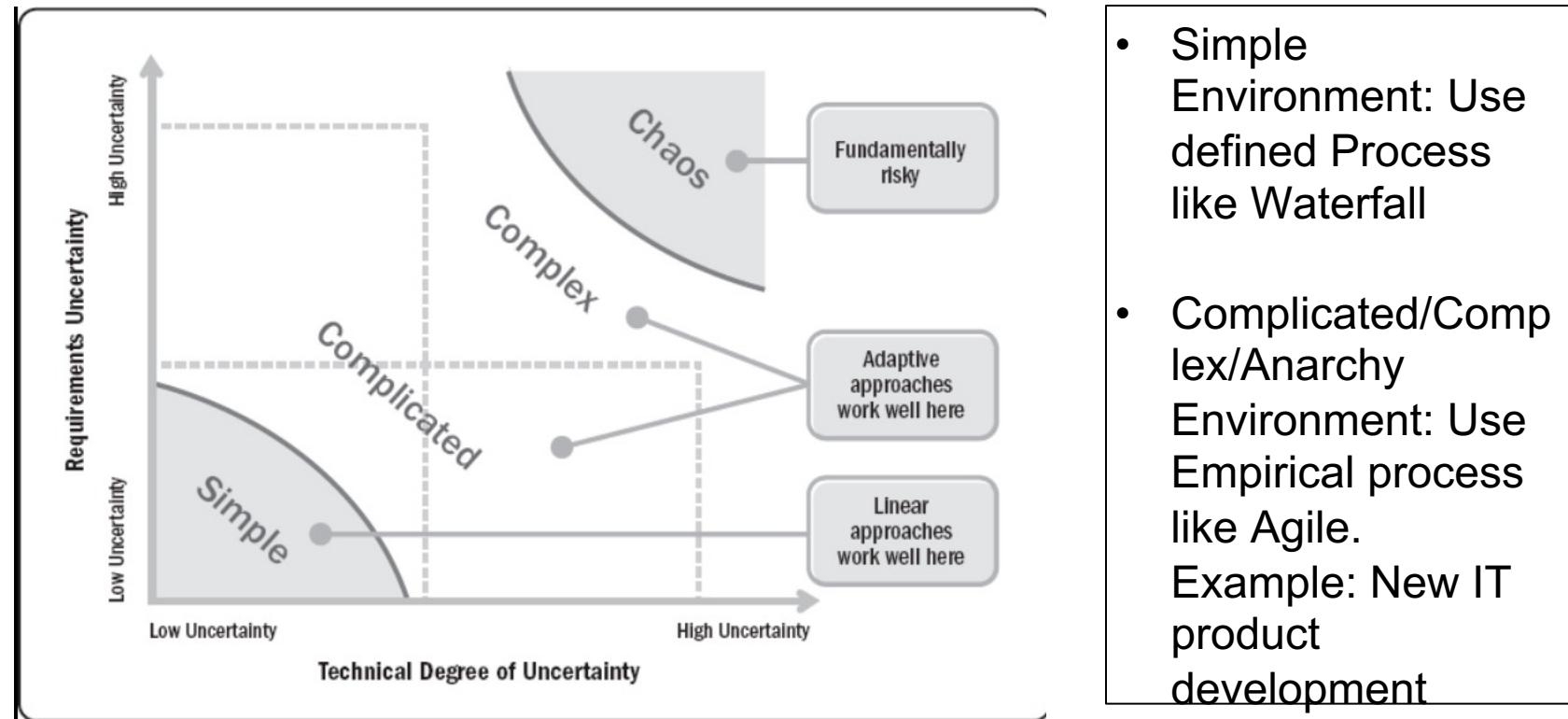


Delivery Environments and Agile Suitability

Delivery Environments

- The environment within which **Project/Product delivery** will occur should largely drive the delivery and **governance framework(s)** that will be implemented.
- For example, in a delivery environment where **high variability** is likely to be encountered (like IT product development), an **Agile framework** would be suited
- In an environment where **variability** is likely to be **low**, a **more defined process** may be more suited (like '**Waterfall**').

Understanding the Delivery Environments: Stacey's Complexity Model



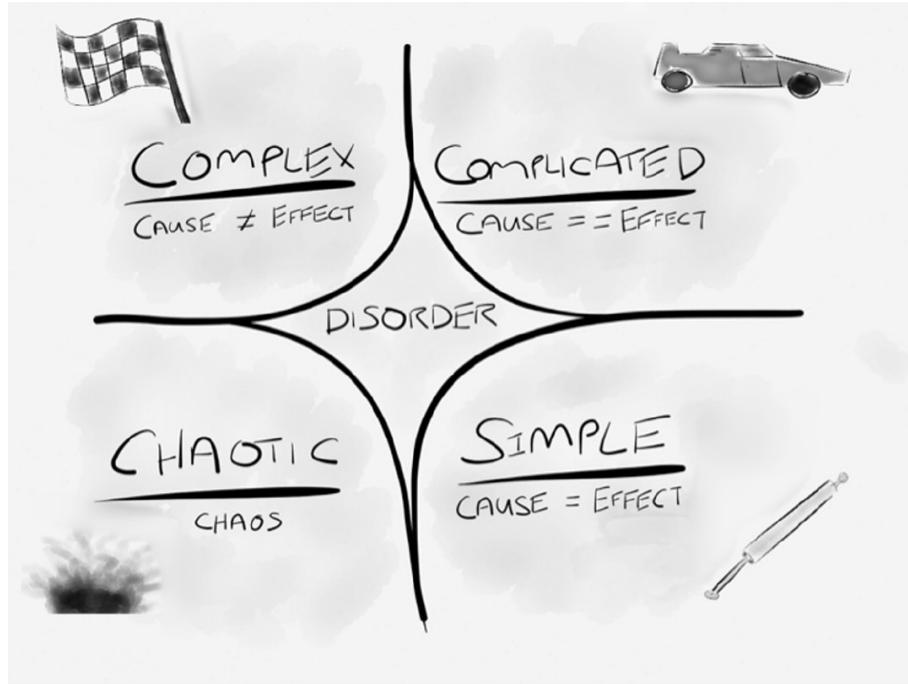
- Simple Environment: Use defined Process like Waterfall
- Complicated/Complex/Anarchy Environment: Use Empirical process like Agile.
Example: New IT product development

When trying to understand types of environments, it is important to take into account the amount of innovation that is being sought or considered for a new product or service. As the level of innovation increases, so does the move towards complexity, and a high variability is likely to be present.

Ref: Agile Foundations - Principles, practices and frameworks by Peter Measay

Cynefin Framework for Decision Making

- The Cynefin framework (Snowdon and Boone, 2007) gives an alternative framework for determining and understanding simple, complicated and complex environments



- The central idea of the framework is to offer decision-makers a “sense of place” to view their perceptions in dealing with a situation or problem. Not all situations are equal, and this framework helps to define which response is required for a given situation or problem.

<https://txm.com/making-sense-problems-cynefin-framework/>

Cynefin identifies five domains:

- **Simple (obvious) domain:**
 - In this domain the relationship between cause and effect is obvious and therefore it is relatively easy to predict an outcome. In this domain predictive planning works well as everything is pretty well understood. Teams can define up front how best to deliver a product, and they can then create a defined approach and plan. The Waterfall model works well in these types of environments with little variability.
- **Complicated domain**
 - In this domain, the relationship between cause and effect becomes less obvious; however, after a period of analysis it should generally be possible to come up with a defined approach and plan. Such a plan will normally include contingency to take into account the fact that the analysis may be flawed by a certain amount. Again, the Waterfall model is suitable for this environment as there is an element of definition up front; however, a more empirical process, like Agile, may be more suited.

<https://txm.com/making-sense-problems-cynefin-framework/>

Cynefin identifies five domains:

Complex domain

- In this domain the relationship between cause and effect starts to break down as there tend to be many different factors that drive the effect. While it may be possible to identify retrospectively a relationship between cause and effect, the cause of an effect today may be different to the cause of the same effect tomorrow. Creating a defined up-front approach and plan is not effective within this domain and therefore an Agile way of working is recommended.

Chaotic domain

- In this domain, there is no recognizable relationship between cause and effect at all, making it impossible to define an approach up front or to plan at all. Instead, teams must perform experiments (e.g. prototyping, modelling) with the aim to move into one of the other less chaotic domains. An Agile approach can work in this domain, for example Kanban which does not require up-front plans.

Disorder

- Being in this environment means that it is impossible to determine which domain definition applies. This is the most risky domain as teams tend to fall into their default way of working, which may prove unsuitable for what they are trying to achieve.

A Note on Cynefin identifies five domains:

- During a product's development and evolution there may be **elements of delivery spread across** all the Cynefin domains at the same time.
- There **may be aspects of a large system that are simple**, while **others may be in the complicated domain**; and there could also be areas where innovation is necessary and which require a move towards the complex or even towards the chaotic domain.

<https://txm.com/making-sense-problems-cynefin-framework/>

Some Popular Iteration Models

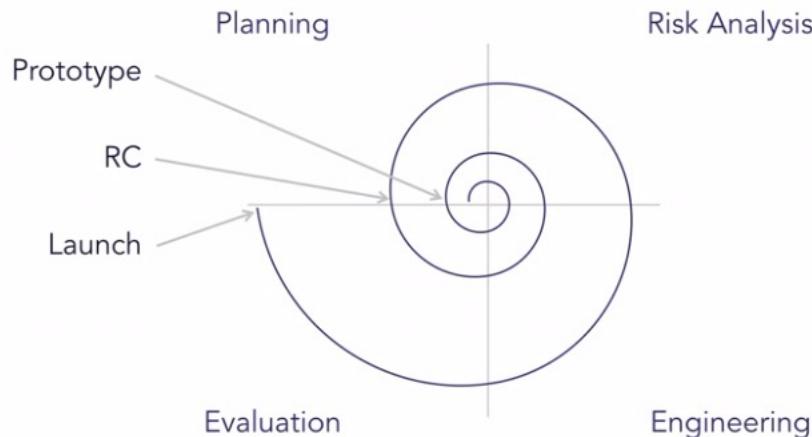


BITS Pilani
Pilani Campus



Some Popular Iteration Models

Spiral Risk Driven Customer driven Planning



- Developed by Barry Boehm, 1986.
- Easier management of risks (Theme)
- Mix of water fall and iterations
- Y-Axis represents Cost
- X-Axis represents Review
- Prototype-1, Prototype-2
- Operational Prototype
- Final Release

Four Phases

Planning: Requirements Identification and Analysis

Risk Analysis: Risk identification, Prioritization and Mitigation

Engineering: Coding, Testing and Deployment

Evaluation: Review and plan for next iteration

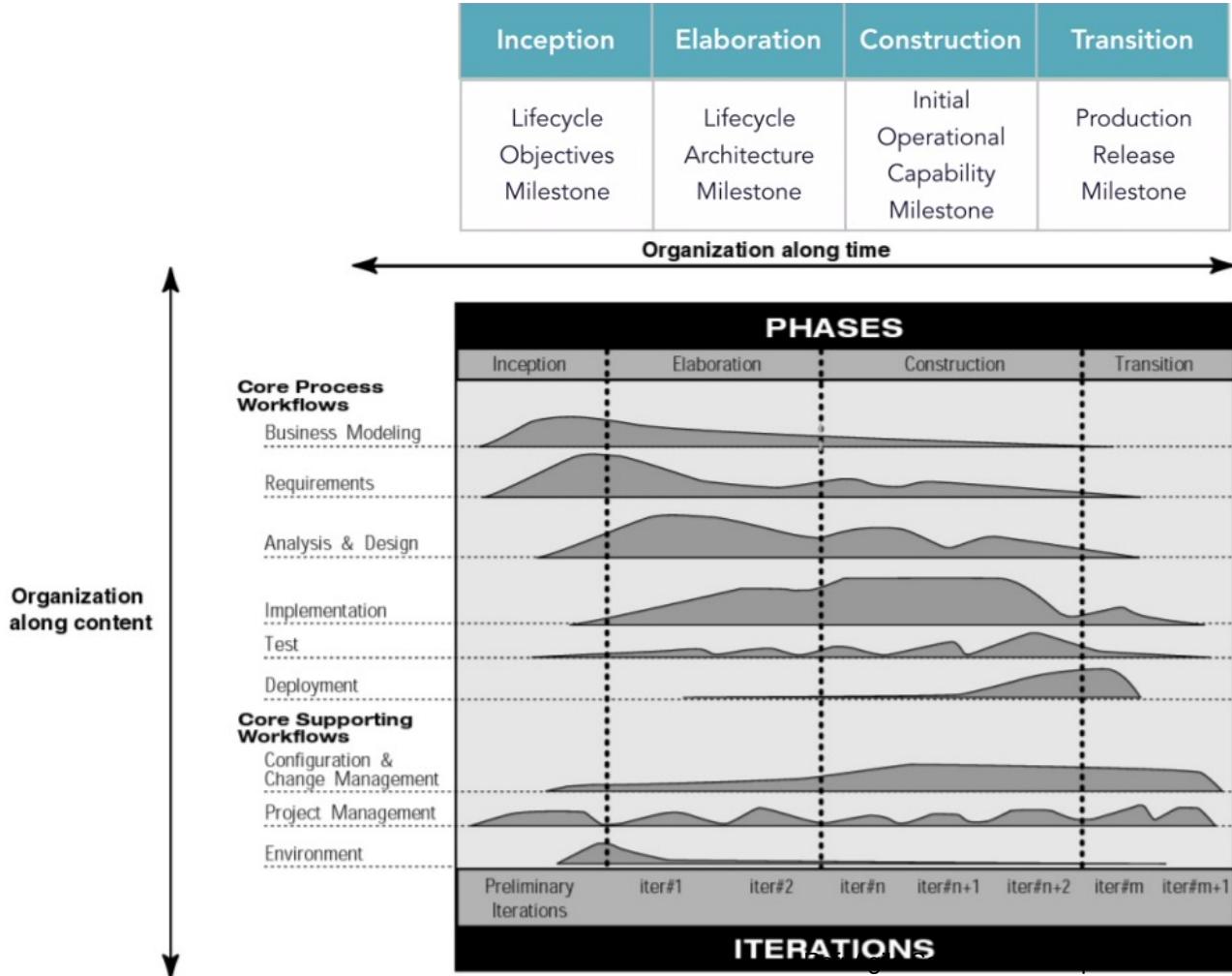
Rational Unified Process (RUP)



- 1990s, Rational Software developed the Rational Unified Process as a software process product.
- IBM acquired Rational software in 2006 (**era of OOAD, UML**)
- Rational Unified Process, or RUP, was an attempt to come up with a comprehensive **iterative software development** process.
- RUP is essentially a **large pool of knowledge**. RUP consists of **artifacts, processes, templates, phases, and disciplines**.
- RUP is defined to be a **customizable** process that would work for building small, medium, and large software systems.

Ref: Agile Software Development with Shashi Shekhar, LinkedIn Learning

RUP Iterative Model

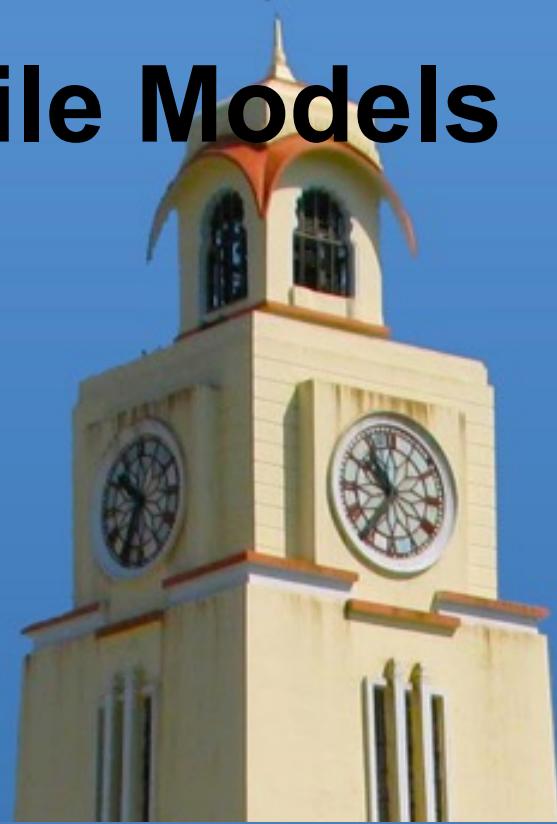


X-Axis: RUP Phases,
Dynamic

Y-Axis: Organization
Process, Static

Early Agile Models

BITS Pilani
Pilani Campus



Early Agile Methods

Dynamic System Development Method (DSDM)



The eight Principles of DSDM:

- Focus on the business need
- Deliver on time
- Collaborate
- Never compromise quality
- Build incrementally from firm foundations
- Develop iteratively
- Communicate continuously and clearly
- Demonstrate control

- Developed in 1994
- Era where organization slowly moving away from waterfall model
- During this time RAD model came into existence
- RAD approach is very agile but has no formal process
- DSDM was formed by group of organizations
- **Project development standard in Europe** for several years
- In 2016 DSDM is changed its name to **Agile business consortium**

<https://www.agilebusiness.org/>

Source: Agile Lynda.com, Agilebusiness.com

Feature Driven Development (FDD)

- Lightweight Agile process
- Software is a collection of features
- Software feature = “working functionality with business value”

Feature Example:

Calculate monthly interest on the account balance

(action) (result) (object)

- Deliver working software (working feature)
- Short iterative process with five activities
 - **Develop over all, Build Feature list, Plan by feature, Design by Feature Build by feature**
- FDD is used to build large banking systems successfully

Crystal Method- Selecting a Model



Criticality	Life	Essential Money	Discretionary Money	Comfort	Team Size	
	1-6	7-20	21-40	41-80	81-200	Large

- Different crystal methodologies based on team size.
- If Criticality increases tweak the process to address the extra risk

Comfort: System malfunction

Discretionary Money: Extra savings

Essential Money: Revenue loss

Life: Loss of life , Critical software

- Crystal methods are people-centric, light-weight, and highly flexible. Focus on People, Interactions, Collaborations.
- Developed by Alistair Cockburn , 1991

Thank you



BITS Pilani
Pilani Campus



BITS Pilani presentation

K.Anantharaman
Faculty CS Department
kanantharaman@wilp.bits-pilani.ac.in



SS ZG544 , Agile Software Processes

Lecture No. 3- Agile Manifesto & Principles

Agile Manifesto & Agile Principles

- <https://agilemanifesto.org/>
- Agile Practices
 - Agile Manifesto → Agile Principles → Agile Practices
 - Agile Practices → Project Outcome
- Sprint Planning, Product Backlog, Sprint Review, Planning Game, Frequent Delivery, Retrospective
- Definition of Done
- Whole Team, Osmotic Communication, Daily Scrum
- TDD, Pair Programming, Continuous Integration, 10-minutes Build

Q&A

Q.1 <https://forms.gle/biAfBryfBpevNVHdA>

Q.9 <https://forms.gle/tu1jJH6ok8UqFxyq9>



Agile Manifesto-1(Anti-Patterns)

When applying the Agile Manifesto:

Individuals and interactions over processes and tools.

- The tool makes us Agile
- Relentless automation
- Hierarchies
- Over-standardization

Ref: Agile From First Principles , Lynda Girvan, Simon Girvan. Published by BCS, The Chartered Institute for IT

Agile Manifesto-2(Anti-Patterns)

When applying the Agile Manifesto:

Working software over comprehensive documentation

- Because they asked us for it: Other parts of the organization often say they require additional documentation or reporting.
- We will need this later
- Documentation as collaboration
- Write only documentation

Q&A

Q.3 <https://forms.gle/biAfBryfBpevNVHdA>

Q.5 <https://forms.gle/bGYxP7Xipteqp1Sa8>

Agile Manifesto-3(Anti-Patterns)

When applying the Agile Manifesto:

Customer collaboration over contract negotiation

- Detailed story descriptions
- Fixed standards or processes
- Restricting who can talk to the customer
- Not considering cultural difference
- Lacking collaboration skills

Agile Manifesto-4(Anti-Patterns)

When applying the Agile Manifesto:

Responding to change over following a plan

- Iterations planned in advance
- The tool makes us plan
- Focus on the tasks not the value
- Small stories on the backlog

Agile Principles – Customer Centric (Anti- Patterns)



Slanted toward customers

- 1** Our highest priority is to satisfy the customer through early and continuous delivery of valuable software
- 2** Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage
- 3** Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale
- 4** Business people and developers must work together daily throughout the project

- Proxy customers (Business Analysts, Architect acting as customer)
- Considering plans and roadmaps as commitments
- Expecting too much detail
- Not engaging Out of sight, out of mind- Stakeholders

Ref: Agile From First Principles , Lynda Girvan, Simon Girvan. Published by BCS, The Chartered Institute for IT

Agile Principles – (Anti-Patterns)



Slanted toward managers

- 5** Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done
- 6** The most efficient and effective method of conveying information to and within a development team is face-to-face conversation
- 7** Working software is the primary measure of progress
- 8** Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely

- One size fits all approach towards team management
- Chasing the metrics
- Ignoring the environment
- Multiple deployment environments

Ref: Agile From First Principles , Lynda Girvan, Simon Girvan. Published by BCS, The Chartered Institute for IT

Q&A

Q.6 <https://forms.gle/xRSq1kwGNwfALi3C7>

Q.7 <https://forms.gle/DEPtdyZiTf5mzRfT8>

Q4 <https://forms.gle/iZcp4fkvHWiGPvT29>

Agile Principles – (Anti-Patterns)



Slanted toward the team

- 9** Continuous attention to technical excellence and good design enhances agility
- 10** Simplicity – the art of maximizing the amount of work not done – is essential
- 11** The best architectures, requirements, and designs emerge from self-organizing teams
- 12** At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly

- Over-complicating things/Future proof everything
- Insisting on Sign-off processes
- Just in case' development-setting things up for later features
- Management focus on individuals

Ref: Agile From First Principles , Lynda Girvan, Simon Girvan. Published by BCS, The Chartered Institute for IT

Q&A

Q.10 <https://forms.gle/3Yp8aeJDR7956pvu6>



BITS Pilani
Pilani Campus



BITS Pilani presentation

K.Anantharaman
Faculty CS Department
kanantharaman@wilp.bits-pilani.ac.in



SE ZG544 , Agile Software Process Lecture No. 4 - Agile Methodologies

Agenda

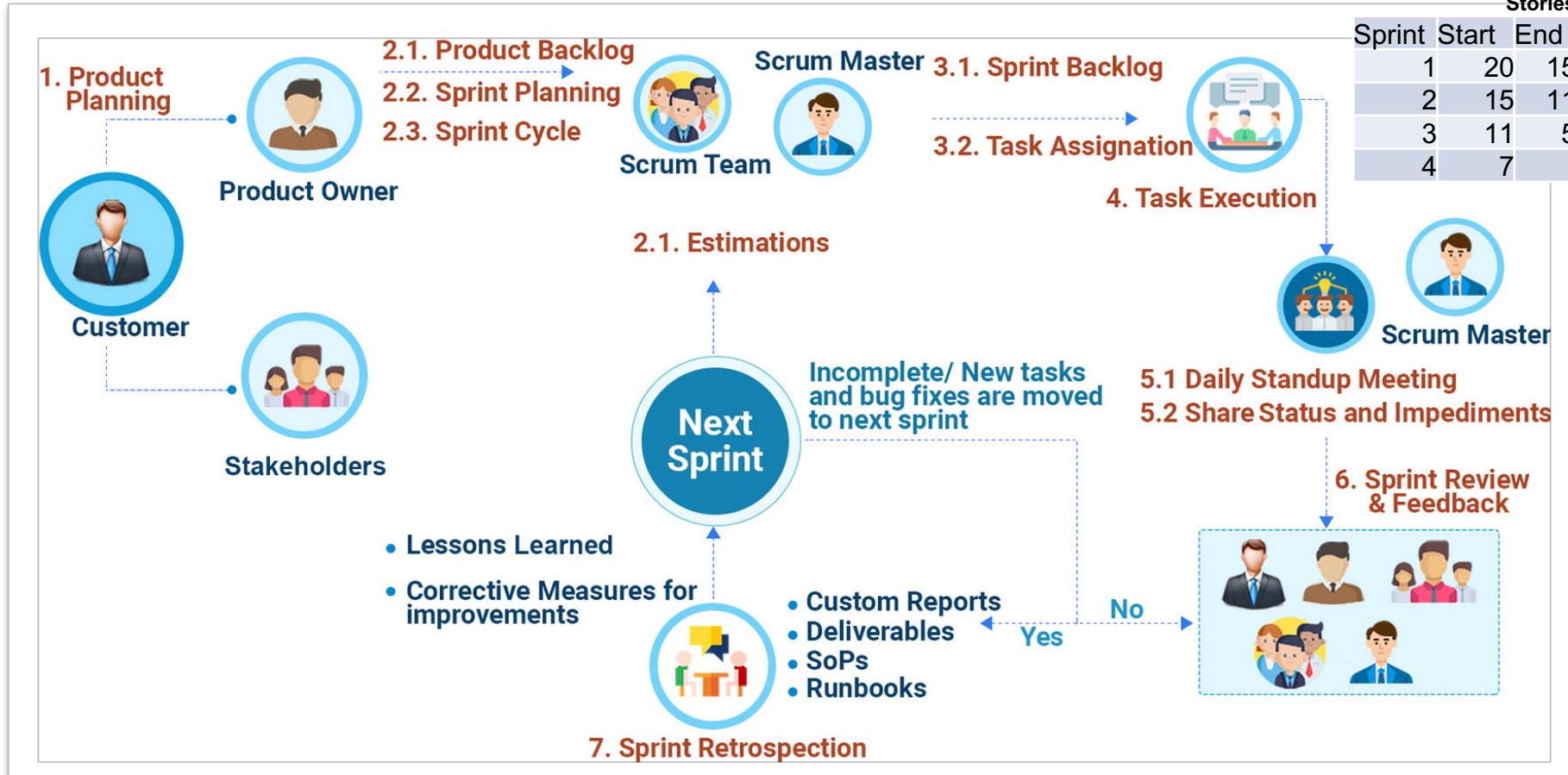
- Agile Methodologies
- Scrum
- XP
- Lean Software Development
 - Kanban
 - Value Stream Mapping

Scrum Model



Product Backlog User Stories

Sprint	Start	End
1	20	15
2	15	11
3	11	5
4	7	



Source: [Hands-On Guide to AgileOps: A Guide to Implementing Agile, DevOps, and SRE for Cloud Operations](#) By Navin Sabharwal, Raminder Rathore, Udit Agrawal

Progress Tracking - Scrum Task Board



Story	To Do	In Process	To Verify	Done
As a user, I... 8 points	Code the... 9 Code the... 2 Test the... 8	Test the... 8 Code the... 8 Test the... SC 8	Code the... DC 4 Test the... SC 6	Code the... D Test the... SC 8 Test the... SC Test the... SC Test the... SC 6
As a user, I... 5 points	Code the... 8 Code the... 4	Test the... 8 Code the... 6	Code the... DC 8	Test the... SC Test the... SC Test the... SC 6

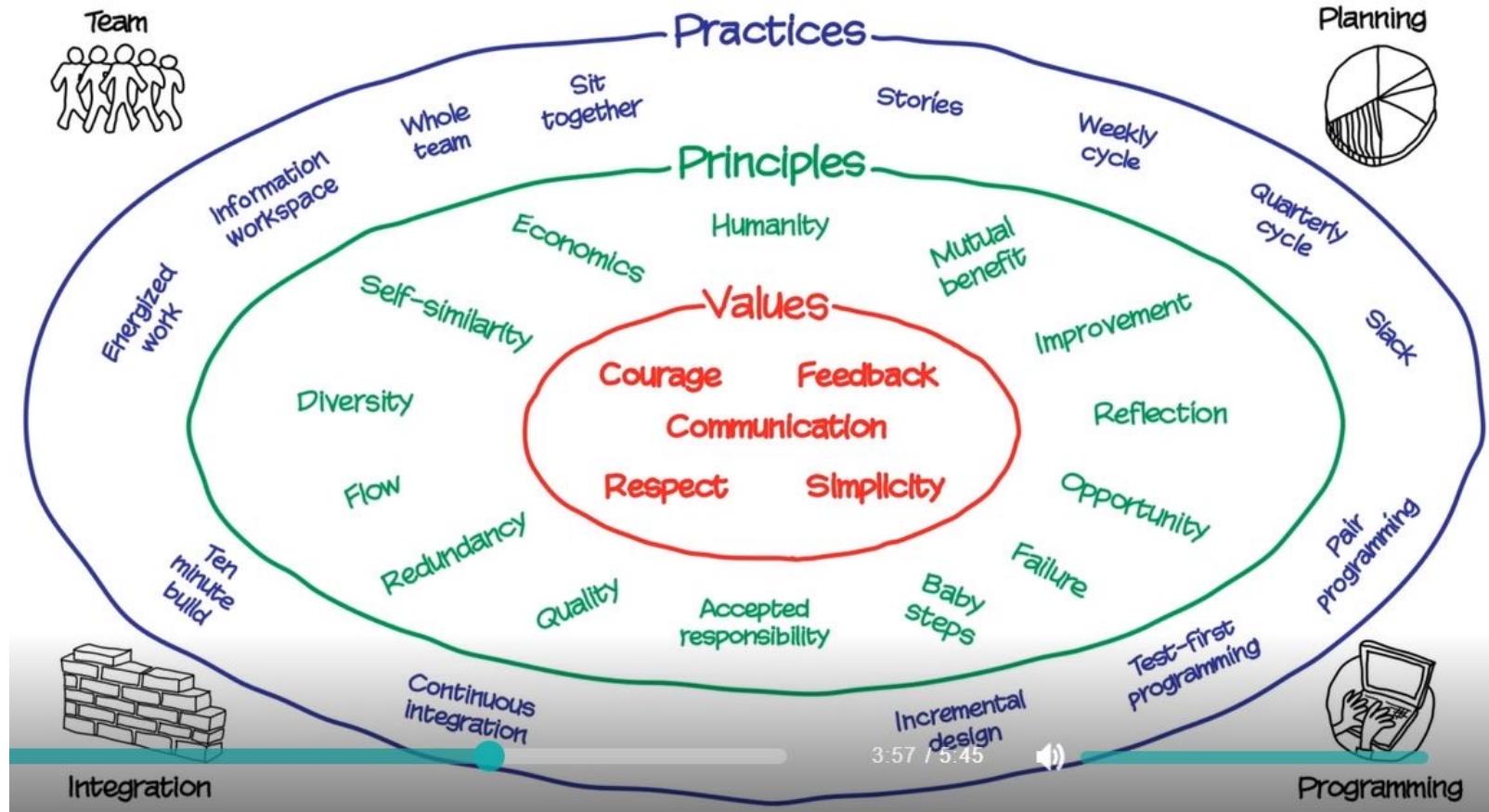
Ref: Agile Estimating and Planning by Mike Cohn Published by Addison-Wesley Professional, 2005

Q&A

- » Q1 <https://forms.gle/acdHAF5B1snczGt27>
- » Q2 <https://forms.gle/MkMUpFgMnxG6ddnw8>
- » Q5 <https://forms.gle/5d2oLmcT5DfrLHbJ8>
- » Q6 <https://forms.gle/TWVNxLATMoRG1hVr9>

eXtreme Programming (XP)

(Similar to Scrum Model with some differences)



Ref :Agile Sketchpad By Dawn Griffiths and David Griffiths

XP Practices

- Test-Driven Development
- Refactoring
- Pair Programming
- 10-Minutes Build
- Continuous Integration

Q&A

- » Q3 <https://forms.gle/ATAexHWAH1QuFWkL6>
- » Q7 <https://forms.gle/8svB5tSqTi6kCU2p8>
- » Q8 <https://forms.gle/uXC9yi2AVNZrjXeX6>
- » Q10 <https://forms.gle/zGBDQksPEi6yYcjn9>
- » Q9 <https://forms.gle/zes6nMXGkNYRLZUr9>

What is Lean Software Development? &

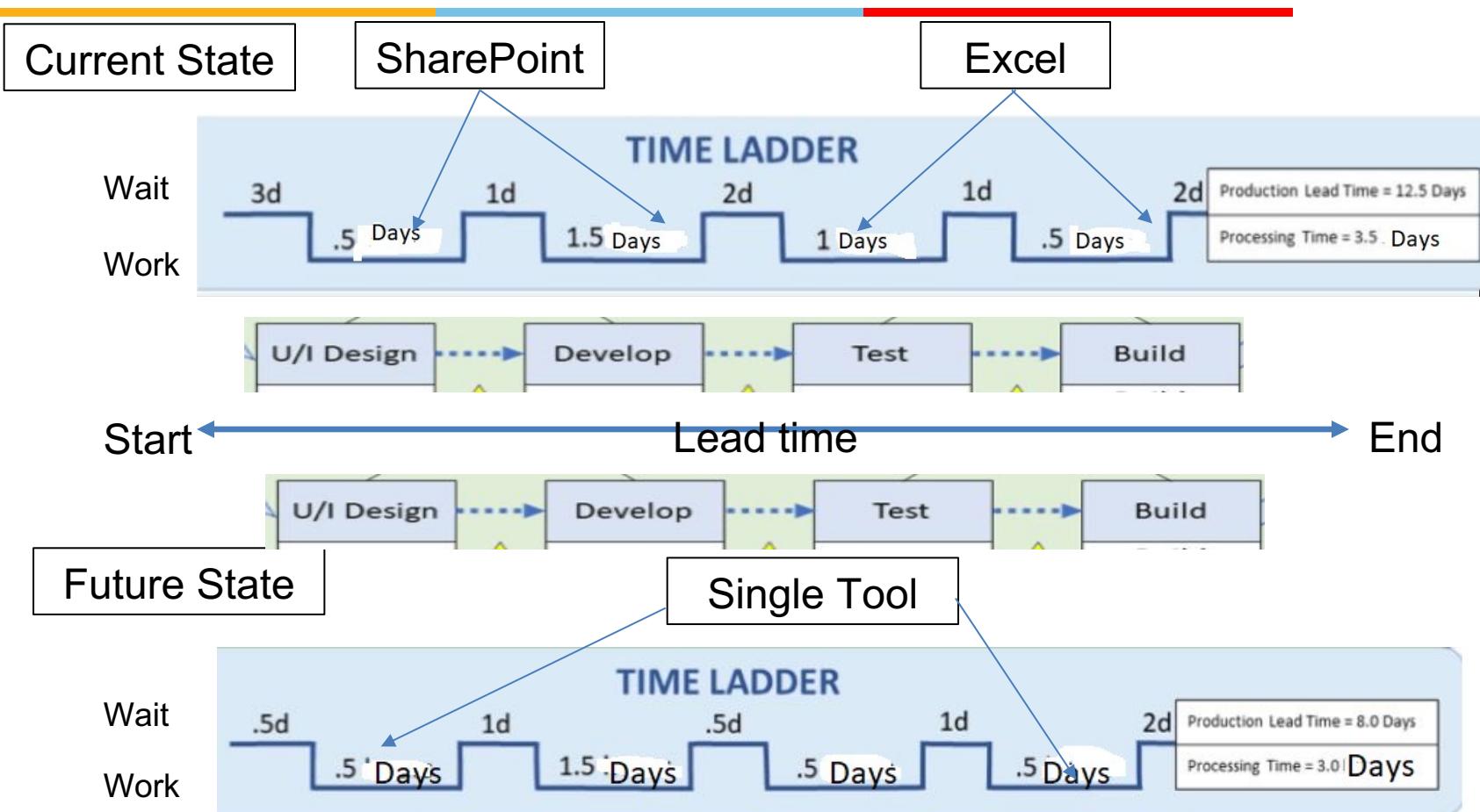
Seven Principles of Lean

- Lean is a systematic method to eliminate waste and maximize the flow of value through a system. Value is defined as something your customer will pay money for.

1. Eliminate Waste
2. Build Quality In
3. Create Knowledge
4. Defer Commitment
5. Deliver Fast
6. Respect People
7. Optimize the Whole

- Value Stream Mapping
- Kanban

Value Stream Mapping



Process Efficiency = Cycle time/Lead Time * 100

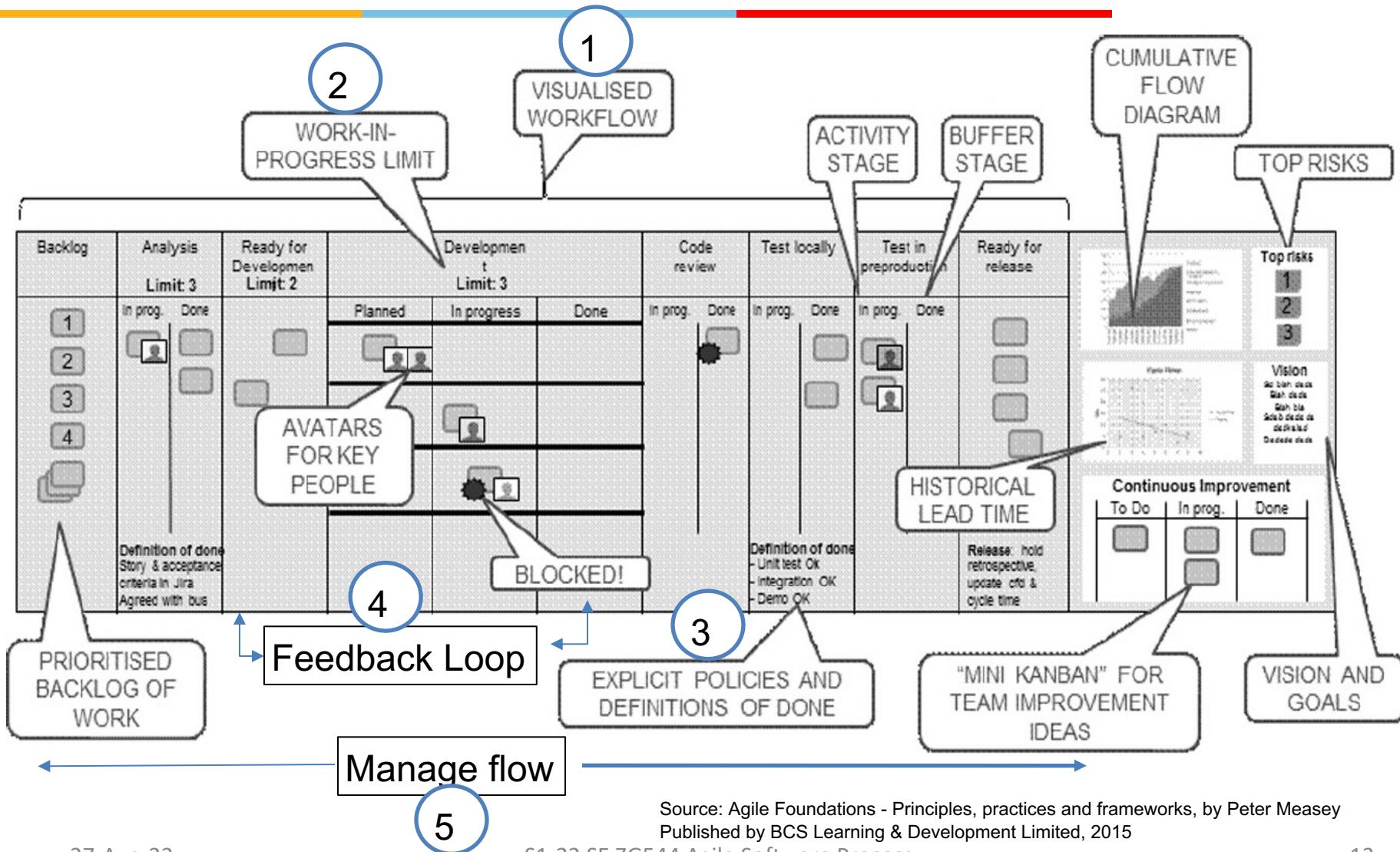
Current State: $3.5/(12.5)*100 = 28\%$; Future state: $3/(8)*100 = 37.5\%$

Ref: <https://www.plutora.com/blog/value-stream-mapping>

Kanban

- Kanban is a popular framework used to implement agile and DevOps software development. It requires real-time communication of capacity and full transparency of work
- Kanban is not an Agile software development method (or process) or a software engineering methodology
- Kanban is flow based methodology and a pull system.
- Kanban does not prescribe specific roles or process steps as it is built on the concept of evolutionary change.

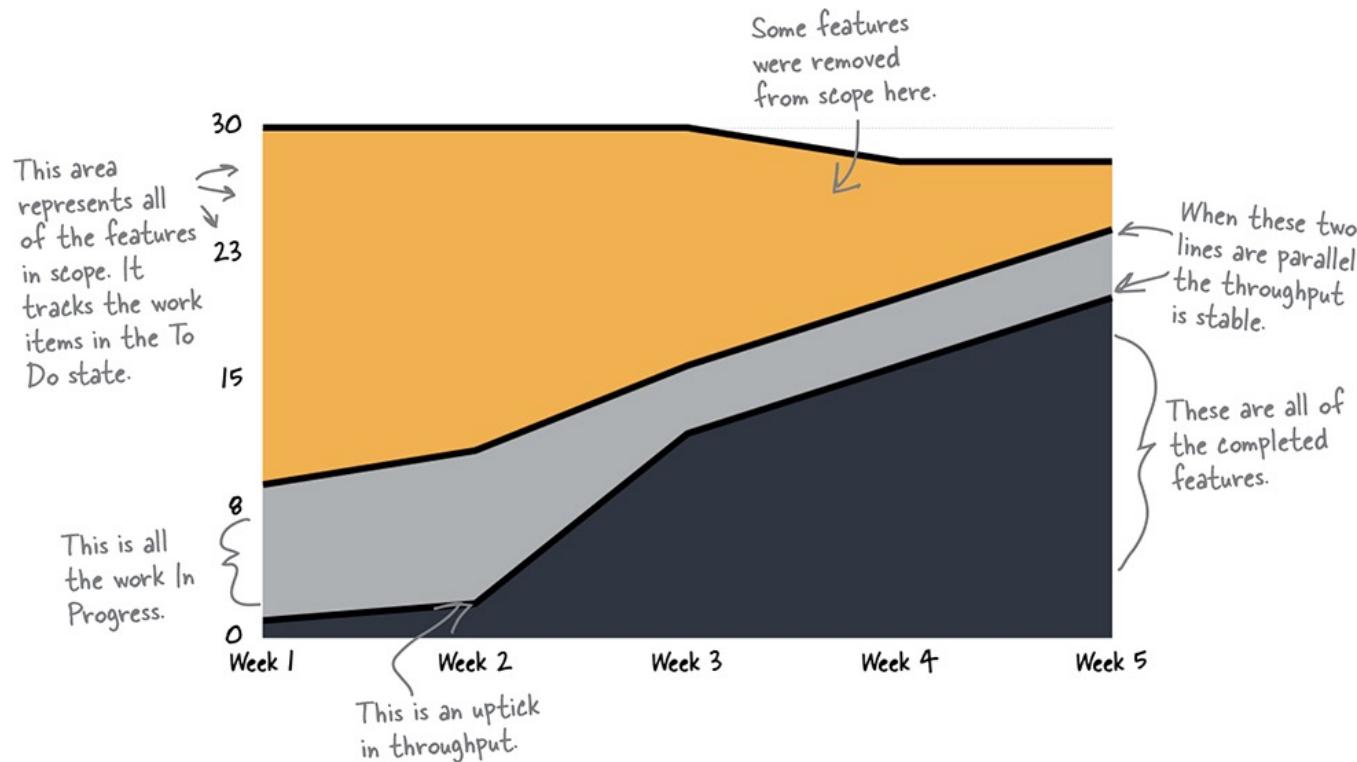
Typical Kanban Board



Source: Agile Foundations - Principles, practices and frameworks, by Peter Measey
Published by BCS Learning & Development Limited, 2015

Cumulative flow diagram (Example-1)

- Kanban teams use cumulative flow diagrams (or CFDs) to find out where they are systematically adding waste and interrupting their flow.



Source: Head First Agile by Jennifer Greene; Andrew Stellman, Published by O'Reilly Media, Inc., 2017

Q&A

- » Q4 <https://forms.gle/XwFUwDgDsGE4btNL8>
- » Q11 <https://forms.gle/dRMWUqDiEHk8dyiJA>
- » Q12 <https://forms.gle/NKWokLkTZxmemrNB8>
- » Q13 <https://forms.gle/GtKZ38Pdyzxz7wkDA>



Module-4 - Agile Methodologies – Additional Notes

Scrum

- History and Origins
- Scrum is a **single-team process** framework used to manage product development.
- Empirical process framework
 - **Empirical method** : A process how you think something works, test it out, reflect on the experience, and make the proper adjustments
 - **Inspection, Adaption, Transparency**
 - Based on adaptive life cycle method (Iterative and Incremental)
- Scrum is the most common approach to agile for good reasons:
 - The **rules of Scrum** are straightforward and easy to learn and teams all around the world have been able to adopt them and improve their ability to deliver projects.
 - **Using Scrum effectively is not so simple**

Scrum Life Cycle Process

Life Cycle and Process

PRE-GAME		DEVELOPMENT		RELEASE
PLANNING	STAGING			
<p>Purpose:</p> <ul style="list-style-type: none"> - establish the vision, set expectations, and secure funding <p>Activities:</p> <ul style="list-style-type: none"> - write vision, budget, initial Product Backlog and estimate items - exploratory design and prototypes 	<p>Purpose:</p> <ul style="list-style-type: none"> - identify more requirements and prioritize enough for first iteration <p>Activities:</p> <ul style="list-style-type: none"> - planning - exploratory design and prototypes 	<p>Purpose:</p> <ul style="list-style-type: none"> - implement a product or system ready for release in a series of 30-day iterations (Sprints) <p>Activities:</p> <ul style="list-style-type: none"> - Sprint planning meeting each iteration, defining the Sprint Backlog and estimates - daily Scrum meetings - Sprint Review 		<p>Purpose:</p> <ul style="list-style-type: none"> - operational and functional deployment <p>Activities:</p> <ul style="list-style-type: none"> - documentation - training - marketing & sales - ...

Ref: So, What's The Big Deal About Scrum?, by André Akinyele, 2019

Scrum Roles

The Scrum Team - Roles



Product
Owner

- Holds the vision for the product and controls the budget
- Works to maximize value delivered by the team
- Clearly expresses what's to be done, makes the Product Backlog visible and transparent to all
- Sets priorities for the team in terms of which Product Backlog items to work on next
- Should be a single person, not a committee



Development
Team

- Create working increments of “done” work
- Self-organizing – team decides how to deliver
- Cross-functional – have all the skills on the team necessary to do the job
- Individuals may have specialist skills, but are accountable as a team for delivery
- Scrum only recognises the title “developer” within the team
- Scrum doesn't ask for or recognise sub-teams within the team



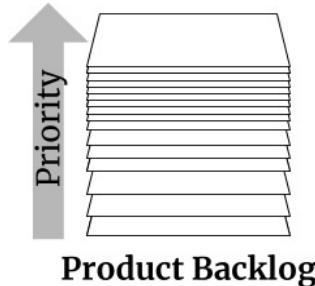
Scrum
Master

- Coaches the team in the use of Scrum
- Coaches the organization how to get best value from its interactions with the team
- Facilitates events as requested or needed (Daily Scrum, Sprint Planning)
- Removes impediments to the team's progress
- Acts as a servant leader to the team

Ref: The Agile Developer's Handbook, by Paul Flewelling, Published by Packt Publishing, 2018

Scrum Artifacts

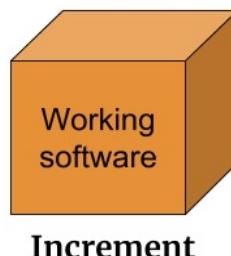
Scrum Artifacts



The set of requirements for the product, usually in the form of User Stories. Managed and prioritized by the Product Owner



The set of requirements the team have selected from the top of the Product Backlog to complete in the upcoming Sprint



The increment of working software that we create during the Sprint from the user stories on the Sprint Backlog. This is completed work, in useable condition, which is ready to be released (or already has been)

Ref: The Agile Developer's Handbook, by Paul Flewelling, Published by Packt Publishing, 2018

Sprint Events/Ceremonies

innovate

achieve

lead

30 days

2 WKS. TO 4WKS.

The **Sprint** is a **timeboxed** iteration. Most teams use a two-week Sprint, but it's common to see 30-day Sprints as well.

Planning

Daily Scrum

Daily Scrum

Daily Scrum

Development

Daily Scrum

Daily Scrum

Daily Scrum

Sprint Review

Retrospective

The **Sprint Planning** session is a meeting with the whole team, including the Scrum Master and Product Owner. For a 30-day Sprint it's timeboxed to 8 hours, for 2-week Sprints it's 4 hours, and other Sprint lengths have proportionally sized timeboxes. It's divided into parts, each timeboxed to half of the meeting length:

- ★ In the first half, the team figures out **what** can be done in the Sprint. First the team writes down the **Sprint Goal**, a one- or two-sentence statement that says what they'll accomplish in the Sprint. Then they work together to pull items from the Product Backlog to create the **Sprint Backlog**, which has everything they'll build during the Sprint.
- ★ In the second half, they figure out **how** the work will get done. They break down (or **decompose**) each item on the Sprint Backlog into **tasks** that will take one day or less. This is how they create a **plan** for the Sprint.

The **Daily Scrum** is a 15-minute timeboxed meeting. It's held at the same time every day, Development Team and the Scrum Master meet, the Product Owner is strongly encouraged to participate. Each person answers three questions:

- ★ What have I done since the last Daily Scrum to meet the Sprint Goal?
- ★ What will I do between now and the next Daily Scrum?
- ★ What roadblocks are in my way?

All of the work is planned, but not all of it is decomposed. The meeting timebox can expire before the team's done decomposing every Sprint Backlog item, so they concentrate on decomposing work for the first days of the Sprint.

In the **Sprint Review** the whole team meets with key users and stakeholders who have been invited by the Product Owner. The team demonstrates what they built during the Sprint, and gets feedback from the stakeholders. They'll also discuss the Product Backlog, so that everyone knows what will *probably* be on it for the next Sprint. For 30-day Sprints, this meeting is timeboxed to four hours.

The **Sprint Retrospective** is a meeting that the team uses to figure out what went well and what can be improved. Everyone on the team participates, including the Scrum Master and Product Owner. By the end of the meeting they'll have written down specific improvements that they can make. It's timeboxed to three hours for a 30-day Sprint.

Ref: Head First Agile by Jennifer Greene; Andrew Stellman, Published by O'Reilly Media, Inc., 2017

The Sprint is over **when its timebox expires**.



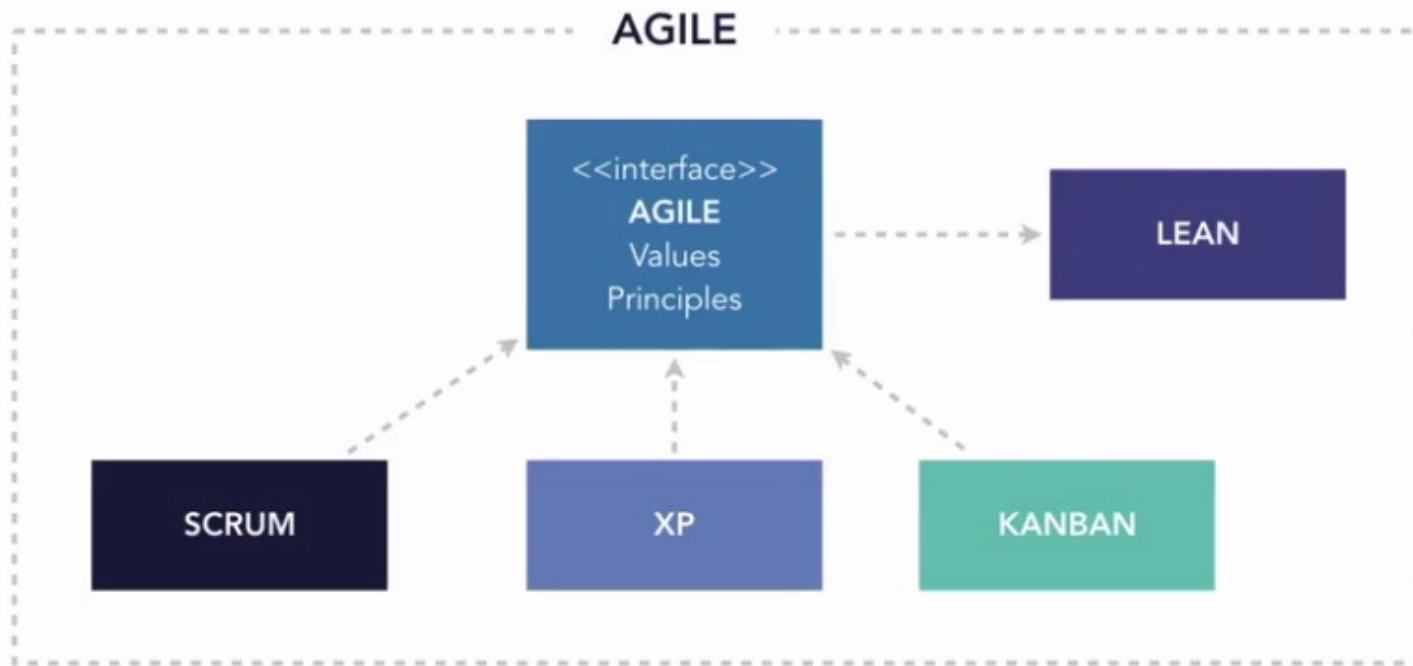
XP- Extreme Programming

References: Agile Foundations - Principles, practices and frameworks, by Peter Measey
Published by BCS Learning & Development Limited, 2015
Scaling Software Agility: Best Practices for Large Enterprises by Dean Leffingwell
Published by Addison-Wesley Professional, 2007

What is eXtreme Programming?

- XP is a widely used agile software development method developed by Ken Beck, 2000.
- Key Practices:
 - A team of five to 10 programmers work at one location with **customer representation on site**.
 - Development occurs in **frequent builds or iterations**, each of which is releasable and delivers incremental functionality.
 - Requirements are specified as **user stories**, each a chunk of new functionality the user requires.
 - **Programmers work in pairs**, follow strict coding standards, and do their own unit testing.
 - Requirements, architecture, and **design emerge** over the course of the project.
 - XP is prescriptive in scope. It is best applied to **small teams** of under 10 developers, and the **customer should be either integral to the team or readily accessible**
- What is Extreme?
 - – Practices are to its purest, simplest form, P-Programming- innovative and sometimes controversial practices for the actual writing of software.
-

How XP fits in Agile



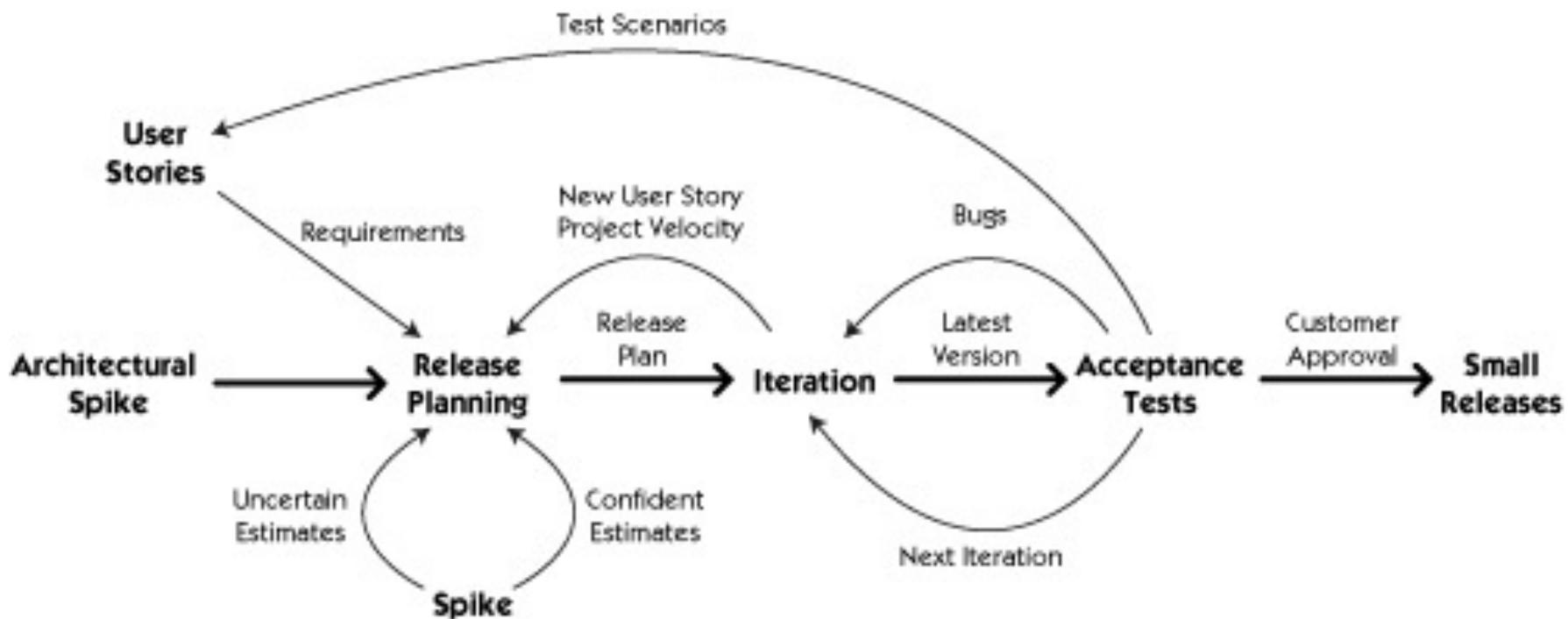
Source :LinkedIn Learning/XP overview

XP Theme

- **The primary theme of XP is that if something hurts, do it all the time.**
 - If code reviews are good, we'll review code all the time (pair programming).
 - If testing is good, everybody will test all the time (unit testing), even the customers (functional testing).
 - If design is good, we'll make it part of everybody's daily business (refactoring).
 - If simplicity is good, we'll always leave the system with the simplest design that supports its current functionality (the simplest thing that could possibly work).
 - If architecture is important, everybody will work at defining and refining architecture all the time (metaphor).
 - If integration testing is important, we will integrate and test several times a day (continuous integration).
 - If short iterations are good, we will make the iterations really, really short—seconds and minutes and hours, not weeks and months and years.
- **The Extreme case!**

Source :[Lynda.com/XP overview](https://www.lynda.com/XP-overview)

A visual process model for XP



XP Core Values

- **Communication** (Key to Product Quality)
 - Planning, Estimation, Co-location, Pair-programming, Unit tests
- **Feedback** (Ensures stay on course)
 - Short iterations, On-site customer, State of functional tests shows the current development of the project and unit tests shows state of the code base.
- **Simplicity**(Simple design has least bugs and easy to modify)
 - “Do the simplest thing that could possibly work” philosophy, focusing on solutions for the current iterations of work and contribute to rapid development of stories.
 - No extra functionality.
- **Respect** (Respect each other ideas we are creating together)
 - Respecting oneself and other team members in the team
- **Courage** (It takes courage to do things you know are right)
 - It takes courage to highlight issues/Architecture flaw even late in the day, it takes courage to throw away the code when you recognize that there is a better design. takes courage to refactor the another developer code, Courage to fail. Change.

Basic XP principles

- **Humanity**
 - XP's first principle is the simple principle of humanity.
 - Focus on people, empower people, provide benefits to people, and you and your people are likely to find a way to a process that engages people in working together and solving problems in new and innovative ways.
- **Rapid feedback**
 - Seek feedback at the **earliest possible moment**, interpret it appropriately and **apply learning** from it back into the system. In practice this is **achieved** by the different Planning, **testing activities**, **direct communication with the customer**, **sharing of knowledge** and **code** across the whole team.
- **Assume simplicity**
 - Choose the simplest solution that could solve the problem. By applying the principle of simplicity to development, design and code becomes leaner, resulting in quicker development.
 - The phrase 'You Ain't Gonna Need It' (**YAGNI**) was coined to embody this principle., **DRY** (Don't Repeat Yourselves)

XP Principles ...

- Incremental change/Baby Steps
 - Small manageable steps/tasks. Work incrementally, one/two week iterations
- Embrace change
- Quality work
 - An XP team is committed to the principle of doing a good job.
 - By producing quality work, members of an XP team will be proud of their contribution to the project, which becomes a **motivating factor**.
 - Sacrificing quality will only have a negative effect on a project. As one of the fundamental principles of XP, **it should not be optional**.
- Reflection.
 - Retrospect and improve

Further principles

These principles are more specific to particular situations.

- Teach learning
- Small initial investment (Focus on innovation)
- Play to win
- Concrete experiments
- Open and honest communication
- Work with people's instincts, not against them
- Accepted responsibility
- Local adaptation
- Travel light
- Honest measurement

Key XP Practices

The planning game:

Release planning: (Monthly or Quarterly)

- **User-stories**, Customer responsibility, Stakeholders
- **Exploration phase** (Elaboration, estimation – **Whole Team** activity)
- **Commitment phase** (Based on the business value, combined with the estimates, the customer will decide the scope and date of the next release)
- **Steering phase** (Weekly cycle - executed over the remaining time till release)
 - Feedback from each iteration's delivery is used to **steer** the project. Both the customer and team have opportunities during the steering phase to make changes.

XP Practices

- Small releases
 - Small releases can start to gather feedback that can be used in steering the system's subsequent development, as well as potentially delivering business value early.
- Metaphor
 - Used to form a form an understanding of the system by whole team through the project
 - Example: Shopping cart as metaphor to discuss e-Commerce application requirements.
- Simple design
- Testing
 - All **stories** are to have automated functional tests
 - Indications of progress as new tests are shown to be successful.
 - Confidence in the system as existing tests are shown to be successful.
 - Team is driven by tests , **Test Driven development (TDD)**

XP Practices ...

- **Refactoring**
 - Refactoring is the process of simplifying the internal structure of code without affecting its external behavior
 - TDD = Test first + Refactoring
- **Pair programming**
 - Code is created by **two** developers using **one** machine.
 - When One person codes, other person in in different perspective - about the design, different solutions, how code fits into overall solutions.
 - After a period of time or at a convenient point, the developers swap places.
 - **Benefits:**
 - Conversation during the process helps to quickly move the solution on.
 - Knowledge is shared as developers pair with different individuals.
 - Code is reviewed in real-time; teams that practice pair programming often eschew code reviews.
 - The practice promotes collective code ownership.

XP Practices ...

- **Collective ownership**
 - Developers can improve any part of the code at any time.
 - This practice also avoids code becoming owned by individuals, which can lead to bottlenecks in development and poorly designed code.
- **Continuous integration**
 - The codebase should be integrated and automated tests run frequently.
 - Developers working locally on their machines should check-in their changes frequently, ensuring that code conflicts are identified and resolved quickly.
- **10-Minute build**
 - Build, Deploy and Test - all in 10 minutes
 - Build Server/Integration server – Builds the code automatically - pull the code from the source control system and compiles the integrated code, then deploy the code on a test/stage environment and run automated tests) Example: Jenkins integration server
 - Continuous integration is a practice of integrating the code several times a day
 - Having a build server/integration server alone is not continuous integration

XP Practices ...

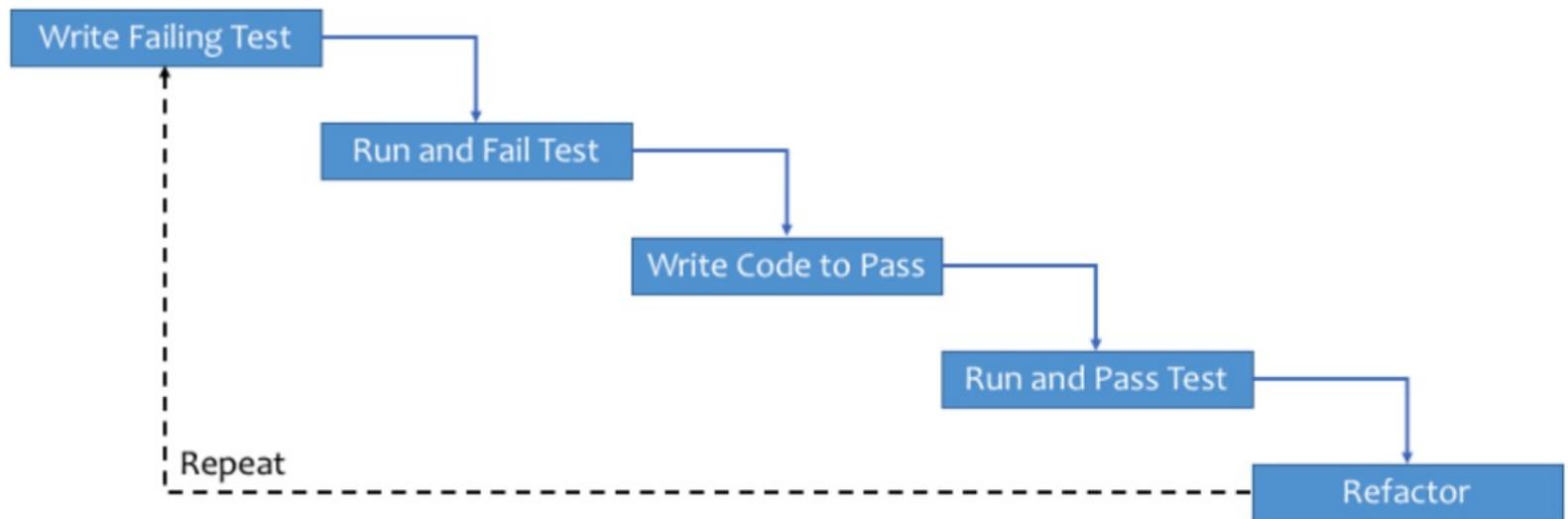
- **Forty-hour week (Energized work)**
 - Teams aim for sustainable phase
 - XP does not forbid overtime, but it has a clear rule – *You can't work a second week of overtime.*
- **On-site customer**
 - A real customer should sit with the team.
 - This person will be someone who will use the system, who has the knowledge and authority to answer questions and who can provide business related clarification so that issues don't block the progress of the iteration.
- **Coding standards**
 - A common coding standard, agreed by all developers, must be adopted across the team.
- **Informative workspace (Information Radiator)**
 - Visual board, Managers can assess status and see what people are working on by simply walking through the team area.



Test Driven Development (TDD)

Test Driven Development- General work flow

- A Process where the Developer takes responsibility of the Quality of their code
- Unit tests are written before the production code.
- Don't write all tests at once
- Tests and Production code are written in small bits of functionality
- TDD is a XP process and created by Ken Buck.



<https://www.freecodecamp.org/news/learning-to-test-with-python-997ace2d8abe/>



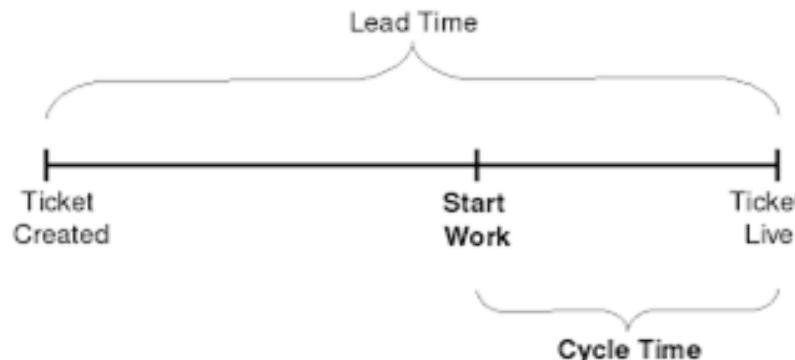
Lean Software Development

What is Lean?

- Lean is a systematic method to eliminate waste and maximize the flow of value through a system. Value is defined as something your customer will pay money for.
- Lean employs something called Value stream mapping.
- This practice is widely used in Manufacturing world.

Lead time & Cycle Time

- Lead time tracks the total amount of time it takes from when work is requested until it's delivered.
- Cycle time tracks the amount of time we spend working on it. (Also called Processing time or Throughput time)



Value Stream Mapping

- Value is defined as something your customer will pay money for.
- Value Stream Mapping practice generates a diagram that shows the exact places where value is created in your system and how it flows through your organization.



7 Principles of Lean Software Development

1. Eliminate Waste

Type of waste in SW Development

- **Unnecessary code or functionality:** Delays time to customer, slows down feedback loops
- **Starting more than can be completed:** Adds unnecessary complexity to the system, results in context-switching, handoff delays, and other impediments to flow
- **Delay in the software development process:** Delays time to customer, slows down feedback loops
- **Unclear or constantly changing requirements:** Results in rework, frustration, quality issues, lack of focus
- **Bureaucracy:** Delays speed
- **Slow or ineffective communication:** Results in delays, frustrations, and poor communication to stakeholders which can impact IT's reputation in the organization

2. Build Quality In

- **Pair programming:** Avoid quality issues by combining the skills and experience of two developers instead of one
- **Test-driven development:** Writing criteria for code before writing the code to ensure it meets business requirements
- **Incremental development** and constant feedback
- **Minimize wait states:** Reduce context switching, knowledge gaps, and lack of focus
- **Automation:** Automate any tedious, manual process or any process prone to human error

3. Create Knowledge

- Pair Programming
- Code reviews
- Documentation
- Wiki – to let the knowledge base build up incrementally
- Chat, Chatops
- Thoroughly commented code
- Knowledge sharing sessions
- Training
- Use tools to manage requirements or user stories

4. Defer Commitment

- Don't make decision/commit if you can defer it at later point in time. Keep options open.
- Continuously collect and analyze the data or information

5. Deliver Fast

- Build a simple solution.
- Put it in front of customers
- Enhance incrementally based on customer feedback.
- Speed to market is an incredible competitive advantage esp. for Software.
- What slows them down?
 - Thinking too far in advance about future requirements
 - Blockers that aren't responded to with urgency
 - Over-engineering solutions and business requirements

6. Respect People

- Communicating proactively and effectively
- Encouraging healthy conflict
- Surfacing any work-related issues as a team (Blameless postmortem)
- Empowering each other to do their best work.

7.Optimize the Whole

- Value Stream mapping
- System thinking
- Operating with a better understanding of capacity and the downstream impact of work.

Lean Principles that are Proven to Work

- Small deliverables
- Limiting work in progress
- Information radiators and visibility into flow,
- Gathering, broadcasting and implementing customer feedback
- Empowered development teams who are free to experiment and improve.



Kanban

Kanban

- Taiichi Ohno, who was an industrial engineer at Toyota, developed the Kanban methodology in 2004 to improve efficiency at the manufacturing plant.
- The Kanban method is an approach to continuously improving service delivery that emphasizes the smooth, fast flow of work.
- Kanban is not an Agile software development method (or process) or a software engineering methodology
- Kanban is flow based methodology and a pull system.
- Kanban does not prescribe specific roles or process steps as it is built on the concept of evolutionary change.

Kanban teams need to see the whole, so the first thing the team does is to look at the way they're currently working and create an accurate visual representation of their workflow.

Kanban Core Practices

- ★ Visualize Workflow
- ★ Limit WIP
- ★ Manage Flow
- ★ Make Process Policies Explicit
- ★ Implement Feedback Loops
- ★ Improve Collaboratively, Evolve Experimentally

As the team learns how to work with flow, they set policies for the team to use to guide them with their work. Kanban teams make a point of clearly communicating those policies so they can be evaluated and changed if necessary.

Feedback loops are all about testing all of the policies and improvements the team is implementing to measure their effects and make sure they are working.

Once the team has a good view of where most of their work is in the workflow, they can start experimenting with WIP limits to see if it helps them focus and get more done.

The team can start to manage the flow through the system by paying attention to how quickly work is getting through their process.

By setting explicit policies, the team builds feedback loops, which are the building blocks that let the team collaborate to continuously improve the process and make it more and more efficient.

Kanban was formulated by David Anderson, who first started experimenting with the ideas of Lean while working at Microsoft and Corbis.

Source: Head First Agile by Jennifer Greene; Andrew Stellman, Published by O'Reilly Media, Inc., 2017

How to use Kanban to improve your process

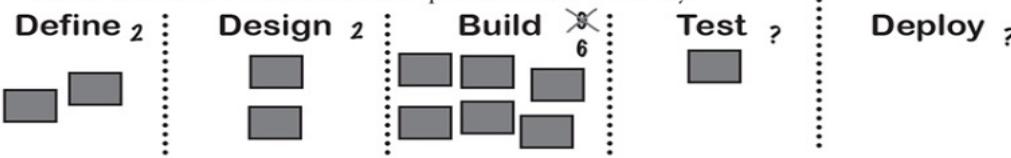
A value stream map is a great way to create this picture! These are the same boxes that you'd see at the top of the map.



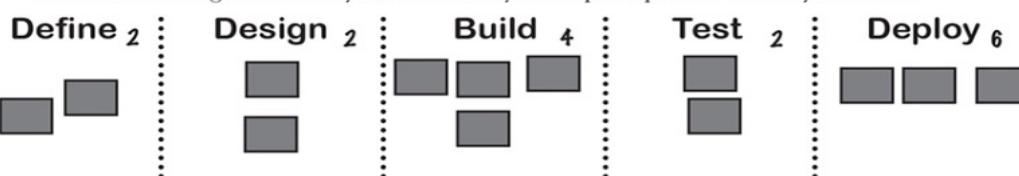
- 1 **Visualize Workflow:** create a picture of the process you're using today.



- 2 **Limit WIP:** watch how work items flow through the system and experiment with limiting the number of work items in each step until work flows evenly.

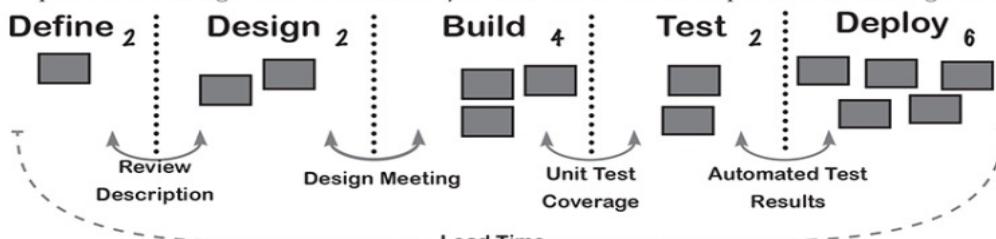


- 3 **Manage Flow:** measure the lead time and see which WIP limits give you the shortest time to delivering features to your clients. Try to keep the pace of delivery constant.



- 4 **Make Process Policies Explicit:** find out the unwritten rules that are guiding your team when they make decisions and then write them down.

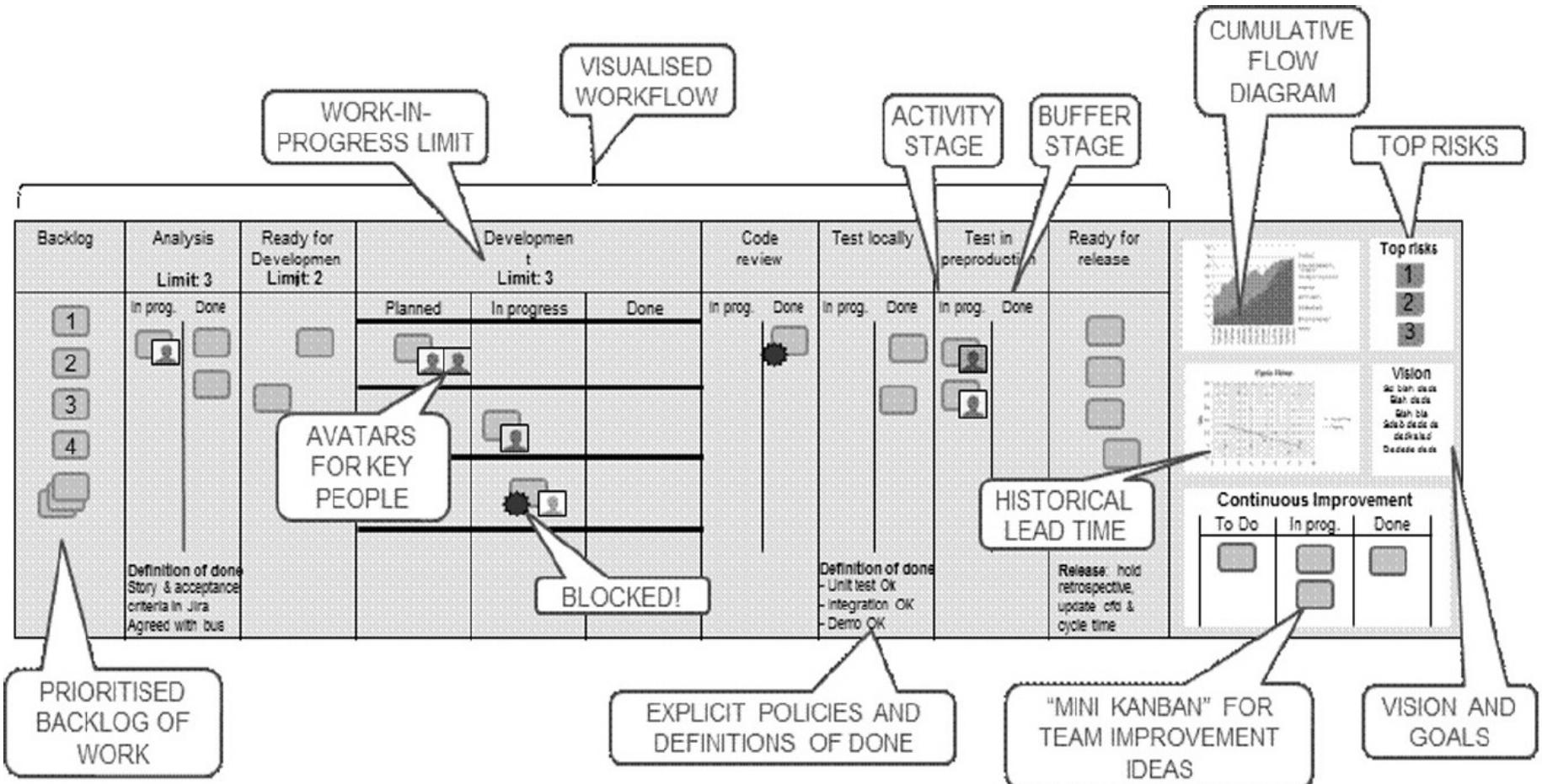
- 5 **Implement Feedback Loops:** for each step in the process create a check to make sure the process is working. Measure lead and cycle time to make sure the process isn't slowing down



- 6 **Improve Collaboratively:** share all of the measurements you gather and encourage the team to come up with suggestions to keep on experimenting

Ref: Head First Agile by Jennifer Greene; Andrew Stellman, Published by O'Reilly Media, Inc., 2017

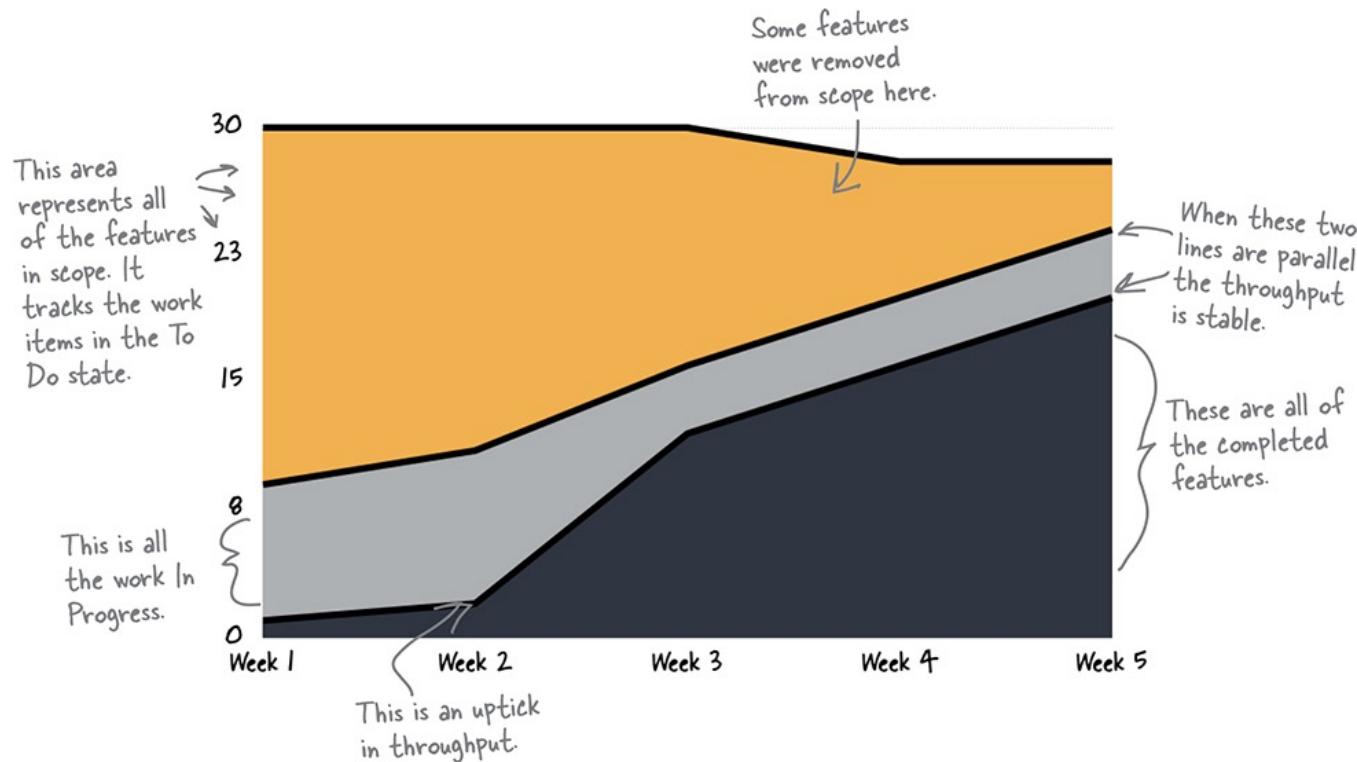
Typical Kanban board



Ref: Agile Foundations - Principles, practices and frameworks, by Peter Measey
 Published by BCS Learning & Development Limited, 2015

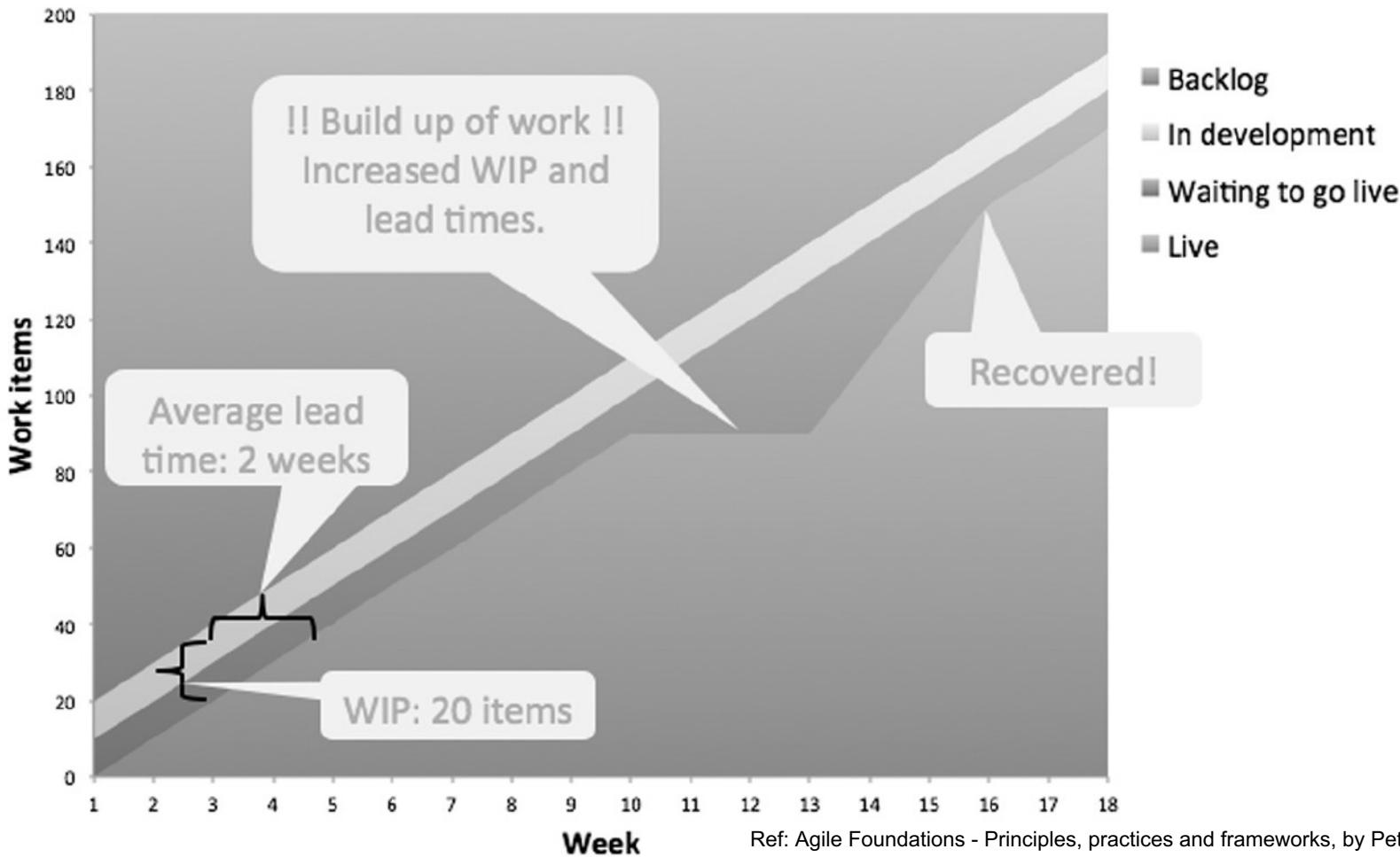
Cumulative flow diagram (Example-1)

- Kanban teams use cumulative flow diagrams (or CFDs) to find out where they are systematically adding waste and interrupting their flow.



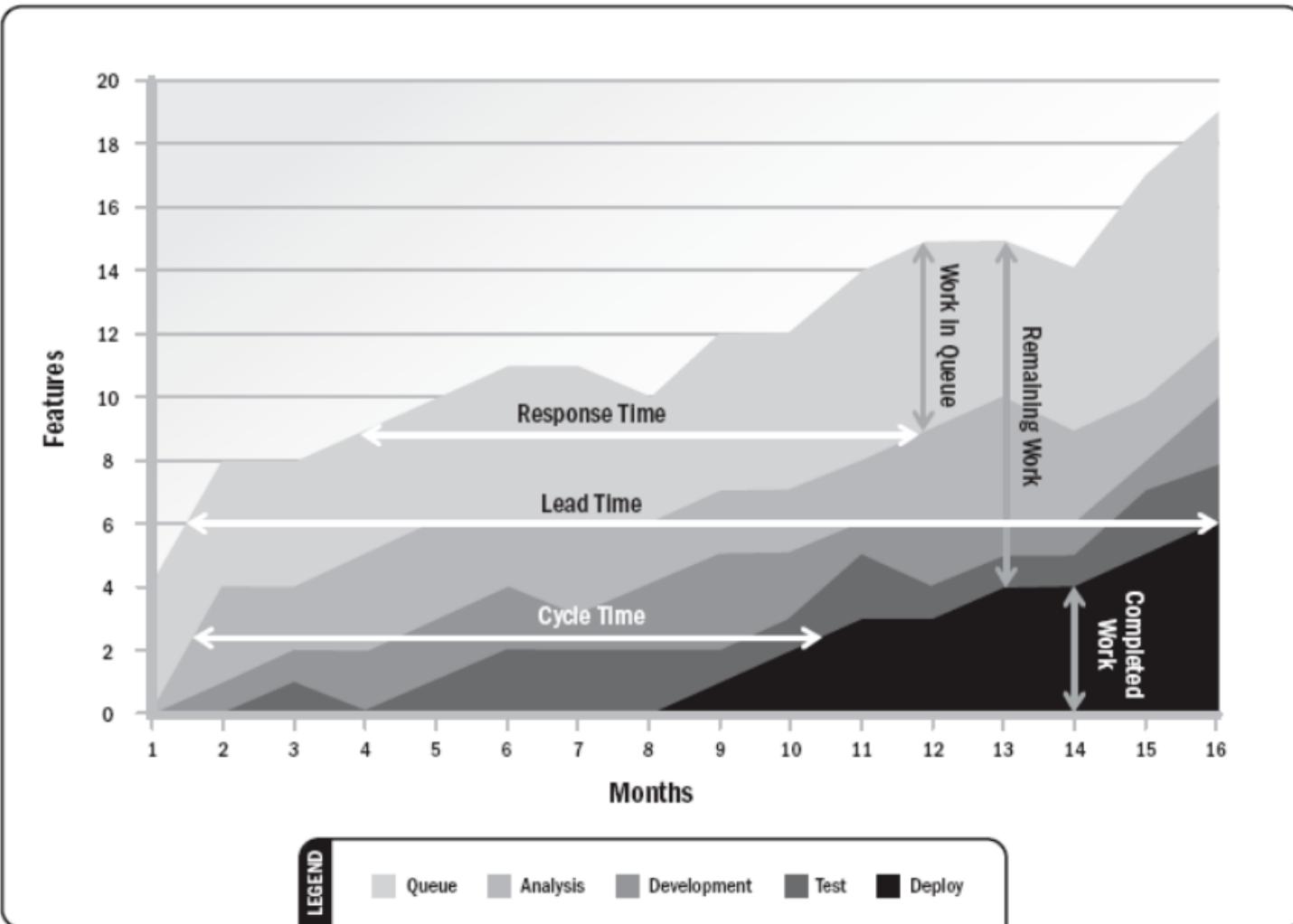
Ref: Head First Agile by Jennifer Greene; Andrew Stellman, Published by O'Reilly Media, Inc., 2017

Cumulative flow diagram (Example-2)



Ref: Agile Foundations - Principles, practices and frameworks, by Peter Measey
Published by BCS Learning & Development Limited, 2015

Cumulative flow diagram (Example-3)





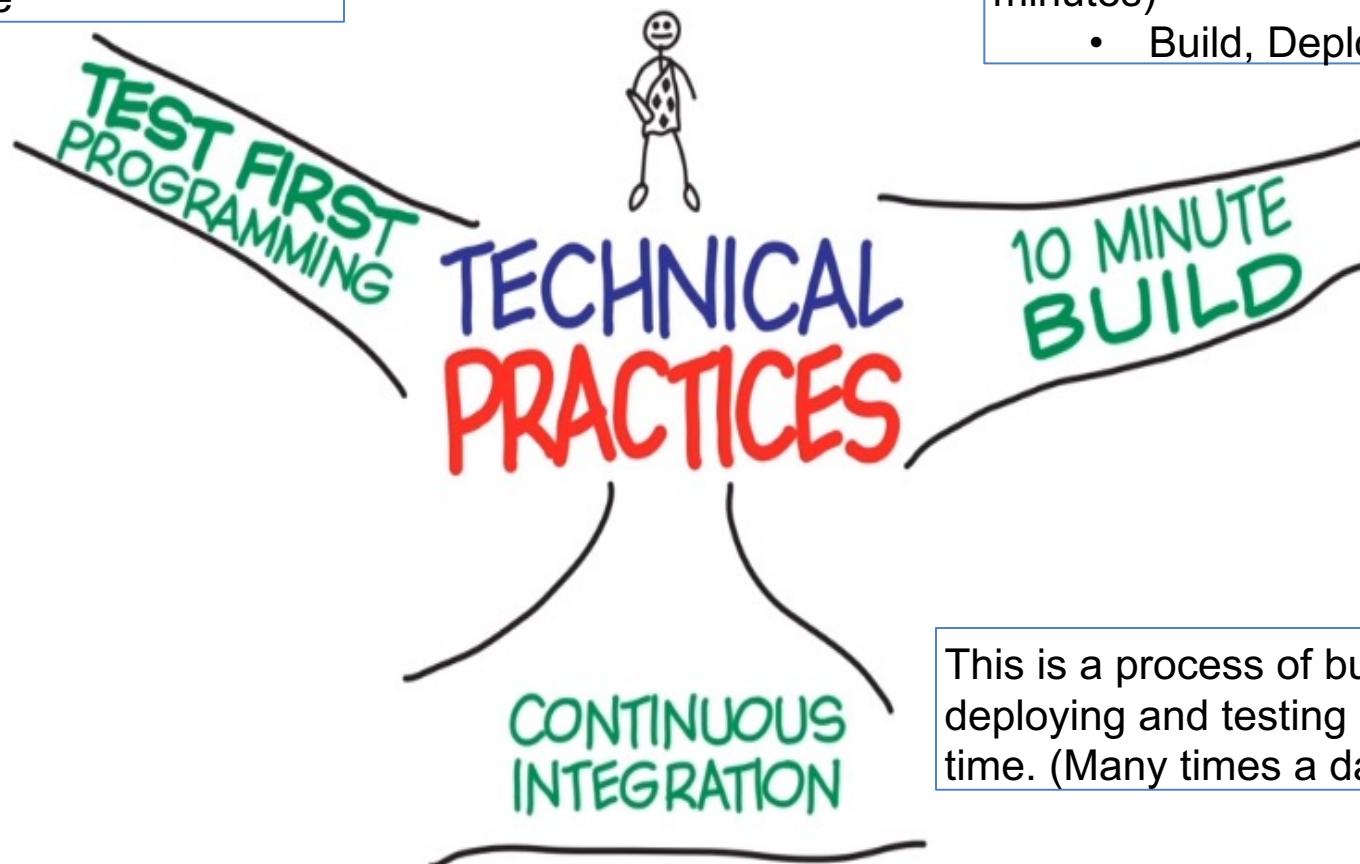
Module-4 XP-Technical Practices

XP-Technical Practices

TDD: Write tests before you write the code

Find any new problem as quickly as possible.(within 10 minutes)

- Build, Deploy, Test



This is a process of building, deploying and testing all the time. (Many times a day)

TDD Helps You Avoid Scope Creep



Scope Creep:

- One common reason why scope creep occurs is lack of documentation with clearly defined requirements.
- This problem can be mitigated through test driven development.
- In a TDD environment, developers write unit tests to test particular segments – units – of code. Unit tests serve as specifications that describe the precise features that should be implemented.
- Therefore, well-specified tests prevent developers from writing superfluous code.
- TDD helps developers focus on what's necessary and prevents gold plating – adding unnecessary or unwanted features that weren't specified in the project requirements.

TDD can serve as living documentation

- Code comments can get out of date , but the automated tests should be up-to-date, otherwise the tests will break the code. By looking at the test we can infer what the code supposed to do
- Tests can serve as documentation to a developer. If you're unsure of how a class or library works, go and have a read through the tests.

TDD Can Lead to Better Design

- A good test suite allows you to refactor, which allows you to improve your design over time.
- The TDD cycle is very detail-oriented and requires you to make some design decisions when writing tests, rather than when writing production code. I find this helps to think about design issues more deeply.
- TDD makes some design problems more obvious.
- Using automated tests, code needs to work with the_rest of the application and also with unit tests. The chances are the code can be reused elsewhere in your system.
- If you have difficulty in writing tests for the code, the changes are the code need to redesign.

TDD helps in Drive Progress

- One of the fundamental ideas behind the concept of test-first development is to let the tests show you what to implement in order to make progress on developing the software.
- You're not just coding away, oblivious to the requirements of the piece of code you're writing. You're satisfying an explicit, unambiguous requirement expressed by a test. You're making progress, and you've got a passing test to show for it.
- Forced to make the code to perform something useful because the tests are passed.

Unit and Acceptance Tests

- **Unit tests** are written by programmers to ensure that the code does what they intend it to do.
- **Acceptance tests** are written by business people (and QA) to make sure the code does what they intend it to do

10-Minute Build

- One of the practices recommended by Extreme Programming (XP) is to keep a ten-minute build. Kent Beck and Cynthia Andres write in *Extreme Programming Explained* (Second Edition):
- "Automatically build the whole system, Deploy and run all of the tests in ten minutes. A build that takes longer than ten minutes will be used much less often, missing the opportunity for feedback."

Continuous Integration

- Continuous Integration (CI) is a development practice that requires developers to integrate code into a shared repository several times a day. Each check-in is then verified by an automated build, allowing teams to detect problems early.
- By integrating regularly, you can detect errors quickly, and locate them more easily



Thank you



BITS Pilani
Pilani Campus

BITS Pilani presentation

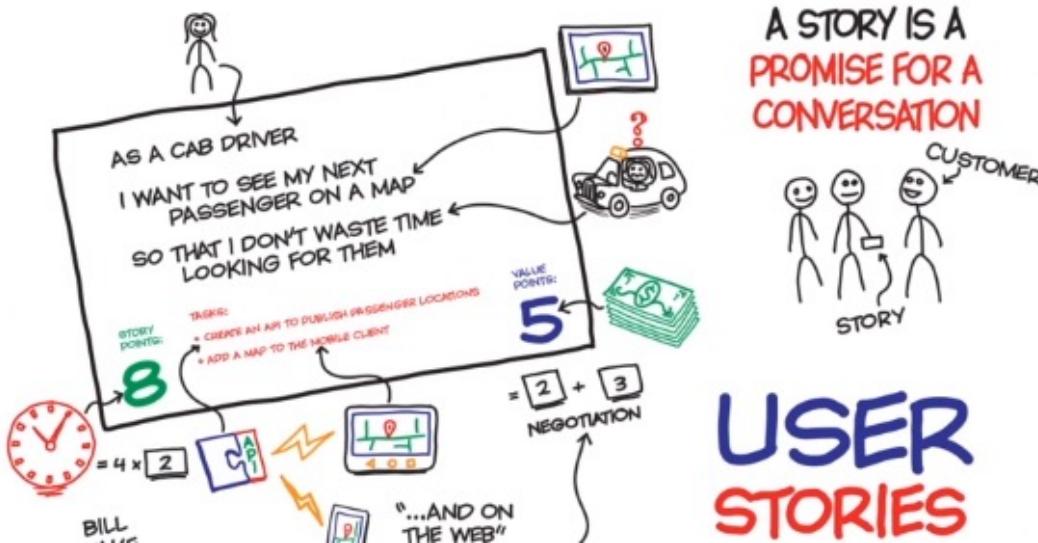
K.Anantharaman
kanantharaman@wilp.bits-pilani.ac.in



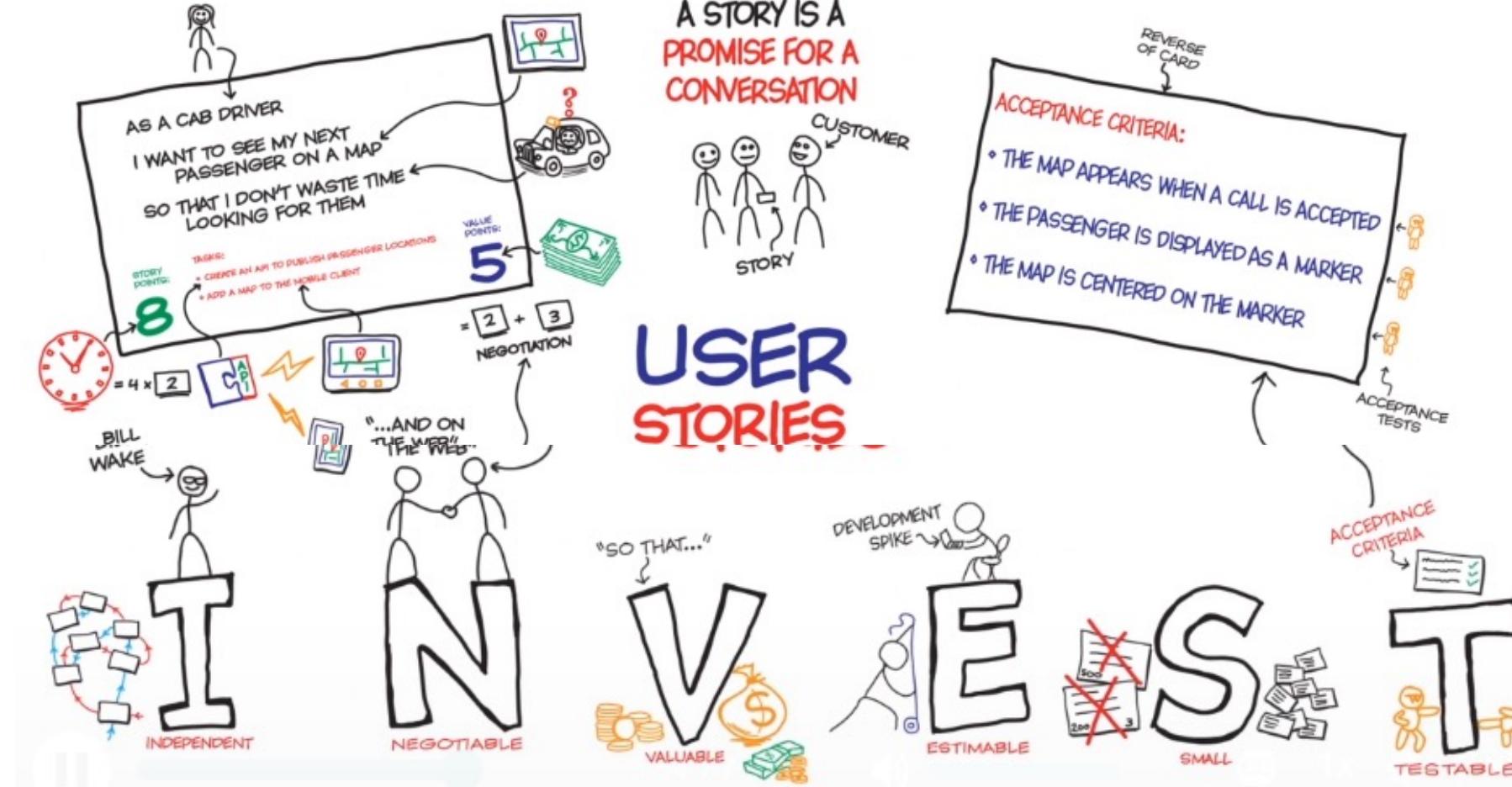
Module-5 Agile Requirements & Agile Estimation

Agile Requirements-1

(Effective User Stories - CCC)



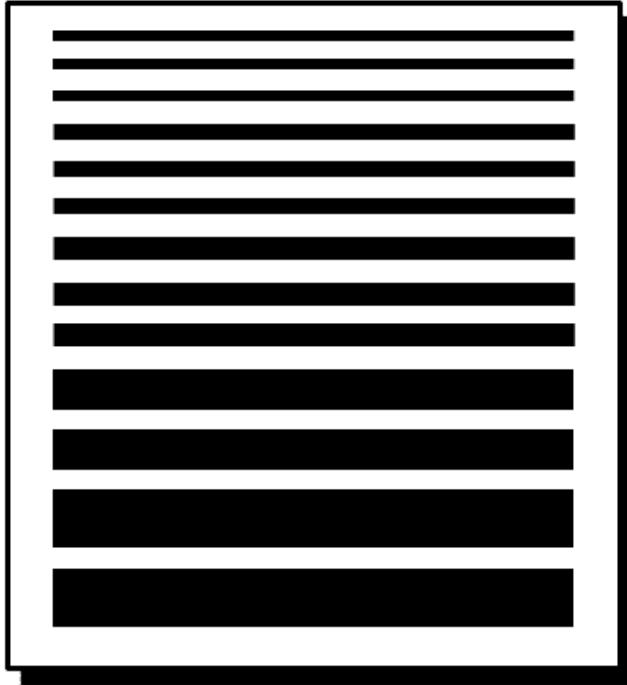
Effective User Stories (CCC & INVEST Guide)



Product Backlog



High Priority



Low Priority

Fine-grained, detailed items ready to be worked on in the next sprint

D E E P
Detailed Emergent Estimatable Prioritized

Large, coarse-grained items

- Themes, Epic

Q&A (Apply INVEST Test)



(Real Estate Project - House Construction)

1. As a home owner, I want my house to have walls so that the house will be wind-proof.
2. As a home owner I want the house to have a roof so that it will be rain proof.
3. As a property developer I want to build a mansion because mansions sell well in this area.
4. As a builder I want to use cement from Acme Corporation because it's run by my sister.
5. As a property developer I want the house to look great so that it will sell

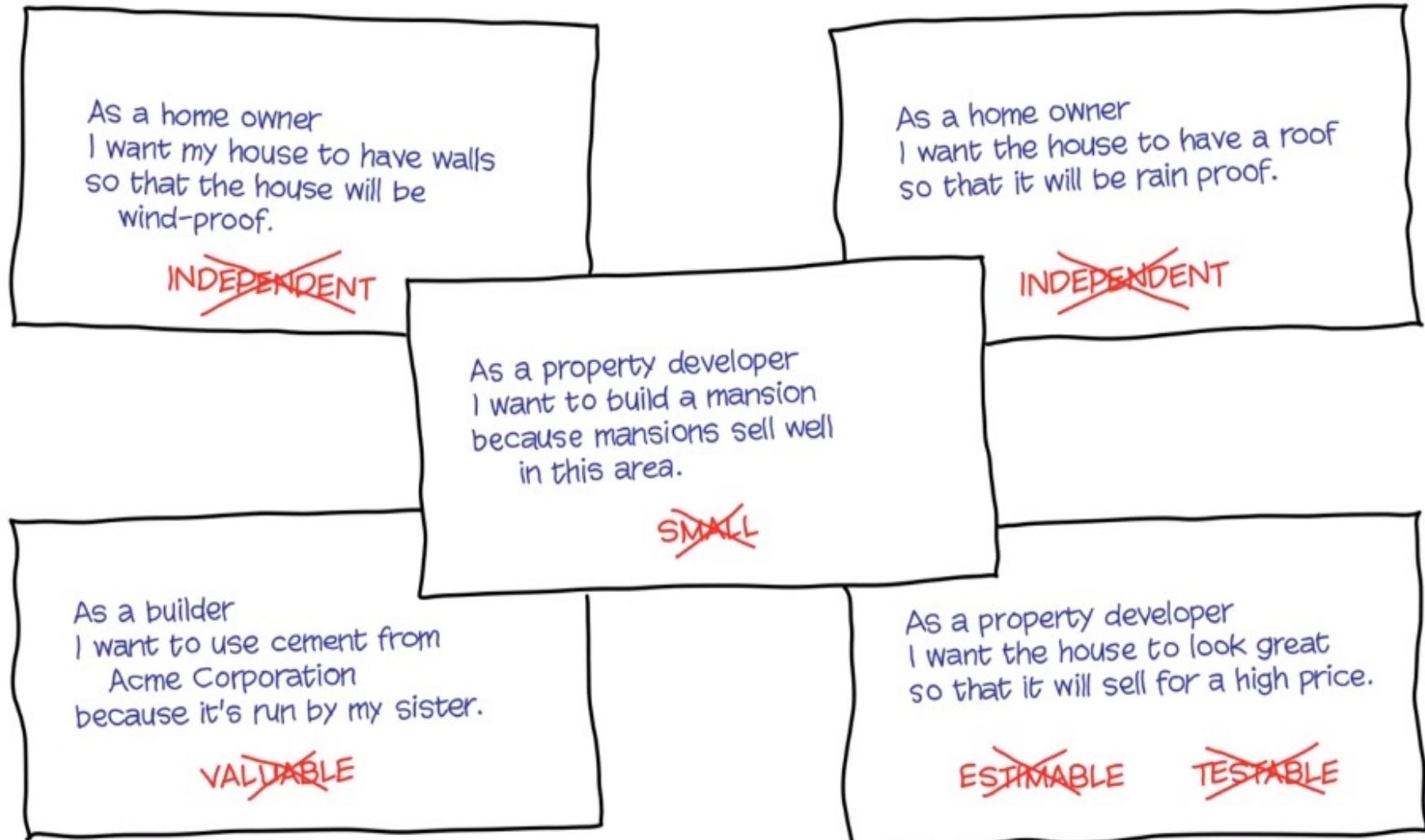
<https://forms.gle/bAjVy4iSD7QEhLGK9>

Q&A (Apply INVEST Test)-Answer

innovate

achieve

lead



Approaches to User Stories Prioritization



- Customer Valued Prioritization
 - Kano Analysis (Satisfied, Dissatisfied, Exciters)
 - MoSCoW Technique (Must have, Should have, Could have, Wont have)
- Relative Prioritization
 - Business Value Vs Risk Vs Effort
 - Relative Weighting Prioritization (Value/Cost)
- Story Mapping



Agile Estimation – Story Point Estimation

Agile Estimation

Absolute Estimation

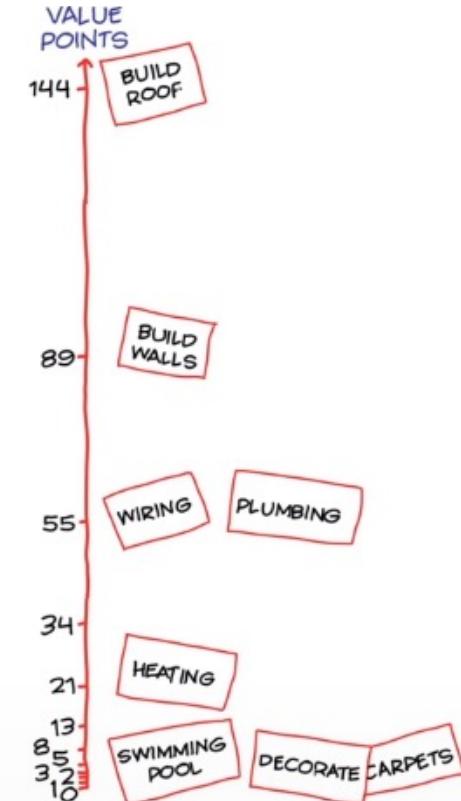
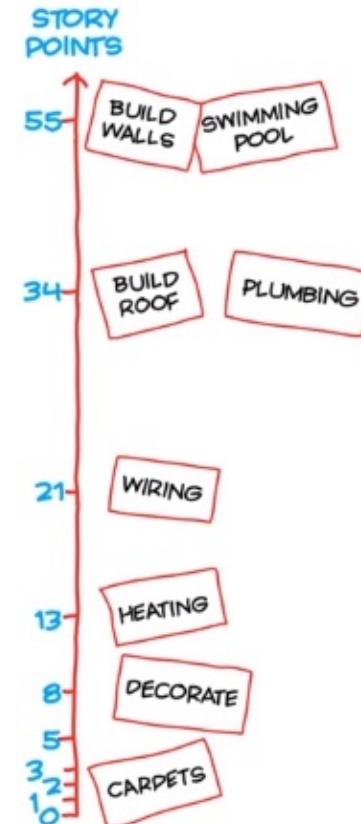
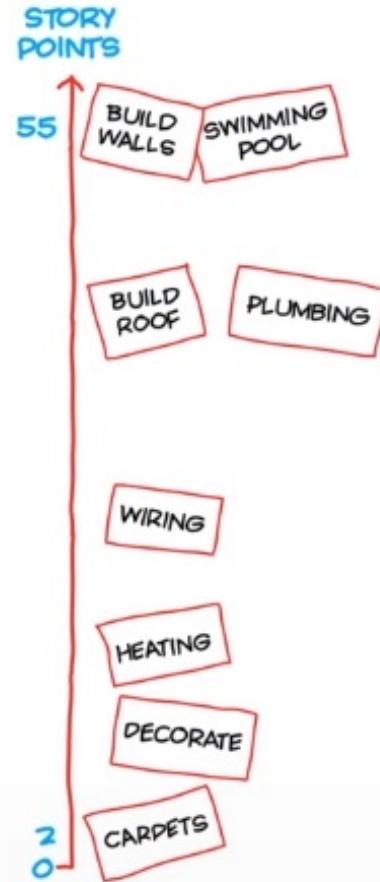
- ✓ Relative Estimation
- ✓ Fibonacci Sequence (1,2,3,5,8,13,21,34,55,)
- ✓ Story Point
- ✓ Value Point
- ✓ Velocity
- ✓ Average Velocity
- ✓ BFTB (Bank For The Buck)= Value Point /StoryPoint

Agile Estimation - User Stories



Example-Housing Project

User Stories
Build Walls
Carpets
Decorate
Build Roof
Wiring
Plumbing
Swimming Pool
Pool Heating



✓ Fibonacci Sequence (1,2,3,5,8,13,21,34,55,

Agile Estimation

↳ ↲

	STORY VALUE BFTB		
	34	144	4.2
BUILD ROOF	34	144	4.2
WIRING	21	55	2.6
BUILD WALLS	55	89	
HEATING	13	21	1.6
PLUMBING	34	55	
CARPETS	2	2	1
DECORATE	8	2	0.25
SWIMMING POOL	55	1	0.01

This story needs to go first

VELOCITY: 55
VALUE: 89
ITERATION 1

BUILD WALLS

Cost: \$20000,
Cost/Value= 20000/89 = \$225

VELOCITY: 55
VALUE: 199
ITERATION 2

BUILD ROOF
WIRING

Cost:
 $199 \times 225 = \$44000$

VELOCITY: 47
VALUE: 76
ITERATION 3

HEATING
PLUMBING

Cost: $76 \times 225 = \$17000$

VELOCITY: 10
VALUE: 4
ITERATION 4

CARPETS
DECORATE

Cost:
 $4 \times 225 = 900$

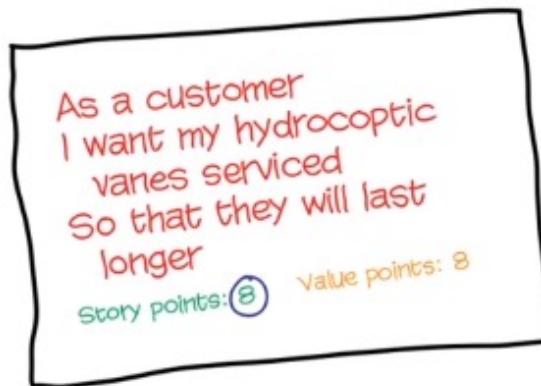
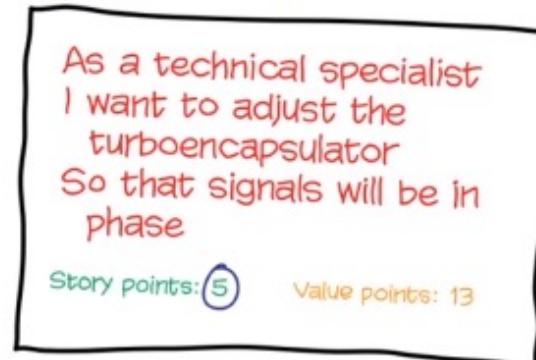
Iteration-5
Swimming Pool

Estimation Exercise

(Iteration Length = 2 weeks (10 Days, 8hrs Per day)

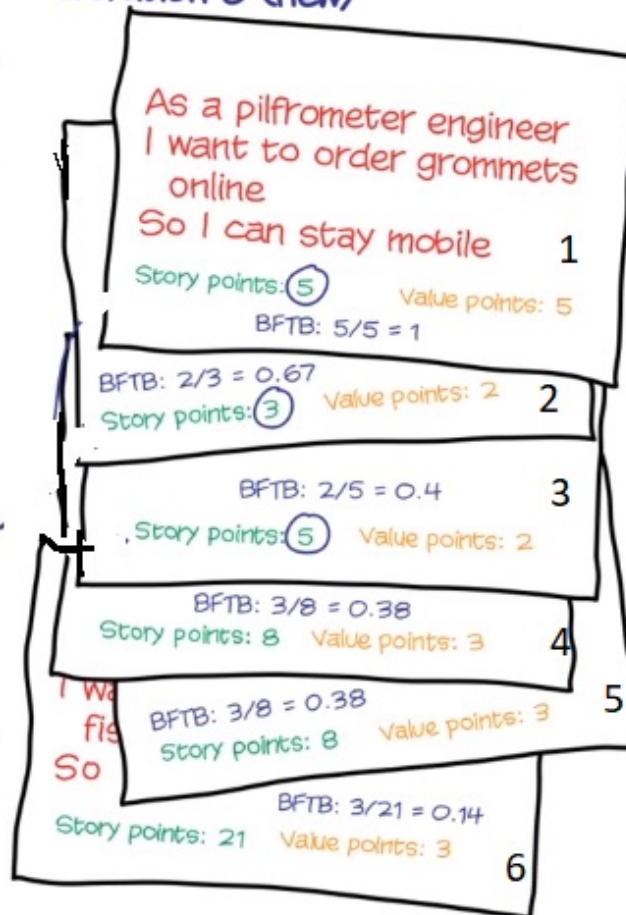


Iteration 7 (complete)



1. Iteration 7 velocity?
2. How long is a story point?
3. Which stories in the next iteration?
4. How long is the rest of the backlog?

Iteration 8 (new)



<https://forms.gle/Zkg8aYpUHdoGa6UV7>

Estimation Exercise

(Iteration Length = 2 weeks (10 Days, 8hrs Per day)

Iteration 7 (complete)

As a technical specialist
I want to adjust the
turboencapsulator
So that signals will be in
phase

Story points: 5

Value points: 13

As a customer
I want my hydrooptic
vanes serviced
So that they will last
longer

Story points: 8

Value points: 8

1. Iteration 7 velocity?

8+5 = 13 Story Points

2. How long is a story
point?

80 hrs = 13 Story Points
1 Story Point = $80/13$
= 6.15hrs

3. Which stories in the
next iteration?

4. How long is the rest
of the backlog?

Total SP= 5+3+5+8+21
=50 Points
Time = $50 * 6.5 \text{ hrs} = 307.5 \text{ hrs}$

Iteration 8 (new)

As a pilfrometer engineer
I want to order grommets
online
So I can stay mobile

Story points: 5 Value points: 5

BFTB: $5/5 = 1$

BFTB: $2/3 = 0.67$

Story points: 3 Value points: 2

BFTB: $2/5 = 0.4$

Story points: 5 Value points: 2

BFTB: $3/8 = 0.38$

Story points: 8 Value points: 3

BFTB: $3/8 = 0.38$

Story points: 8 Value points: 3

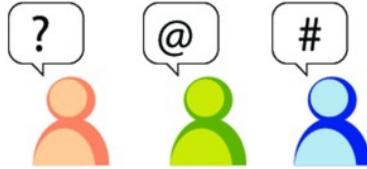
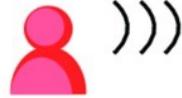
BFTB: $3/21 = 0.14$

Story points: 21 Value points: 3

Planning Poker

How User Stories are estimated by the team?

1. Customer reads story.



Development team asks questions

2. Team estimates.
This includes testing.

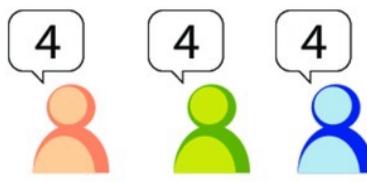


Discussion ...

3. Team discusses.



4. Team estimates again.
Repeat until consensus reached.



Estimator	Round 1	Round 2
Team member-1	3	5
Team member-2	8	5
Team member-3	2	5
Team member-4	5	8

Ref: The Agile Samurai by Jonathan Rasmusson Published by Pragmatic Bookshelf, 2010
Image source: <https://www.pmi.org/learning/library/agile-project-estimation-techniques-6110>



Module – Agile Requirements & Agile Estimation – Additional Notes

Requirements Gathering in Waterfall Method



- In Waterfall model, We tend to describe upfront how the entire product/system will work and document them.
 - PRD or SRS or CRS
- The problem with gathering requirements as documentation isn't one of volume—**it's one of communication.** It's just really easy to misinterpret what someone wrote.
- Other Issues:
 - Lengthy Process (1 to 3 months), Sometime Project wont get started
 - Requirement change is hard, especially late in the cycle
 - Bad guesses and wrong assumptions and so on

Requirements Gathering in Agile



- In Agile Projects, **User Stories** are the main way to track the information or requirements, of the project.
- User Stories tell us about:
 - What customer the wants the team to do?
 - How valuable the work is?
 - How long it is likely to take completed?
- **User stories are fundamental unit** of product development in Agile environments
- User stories describe single feature **which enable rapid iteration.**

Why Write User Stories?

- User stories also enable empathic design and development as they are written from the perspective of the end user
- A well-written user story will communicate both how a feature will work and how it will benefit the end-user
- User stories ensure that teams are building features to meet a user goal or need instead of “building stuff to build stuff”

Empathic design is a user-centered design approach

Another User Story format and Examples



Writing User Stories

The user story is written in the following format:

"As a [user], I want to do [x] so that I can accomplish [y]."

For example, "As a Gmail user, I want to
be able to attach a photo to an email so
that I can share it as part of my
message."

Who?

What?

Why?

Note: If the user story involves a frontend (user-facing) design component, the design files should be included with the user story

Ref: Writing User Stories By Ryan Harper O'Reilly Media -Video

User Story Examples

A user story for returning images in Google Image search.

“As a Google Images user, when I search for an image I want to see images that match my query so that I can find the image for which I’m looking.”

- Note that, user story does not focus on how the images will be returned or displayed, but rather on end user’s goal and needs.

Writing Acceptance Criteria for User Stories



- The second part of the user story , **the acceptance criteria**, explains how the feature will work.
- The acceptance criteria consists of series of **boolean statements (true or false)**, such as “ When [x] happens, [y] should happen

Acceptance Criteria/Conditions of Satisfaction

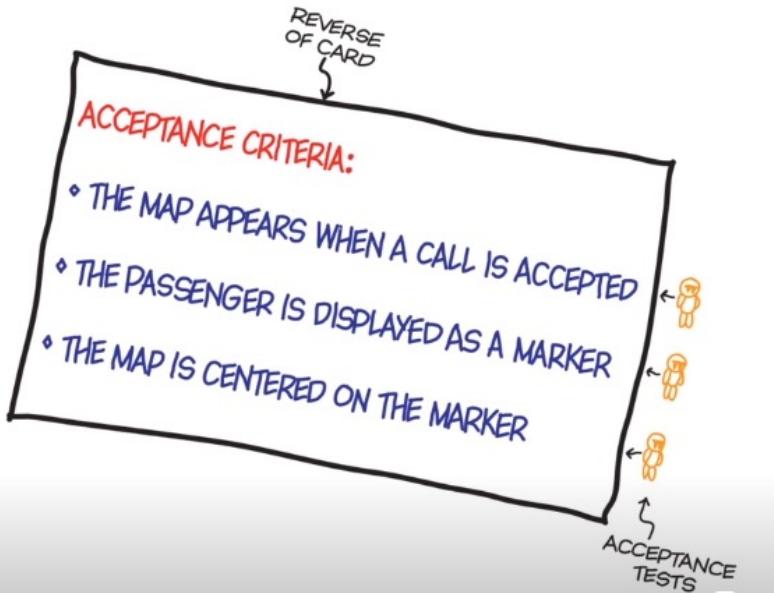


Creating clear acceptance criteria reduces ambiguity for the development team and allows a feature to be easily tested.

Acceptance criteria can also serve as a form of documentation once a feature has gone live, providing a written record of how a feature is intended to work.

Examples Acceptance Criteria

Back of the User Story card



For example for an Gmail user,

“ When the user saves an email that has not been sent, it should be stored in the user’s Drafts folder”

Outcome: Email stored in Drafts (Yes) or Not (No)

Acceptance Criteria for Google Image search



"As a Google Images user, when I search for an image I want to see images that match my query so that I can find the image for which I'm looking."

Some possible acceptance criteria:

"When the user inputs a query, such as 'cat', the image results should be returned in order of relevance."

"The image results should be returned in rows."

"When the user clicks/taps on an image, a detail view of that image should appear between that image's row and the row below."

1. Relevance:
The image most related to user query appears first, the images least related to user query appears last
2. Rows: Layout function
3. Tap on Image:
how user will interact with the image

Elements of Good User Stories

- Bill Wake came up with the **INVEST** acronym for good user story.
- Good user stories also have the following characteristics:
 - **I**ndependent
 - **N**egotiable
 - **V**aluable
 - **E**stimatable
 - **S**mall
 - **T**estable

The 3 Cs- Story Process

- In the book *Extreme Programming Installed*, Ron Jeffries et al. (Addison-Wesley Longman Publishing) **describe the story process** best:

• Card:

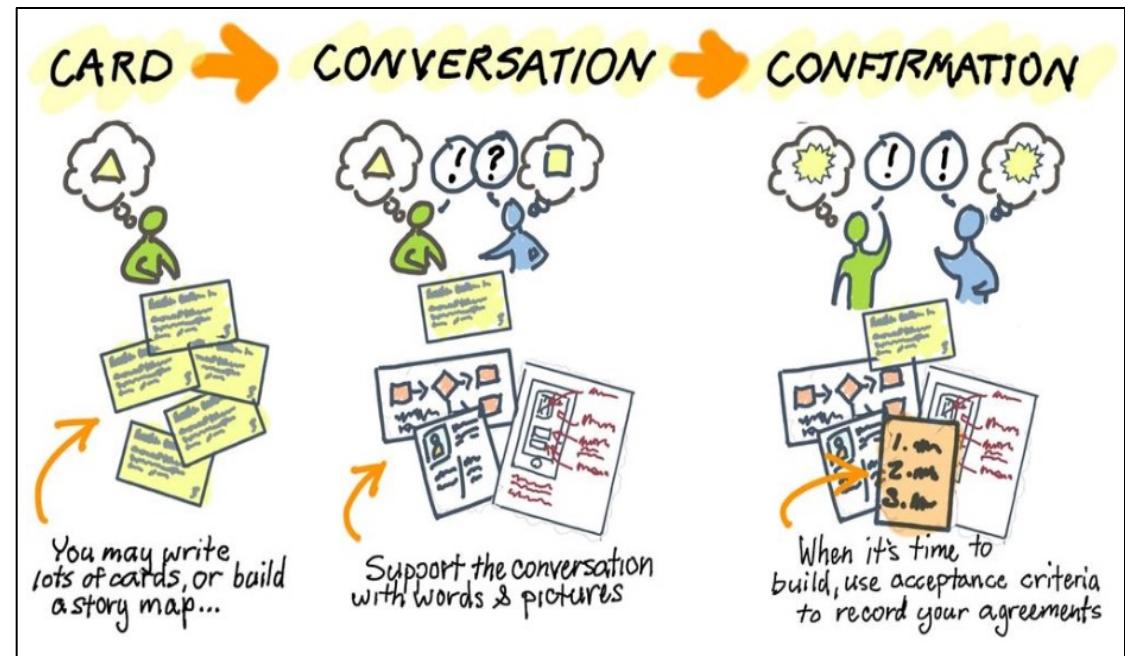
- Write what you'd like to see in the software on a bunch of index cards.

• Conversation

- Get together and have a rich conversation about what software to build.

• Confirmation

- Together agree on how you'll confirm that the software is done.



Difference Between User Story, Bugs, Constraints



Features vs. Bugs

Unlike features, bugs (problems with how a live feature is working) are not written using the user story format.

Instead, bugs are documented with a descriptive title and clear steps for how to reproduce the issue.

For example, if tapping a pause button on a video player in Mobile Safari wasn't working, the bug could be written as follows:

Title: Tapping Pause on Video Player Doesn't Work

1. In Mobile Safari on iOS 10.3 / iPhone 6S, go to myvideoplayer.com/videoexample.
2. The video will play automatically on mute.
3. Tap the pause button. The pause button does not become a play button, and the video is not paused.

Constraints

Story: Website must be super fast

Story: Design should look really good
– Constraint Card

- **Stories like these, we call constraints.**
- But they are important because they describe characteristics our customers would like to see in their software.
- For example, The Website must be super fast can be written like this.

All web pages must load in less than 2 sec

A constraint card

Ref: Writing User Stories By Ryan Harper O'Reilly Media -Video

How to take care of Frontend Design?

- If a user story includes a new design, the design files illustrating that design (including any interactions) are included with user story.
 - Design tools: Adobe Photoshop, Sketch and Invision
 - Design files: Wireframes, Mockup, Prototypes

<https://justcoded.com/blog/wireframe-mockup-and-prototype-whats-the-difference/>

Story Grooming Meeting

- Story grooming meetings give the engineering team a chance to review user stories **before they are scheduled for a development sprint.**
- Story grooming meetings are **critical for securing the development team's buy-in.**
- The team is given a chance to ask the questions that would normally arise during sprint planning:
 - What should we do if the user enters invalid data here?
 - Are all users allowed to access this part of the system?
 - What happens if...?
- The team provides feedback on the feasibility, viability, and size of each feature and may provide alternate solutions/ or identify previously unforeseen prerequisites or roadblocks for the user needs identified in the user stories.



Agile Estimation

Absolute Estimation

- We estimate our work in hours, days, and weeks.
- We use all the knowledge and experience at hand to make a guess about the amount of time it is going to take.
- Estimation is **approximate and not accurate**
- Absolute estimation:
 - Estimating in absolute values (Examples, days, weeks, months or KMs, Miles)
 - **Absolute values are not easier to judge**
 - **People are not good at absolute estimation**

Relative Estimation

- Agile team use relative estimation.
- Relative estimating compares what you don't know against what you do know.
 - For example, You might not be able to guess how much a truck weighs, but if you saw the truck, you can probably guess how many cars equal a truck.
 - A “customer search” story, as it probably involves double the effort to implement than a simple “Login user” story.
- Relative estimation is easier to judge than absolute values.
 - This means judging how big or complex tasks are with respect to other tasks
- This estimation is not designed to be precise.
 - But that doesn't mean it's useless. Instead it gives you a starting point, a way to start the discussion on what it takes to deliver your stories.

Absolute vs Relative Estimation



As an analogy, it is much easier to say that Delhi to Bangalore is twice the distance of Mumbai to Bangalore than saying that the distance from Delhi to Bangalore is 2061 kms.

Why Agile team use Relative Estimation?

1. Relative estimation takes away from the false comfort of precision.
 - The team is accepting the fact that the estimates will be imprecise.
 - That way we can start talking about what it takes to deliver this story instead spending too much time on estimates.
2. Agile uses relative estimating is that it keeps the team from **confusing estimates from commitments**.
 - An estimate is the useful information you might give a co-worker. A commitment is something that you usually give to a supervisor. An estimate is a best guess. A commitment is often a worst case scenario. That's why for Agile planning, you want estimates and not commitments.
3. Relative sizing across stories tends to be much more accurate over a larger sample, than trying to estimate each individual story for the effort (in hours) involved.



Story Point Estimation

Story Point for Estimation

- In Agile, we use relative estimation
- We do this by comparing the time to take one story vs time to take another story without using absolute estimates
- We do this by using Story points.
- We will have an exponential number sequence.
 - Something like 1,2,3,5,8, 13 These are the points for each of the stories.
- When we estimate with story points, we assign a point value to each item.
 - **The raw values we assign are unimportant.** What matters are the ***relative values***. A story that is assigned a 2 should be twice as much as a story that is assigned a 1. A 2 point story is 2/3 of 3 point story.
 - Instead of assigning 1, 2 and 3, that team could instead have assigned 100, 200 and 300. Or 1 million, 2 million and 3 million. It is the ***ratios that matter***, not the actual numbers.

What does a Story Point represent ?



- **Represents the amount of effort or fixed period of time required to implement a user story. (Size)**
- Story Point is not an estimate of the amount of time it takes to implement a Story.
- Some argue that it is **a measure of complexity**, but that is only true if the complexity or risk involved in implementing a user story translates into the effort involved in implementing it.

Fibonacci series as Story points

- The most common way is to estimate a user story is to use the **Fibonacci series** (1, 2, 3, 5, 8, 13, 21, 34, 55..... with each number the sum of the preceding numbers.
- Why Fibonacci?
 - It's because numbers that are too close to one another are impossible to distinguish as estimates.
- In Fibonacci series, after the 2 (which is 100% bigger than one), each number is about **60% larger** than the preceding value.

Predictability of User Stories Estimation

- Small stories tend to result in a more accurate and reliable estimates.
- Small stories reduces variability and improves predictability.
- So, a 13 or 20-point story is likely much less predictable than several 2, 3, or 5-point stories.
- Relative story point estimates using the Fibonacci sequence are, by design, increasingly **less accurate for larger estimates** – like the “cone of uncertainty”

Velocity

- **Velocity** = Number of story points the team can deliver in an iteration/Sprint (OR)
- **Calculating Velocity:**

$$1. \text{Average} = (16+15+17+20) / 4 = 17 \text{ Story points}$$

Sprints	Number of Story points Delivered
Sprint-1	16
Sprint-2	15
Sprint-3	17
Sprint-4	20

Iterations Completed	Low Multiplier	High Multiplier
1	0.6	1.60
2	0.8	1.25
3	0.85	1.15
4 or more	0.90	1.10

2. Give it as a range

- Velocity is a rolling average. That means that the velocity may increase or decrease depending on what happens with the team.
- After some iterations the velocity will become stable.

Examples from Software Development- Story Points are relative

1 –QUICK TO DELIVER AND MINIMAL COMPLEXITY. AN HOUR

Example: add field to a form

2 –QUICK TO DELIVER AND SOME COMPLEXITY. MULTIPLE HOURS

Example: Add parameter to form, validation, storage

3 –MODERATE TIME TO DELIVER, MODERATE COMPLEXITY, POSSIBLE
UNKNOWNs

Example: Migrate somewhat complex static CSS into a CSS pre-processor

5 –LONGER TIME TO DELIVER, HIGH COMPLEXITY, LIKELY UNKNOWNs

Example: Integrate with third-party API for pushing/pulling data, and link to user profiles in
platform

8 –LONG TIME TO DELIVER, HIGH COMPLEXITY, CRITICAL UNKNOWNs

Example: Overhaul the layout/HTML/CSS/JS of a web application

13 –LONG TIME TO DELIVERY, HIGH COMPLEXITY, MANY CRITICAL UNKNOWNs

Example: Migrate application from an outdated data store to new DB technology and ORM

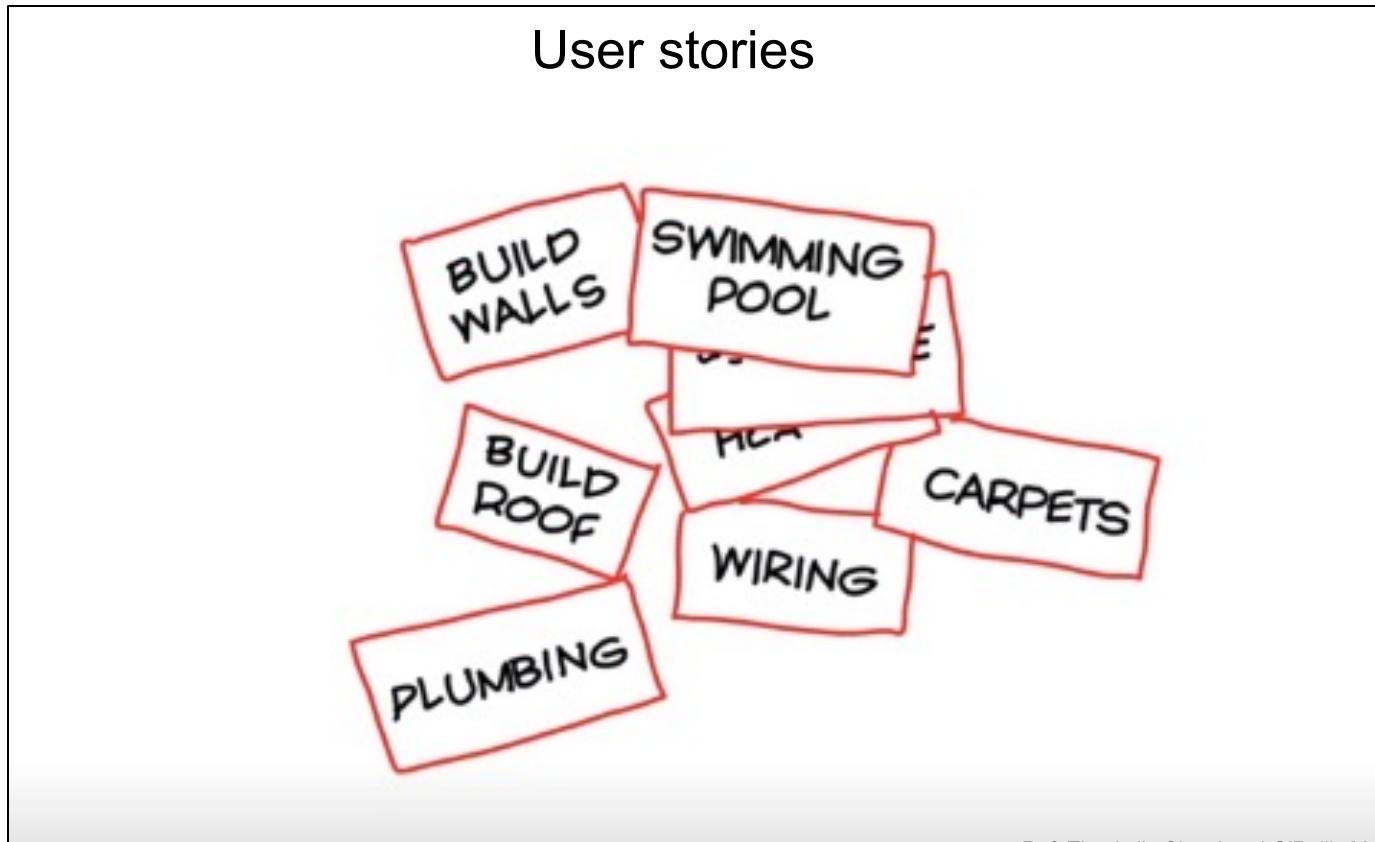
How User Stories are estimated by the team?

- One method is to play **Planning poker** game.
 - Planning poker helps give everyone a voice.
 - Combining of individual estimates through group discussion leads to better estimates
 - Combat Groupthink-meaning, the way that people tend to agree with the most popular idea.
- Planning poker is a game where the development team estimates stories individually first (using a deck of cards with numbers like **1, 2, 3, 5, 13 ...**on them) and then compares the results collectively together after.
- If everyone's estimate is more or less the same, the estimate is kept. If there are differences, however, the team discusses them and estimates again until consensus is reached.

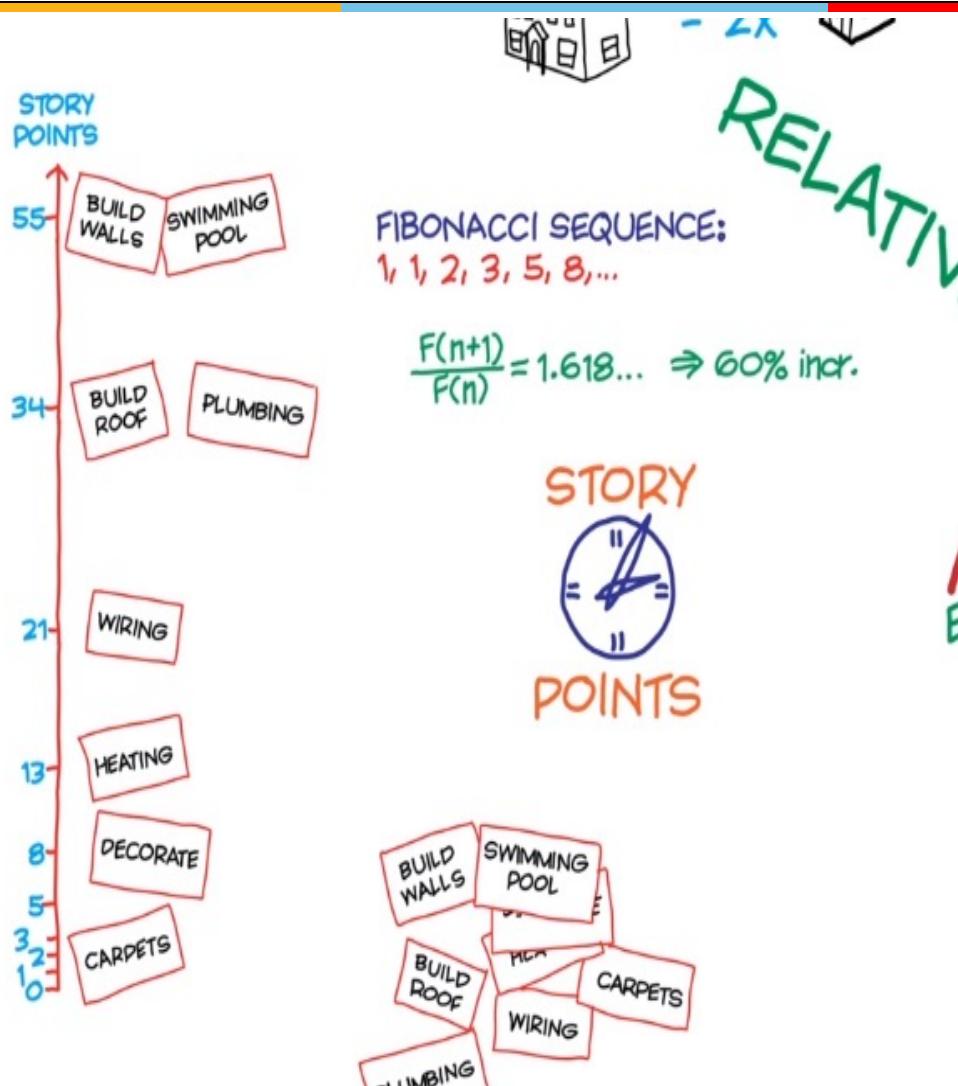
Story Point Estimation – An Example



Project : Build a House, Suppose we have the following bunch of user stories to be estimated. How do we start?



Story Point Estimation – Example



Steps:

1. The team may start with the smallest - Carpets Story , assign 2 points.
2. Next, for example, we may discuss the Build wall story. We agree on, it is 30 times larger than Carpet story. Hence, we assign 55 points in Fibonacci scale.
3. Then relatively, assign story points to other stories, Decorate, Heating etc....

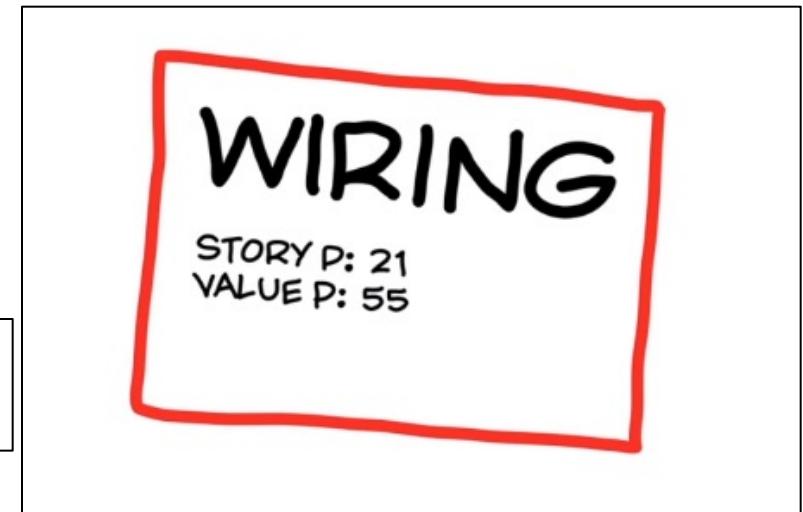
At this point, We do not know the effort of each story

Value Point

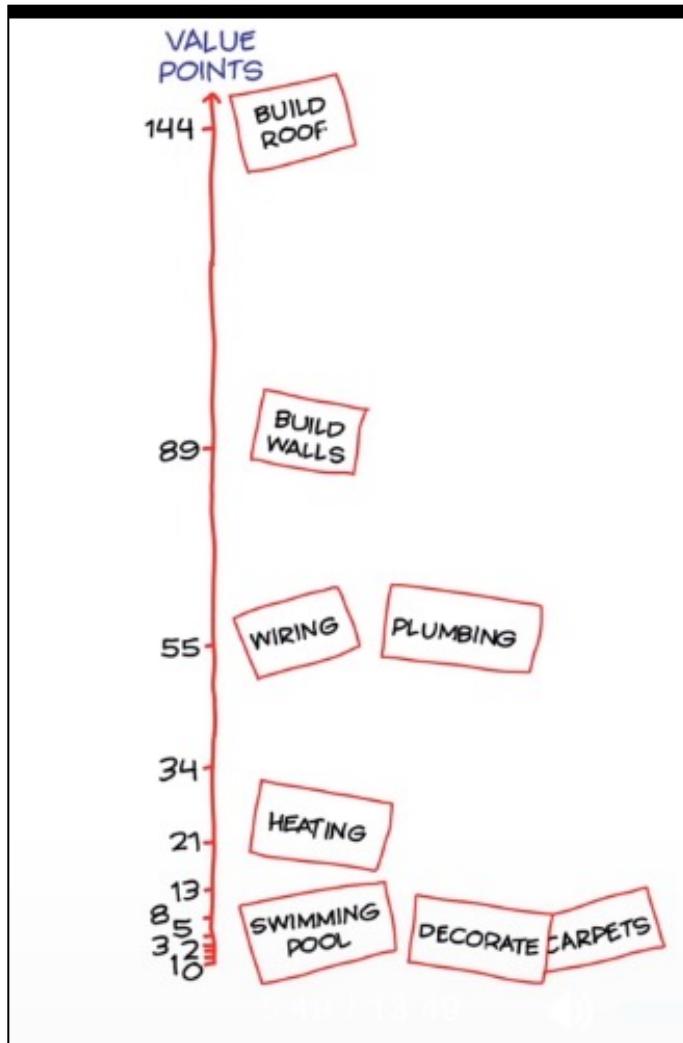
- A user Story has two estimates.
 - Story point – estimate of time
 - Value Point – estimate of value
- Developers , the people who do the work, estimate User Stories in Story points,
- Customer / Product owner estimates User Stories in Value Point, in the same way.

Story Card
Story Point : Amount of time/effort
Value Point : Worth to Customer

Agile is about delivering value early.



Value Point Estimation – use the previous example

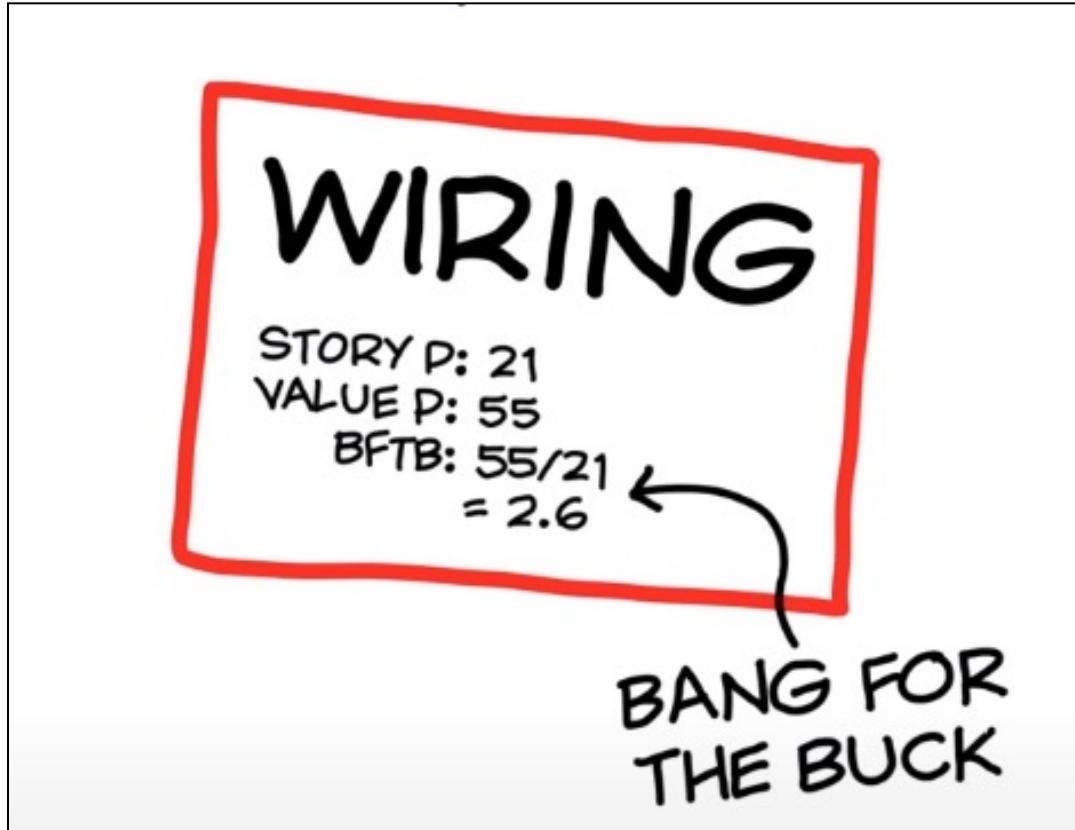


Highest Valued Stories at the top
of Product backlog

Relatively Valued Stories

Lowest Valued Stories
at the bottom

Bang For the Buck (BFTB) (OR) Priority



BFTB = Value Point divided by Story Point for each story

How stories are prioritized for each Iteration – by BFTB

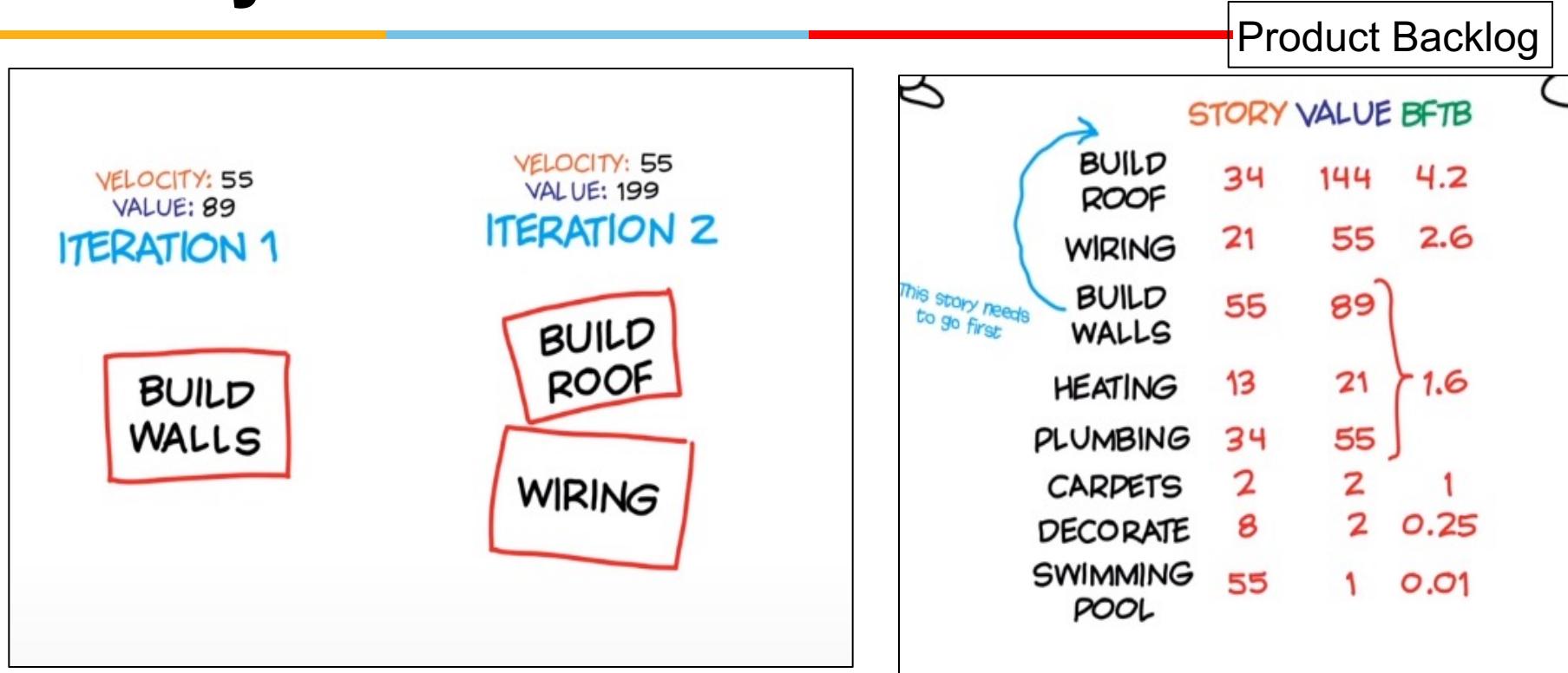
Product Backlog



STORY VALUE BFTB

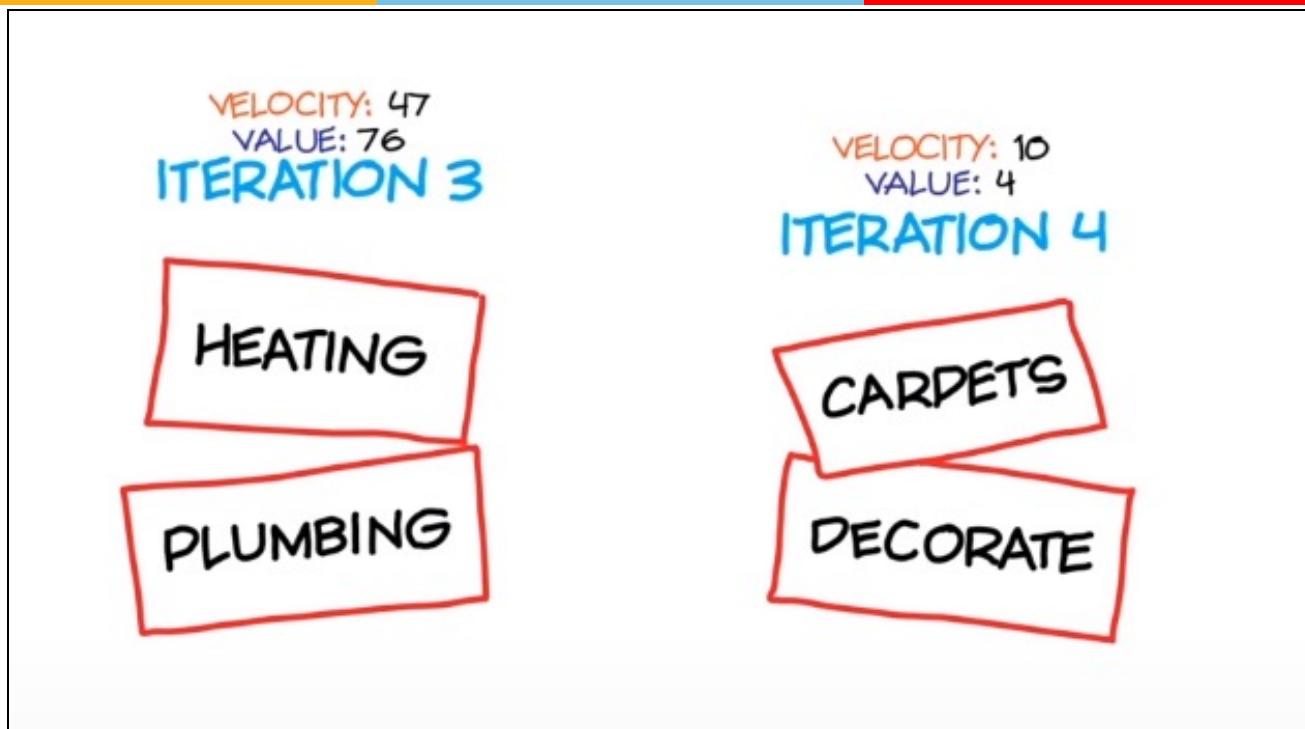
	34	144	4.2
BUILD ROOF	21	55	2.6
WIRING	55	89	1.6
BUILD WALLS	13	21	
HEATING	34	55	0.25
PLUMBING	2	2	
CARPETS	8	2	0.25
DECORATE	55	1	0.01
SWIMMING POOL			

Highest value delivered in early Iterations



Suppose, Cost of this iteration-1 is 20000\$;
= $20000/89 \sim 225$ Per Value Point.
For Iteration-2 = $225 * 199 \sim \$44,000$ (Highest value delivered)

Value delivered decreases as iteration progress



Iteration-3 value = $76 * \$225 = \$17,100$; Iteration-3= $4 * 225 = 900$

- **This is an example**, but In reality, the value will decrease after many iterations, then customer can take a call to continue the project or not.
- Over the period of time, after some iterations the velocity will become stable and value delivered will decrease.

Estimation Exercise (Assume, 2 week Iteration)

Iteration 7 (complete)

As a technical specialist
I want to adjust the
turboencapsulator
So that signals will be in
phase

Story points: 5

Value points: 13

As a customer
I want my hydrooptic
vanes serviced
So that they will last
longer

Story points: 8

Value points: 8

1. Iteration 7 velocity?

$8 + 5 = 13$ story points

2. How long is a story
point?

$80 \text{ hrs} = 13 \text{ story pts}$

$1 \text{ story pt} = (80/13) \text{ hrs}$
 $= 6.15 \text{ hrs}$

3. Which stories in the
next iteration?

4. How long is the rest
of the backlog?
Total sp = $5+3+5+8+8+21$
 $= 50$

Time = $50 \times 6.15 \text{ hrs}$
 $= 307.5 \text{ hrs}$

Iteration 8 (new)

As a pilfrometer engineer
I want to order grommets
online
So I can stay mobile

Story points: 5

Value points: 5

BFTB: $5/5 = 1$

BFTB: $2/3 = 0.67$

Story points: 3

Value points: 2

BFTB: $2/5 = 0.4$

Story points: 5

Value points: 2

BFTB: $3/8 = 0.38$

Story points: 8

Value points: 3

I

W

fis

So

BFTB: $3/8 = 0.38$

Story points: 8

Value points: 3

BFTB: $3/8 = 0.38$

Story points: 8

Value points: 3

BFTB: $3/21 = 0.14$

Story points: 21

Value points: 3

Story Points – Real Examples



Pointing User Stories

Pointing Rubric at iHeartMedia
(two week development sprints)

- 1: Text Change
- 2: Text Change + Small Functionality Change
- 3: One Day of Work for One Developer
- 5: One Week of Work for One Developer
- 8: Two Weeks of Work for One Developer
- 13: Two Weeks of Work for Two Developers

Pointing Rubric at Condé Nast Entertainment
(one week development sprints)

- 1: Text Change
- 2: Text Change + Small Functionality Change
- 3: One Day of Work for One Developer
- 5: One Week of Work for One Developer
- 8: One Week of Work for Two Developers
- 13: Must Be Broken Down Into Smaller Stories



Other Estimation Techniques

Estimate by Analogy

- Comparing a user story to others
 - “This story is like that story, so its estimate is what that story’s estimate was.”
- Don’t use a single gold standard
 - Triangulate instead
 - Compare the story being estimated to multiple other stories

Triangulation

- Confirm estimates by comparing the story to multiple other stories.
- Group like-sized stories on table or whiteboard

3 points	Story A		
2 points	Story B	Story E	Story F
1 point	Story C	Story D	

A blue curved arrow starts at Story A and points to Story E, then from Story E it points to Story D, and finally from Story D it points back to Story C.

Ideal Time

- How long something would take:
 - If it's all one person worked on
 - Had no interruptions
 - And everything you need is available.
- The ideal time of a football game is 90 minutes
 - Four 15-minute quarters
 - The elapsed time is much longer (3+ hours)
- It's easier to estimate in ideal time.
- It's too hard to estimate directly in elapsed time.
 - Need to consider all the factors that affect elapsed time at the same time you're estimating

Story Points Vs Ideal Time

- Story points help drive cross-functional behavior
 - Story point estimates do not decay
 - Story points are a pure measure of size
 - Estimating in story points is typically faster
-
- My ideal days cannot be added to your ideal days
 - Ideal days are easier to explain outside the team
 - Ideal days are easier to estimate at first

T –Shirt Sizing, Disaggregation

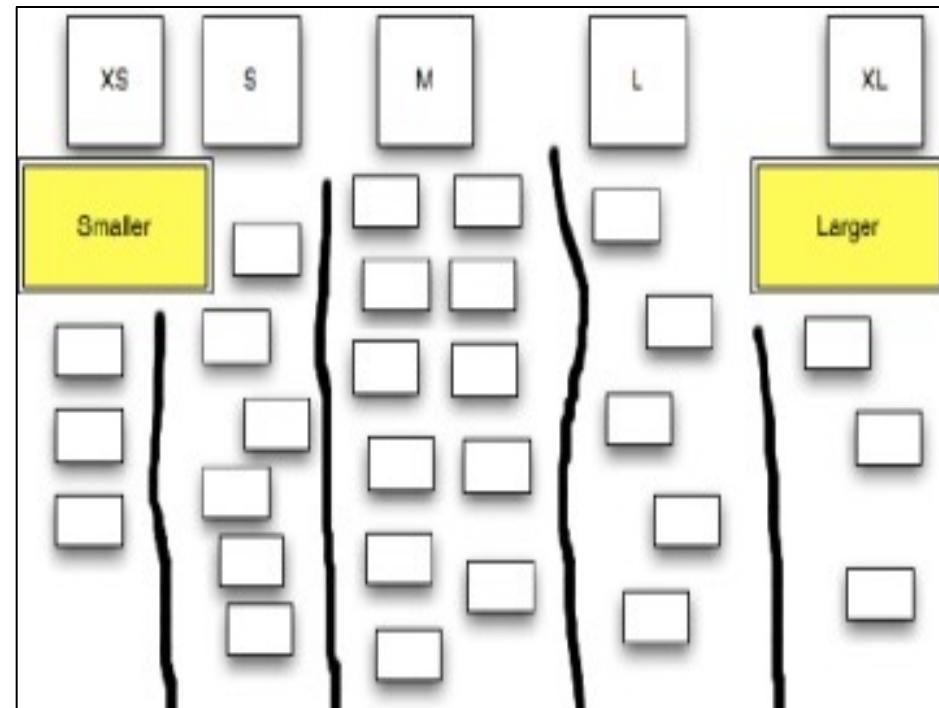
- Level of Effort (LOE) or T-Shirt Sizing
 - T-shirt size,” “level of effort” (LOE), or “small, medium, large.” (Easy, but lack precision, inability to add up several stories into a meaningful measure.)

Extra small	Small	Medium	Large	Extra Large	Extra Extra Large
1 point	2 points	3 points	5 points	8 points	13 points

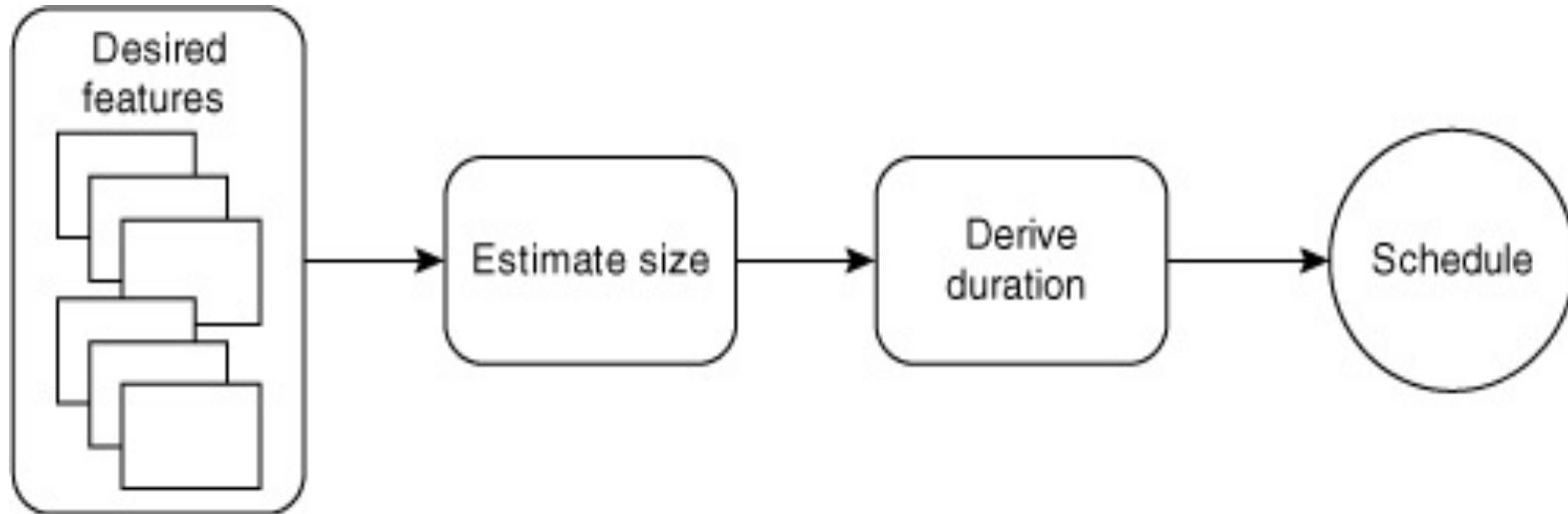
- Disaggregation
 - Breaking a big story into smaller stories ,we know how long the smaller stories take, So, disaggregating to something we know lets us estimate something bigger we don't know

Affinity Grouping

- Team members simply group items together that are like-sized, resulting in configuration similar to the one in figure.



Estimating the duration of a project begins with estimating its size.



- Sum the story-point estimates for all desired features we come up with a total size estimate for the project.
- If we know the team's velocity we can divide size by velocity to arrive at an estimated number of iterations.
- We can turn this duration into a schedule by mapping it onto a calendar.

Source: Agile Estimating and Planning by Mike Cohn
 Published by Addison-Wesley Professional, 2005

Re-estimating

- Remembering that story points and ideal days are estimates of the size of a feature helps you know when to re-estimate.
- You should re-estimate only when your opinion of the relative size of one or more stories has changed.
- Do not re-estimate solely because progress is not coming as rapidly as you'd expected.
- Let velocity, the great equalizer, take care of most estimation inaccuracies.

Source: Agile Estimating and Planning by Mike Cohn
Published by Addison-Wesley Professional, 2005

Thank you



BITS Pilani
Pilani Campus

BITS Pilani presentation

K.Anantharaman
kanantharaman@wilp.bits-pilani.ac.in



Module-6 Agile Planning & Release Planning



Agile Planning

Harvard
Business
Review

Diversity Latest Magazine Popular Topics Podcasts Video Store The Big Ic

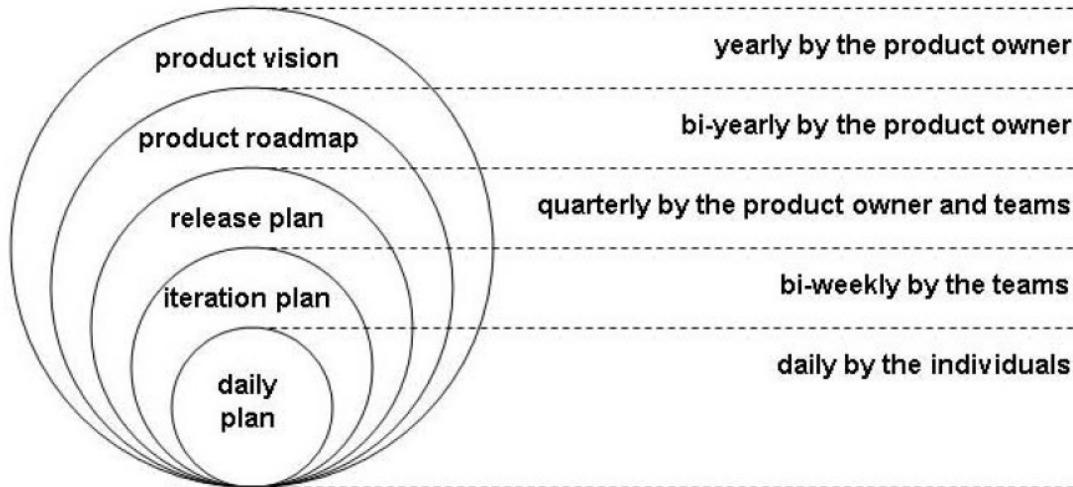
MANAGING ORGANIZATIONS

Bring Agile Planning to the Whole Organization

by Jeff Gothelf

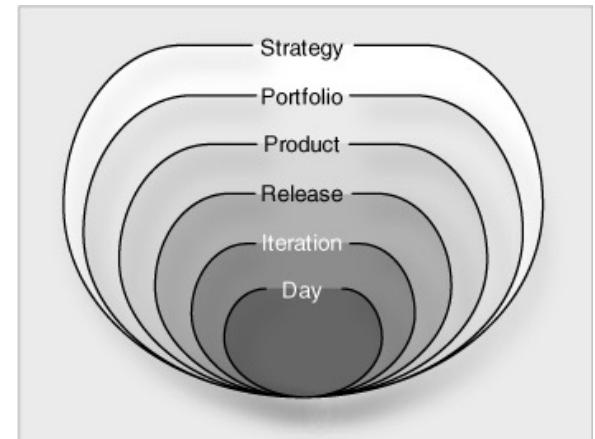
<https://hbr.org/webinar/2015/05/bring-agile-planning-to-the-whole-organization>

Agile Planning



Many Products or Services Organization

Single Product Organization



An Enterprise Agile Framework

Ref: 5 Levels of Agile Planning: From Enterprise Product Vision to Team Stand-up by Hubert Smits

Release Planning

Inputs:

Product Vision

Product Road Map

Product Backlog

Release Backlog, Velocity, Iteration length, Trade off-matrix (Scope, Cost, Schedule)

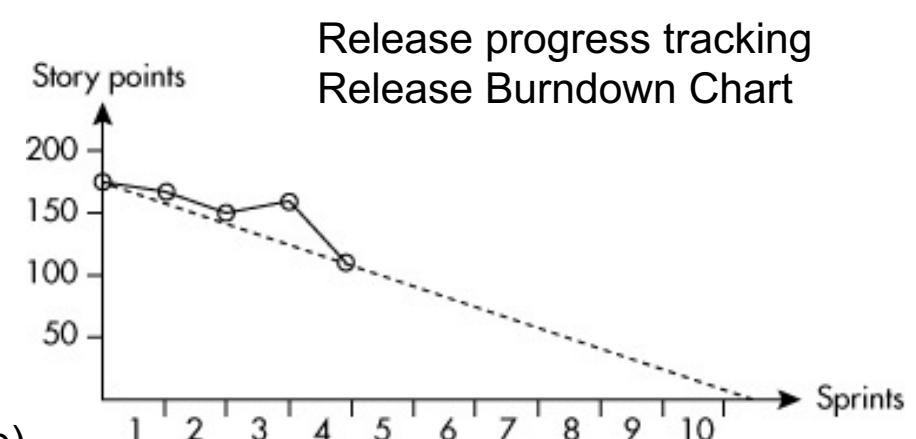
Release Planning



Example: Release planning

Inputs:

- Release backlog - 50 User stories
 - (200 Story points)
- Velocity = 20 Story points
- Iteration Length - 2 weeks
- Budget = \$200,000
- Cost of each Iteration = \$20000
- Trade of Matrix :
- Schedule (Fixed), Cost(Fixed), Scope(Flexible)



Outputs:

- Total number of Iterations required = 10 Iterations ($200/20$)
- If you are planning for 2 releases
- Number of iterations per release = 5 Iterations
- Duration of each release = $5*2 = 10$ weeks
- Suppose, Iteration cost = \$25000; only 8 iterations is possible.
- 160 points can be delivered (Scope may have to be reduced)

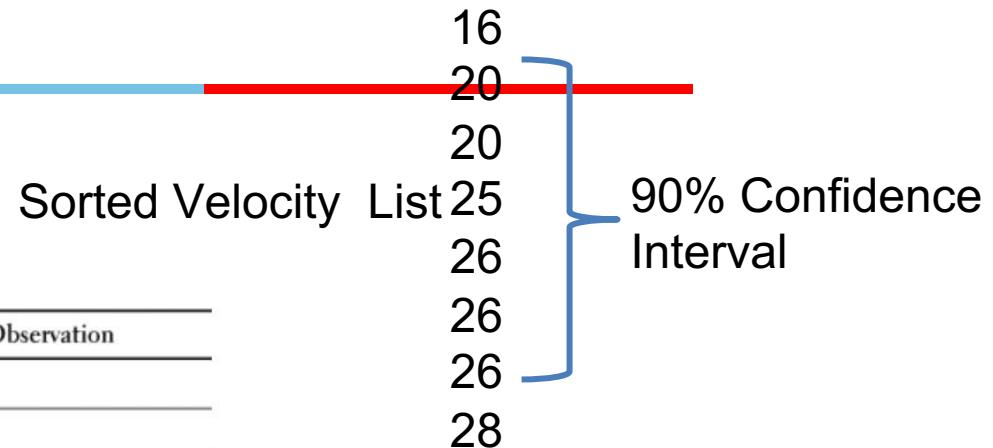
Estimating Velocity

- Use historical values.
- Run an iteration
- Make a forecast.
- You should consider expressing the estimate as a range.
 - Example: If your team velocity is 20 story points - You have a very limited chance of being correct in future. Instead give a range 15-24 story points

Iterations Completed	Low Multiplier	High Multiplier
1	0.6	1.60
2	0.8	1.25
3	0.85	1.15
4 or more	0.90	1.10

High-confidence forecast- Example

- Velocity of completed **8 sprints**
- : 20, 25, 28, 26, 16, 20, 26, 26



Number of Velocity Observations	<i>n</i> th Velocity Observation
5	1
8	2
11	3
13	4
16	5
18	6
21	7
23	8
26	9

- 20 → Lower confidence, certainly we will do
 23 → Mean Velocity – We will get here
 26 → Upper confidence, Most we could expect

Use the *n*th Lowest and the *n*th Highest Observation of a Sorted List of Velocities to Find a 90% Confidence Interval

Source: Succeeding with Agile SW development by Mike Cohen

Creating a Release Plan Exercise



- The backlog for this release has 140 story points, with a start date of D0 and a sprint length of 2 weeks. Range of estimated velocities: Low = 18; High = 20
 - The average velocity of the first two sprints was measured to be 15 Story Points.
1. Calculate the maximum and minimum schedules, as well as the points that can be completed per sprint, by maintaining the same velocity range.
 2. What is the maximum and minimum timeline and number of points that can be completed if the budget is \$140000 and the cost of a sprint is \$20000?

Creating a Release Plan Exercise



1. Calculate the maximum and minimum schedules, as well as the points that can be completed per sprint, by maintaining the same velocity range.

- Velocity High =20; Number of Iteration Required = $140/20 = 7$
- Number of Story points completed in first two sprints= 30
- Remaining Story points = 110
- Number of iteration required to complete the 110 points = $110/20 = 5.5 \sim 6$ Sprints
- Sprint 1-2 = 15 points; Sprint 3-7 = 20; Total number of points that ca be delivered = 130

- Velocity low = 18; Number of Iteration Required = $140/18 \sim 8$ Sprints
- Number of Story points completed in first two sprints= 30
- Remaining Story points = 110
- Number of iteration required to complete the 110 points = $110/18 = 6.1 \sim 7$ Sprints
- Sprint 1-2 = 15 points; Sprint 3-7 = 18; Total number of points that ca be delivered = 120

Creating a Release Plan Exercise



2. What is the maximum and minimum timeline and number of points that can be completed if the budget is \$140000 and the cost of a sprint is \$20000?

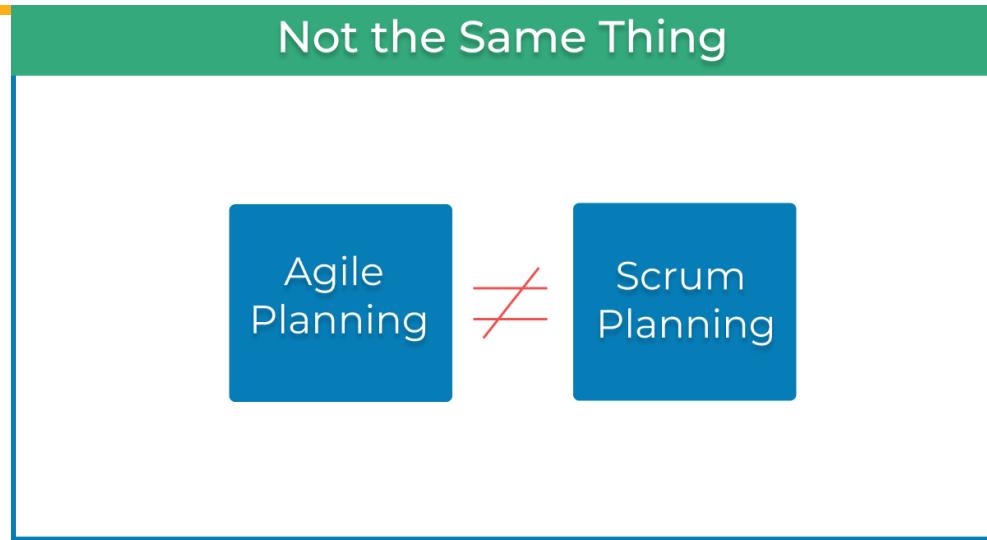
- Available budget is \$140000, Each Iteration cost = \$20000; Only 7 Iterations is possible.
- Max and Min Schedule is same = D0 +14 Weeks
- Velocity High =20; Number of Iteration Required = $140/20 = 7$
- Number of Story points completed in first two sprints= 30
- Remaining Story points = 110
- Number of iteration required to complete the 110 points = $110/20 \sim 6$
- Sprint 1-2 = 15 points; Sprint 3-7 = 20 points ;
- Total number points that can be delivered = 130 points

- Velocity low = 18; Number of Iteration Required = $140/18 \sim 8$ Sprints
- Number of Story points completed in first two sprints= 30
- Remaining Story points = 110
- Number of iteration required to complete the 110 points = $110/18 \sim 7$
- Max Schedule = D0+ 14 weeks



Module-6 Agile Planning & Release Planning – Additional Notes

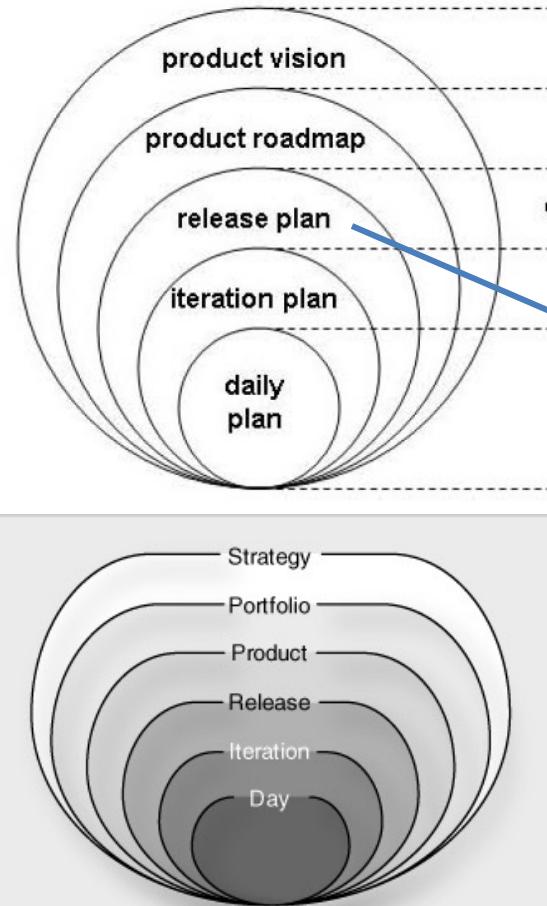
Agile Planning



- Agile thinking applied across various industries and not just software.
- It is more important to know how to apply generic techniques and practices on the global company level, irrespective of the type of business.

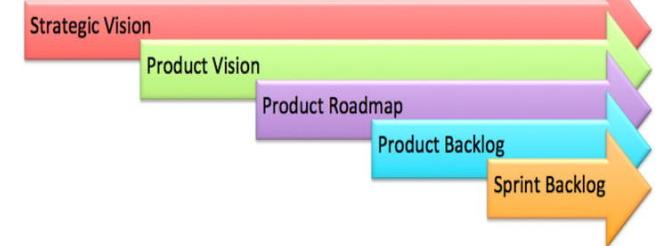
Source : <https://kanbanize.com/agile/project-management/planning>

5-Levels of Agile Planning (Product Planning)



yearly by the product owner
bi-yearly by the product owner
quarterly by the product owner and teams
bi-weekly by the teams
daily by the individuals

Flexibility to accommodate change
Decreases



An Enterprise Agile Framework

10/9/22

Ref: 5 Levels of Agile Planning: From Enterprise Product Vision to Team Stand-up by Hubert Smits

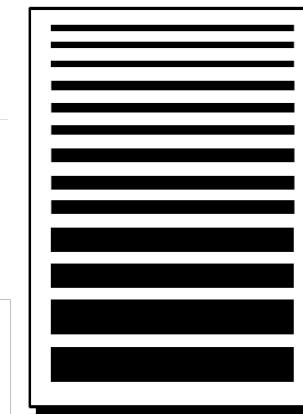
SE ZG544 S1-22 Agile SW Process

14

BITS Pilani, Pilani Campus

DEEP:
Detailed,
Emergent,
Estimable
Prioritized

Low Priority



Fine-grained, detailed items ready
to be worked on in the next sprint

Large, coarse-grained items

5-Levels of Agile Planning (Product Planning)

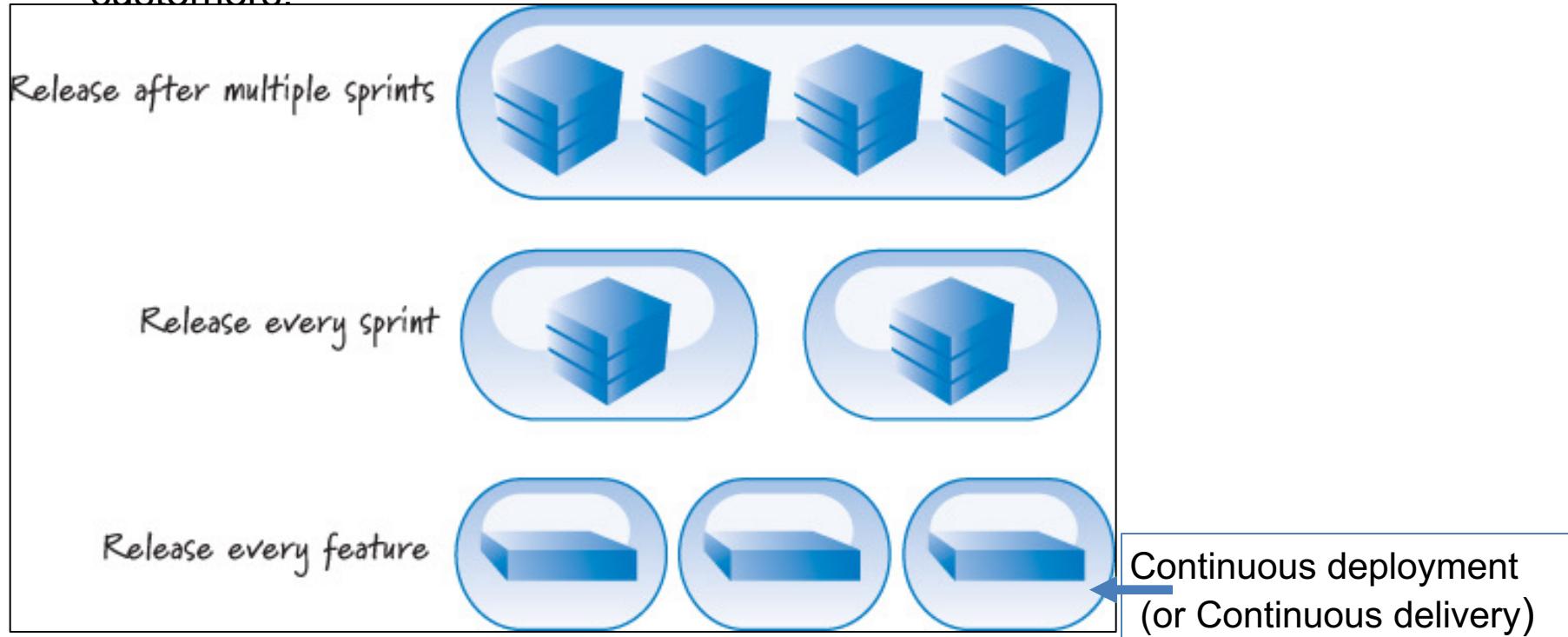


- Each of the five levels of planning addresses the fundamental planning principles: priorities, estimates and commitments.
- 5 Levels of Agile Planning is aimed to avoid big upfront design
- Most agile teams are concerned only with the three innermost levels (Day, Iteration, Release) of the **planning onion**.
- Involve stakeholders in planning, Review the plans frequently

Patterns of Release Planning/Different release cadences



- Many organizations have its own cadence regarding release of products to its customers.



Whichever release cadence being followed, Most organizations find some amount of longer-term, higher-level planning to be useful. We refer to this type of planning as release planning

Agile Release Planning

- Release planning is an important task for product people working with agile teams:
 - It ensures that the product is moving in the right direction and it connects Product strategy and tactics.
- Release as a version of a product:
 - For example, Mac OS X Catalina and Windows 10.
 - Releases come in two flavors: major releases, like iOS 13, and minor releases, such as iOS 13.3.
- Release planning is the process of determining the desired outcome of one or more major releases and maximizing the chances of achieving it.

Source: <https://www.romanpichler.com/blog/release-planning-advice/>

Agile Release Planning ...

- Agile release planning provides a high-level summary timeline of the release schedule (typically 3 to 6 months).
- Agile release planning also determines the number of iterations or sprints in the release.
- Allows the product owner and team to decide how much needs to be developed and how long it will take to have a releasable product based on business goals, dependencies, and impediments.

Source: <https://www.romanpichler.com/blog/release-planning-advice/>

Make Release Planning Collaborative

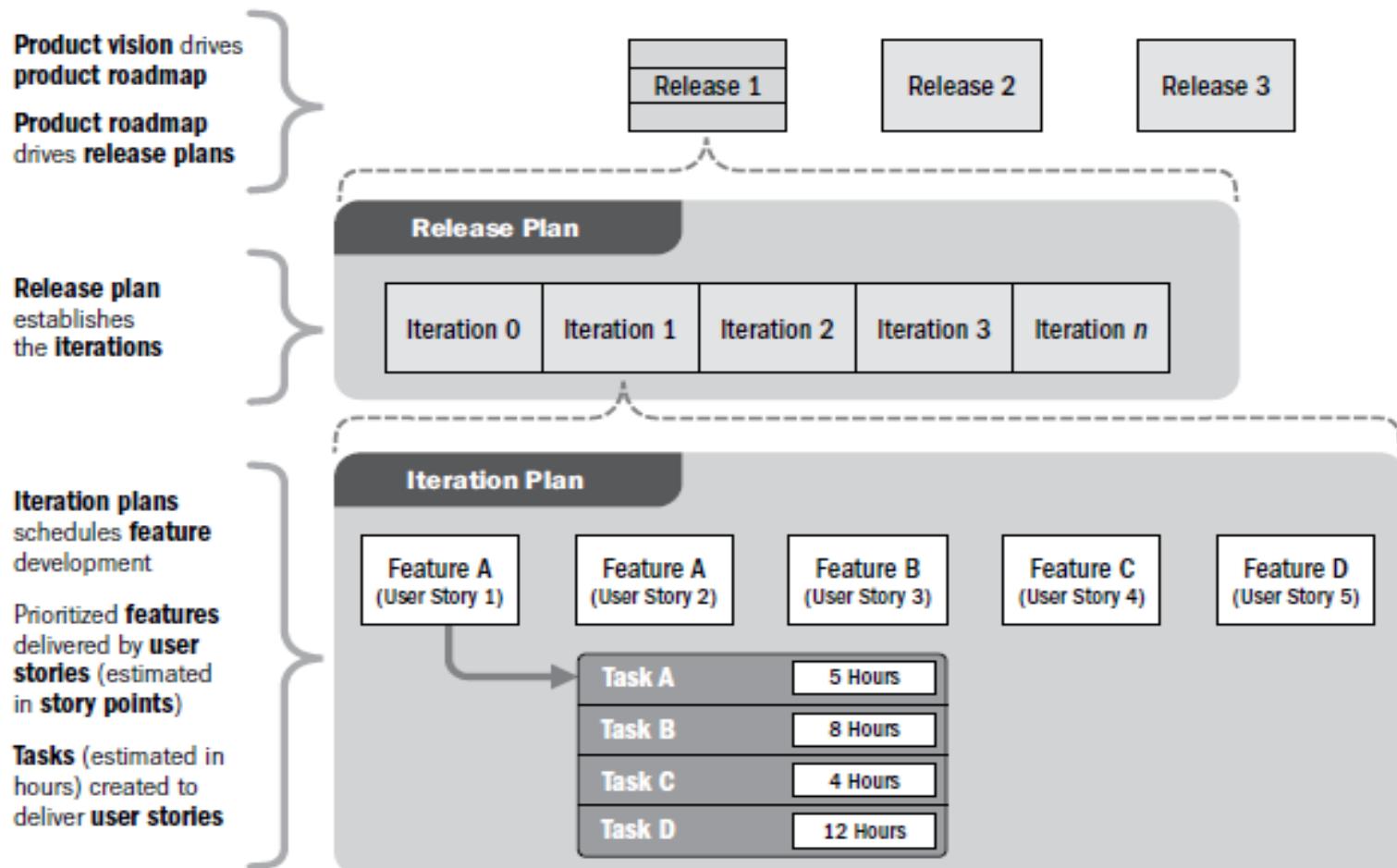
- Release planning is best done as a collaborative effort by involving the stakeholders and the development team



- Schedule regular roadmapping sessions.
- Possibly as part of your strategy review process and invite key stakeholders and development team members.
- Discuss Release Progress
- Invite Stakeholders to Sprint Review meetings.

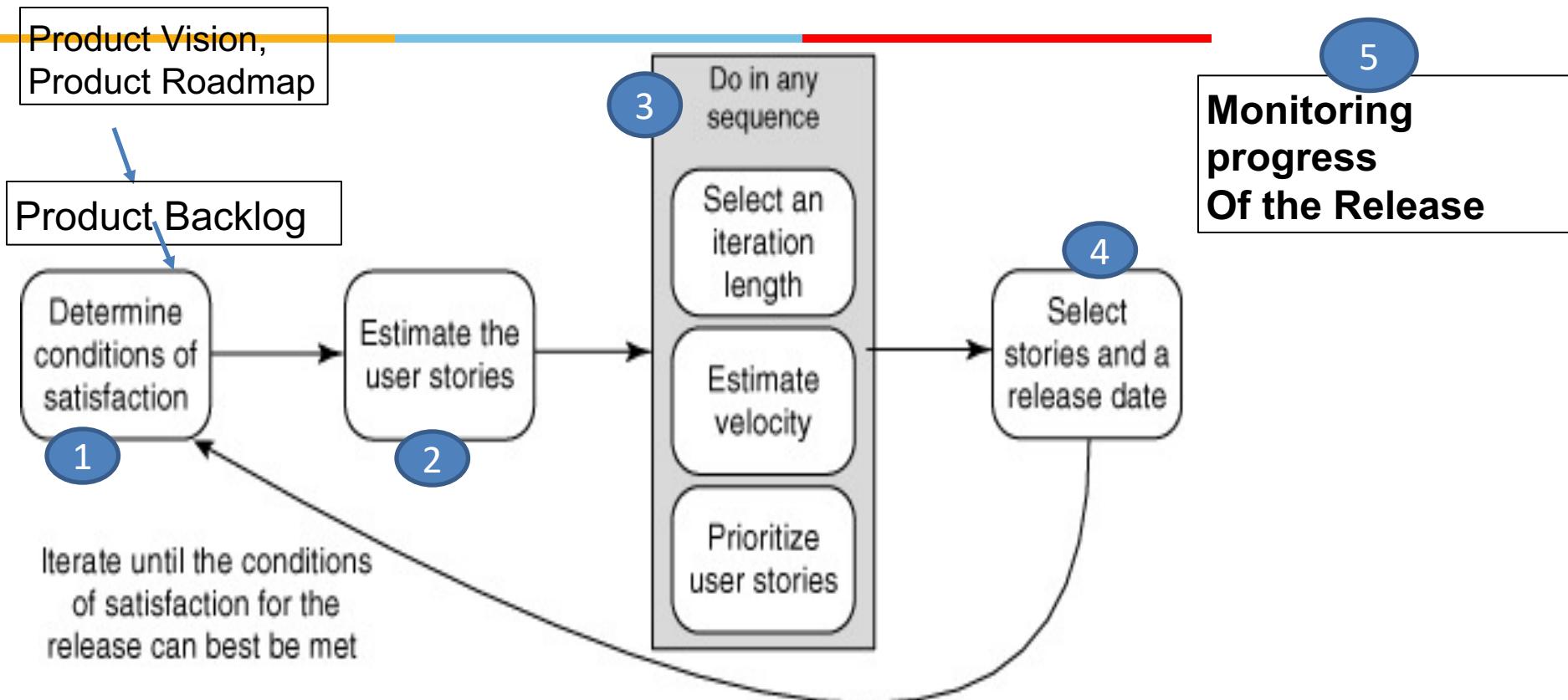
Source: <https://www.romanpichler.com/blog/release-planning-advice/>

Relationship between product vision, product roadmap, release planning, and iteration planning.



Source: PMI.ORG

The steps in planning a release.



1 Use Trade-off Matrix (Fixed, Flexible, Accept), Date, Scope, Cost - Fix important factor

Given a fixed schedule, we will choose a level of resources and adjust the features set as necessary.

Development Constraint Combinations

Project Type	Scope	Date	Cost
Fixed Everything (Not Recommended)	Fixed	Fixed	Fixed
Fixed Scope and Date (Not Recommended)	Fixed	Fixed	Flexible/Accept
Fixed Scope	Fixed	Flexible	Fixed/Flexible
Fixed Date	Flexible	Fixed	Fixed

Condition of satisfaction

- **Establishing clear, specific, and measurable goals.** Call these goals product or release goals - captured in product roadmap.
- **Prioritize the Success Factors for Releases:**
 - But in reality, unforeseen things do happen. The development progress may not be as fast as anticipated, for instance, or one of the technologies may not work as expected.
 - Use Trade-off Matrix (Fixed, Flexible, Accept)
 - Date, Scope, Cost - Fix important factor
- **Quality:** Quality should be fixed and not be compromised. Otherwise, responding to user feedback and changing market conditions and quickly adapting your product will be hard, if not impossible.

Estimate User Stories

- It is not necessary to estimate everything that a product owner may ever want.
- It is necessary only to have an estimate for each new feature that has some reasonable possibility of being selected for inclusion in the upcoming release.
- Often, a product owner will have a wish list that extends two, three, or more releases into the future. It is not necessary to have estimates on the more distant work.

Factors in Select an Iteration Length

- The length of the release being worked on
- The amount of uncertainty
- The ease of getting feedback
- How long priorities can remain unchanged
- Willingness to go without outside feedback
- The overhead of iterating
- How soon a feeling of urgency is established
- Make a Decision and stick to the Rhythm
- 2 weeks sprint is ideal.

The Overall Length of the Release



- Short projects benefit from short iterations.

The length of a project's iterations determines:

1. How often the software can be shown and progress measured?
2. How often the product owner and team can refine their course, because priorities and plans are adjusted between iterations.
 - Opportunities to gather end-of-iteration feedback
 - General rule of thumb: Aim for five to six feedback opportunities per release.
 - Example: 3 months release
 - Iteration length : 2 weeks – 5 times feedback for course corrections-ok
 - 4 weeks iteration provides only two times feedback- not ok

The Amount of Uncertainty

Uncertainty comes in multiple forms.

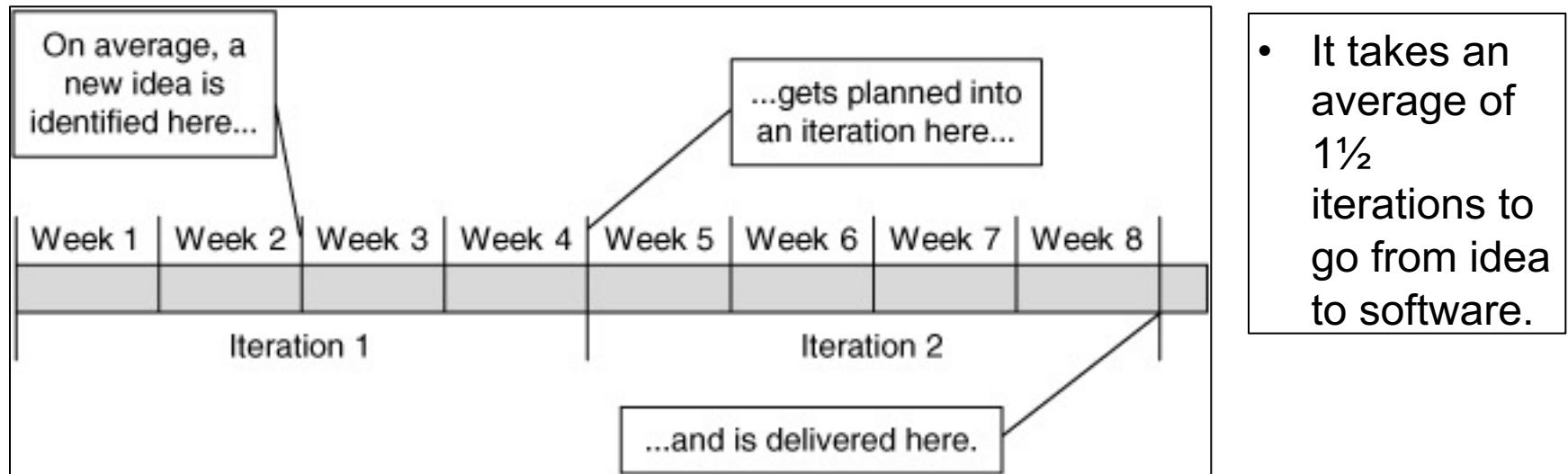
- User need
- Technical aspects
- Team Velocity
- The more uncertainty of any type there is, the shorter the iterations should be.
 - Shorter iterations allow more frequent opportunities for the team to measure its progress through its velocity and more opportunities to get feedback from stakeholders, customers, and users.

The ease of getting feedback

- Choose your iteration length to maximize the value of the feedback that can be received from those inside and outside the organization.

How Long Priorities Can Remain Unchanged

- Once a development team commits to completing a specific set of features in an iteration, it is important that that the **product owner not change priorities** during the iteration, also protect the team from others to change the priorities.



Ref: Agile Estimating and Planning by Mike Cohn Published by Addison-Wesley Professional, 20

Willingness to Go without Outside Feedback

- Even with a well-intentioned and highly communicative team, it is possible that the results of an iteration could be found worthless when shown to the broader organization or external users at the conclusion of the iteration.
 - This may happen if the developers misunderstand the product owner (and don't communicate often enough during the iteration).
 - It could also happen if the product owner misunderstands the needs of the market or users.
- Less often a team receives outside feedback, the more likely we are to go astray and the greater the loss will be when that happens.

The Overhead of Iterating

- There are costs associated with each iteration.
- For example, each iteration must be fully regression tested:
 - If this is costly (usually in terms of time), the team may prefer longer, four-week iterations.
 - Naturally, one of the goals of a successful agile team is to reduce (or nearly eliminate) the overhead associated with each iteration.
 - But especially during a team's early iterations, this cost can be significant and will influence the decision about the best iteration length.

How Soon a Feeling of Urgency Is Established

- “As long as the end date of a project is far in the future, we don’t feel any pressure and work leisurely. When the pressure of the finish date becomes tangible, we start working harder.” - Niels Malotaux (2004).
- Even with four-week iterations , it is sufficiently far away that many teams will feel tangibly less stress during their first week than during the fourth and final week of an iteration.
- The point is not to put the team under more pressure but distribute it more evenly across a suitably long iteration.

Stick with It to Achieve a Steady Rhythm



- Whatever duration you choose, you are better off choosing a duration and sticking with it rather than changing it frequently.
- Teams fall into a natural rhythm when using an unchanging iteration duration.
- A regular iteration rhythm acts like a heartbeat for the project.
- “Rhythem is a significant factor that helps achieve a sustained pace”

Making a Decision

- One of the main goals in selecting an iteration length is finding one that encourages everyone to work at a consistent pace throughout the iteration.
- If the duration is too long, there is a natural tendency to relax a bit at the start of the iteration, which leads to panic and longer hours at the end of the iteration. Strive to find an iteration duration that smooths out these variations.
- Two-week iterations to be ideal.
- **Mike Cohen suggests:**
 - To follow a macro-cycle of six two-week iterations followed by a one-week iteration. “ $6 \times 2 + 1$.”
 - During the one-week iteration, however, the team chooses its own work.

Estimating Velocity

- **It is better to be roughly right than precisely wrong.”—John Maynard Keynes.**
- One of the challenges of planning a release is estimating the velocity of the team. You have the following three options:
 - Use historical values.
 - Run an iteration
 - Make a forecast.
- You should consider expressing the estimate as a range.
 - You could create a range by simply adding and subtracting a few points to the average or by looking at the team's best and worst iterations over the past two or three months.
 - Example: If your team velocity is 20 story points - You have a very limited chance of being correct in future. Instead give a range 15-24 story points.

Using Historical values

- Use historical values only when very little has changed between the old project and team and the new project and team.
- Before using them, ask yourself questions like these:
 - Is the technology the same?
 - Is the domain the same?
 - Is the team the same?
 - Is the product owner the same?
 - Are the tools the same?
 - Is the working environment the same?• Were the estimates made by the same people?
 - The answer to each question is often yes when the team is moving onto a new release of a product they just worked on. In that case, using the team's historical values is entirely appropriate. Even though velocity in a situation like this is relatively stable, you should still consider expressing it as a range.

Run an Iteration

- An ideal way to forecast velocity is to run an iteration (or two or three) and then estimate velocity from the observed velocity during the one to three iterations.
- Because the best way to predict velocity is to observe velocity, this should always be your default approach.
- Multipliers for Estimating Velocity Based on Number of Iterations Completed

Iterations Completed	Low Multiplier	High Multiplier
1	0.6	1.60
2	0.8	1.25
3	0.85	1.15
4 or more	0.90	1.10

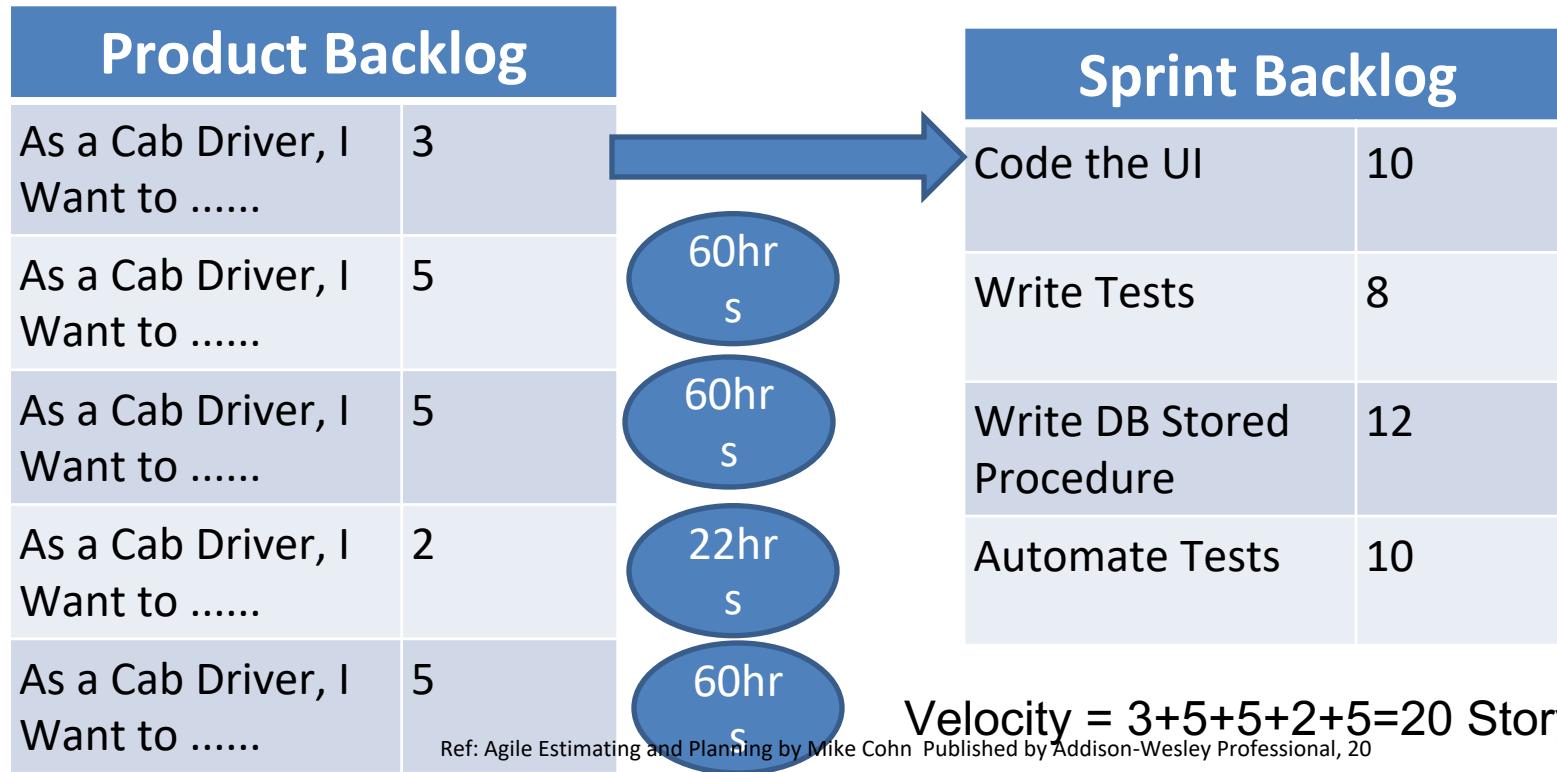
Ref: Agile Estimating and Planning by Mike Cohn Published by Addison-Wesley Professional, 20

Forecasting Velocity

1. Estimate the number of hours that each person will be available to work on the project each day.
2. Determine the total number of hours that will be spent on the project during the iteration.
3. Arbitrarily and somewhat randomly select stories, and expand them into their constituent tasks.
 - Repeat until you have identified enough tasks to fill the number of hours in the iteration.
 - 4. Convert the velocity determined in the preceding step into a range.

Example

Number of Team members	Available hours per day/team member	Total Available hrs	Team Capacity for 10 days iteration
4	6 hrs.	$4*6= 24$	$10*24=240$



High-confidence forecast- Example



- Suppose we want to create high confidence forecast(90%) for the next release.
- As soon as the team has run five or more sprints, we can create a high-confidence forecast
- Suppose, Velocity of completed 8 sprints:20, 25, 28, 26, 16, 20, 26, 26.
- Sorted list:16, 20, 20, 25, 26, 26, 26, 28

Use the nth Lowest and the nth Highest Observation of a Sorted

List of Velocities to Find a 90% Confidence Interval

Number of Velocity Observations	<i>n</i> th Velocity Observation
5	1
8	2
11	3
13	4
16	5
18	6
21	7
23	8
26	9

- Velocity of completed **8 sprints**
- :20, 25, 28, 26, 16, 20, 26, 26

Sorted Velocity List

16

20

20

25

26

26

26

26

28

90% Confidence Interval

- 20 → Lower confidence, certainly we will do
- 23 → Mean Velocity – We will get here
- 26 → Upper confidence, Most we could expect

Creation a Release Plan

- Total story points of Release backlog **divided by** Mean velocity or Velocity range.
- This will give us a provisional number of sprints required for the release
- Example:
 - Total Story points = 200; Mean velocity = 20; Number Sprints required = 10
 - We then map the identified number of sprints onto the calendar and consider the factors that are likely to influence the velocity and that are not accounted for in the velocity forecast.
 - These can include holidays, vacations, training and development, sickness statistics, and planned changes to the project organization, such as modifying the team composition. We adjust the forecasted velocity of each sprint accordingly.

Sample Release Plan

Sprint	1	2	3	4	5	6	7	8
Velocity forecast	N/A	12-32	18-28	21-28	11-18	16-23	21-28	21-28
Actual velocity	20	25	28					
Dependencies			Imaging library					
Releases				Alpha: Calls, basic text messages	Holidays	Beta: Con- ference calls, picture messages		V1.0
				Current sprint				

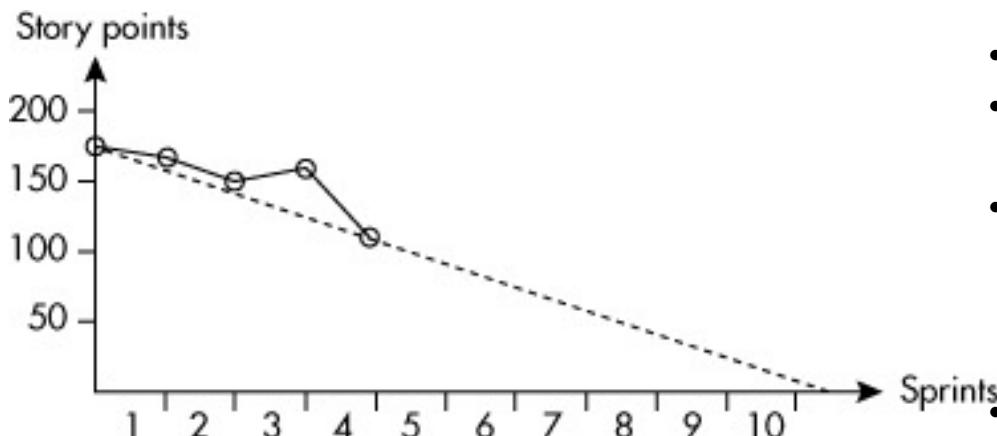
Iterations Completed	Low Multiplier	High Multiplier
1	0.6	1.60
2	0.8	1.25
3	0.85	1.15
4 or more	0.90	1.10

1. Actual velocity for the first three sprints of 20, 25, and 28.
2. The average (mean) velocity per sprint, then, is 24 points.
3. The Scrum team has forecasted a velocity of 21 to 28 points for the fourth, seventh, and eighth sprints using the multipliers Table(below).
4. The release plan also anticipates a velocity drop in sprints five and six, when several team members will take time off and then return to work.

Source: Agile Estimation and Planning by Mike Cohen

Tracking the Progress of the Release

– Release Burndown chart



- The solid line is the actual burndown- Indicate the progress
- Slow start. Might be - impediments and risks materializing, team-building dynamics, or technology issues.
- Third sprint, the remaining effort even increased. - caused by the team reestimating backlog items or discovering new requirements
- The fourth sprint saw a steep burndown; the project progressed fast.

- X-Axis - Number of sprints as the unit
- Y- Axis - Number of story points estimated
- The first data point is the estimated effort of the entire product backlog before any development has taken place.
- To arrive at our next data point, we determine the remaining effort in the product backlog at the end of the first sprint.
- Then we draw a line through the two points. This line is called the burndown(.... Line)
- It shows the rate at which the effort in the product backlog is consumed.
- If we extend the burndown line to the x-axis, we can forecast when the project is likely to finish—assuming effort and velocity stay stable.

Product Visioning - Level 1

- A product vision describes the **future state of a product** (Big Picture) that a company or team desires to achieve. You can also define that future state as: **a goal**.
- Aligns:
 - Product strategy, product development roadmap, backlog & planning, execution & product launch
 - There is/can be a difference between a product and company vision.
- What information does a product vision contain?
 - Focused on Customers (B2C or B2B)- How it will benefit the company and the customer.(What?)
 - It's looking into the future and outlining a clear state of the product/goal that the company and team(s) want to achieve. This goal should be underlined with the motivation behind it (Why?, not How?)
 - The art of defining a great product vision that people want to follow is to make it catchy.

Source:<https://www.christianstrunk.com/blog/product-vision>

A. How to define a product vision?

1. Defining key product information.

- Have some valid data in the product discovery process to find answers to open questions.
- Gaining a clear picture of your customer, your market, the problems you want to solve, and your business goals
- According to Roman Pichler's product vision board, it's important to answer 4 key questions:
- What's the target group?, What are the customer needs?, What is and will be the product and its USP(s)?, What are the business goals?

2. Phrasing the product vision in one inspiring sentence.

- Examples: Google's company vision statement is: "*to provide access to the world's information in one click.*" because that's Google's core business.
- Card reader Makers: "*We believe in a world where small businesses can offer a super fast and safe payment experience to their customers, for minimal costs with no administrative efforts.*"

3. Why is having a product vision important? – Gives direction to Teams

- Who owns? What is the Process to create product vision?

B. How to define a product vision?- Classical format.

- Create an **elevator statement** or a Product vision box/Product Vision Board . (Non technical)
- A format popularized by Geoffrey Moore's classic *Crossing the Chasm*

For (**target customer**) who (**statement of need or opportunity**), the (**product name**) is a (**product category**) that (**key benefit, reason to buy**).

Unlike (**primary competitive alternative**), our product (**statement of primary differentiation**).

- Here's an example of a product vision statement for Microsoft Surface:
 - For the business user who needs to be productive in the office and on the go, the Surface is a convertible tablet that is easy to carry and gives you full computing productivity no matter where you are.
Unlike laptops, Surface serves your on-the-go needs without having to carry an extra device.
- Any further planning (Design) at this stage may divert our attention from future vision of the product.

Source:280 Group LLC

Product Roadmap – Level 2 Planning



- A product vision is a high-level aspirational projection of the future state of a product.
 - It must be impactful to generate sufficient interest among the innovators, early adopters, and early-stage investors.
- A product roadmap is essentially a timeline of feature rollout plans.- (Review the roadmap regularly)
 - It helps product managers prioritize R&D dollars to maximize chances of realizing the product's promised or anticipated ROI.
 - It allows the product team to focus on more value-creating features "here and now" versus hundreds of features that might have limited relative potential.
 - It helps customers know that their favorite features are planned somewhere down the road, and, if they so desire, the product team can expedite them.
 - it also allows customer feedback of what features are perceived as critical and what could be deferred to another time.
 - Helps the delivery team to see as whole, learn business priorities, Provide technical and estimates inputs to Product roadmap.

Type of Product Roadmaps

- Goal/Objectives driven roadmap
- Feature Driven
- Date/Time Driven

Goal Oriented Roadmap

THE GO PRODUCT ROADMAP



 DATE The release date or timeframe	Date or timeframe	Date or timeframe	Date or timeframe	Date or timeframe
 NAME The name of the new release	Name/version	Name/version	Name/version	Name/version
 GOAL The reason for creating the new release	Goal	Goal	Goal	Goal
 FEATURES The high-level features necessary to meet the goal	Features	Features	Features	Features
 METRICS The metrics to determine if the goal has been met	Metrics	Metrics	Metrics	Metrics

When will the release be available?

What is it called?

**Why is it developed?
Which benefit does it offer?**

What are the 3-5 key features?

How do we know that the goal is met?



Goal Oriented Roadmap – An Example



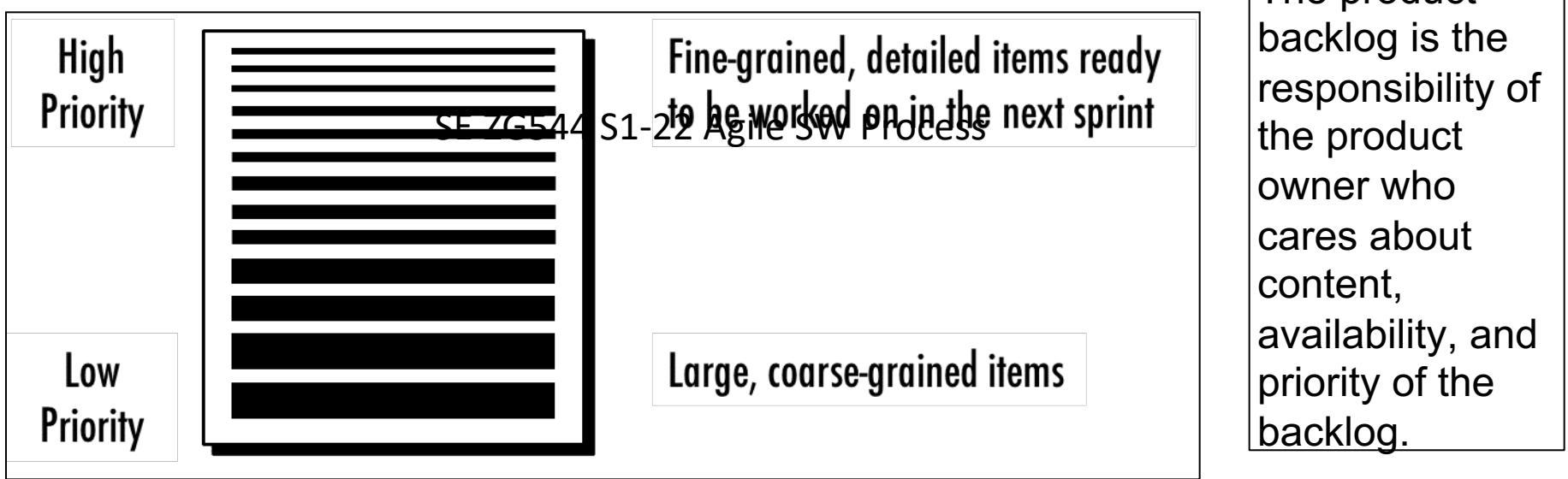
Develop a new dance game for girls aged eight to 12 years. The app should be fun and educational allowing the players to modify the characters, change the music, dance with remote players, and choreograph new dances.

	1 st quarter	2 nd quarter	3 rd quarter	4 th quarter
	Version 1	Version 2	Version 3	Version 4
	Acquisition: Free app, limited in-app purchases	Activation: Focus on in-app purchases	Retention	Acquisition: New segment
	<ul style="list-style-type: none">Basic game functionalityMultiplayerFB integration	<ul style="list-style-type: none">Purchase dance movesCreate new dances	<ul style="list-style-type: none">New characters and floorsEnhanced visual design	<ul style="list-style-type: none">Street dance elementsDance competition
	Downloads: top 10 dance app	Activations, downloads	Daily active players, session length	Downloads

Source: <https://www.romanpichler.com/blog/goal-oriented-agile-product-roadmap/>

Product Backlog - Level 3

- A product backlog is a prioritized list of work* for the development team that is derived from the roadmap and its requirements.
- The most important items are shown at the top of the product backlog so the team knows what to deliver first.



* List of the new features, changes to existing features, bug fixes, infrastructure changes or other activities that a team may deliver in order to achieve a specific outcome.

Source: <https://www.romanpichler.com/blog/goal-oriented-agile-product-roadmap/>

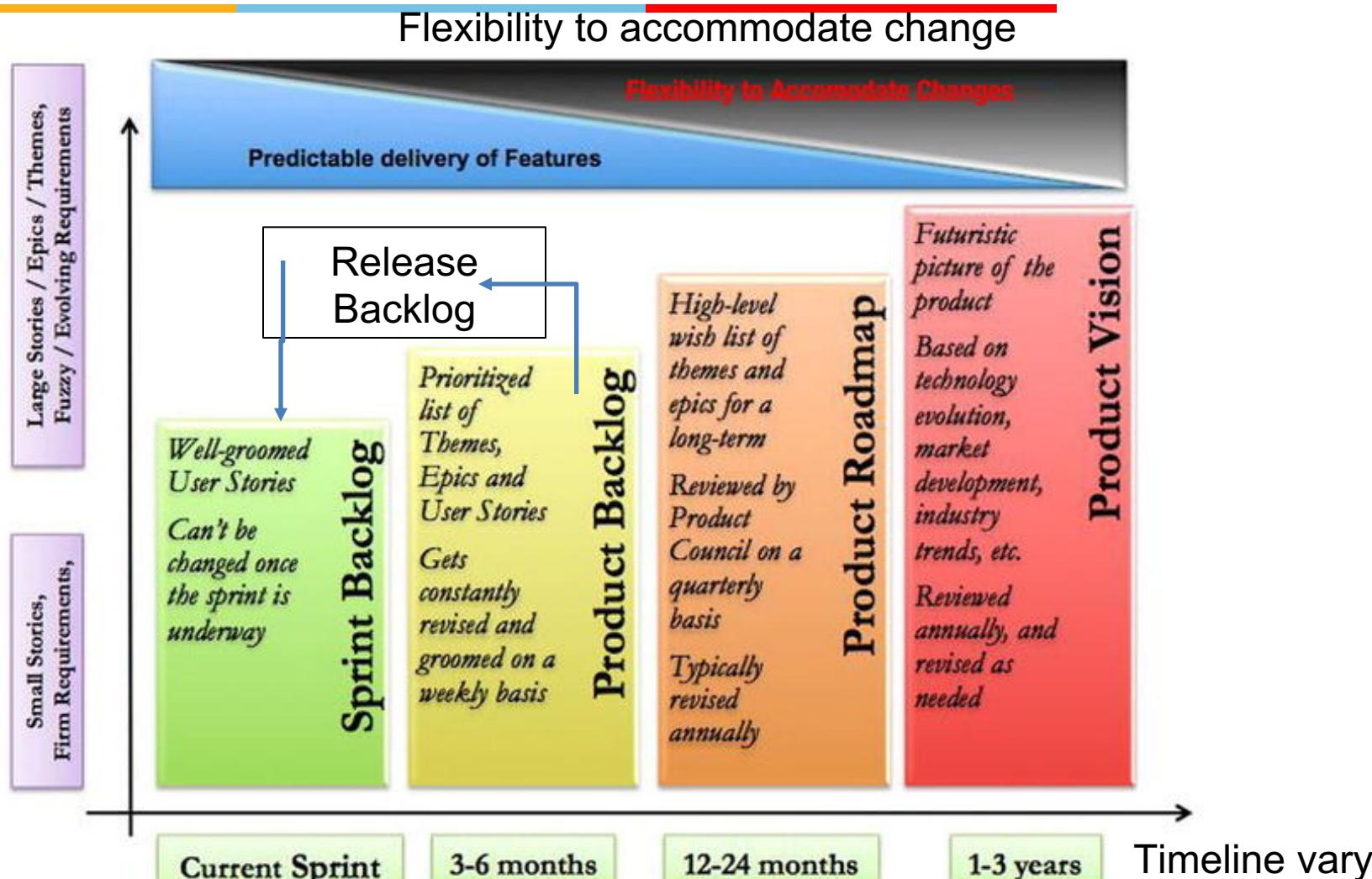
Characteristics of a Product Backlog



- There is an abbreviation that combines similar characteristics of good product backlogs. This is DEEP:
 - **Detailed appropriately**
 - higher-priority items are described in more detail than lower-priority ones
 - **Emergent**
 - It evolves and its contents change frequently. New items emerge based on customer and user feedback and are added to the backlog. Existing items are modified, reprioritized, refined, or removed on a regular basis.
 - **Estimated**
 - The product backlog items—certainly the ones participating in the next major release—should be estimated. The estimates are coarse-grained and often expressed in story points or ideal days.
 - **Prioritized**
 - All items in the product backlog are prioritized (or ordered)

Source: <https://www.romanpichler.com/blog/make-the-product-backlog-deep/>
Copyright © Pichler Consulting

Product runways represent a healthy trade-off between flexibility and predictability



Ref: Agile Product Development: How to Design Innovative Products That Create Customer Value by Tathagat Varma published by Apress, 2015

Project Trade-off Matrix

	Fixed	Flexible	Accept
Scope	X		
Schedule		X	
Cost			X

- The tradeoff matrix helps the development team, the product team, and the executive stakeholders manage change during a project.
- The trade-off matrix informs all participants that changes have consequences and acts as a basis for decision making.
- The trade-off matrix indicates relative importance of the three constraints (scope, schedule, cost) identified on the agile triangle (value, quality, constraints).
- The importance goes from Fixed, to Flexible, to Accept, the tolerance for variation increases.

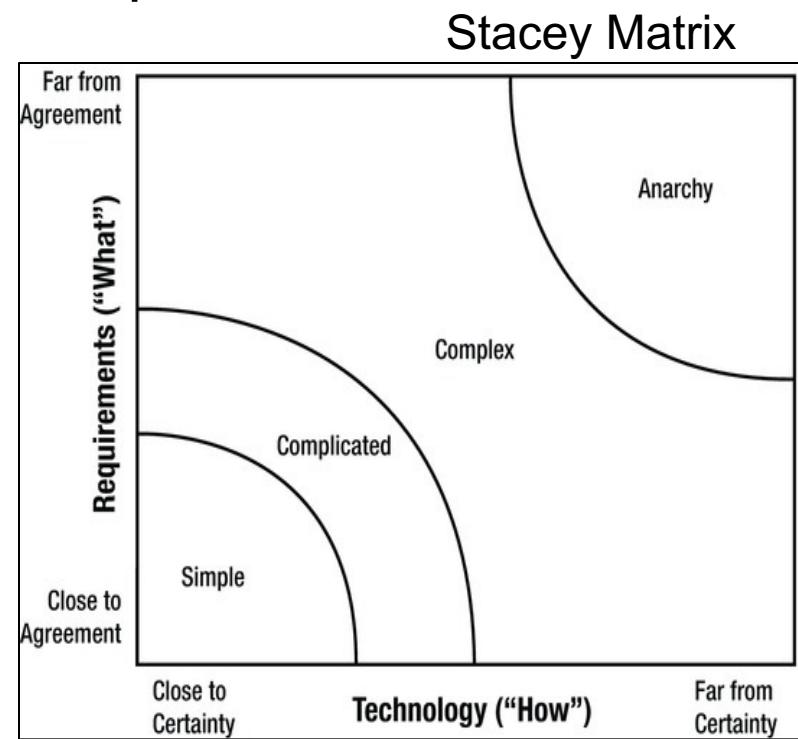
Ref: Agile Project Management: Creating Innovative Products, Second Edition by Jim Highsmith Published by Addison-Wesley Professional, 2009

Exploration Factor

- Articulating an exploration factor helps considerably in managing customer and executive expectations.

Product Technology Dimension				
Product Requirements Dimension	Bleeding Edge	Leading Edge	Familiar	Well-known
Erratic	10	8	7	7
Fluctuating	8	7	6	5
Routine	7	6	4	3
Stable	7	5	3	1

Category	Requirements Variability
Erratic	25–50% or more
Fluctuating	15–25%
Routine	5–15%
Stable	<5%



End