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SE ZG 544 , Agile Software Process
Module-4 - Agile Methodologies

Module-4 Topics

- Agile Methods
- Scrum
- XP
- Lean
- Kanban

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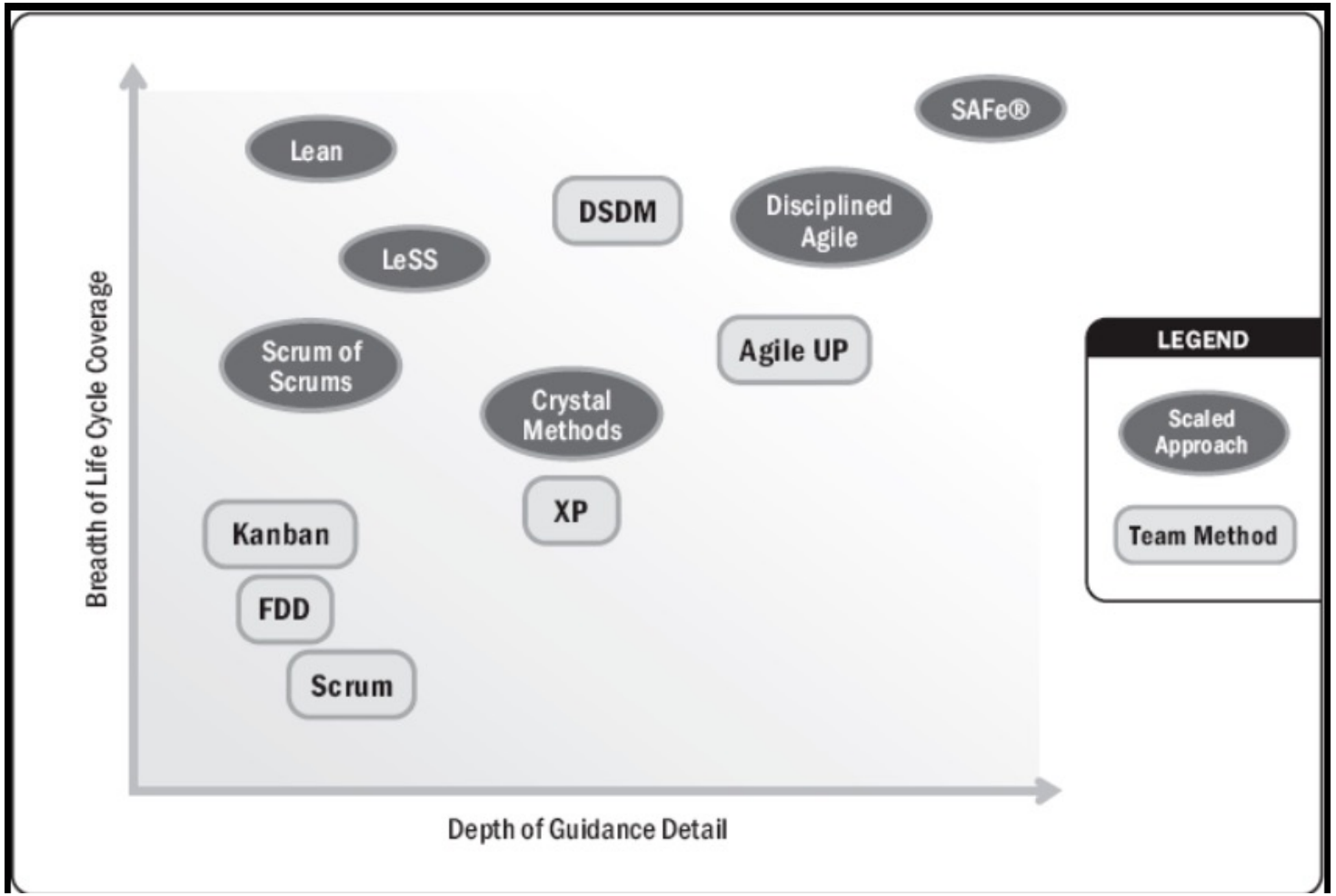
Agile Methodologies
Scrum, Kanban, XP, Lean

Agile Methods



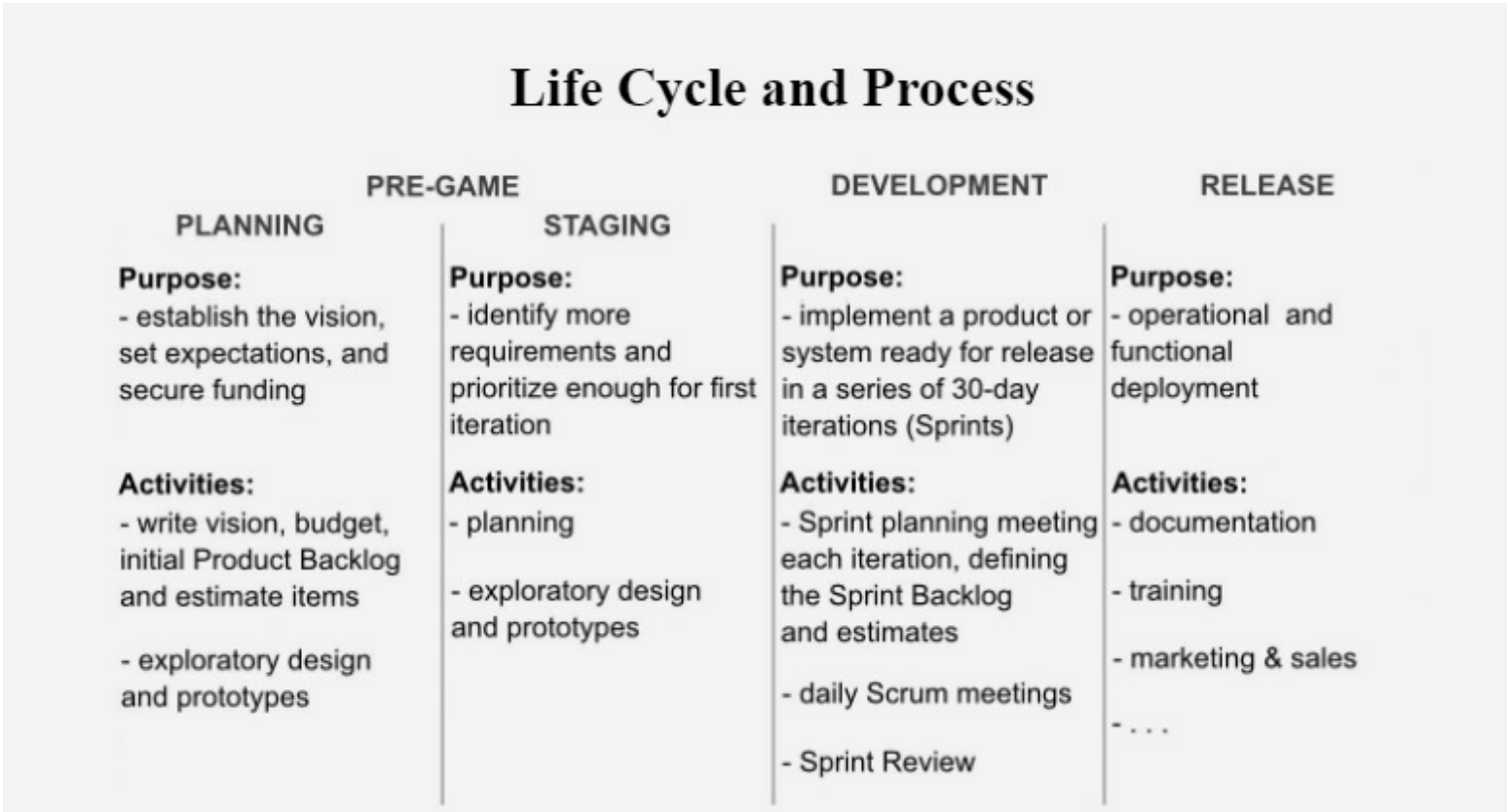
Source :Agile Practice Guide by Project Management Institute, published by Project Management Institute, 2017

Scrum

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

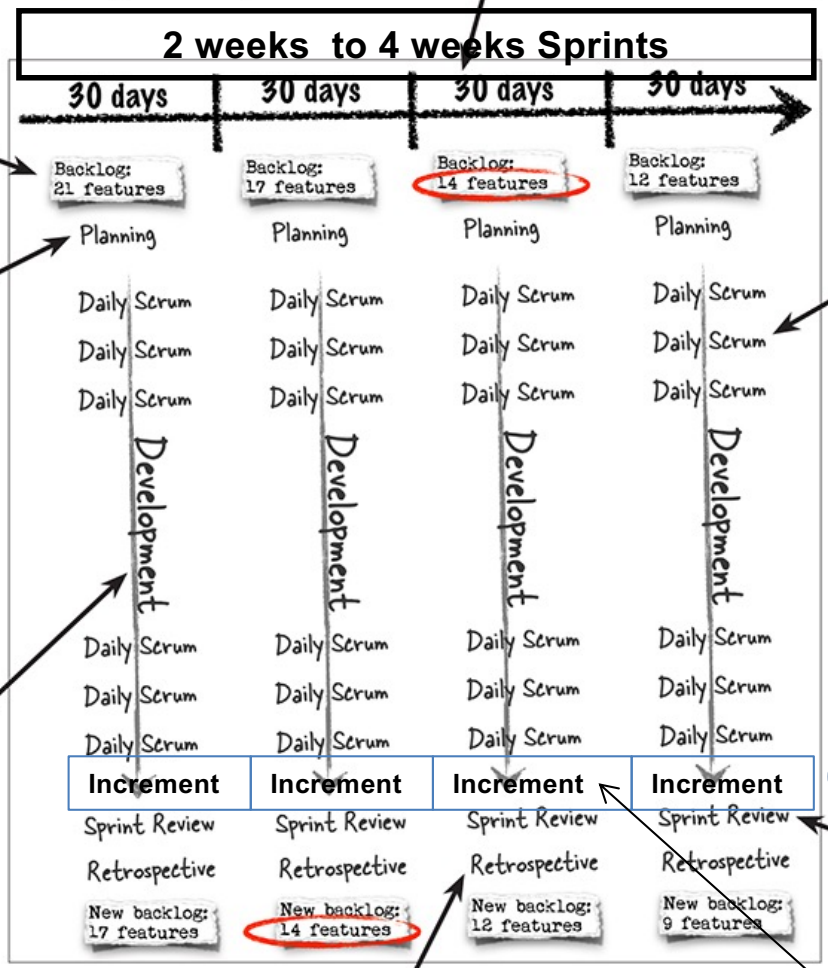


Source: So, What's The Big Deal About Scrum?,by by André Akinyele,2019

Scrum Project Life cycle

This is the single source for requirements and any changes that will be made to the product throughout the project.

Every Scrum project is organized into timeboxed iterations called Sprints. Many teams use 30-day Sprints, but it's pretty common to see two-week Sprints too.



1. The team uses the Product Backlog to keep track of the features that they'll build for the whole project.
2. At the beginning of each Sprint, the Scrum Team gets together for a Sprint Planning session where they choose what items to include in the Sprint.
3. The items for the Sprint are pulled off of the Product Backlog and added to the Sprint Backlog. During the Sprint, all of the development work is focused on building the items in the Sprint Backlog.
4. When Sprint is done, the team holds a meeting called the Sprint Review, where they meet with the users and give a demo of the working software that they built.
5. The very last thing the team does in the Sprint is meet and hold a Sprint Retrospective, where they talk about what happened during the Sprint so they can reproduce the things that went well and learn from any problems.

Every day, the team holds a Daily Scrum, a short meeting where each person gives an update on their progress, what they'll work on next, and any roadblocks they've hit.

The Scrum events:
1. The Sprint
2. The Sprint Planning
3. The Daily Scrum
4. The Sprint Review
5. The Sprint Retrospective

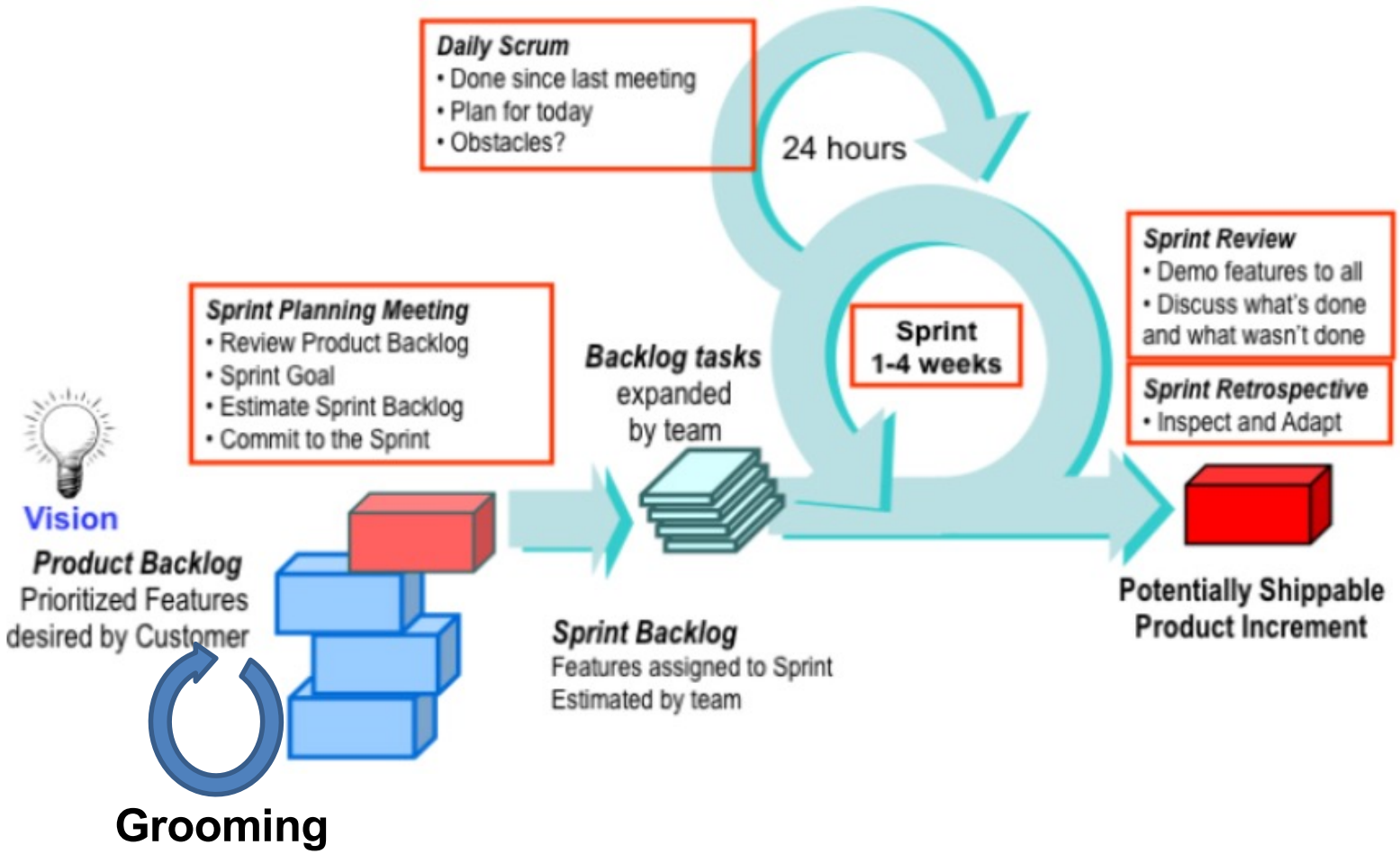
The Scrum Artifacts:
1. The Product Backlog
2. The Sprint Backlog
3. The Product Increment

The Scrum Roles:
1. The Product Owner
2. The Scrum Master
3. The Team

PSI-Potentially shippable increment

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

Scrum Project Lifecycle



Agile project management with Scrum

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

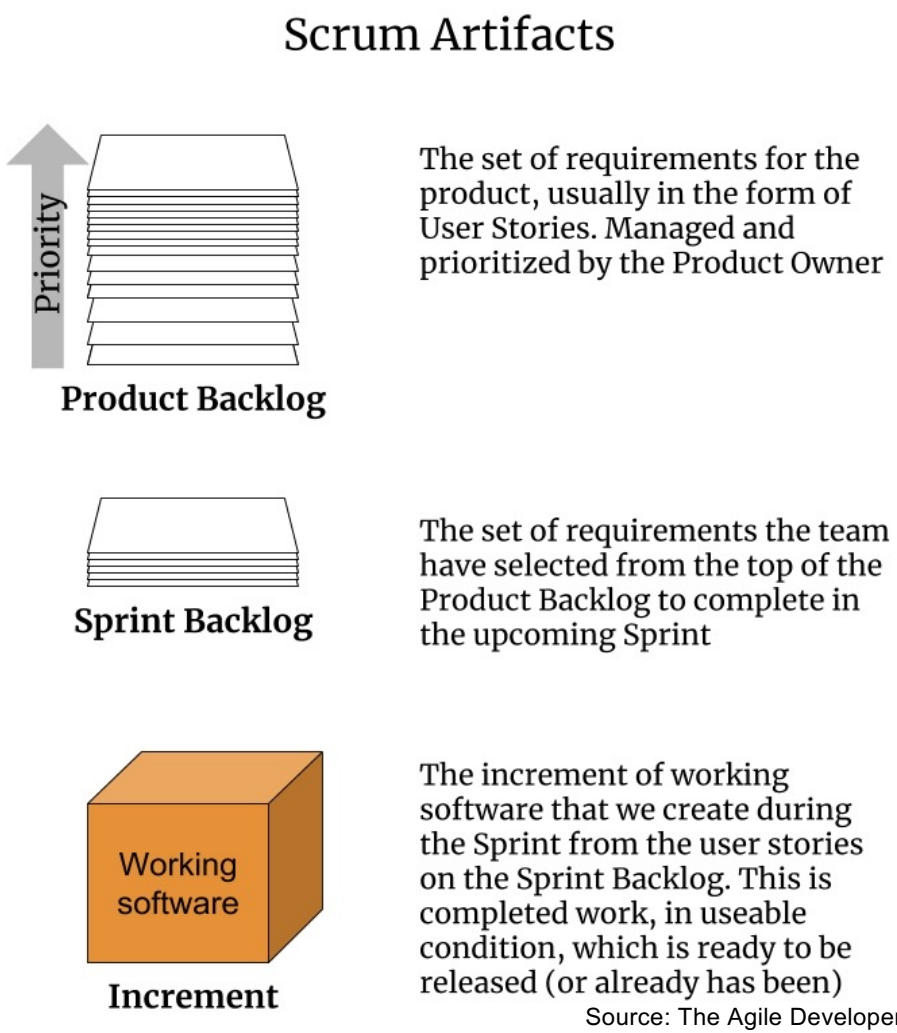
- Create working increments of "done" work
- Self-organizing - team decides how to deliver
- Cross-functional - have all the skills on the team necessary to do the job
- Individuals may have specialist skills, but are accountable as a team for delivery
- Scrum only recognises the title "developer" within 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

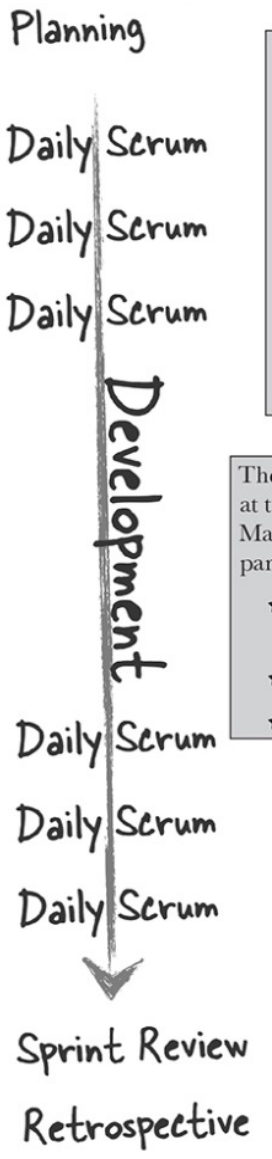
Source: The Agile Developer's Handbook, by Paul Flewelling,Published by Packt Publishing, 2018

Scrum Artifacts



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

Sprint Events/Ceremonies



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.

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.

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

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.

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

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

Quiz

Set1

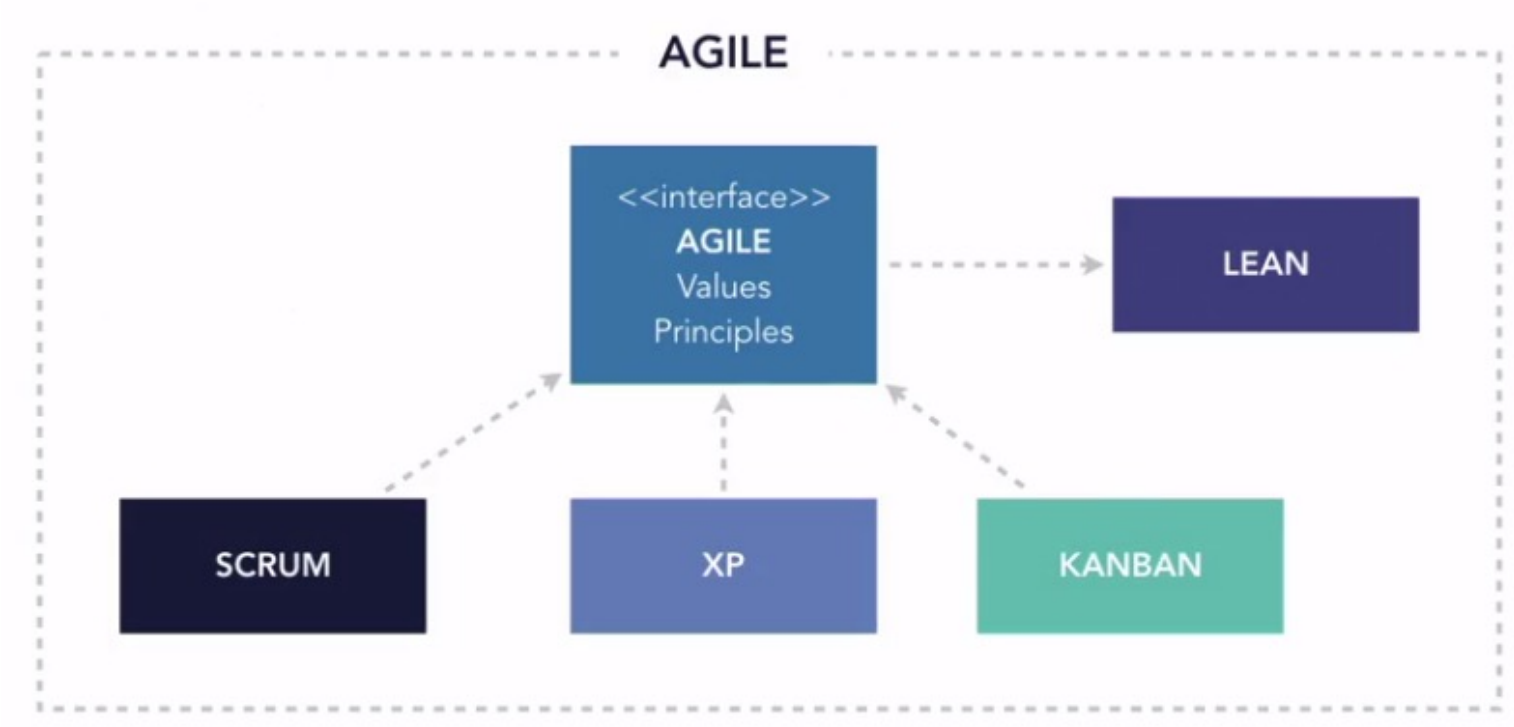
XP- Extreme Programming

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



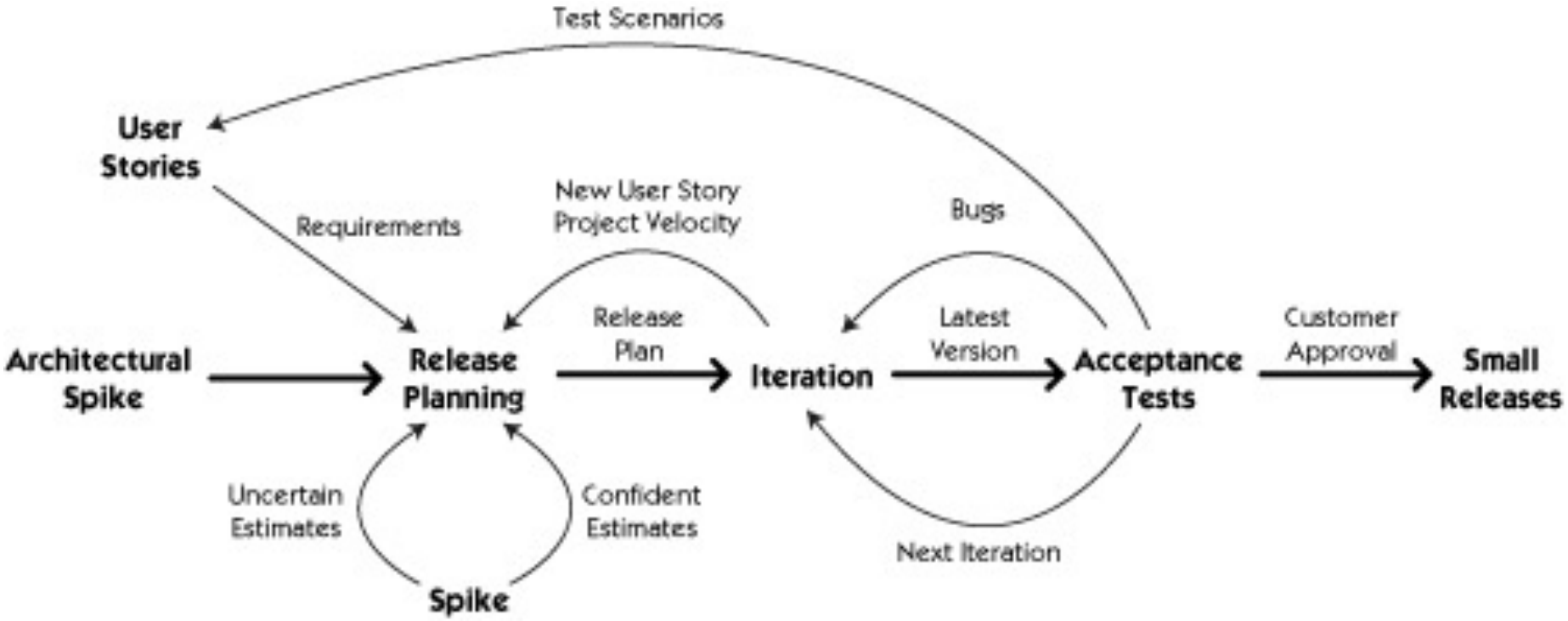
Source :Lynda.com/XP overview

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

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.

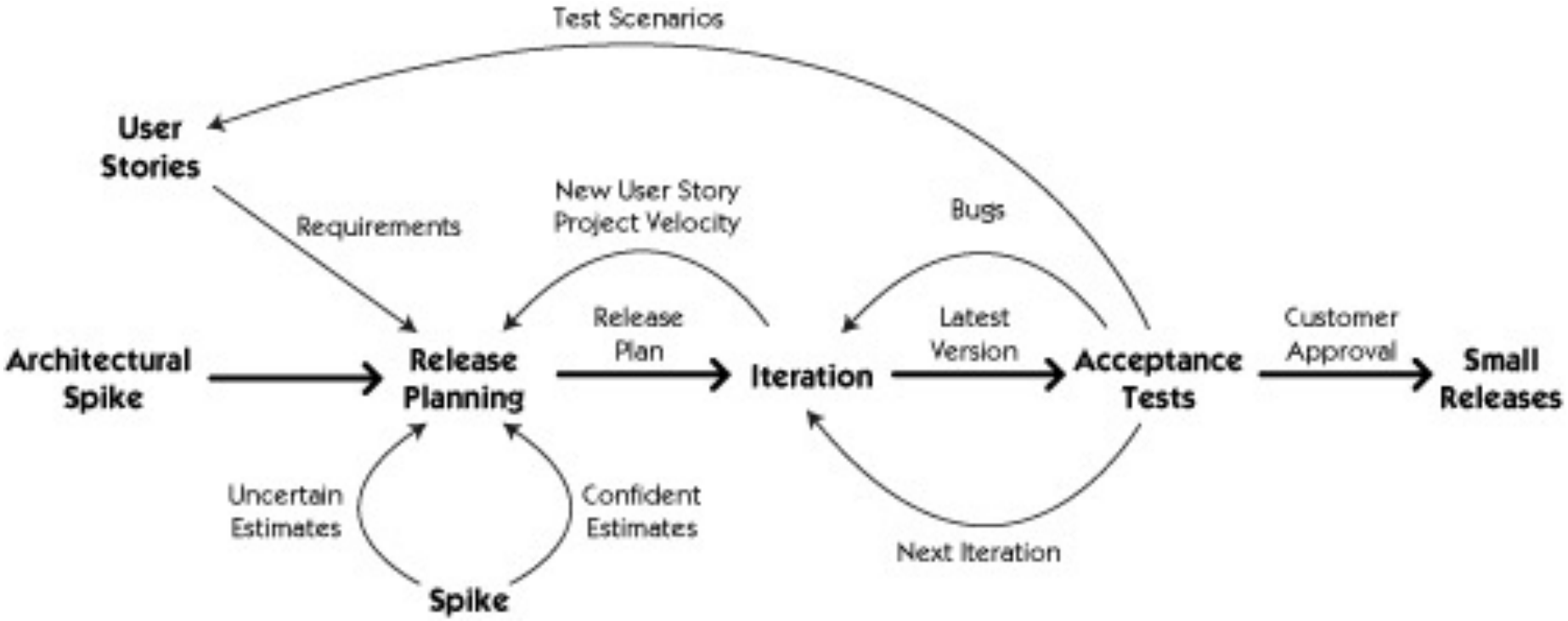
XP Practices …

- 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.

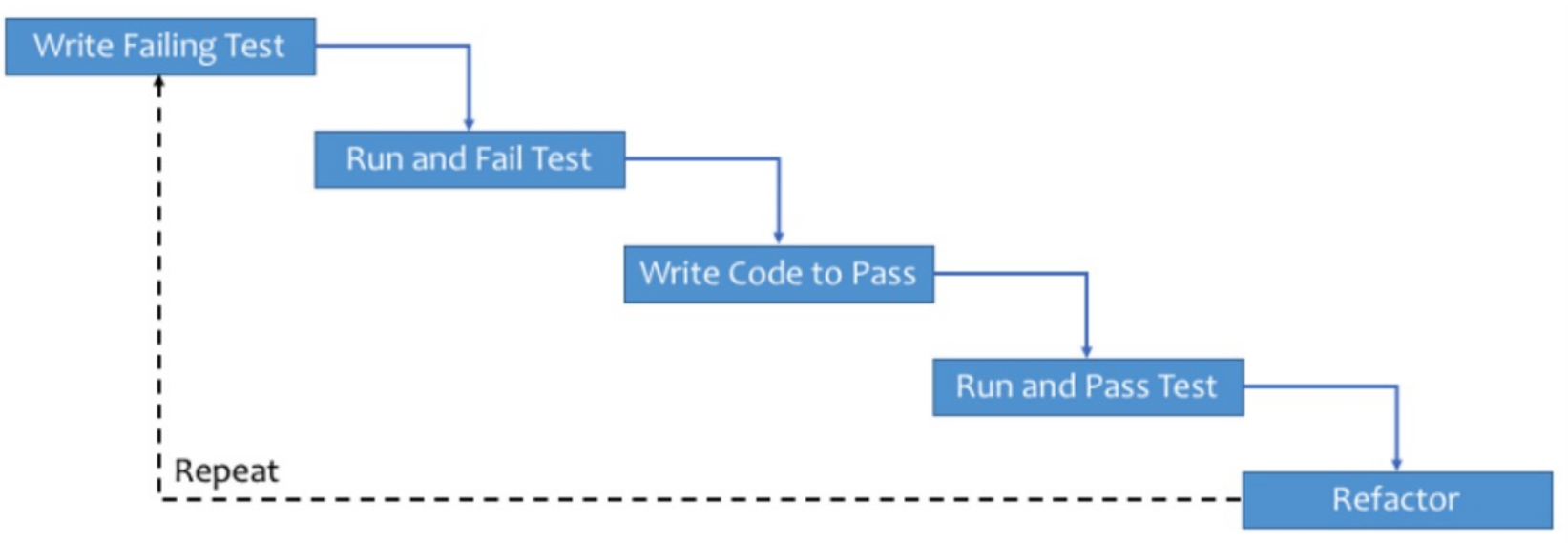
A visual process model for XP



Test Driven Development (TDD)

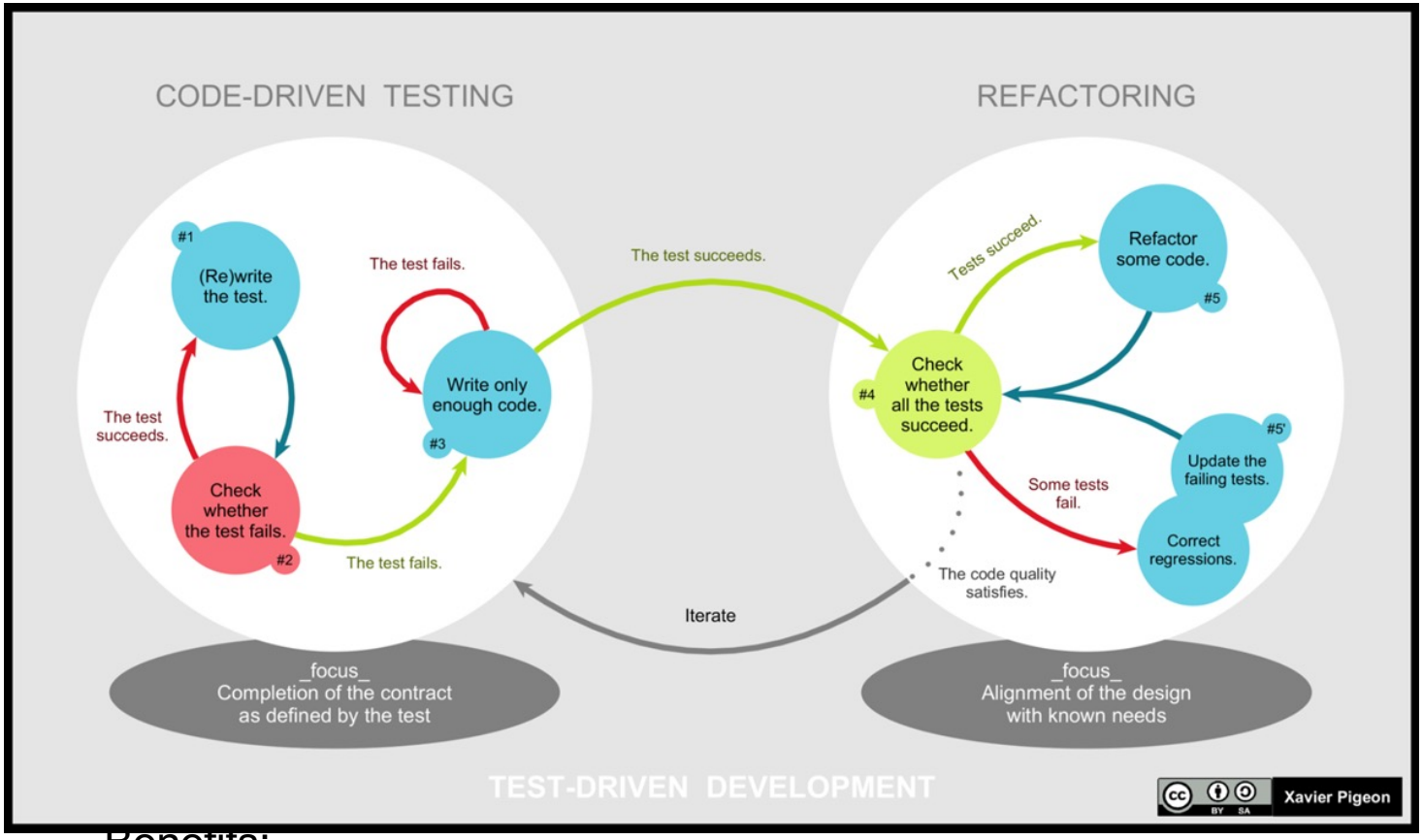
Test Driven Development- General work flow

- 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/

Test Driven Development (TDD) – Detail Process



Tools:

- Junit for Java
- Pyunit for Python

Benefits:

- Improves Code quality
- Shortens feedback loop
- Shorten Development time
- TDD is part of Agile Culture

“Hello World” TDD Example

File mytests.py

```
import unit test from mycode import *
class MyFirstTests(unittest.TestCase):
def test_hello(self):
  self.assertEqual(hello_world(), 'hello world')
```

1.File mycode.py

```
def hello_world():
```

Run mytest.py

Test fails . No return value.

2. Then Add code to mycode.py

```
def hello_world():    return 'hello world‘
```

Run mytest.py

Test Pass.

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

Quiz

S2

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Lean Software Development

Source: Lynda.com :DevOps Foundations: Lean and Agile with Ernest Mueller and Karthik Gaekwad

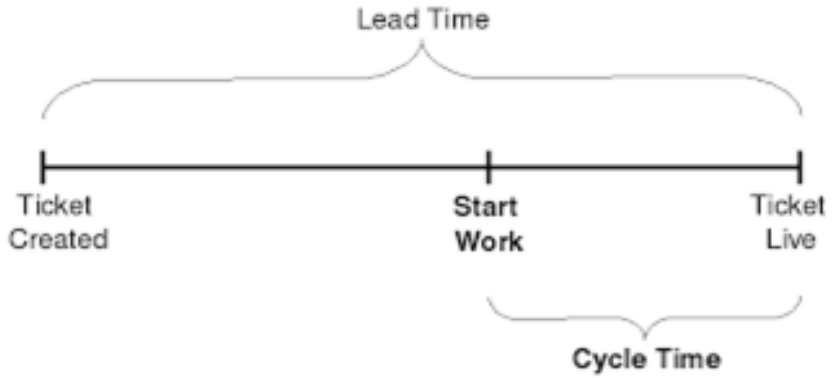
What is Lean?

- 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.

Example-Value stream Mapping- Initial State

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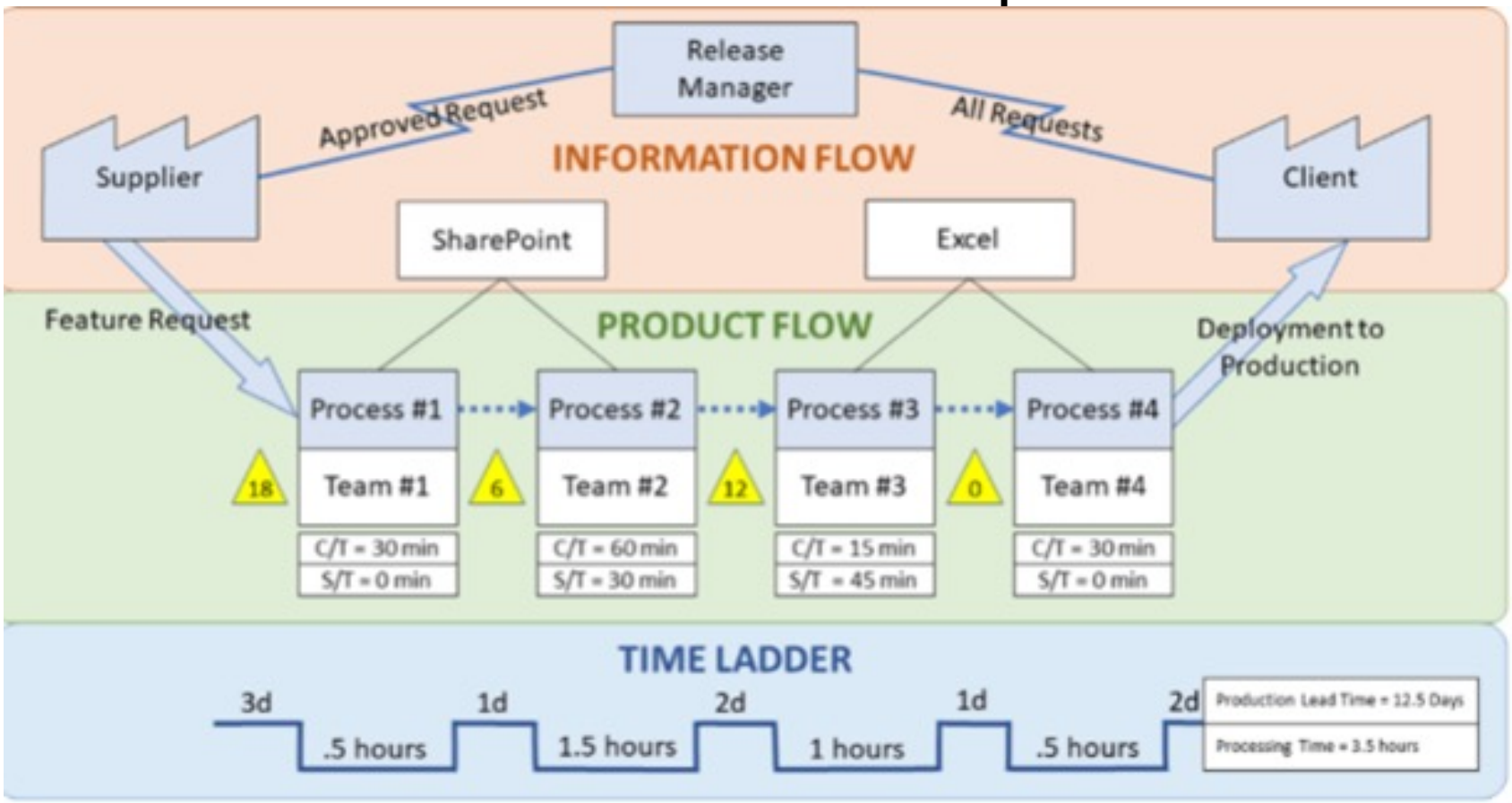
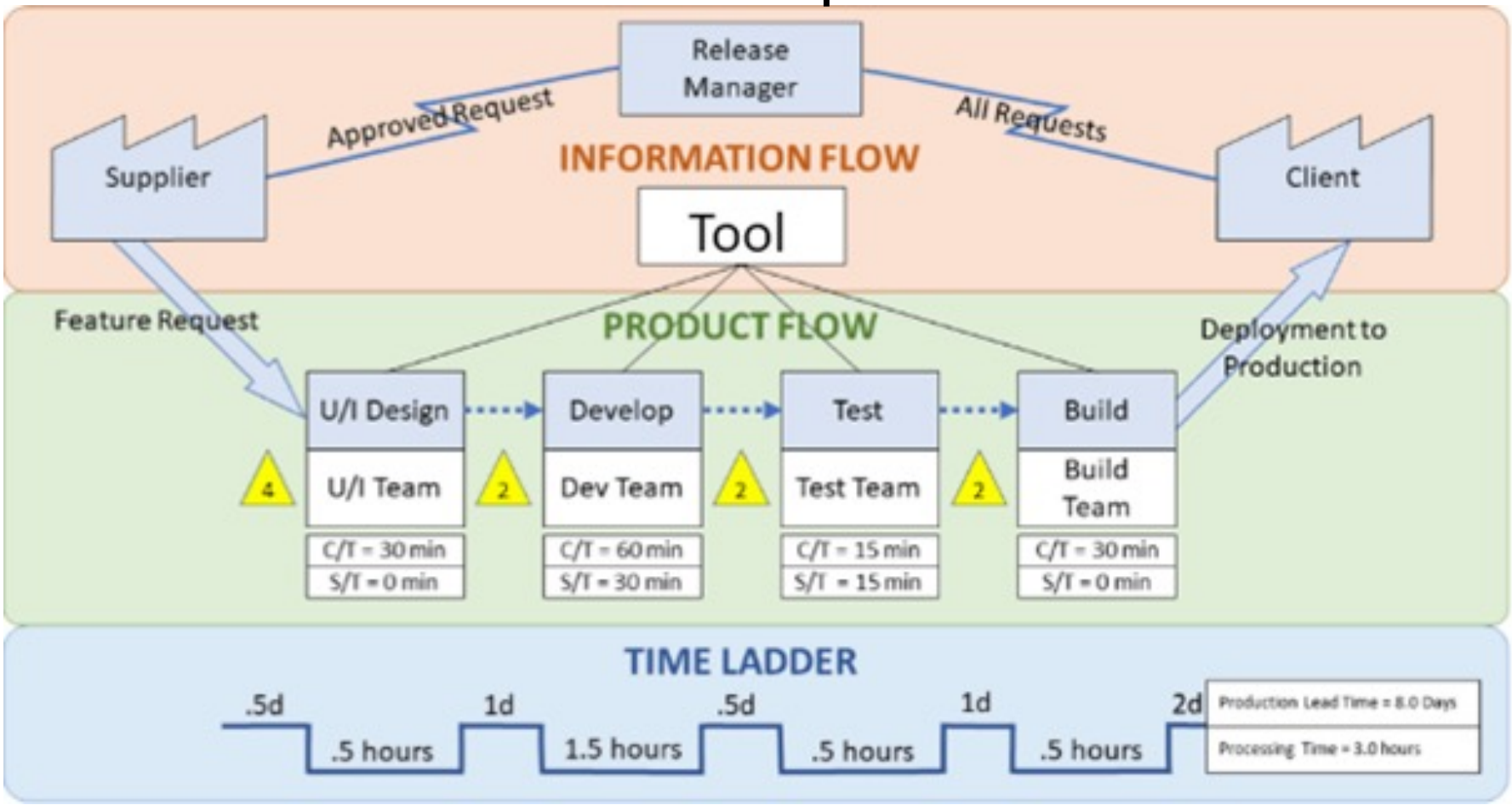
Current State of SW Development



Source: https://www.plutora.com/blog/value-stream-mapping

Example-Value stream Mapping – Future state



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

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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 differ 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.

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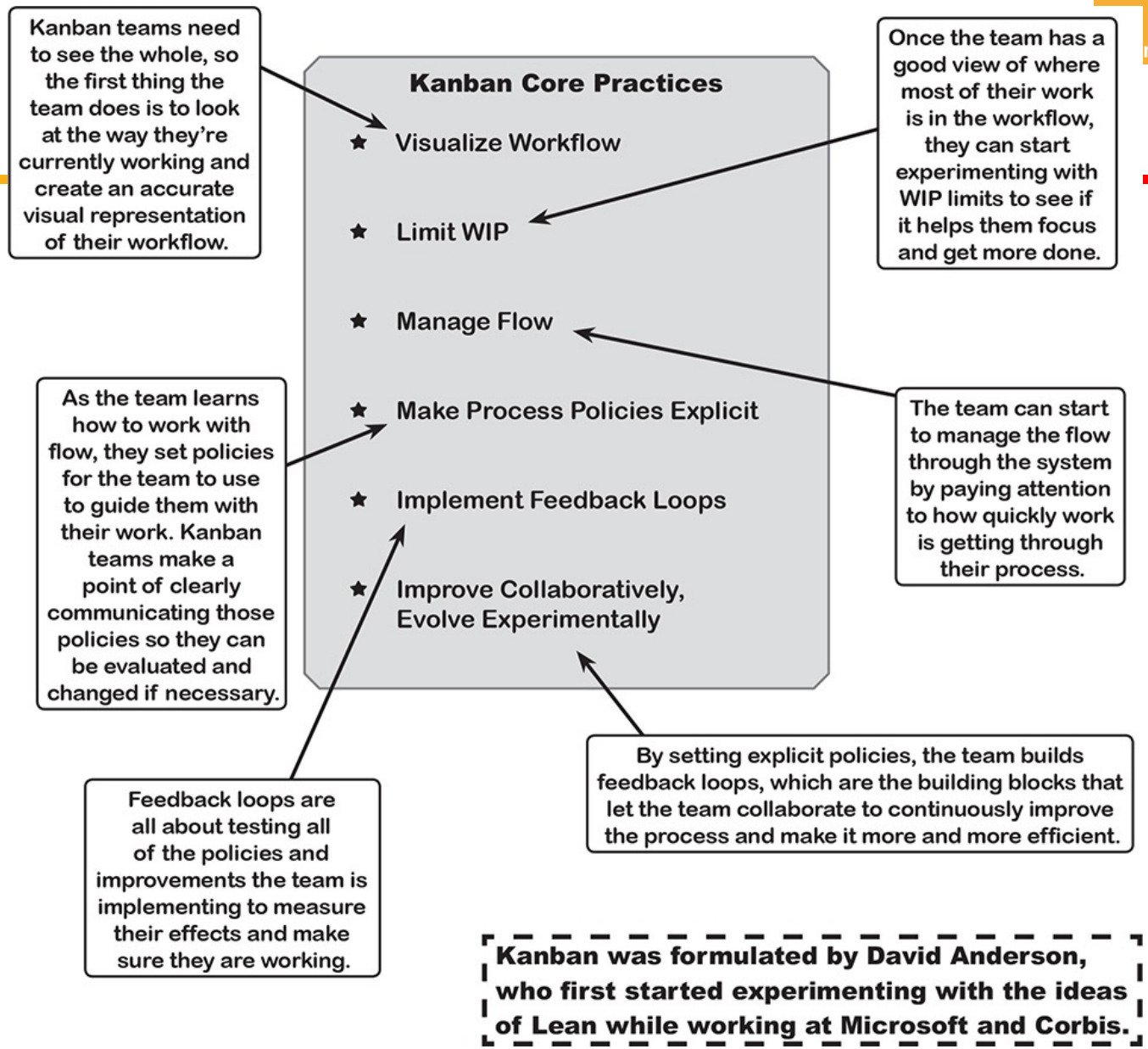
Kanban

Kanban

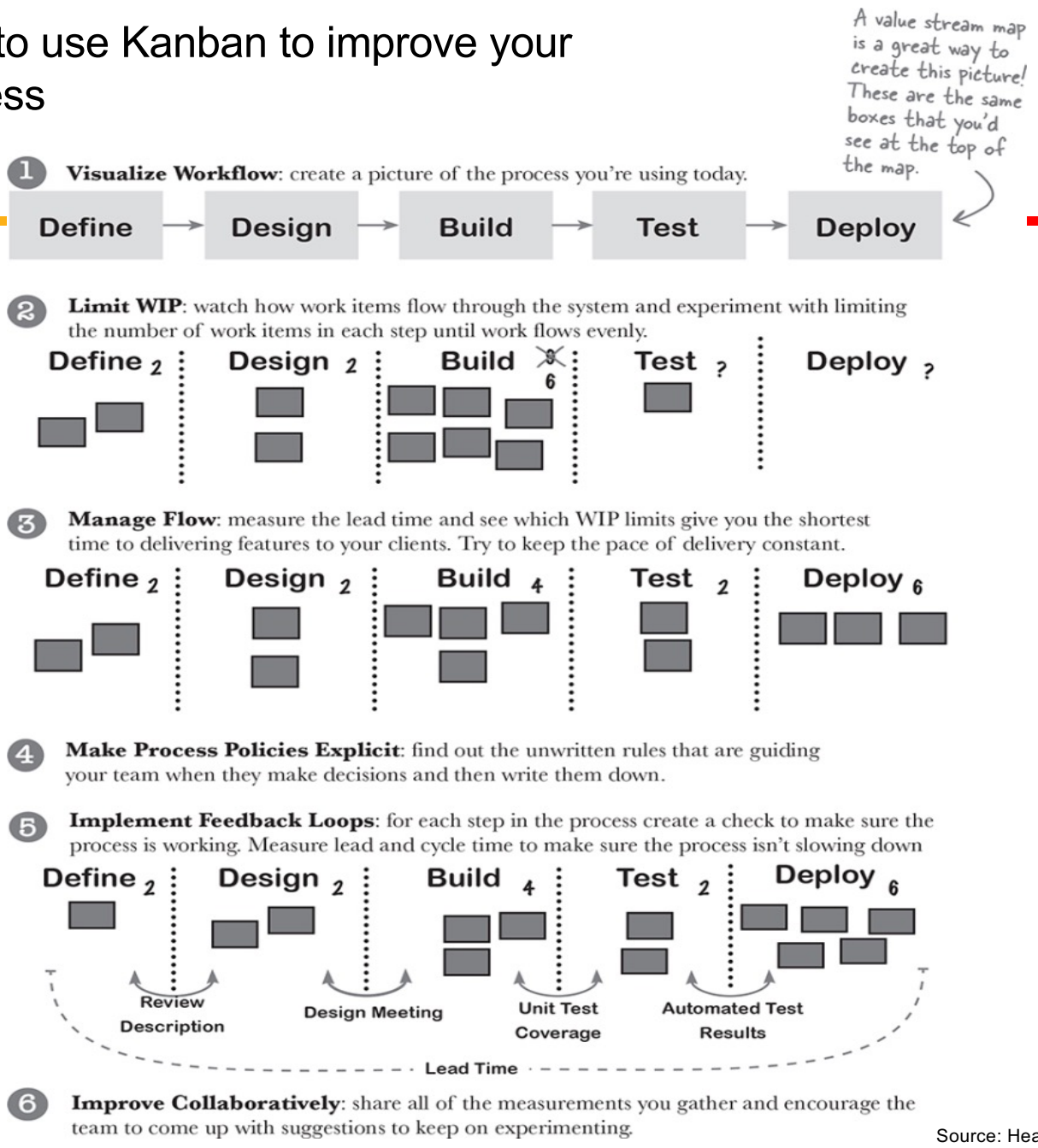
- Taiichi Ohno, who was an industrial engineer at Toyota, developed the Kanban methodology in 2004 to improve efficiency at the manufacturing plant.
- The Kanban method is an approach to continuously improving service delivery that emphasizes the smooth, fast flow of work.
- Kanban is not an Agile software 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 was formulated by David Anderson, who first started experimenting with the ideas of Lean while working at Microsoft and Corbis.

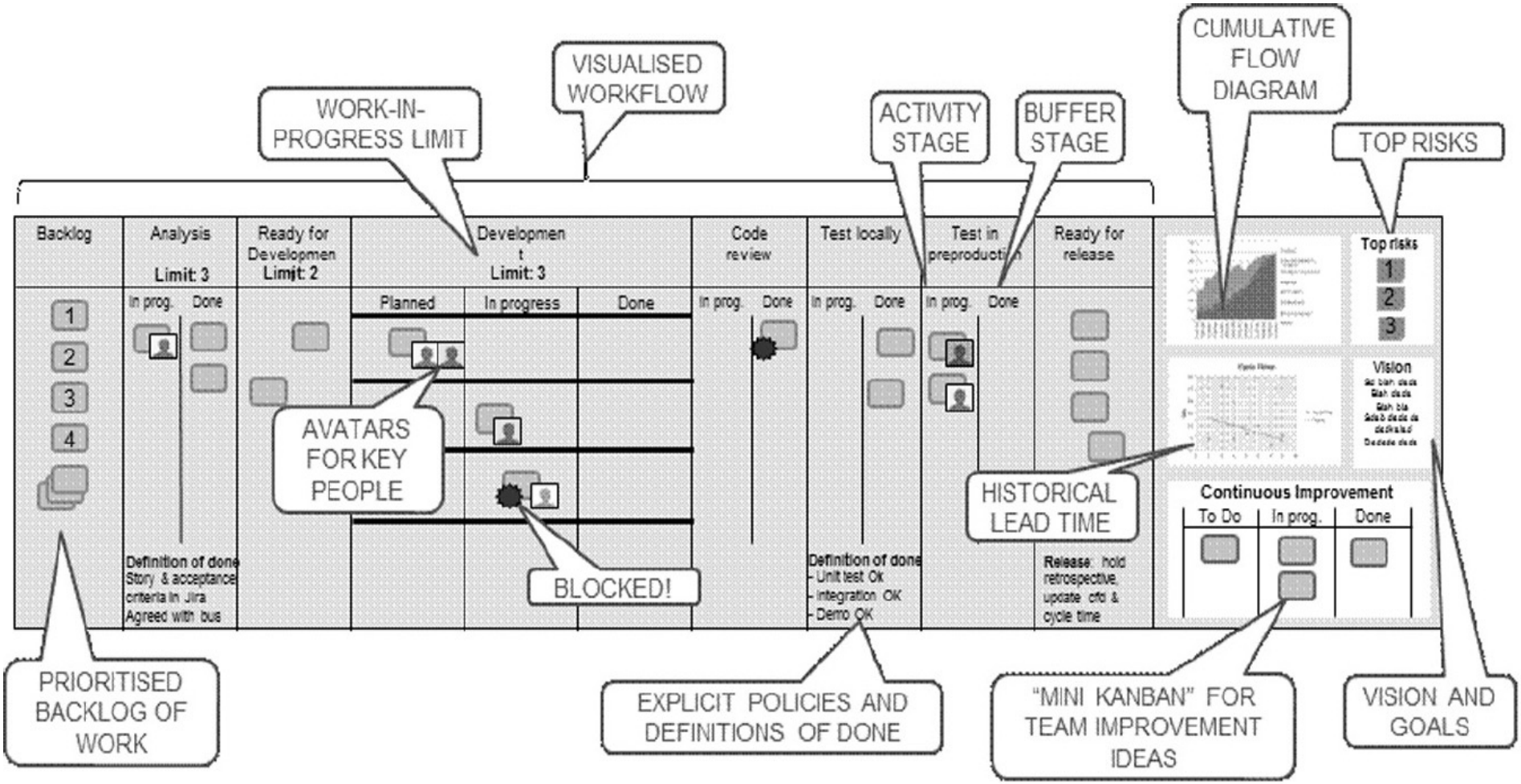
Source:Head First Agileby Jennifer Greene; Andrew Stellman, Published by O'Reilly Media, Inc., 2017

How to use Kanban to improve your process



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

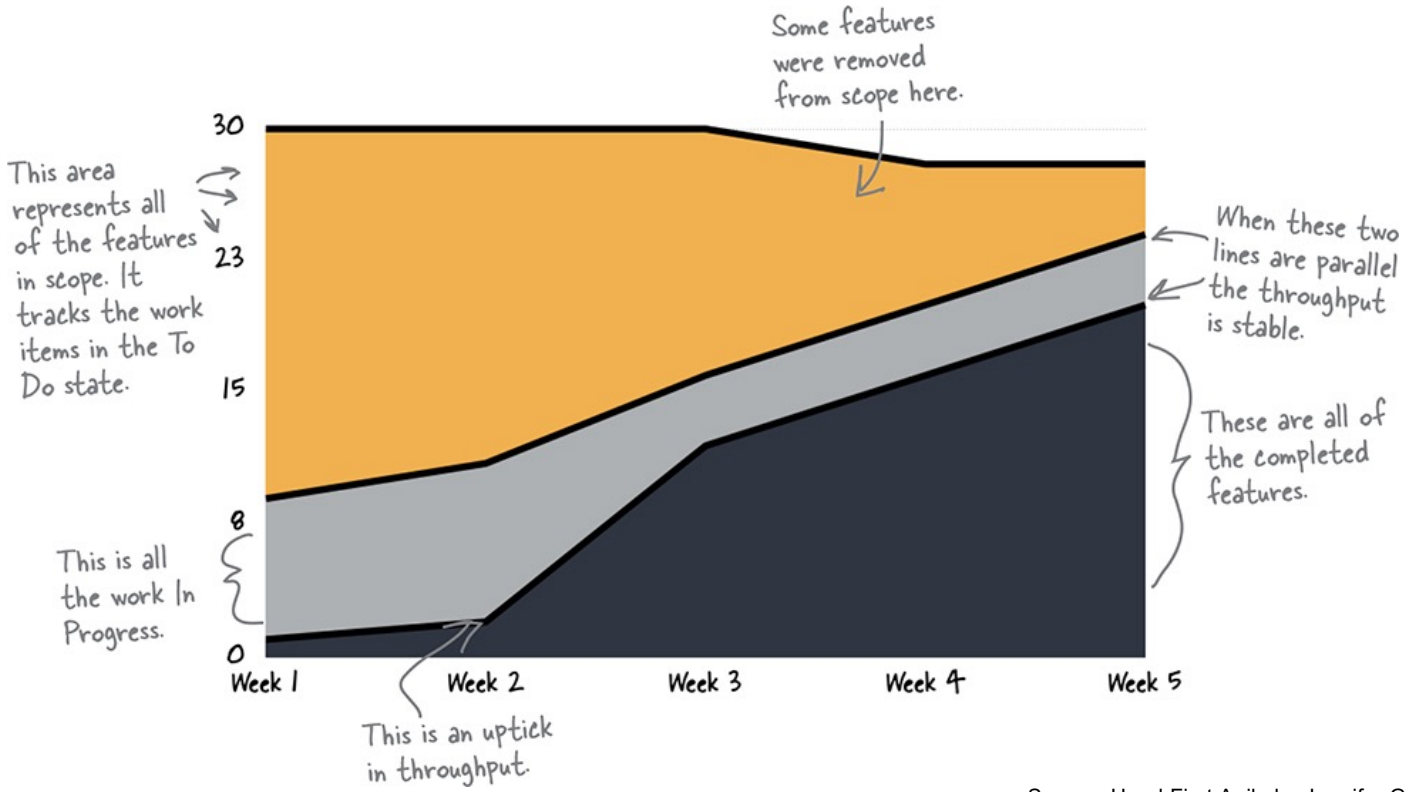
Typical Kanban board



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

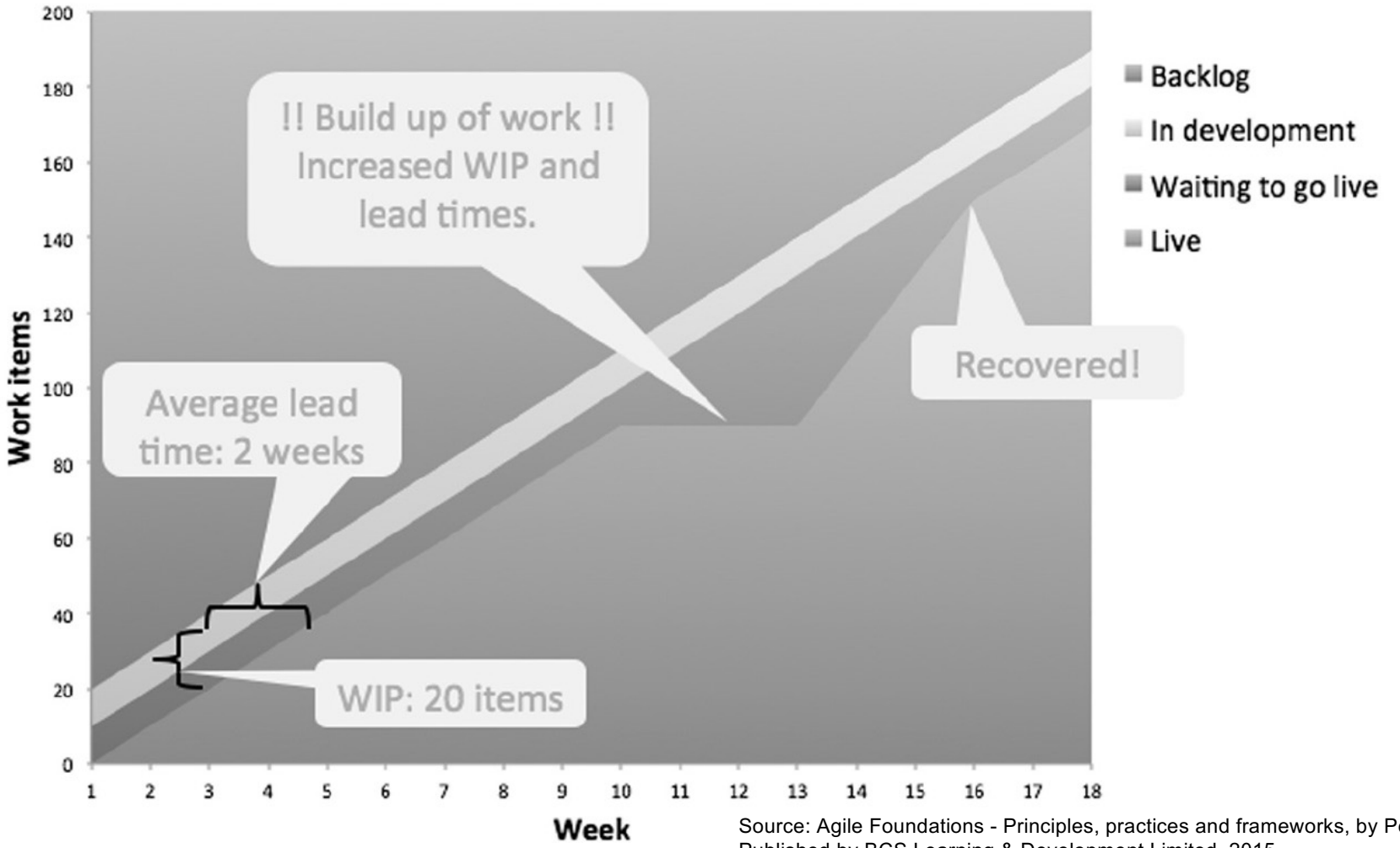
Cumulative flow diagram (Example-1)

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



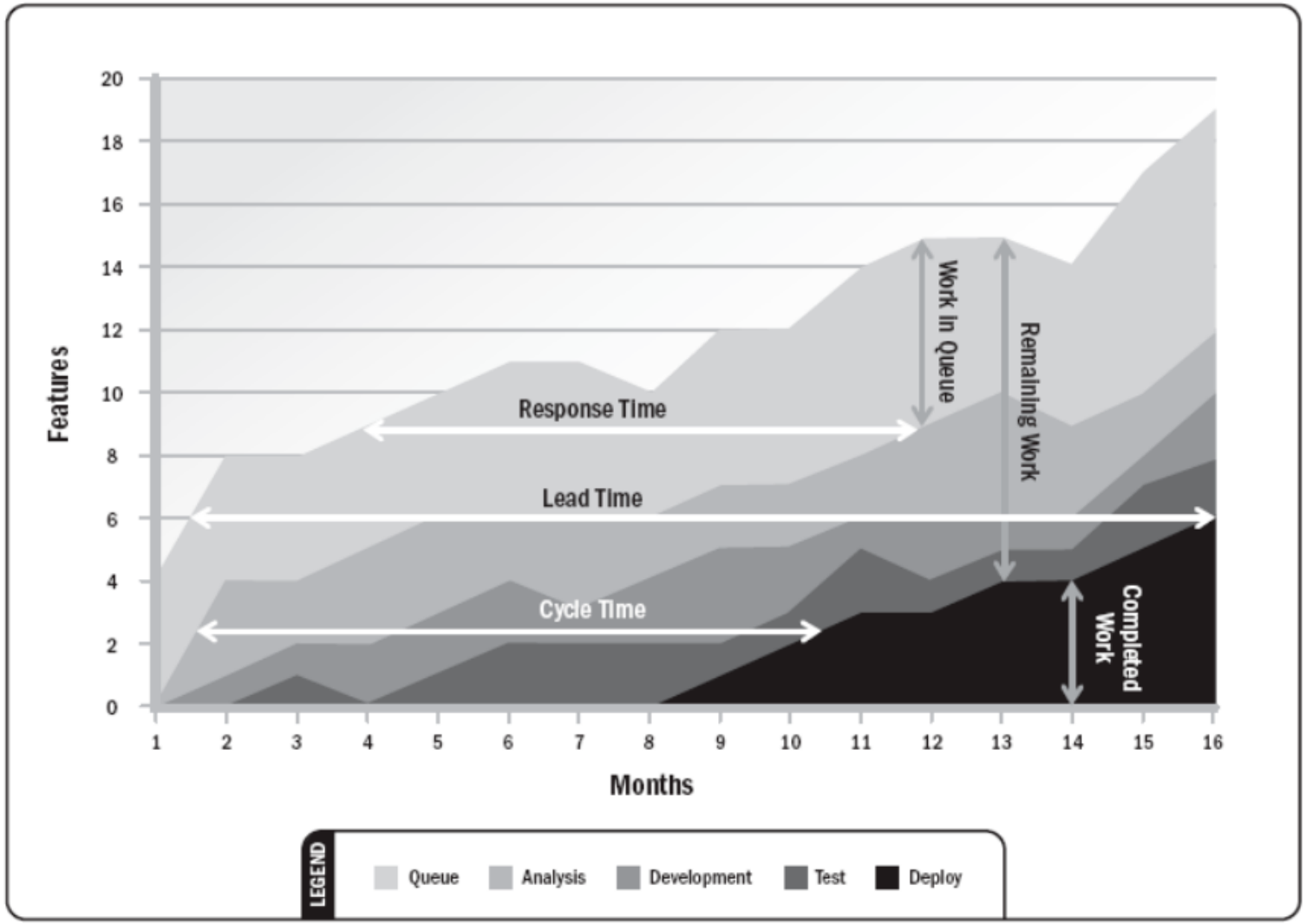
Source: Head First Agile by Jennifer Greene; Andrew Stellman, Published by O'Reilly Media, Inc., 2017

Cumulative flow diagram (Example-2)



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

Cumulative flow diagram (Example-3)



Quiz

S3

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BITS Pilani
Pilani Campus

Thank you