KAIST

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CS30500:
Introduction to Software Engineering

Chapter 3. Agility and Process

Prof. In-Young Ko

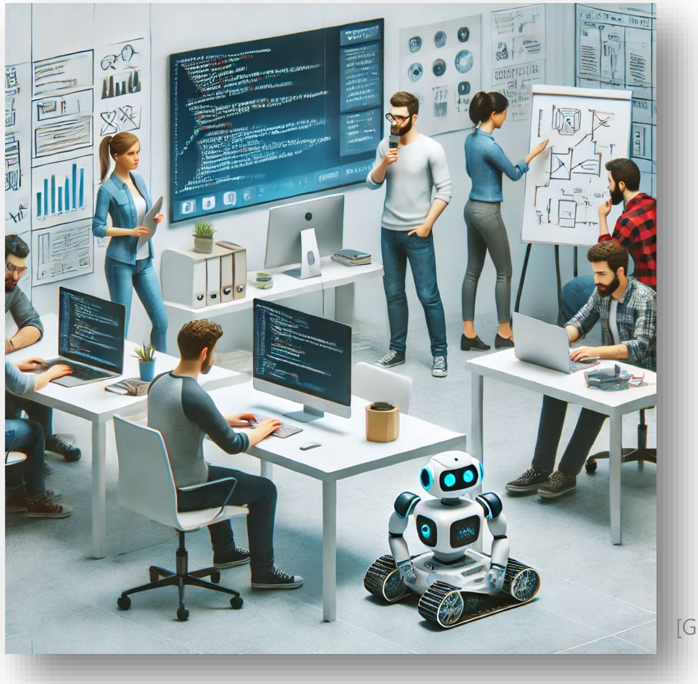
School of Computing

Today’s Plan

- Agility
- Popular agile methods
  - Scrum
  - Extreme Programming (XP)
  - Kanban

As a Software Engineer…

- Your task is to design and develop a smart home system where a butler robot understands the user's needs and seamlessly controls and coordinates home appliances.
- What <u>development activities</u> do you plan to carry out?



[Generated by ChatGPT 4o]

What would be the most effective development process for this project?

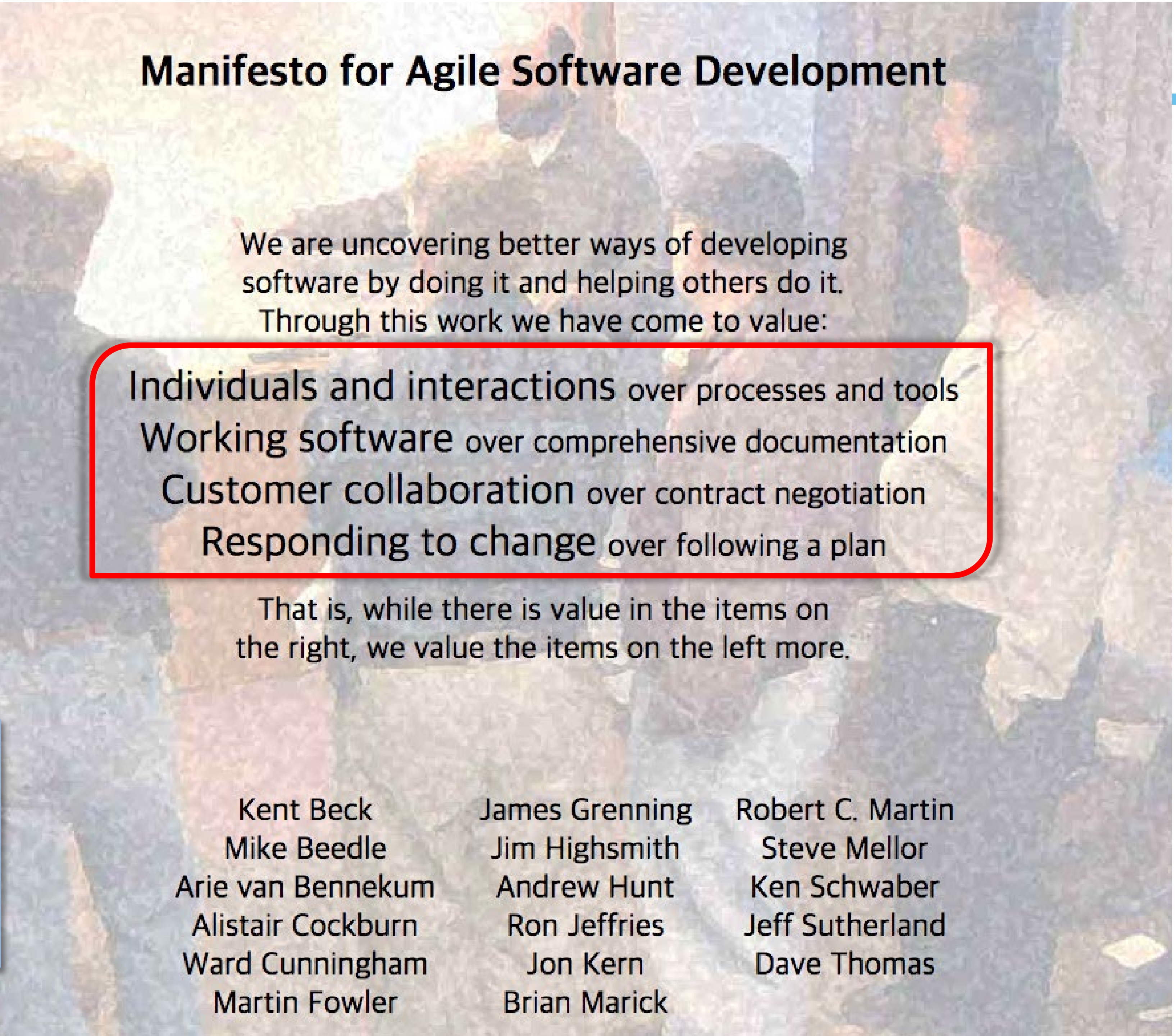
What would be the most effective development process?

ChatGPT’s Answer:

For a **normal development situation** (not a fast-track approach), an **Agile methodology**—specifically **Scrum or Kanban**—would be the best software process. This ensures **continuous iteration, flexibility, and adaptability** while developing a complex smart home system like the LG butler robot.

AGILITY

"In February 2001, seventeen software developers met at the Snowbird resort in Utah to discuss lightweight development methods."



Manifesto for Agile Software Development

We are uncovering better ways of developing
software by doing it and helping others do it.
Through this work we have come to value:

Individuals and interactions over processes and tools
Working software over comprehensive documentation
Customer collaboration over contract negotiation
Responding to change over following a plan

That is, while there is value in the items on
the right, we value the items on the left more.

Kent Beck
Mike Beedle
Arie van Bennekum
Alistair Cockburn
Ward Cunningham
Martin Fowler

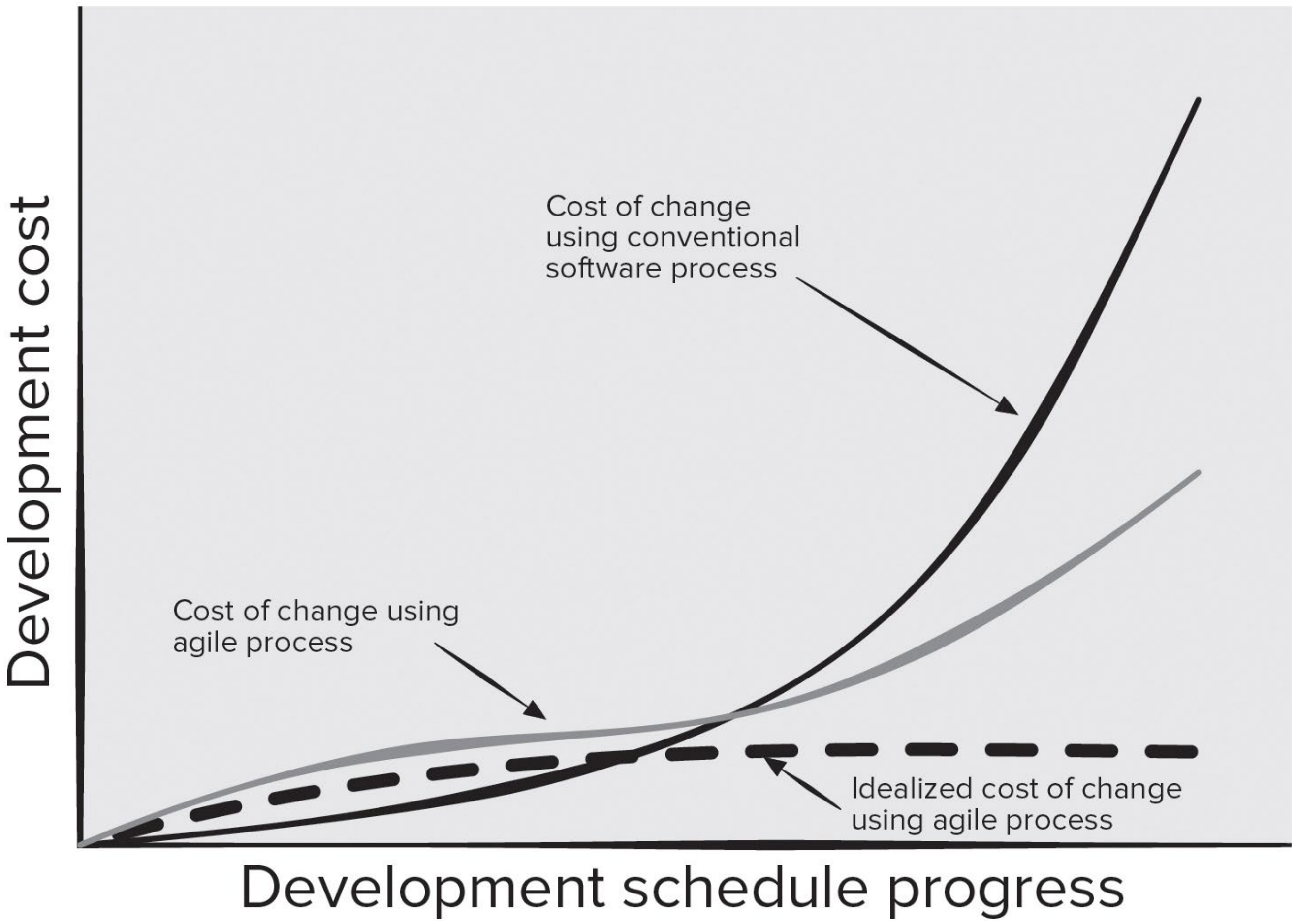
James Grenning
Jim Highsmith
Andrew Hunt
Ron Jeffries
Jon Kern
Brian Marick

Robert C. Martin
Steve Mellor
Ken Schwaber
Jeff Sutherland
Dave Thomas

http://agilemanifesto.org/

What is Agility?

- Effective (rapid and adaptive) response to change
- Effective communication among all stakeholders
- Drawing the customer onto the team
- Organizing a team so that it is in control of the work performed
- Rapid, incremental delivery of software



Agility and Cost of Change

[PrMa20]

Principles Behind the Agile Manifesto

1. Early and continuous delivery of valuable software
2. Welcome changing requirements (even late in development)
3. Deliver working software frequently (from two weeks to two months)
4. Business people and developers must work together daily
5. Build projects around motivated individuals
6. Face-to-face conversation (within a team)
7. Working software is the primary measure of progress
8. Sustainable development (maintain a constant pace indefinitely)
9. Continuous attention to technical excellence and good design
10. Simplicity
11. Self-organizing teams
12. The team reflects on how to become more effective, then tunes and adjusts its behavior accordingly

Agile Practices

- More than 70% of organizations employ agile approaches
- Core concept:
  - Iterative, intensive communication, early customer feedback
- Several weeks per iteration
- Each iteration delivers a complete working software
- Pay less attention to detailed documentations
- Close collaboration across the team and with customers
- Frequent releases allow continuous improvement
- Cons of Agile Methods
  - Make the maintenance more complicated
  - Difficult to accurately estimate budget, time and people required for the project

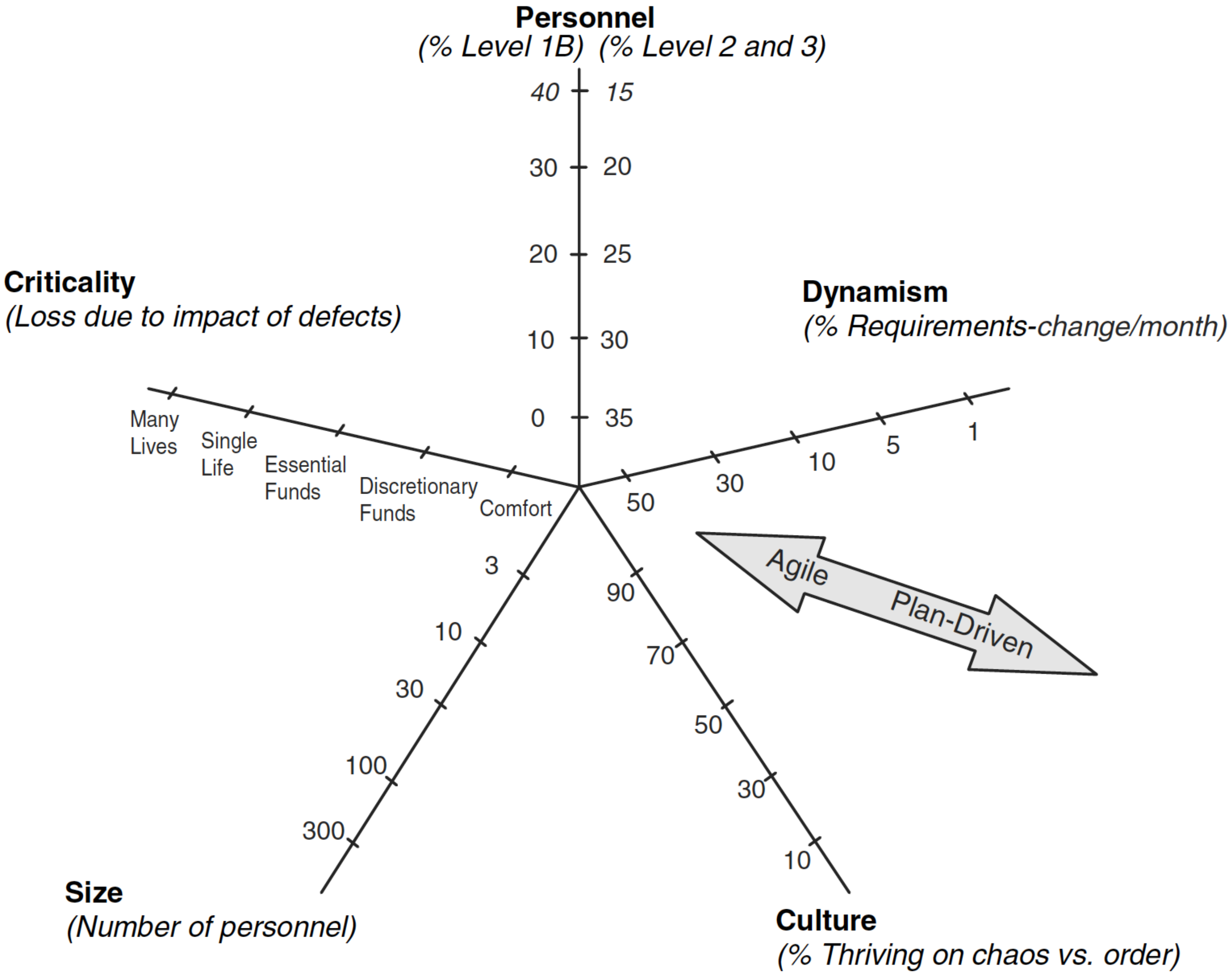
Adopted from Prof. Doo-Hwan Bae's CS350 lecture material

Self-organizing Team

- Does not depend on or wait for a manager to assign work
  - Finds their own work and manage the associated responsibilities and timelines
- Takes on the responsibility of choosing the most effective and efficient way to complete their work
  - Regularly looks for ways to improve through experimentation
- Must have a high sense of ownership and responsibility
- Needs to communicate often and trust in the capabilities of everyone on the team

https://www.planview.com/resources/articles/what-is-self-organizing-team/

When is Agile Recommended?



Boehm and Richard Turner. 2003. Balancing Agility and Discipline: A Guide for the Perplexed. Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA.

Use Cases of Agile Processes

- Startup initiatives, when end users' early feedback is required
- Most of mid-sized projects where business requirements cannot be confidently translated to detailed software requirements
- Large projects that are easy to divide into small functional parts and can be developed incrementally over each iteration

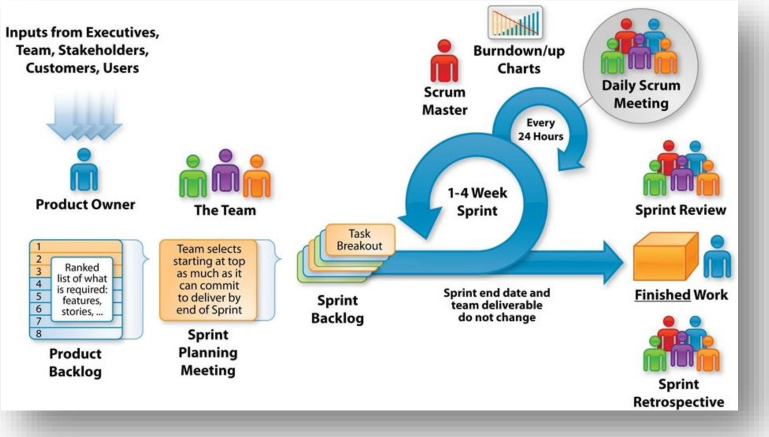
[Shi19]

Adopted from Prof. Doo-Hwan Bae's CS350 lecture material

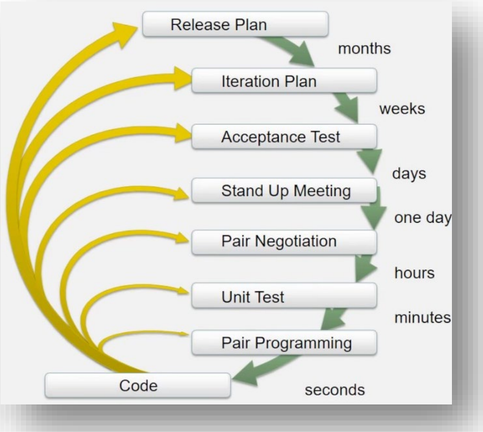
POPULAR AGILE METHODS

Popular Agile Methods

- Scrum
- Extreme Programming (XP)
- Kanban
- DevOps
- ….


Inputs from Executives, Team, Stakeholders, Customers, Users
Product Owner
The Team
Scrum Master
Burndown/up Charts
Daily Scrum Meeting
Every 24 Hours
1-4 Week Sprint
Sprint Review
1 2 3 4 5 6 7 8
Ranked list of what is required: features, stories, ...
Product Backlog
Team selects starting at top as much as it can commit to deliver by end of Sprint
Sprint Planning Meeting
Task Breakout
Sprint Backlog
Sprint end date and team deliverable do not change
Finished Work
Sprint Retrospective

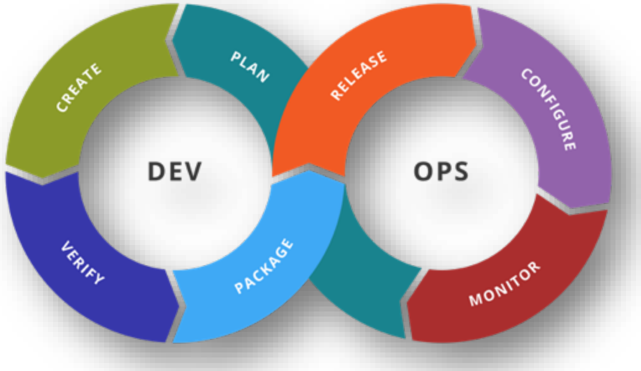
https://www.c-sharpcorner.com/UploadFile/d9c992/the-agile-scrum-framework/



https://www.youtube.com/watch?v=FufRFdFFu4k

KANBAN BOARD
Stories
To Do
In Progress
Testing
Done

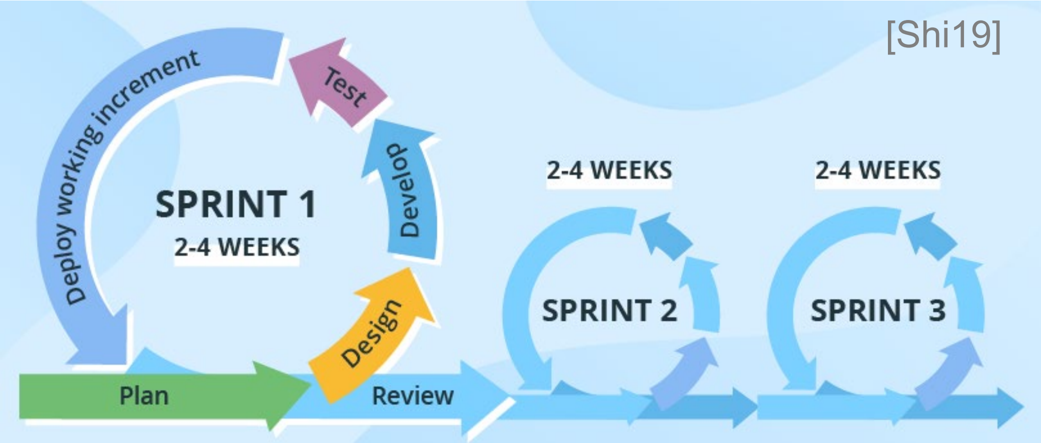
https://www.bocasay.com/kanban-method-it-development-projects/



https://ko.m.wikipedia.org/wiki/%ED%8C%8C%EC%9D%BC:Devops-toolchain.svg

What is Scrum?

- The name is derived from a rugby activity (working together with the teammates)
- Developed by Jeff Sutherland and his team in the early 1990s
- Sprint
  - An iteration of a framework activity (requirements, analysis, design, …)
  - 2-4 weeks long
  - Preceded with thorough planning and previous sprint assessment
  - No changes are allowed after the sprint activities have been defined



- The work tasks to be done within a print are defined by the Scrum team
  - Adapted to the problem to solve
  - Defined and modified in real time
- Number of sprints needs to be decided based on product complexity and size

[PrMa20]

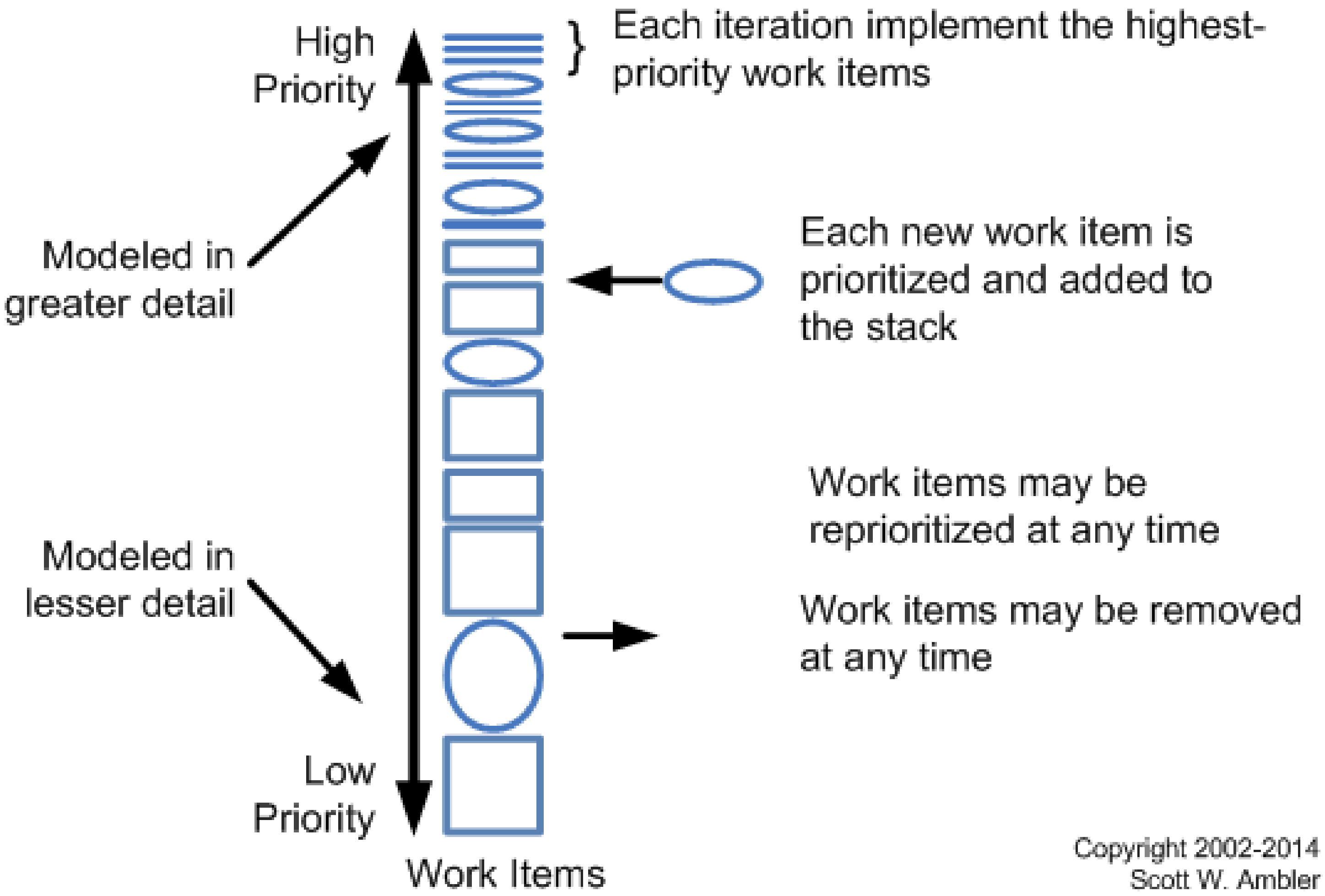
Scrum Teams and Artifacts

[PrMa20]

- Scrum team: A self-organizing interdisciplinary team consisting of a
  - *Product owner*: the person who orders the product features and decides whether to end a sprint
  - *Scrum master*: a facilitator who runs the daily Scrum meeting, coaches the team members, and helps the product owner to manage the product backlog
  - *Development team*: a small (3-6 people)
- Scrum artifacts:
  - *Product backlog*: a prioritized list of product requirements (a requirement can be added at any time)
  - *Sprint backlog*: the subset of product backlog items selected by the team to be completed during the current active sprint (cannot be changed during a sprint)
  - *Code increment*: all backlog items completed in previous sprints + sprint backlog items
- Development proceeds by breaking the project into a series of incremental prototype development (*sprints*, 2-4 weeks each)

Agile Requirements Change Management

http://www.agilemodeling.com/essays/changeManagement.htm



Each iteration implement the highest-priority work items

Each new work item is prioritized and added to the stack

Work items may be reprioritized at any time

Work items may be removed at any time

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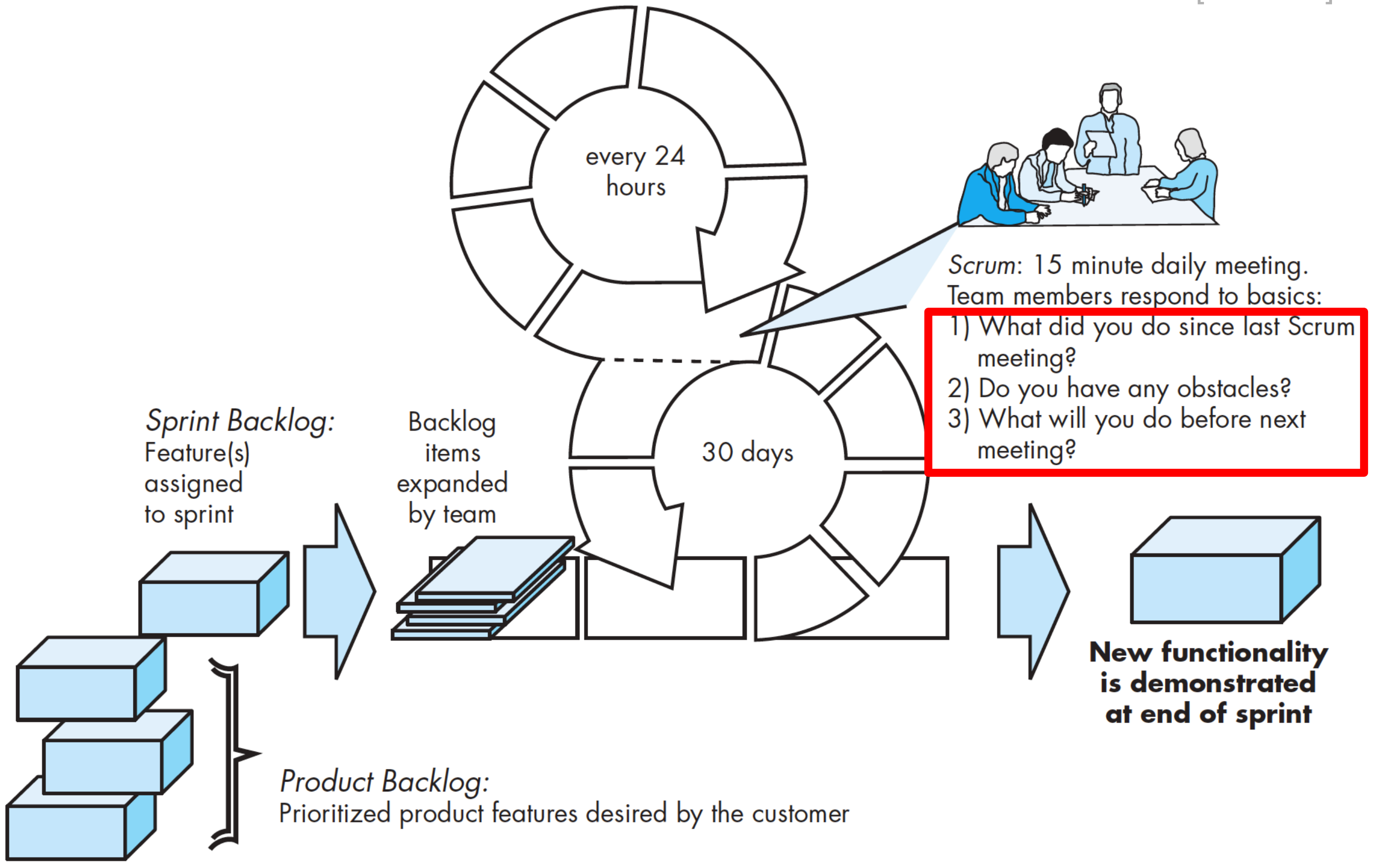
Scott W. Ambler

Scrum Meetings

- **Backlog Refinement Meeting**: developers work with stakeholders to create the product backlog
- **Sprint Planning Meeting**: backlog partitioned into “sprints” derived from the backlog and next sprint defined (sprint backlog items are prioritized)
- **Daily Scrum Meeting**: team members synchronize their activities and plan a work day (15 minutes max.)
- **Sprint Review**: prototype “demos” are delivered to the stakeholders at the end of a sprint
- **Sprint Retrospective**: after sprint is complete, team considers what went well and what needs improvement (3 hours)

[PrMa20]


every 24 hours
30 days
Scrum: 15 minute daily meeting.
Team members respond to basics:
1) What did you do since last Scrum meeting?
2) Do you have any obstacles?
3) What will you do before next meeting?
Sprint Backlog: Feature(s) assigned to sprint
Backlog items expanded by team
New functionality is demonstrated at end of sprint
Product Backlog: Prioritized product features desired by the customer

- Example of a daily scrum meeting:
  - https://www.youtube.com/watch?v=q_R9wQY4G5I (3:40-5:40-8:30)

Pros and Cons of Scrum

[PrMa20]

- Pros
  - Product owner sets priorities
  - Team owns decision making
  - Documentation is lightweight
  - Supports frequent updating
- Cons
  - Difficult to control the cost of changes
  - May not be suitable for large teams
  - Requires expert team members

[PrMa20]