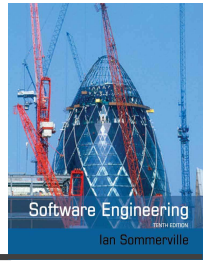


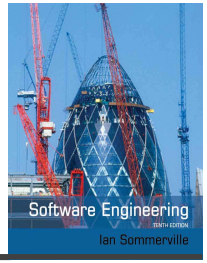
Chapter 3 – Agile Software Development

Some of the slides taken from:

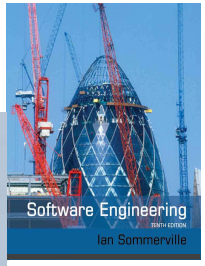
Adam Warner's presentation during NCES MIS Conference - February 15, 2012 - San Diego

https://nces.ed.gov/whatsnew/conferences/MIS/2012/ppt/V_G_Warner.pptx

Topics covered

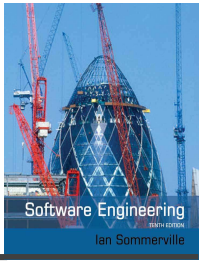


- ✧ Agile methods
- ✧ Agile development techniques
- ✧ Agile project management
- ✧ Exercise: Select suitable Agile project management tool



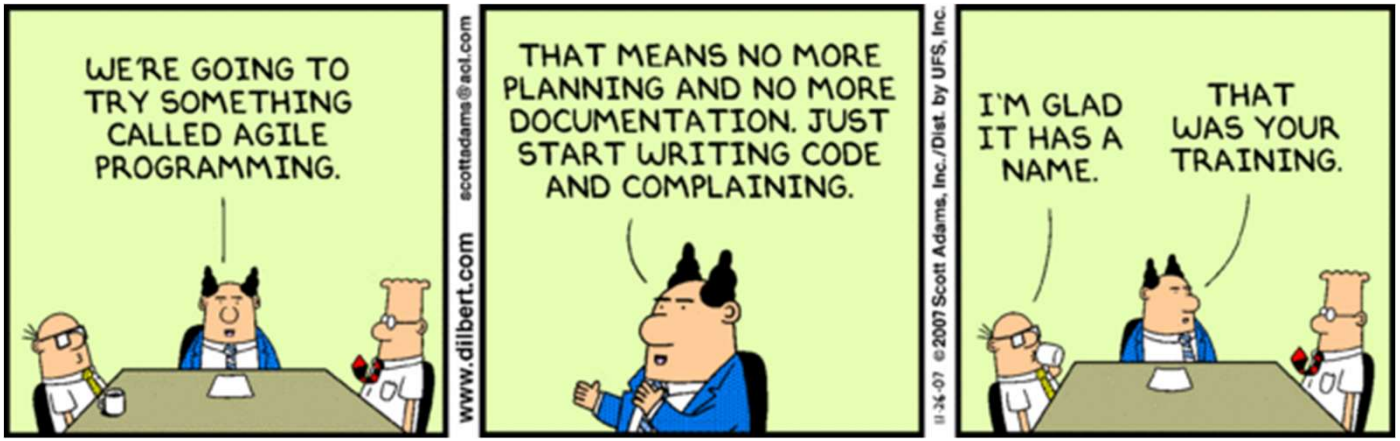
- https://exceptionnotfound.net/useful-software-development-analogies-meme-version/

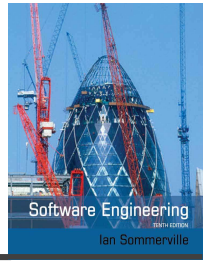
The Problem(s) with Software Development



- ✧ Customers do not know exactly what they need or want
- ✧ Customers change their minds
- ✧ Customers' priorities change
- ✧ It is difficult to solve the needs of many stakeholders
- ✧ We can never *adequately* specify requirements
- ✧ We are lousy at estimating software tasks
- ✧ Unpredictable "stuff" happens
- ✧ It often takes several times to get "something" right

- Users do not know what they want until they see it (but are good at telling us what they do not like)
- It is difficult to determine the 80:20; that is, what features are most important - before the product is built and deployed
- It is difficult to account for the unknown


WE'RE GOING TO TRY SOMETHING CALLED AGILE PROGRAMMING.
THAT MEANS NO MORE PLANNING AND NO MORE DOCUMENTATION. JUST START WRITING CODE AND COMPLAINING.
I'M GLAD IT HAS A NAME.
THAT WAS YOUR TRAINING.
www.dilbert.com scottadams@aol.com
© 2007 Scott Adams, Inc./Dist. by UFS, Inc.



Agile Manifesto

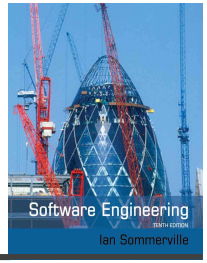
We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- **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.

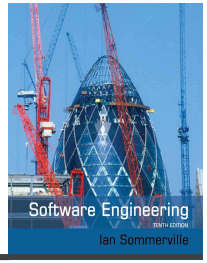
- http://agilemanifesto.org/

Principles behind the Manifesto



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.
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.

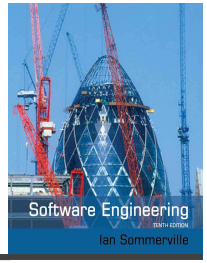
Principles behind the Manifesto

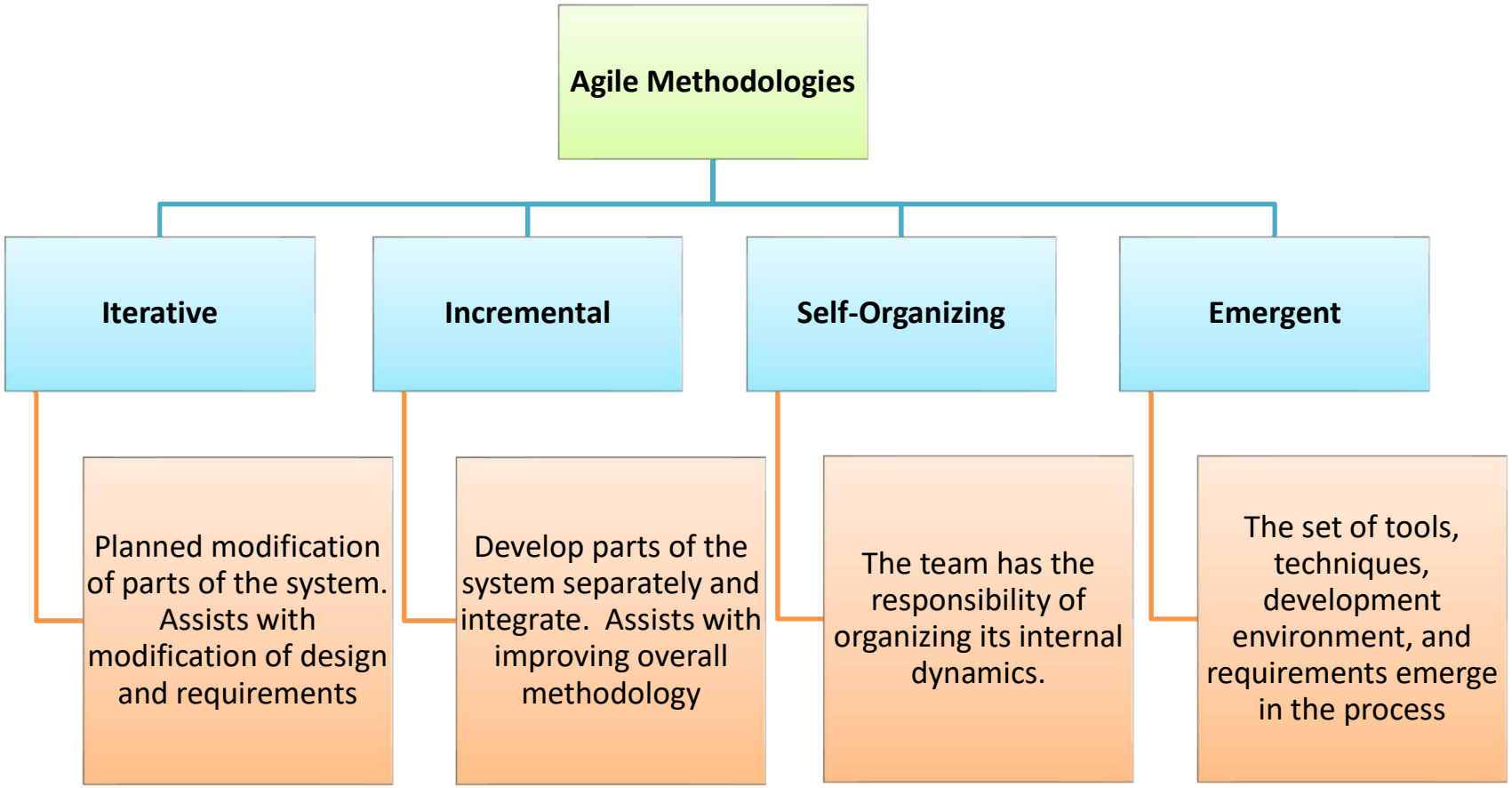


7. Working software is the primary measure of progress.
8. Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9. Continuous attention to technical excellence and good design enhances agility.
10. Simplicity--the 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.

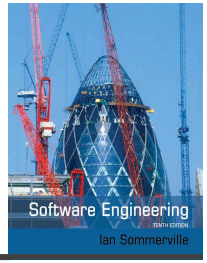
Source: *http://agilemanifesto.org/principles.html*

Key Aspects of Agile Methodology

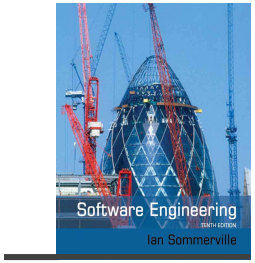




The principles of agile methods



Principle	Description
Customer involvement	Customers should be closely involved throughout the development process. Their role is provide and prioritize new system requirements and to evaluate the iterations of the system.
Incremental delivery	The software is developed in increments with the customer specifying the requirements to be included in each increment.
People not process	The skills of the development team should be recognized and exploited. Team members should be left to develop their own ways of working without prescriptive processes.
Embrace change	Expect the system requirements to change and so design the system to accommodate these changes.
Maintain simplicity	Focus on simplicity in both the software being developed and in the development process. Wherever possible, actively work to eliminate complexity from the system.

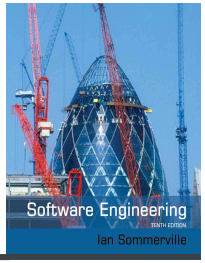


Waterfall vs. Agile

Traditional	Agile
Detailed plan	Dynamic plan
Sequential phases conducted by documentation Errors may be magnified	Iterative phases conducted by product delivery (by prioritizing) Errors may be minimized
Functionality at the end One Long period of time	Functionality after each iteration: Increments of the system every thirty days or less Short periods of time
Project Manager	Team self management
Requirements Analysis	Customers working with development team (every iteration)
Reports (Docs)	Communication

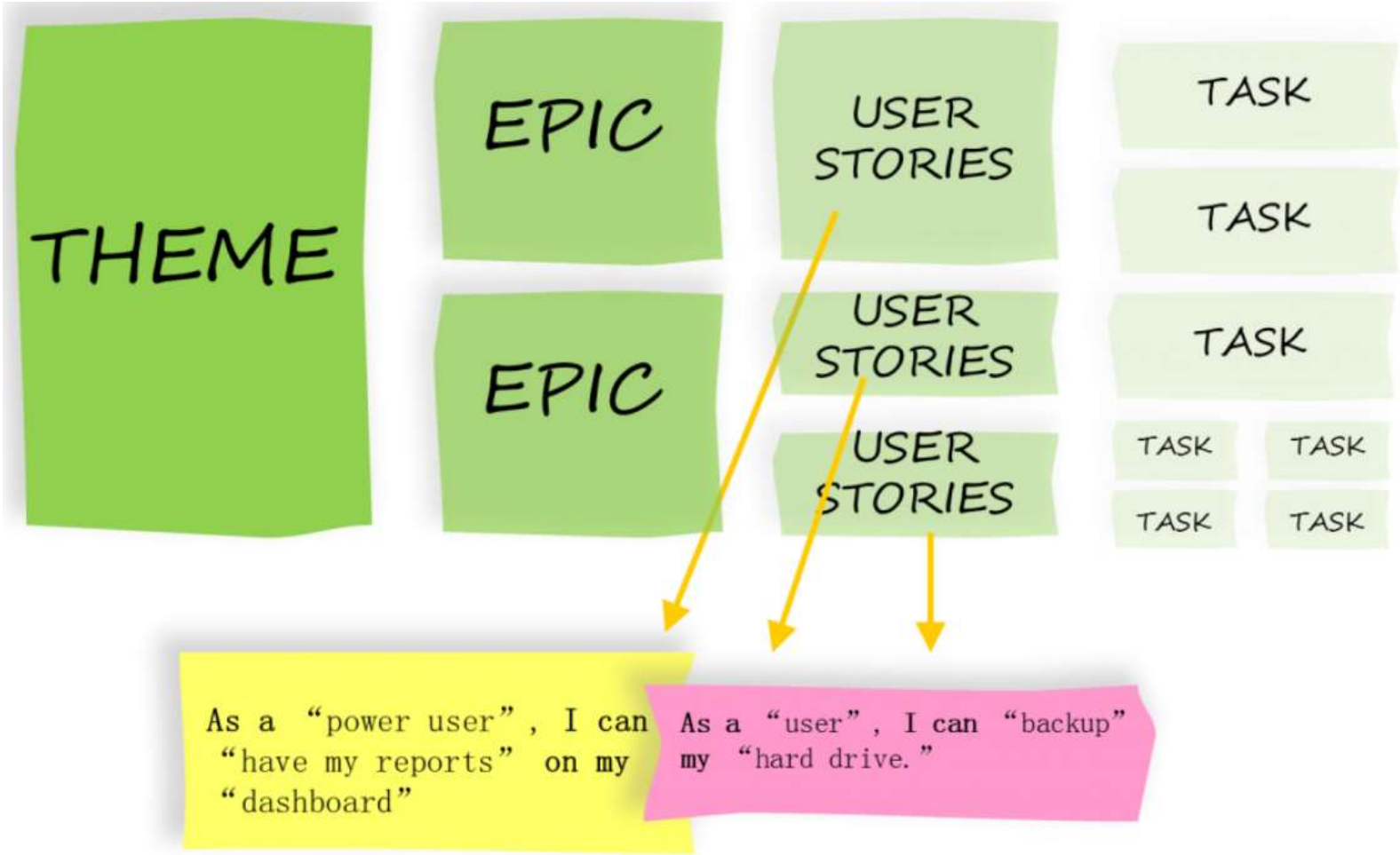
7

Agile Implementations

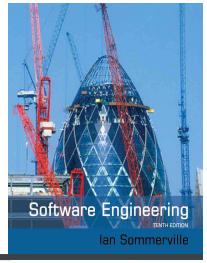


- ✧ Extreme Programming
- ✧ Scrum
- ✧ Iterative development
- ✧ Kanban
- ✧ And many others

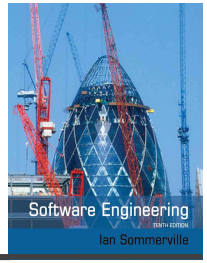
Theme, Epic, Story, Task



Theme, Epic, Story, Task

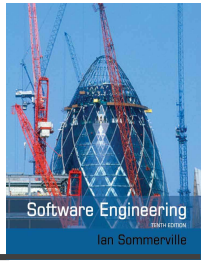


Stories – aka Product Backlog Item, Work Item



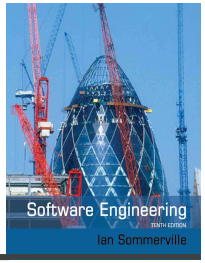
- A story is an individual feature or requirement that the client (and business) wants. It is something that is deliverable (i.e. production ready) within a single sprint.
- Stories are often written in a specific format:
  - As a [end user of the required feature]
  - I want [actual thing the user wants to be able to do once the feature is live – so often contains a verb]
  - So that [why they want this feature / the benefit this feature brings]
- *An example story: "As a customer, I want to be able to save a product in my wishlist so that I can view it again later."*

User Stories



- A set of stories that describe how the system should behave, from the user's viewpoint.
- There may be several different types of user; for instance, browser, shopper, marketer, content editor, systems administrator, etc., and we can write stories for all of them.
- This is usually done collaboratively, with a bunch of people writing out cards, grouping them together and reviewing.
- After a short period we should have a broad idea of what our system should do, encapsulated in a set of user stories, which we call the Product Backlog.

Key Aspects of User Stories



INVEST by Bill Wake

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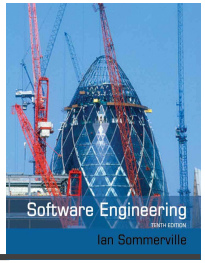
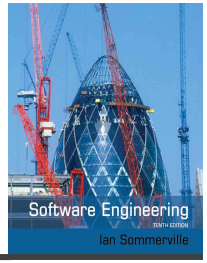
Independent	• Of order of user story delivery • Of internal and especially external dependencies
Negotiable	• Flexible scope • None specific language • Explain the intention, not the implementation
Valuable	• Value is clear to everyone • Persona matches Benefit & Goal will deliver the benefit. • Avoid technical / role specific language
Estimatable	• Clear and concise explanation • Avoid technical / role specific language
Small	• Easily fits into a Sprint. i.e. < 20% of velocity. • Definitely not > 33% of velocity
Testable	• Can be automated • Avoid external testing / long test suites

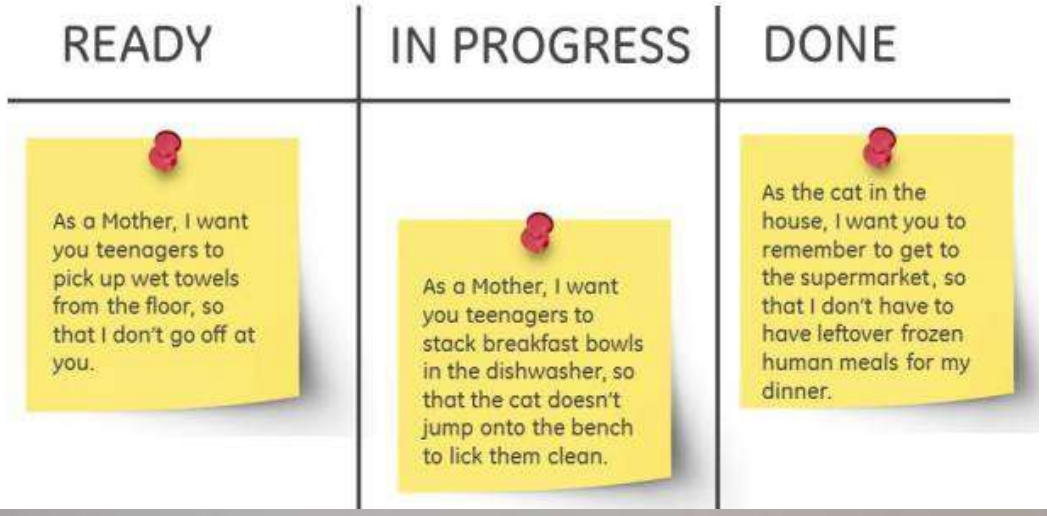
Story Walls



- A story wall is a very common and effective information radiator that displays the status of each card in the current iteration or sprint.
- Typically, a story wall contains columns that represent a team's workflow, index cards representing the actual work, user stories and other metadata to communicate the status of a project.
- The team moves a card through each column as it gets completed.

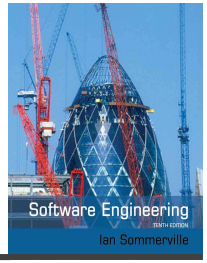
Story Walls


Software Engineering
Ian Sommerville

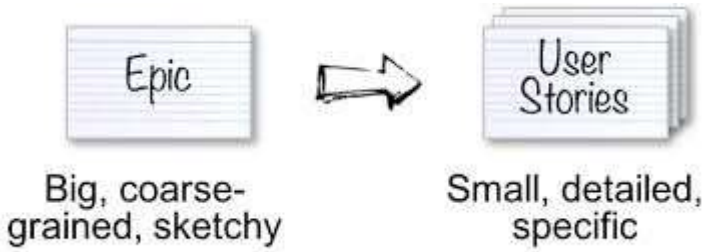

READY
IN PROGRESS
DONE
As a Mother, I want you teenagers to pick up wet towels from the floor, so that I don't go off at you.
As a Mother, I want you teenagers to stack breakfast bowls in the dishwasher, so that the cat doesn't jump onto the bench to lick them clean.
As the cat in the house, I want you to remember to get to the supermarket, so that I don't have to have leftover frozen human meals for my dinner.


IN ANALYSIS
READY FOR DEVELOPMENT
IN DEVELOPMENT
READY FOR TESTING
IN TESTING
READY FOR SIGNOFF

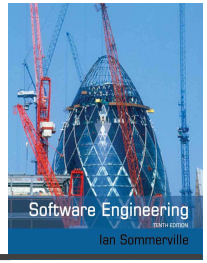
Epic



- An epic is a big story. A requirement that is just too big to deliver in a single sprint.
- Epics need to be broken into smaller deliverables (stories).
- *An example epic: "As a customer, I want to be able to have wishlists so that I can come back to buy products later."*

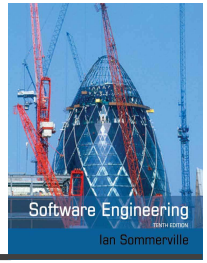


Theme



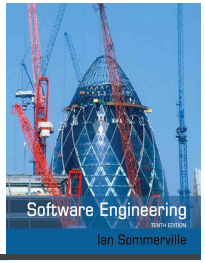
- A collection of stories by category. A basket or bucket of stories. By its nature, an epic can also be a theme in itself.
- *An example theme: "Wishlist".*

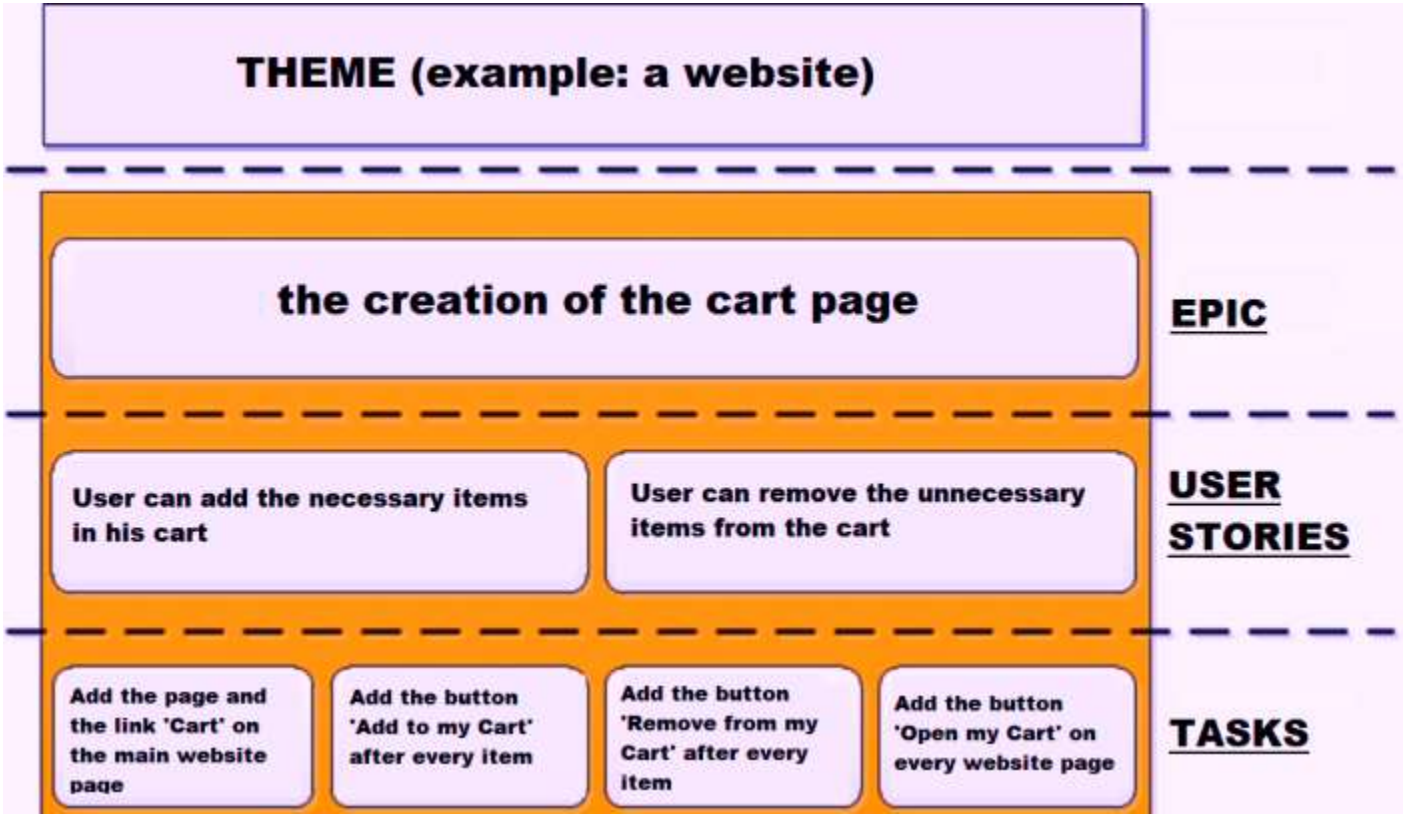
Tasks



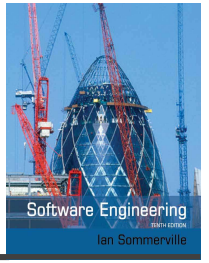
- The elements of a story.
- Stepping stones to take the story to ‘Done’.
- Tasks often follow the SMART acronym: specific, measurable, achievable, relevant, time-boxed.
- *An example task: “Put ‘Add to wishlist’ button on each product page.”*

Theme, Epic, User Stories, Tasks



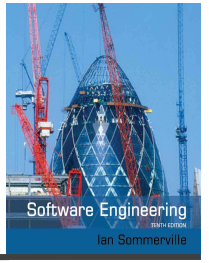


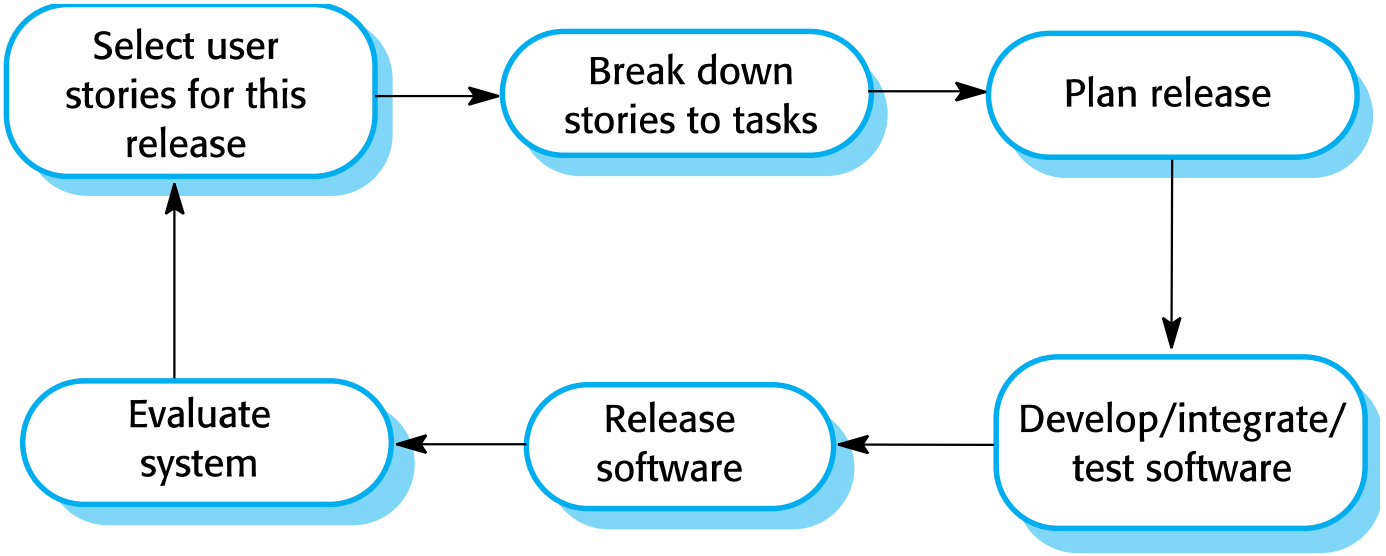
Extreme programming



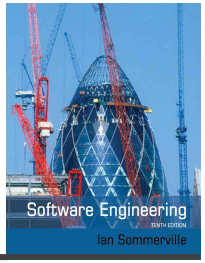
- A very influential agile method, developed in the late 1990s, that introduced a range of agile development techniques.
- Extreme Programming (XP) takes an 'extreme' approach to iterative development.
  - New versions may be built several times per day;
  - Increments are delivered to customers every 2 weeks;
  - All tests must be run for every build and the build is only accepted if tests run successfully.

The extreme programming release cycle



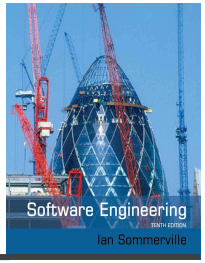


Extreme programming practices (a)



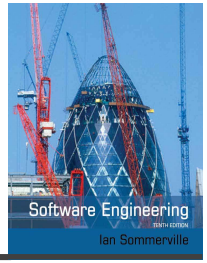
Principle or practice	Description
Incremental planning	Requirements are recorded on story cards and the stories to be included in a release are determined by the time available and their relative priority. The developers break these stories into development 'Tasks'. See Figures 3.5 and 3.6.
Small releases	The minimal useful set of functionality that provides business value is developed first. Releases of the system are frequent and incrementally add functionality to the first release.
Simple design	Enough design is carried out to meet the current requirements and no more.
Test-first development	An automated unit test framework is used to write tests for a new piece of functionality before that functionality itself is implemented.
Refactoring	All developers are expected to refactor the code continuously as soon as possible code improvements are found. This keeps the code simple and maintainable.

Extreme programming practices (b)



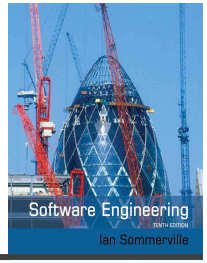
Pair programming	Developers work in pairs, checking each other's work and providing the support to always do a good job.
Collective ownership	The pairs of developers work on all areas of the system, so that no islands of expertise develop and all the developers take responsibility for all of the code. Anyone can change anything.
Continuous integration	As soon as the work on a task is complete, it is integrated into the whole system. After any such integration, all the unit tests in the system must pass.
Sustainable pace	Large amounts of overtime are not considered acceptable as the net effect is often to reduce code quality and medium term productivity
On-site customer	A representative of the end-user of the system (the customer) should be available full time for the use of the XP team. In an extreme programming process, the customer is a member of the development team and is responsible for bringing system requirements to the team for implementation.

Scrum



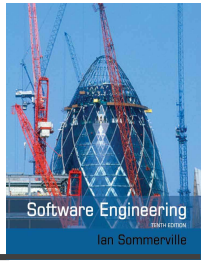
- Scrum is an agile method that focuses on managing iterative development rather than specific agile practices.
- There are three phases in Scrum.
  - The initial phase is an outline planning phase where you establish the general objectives for the project and design the software architecture.
  - This is followed by a series of sprint cycles, where each cycle develops an increment of the system.
  - The project closure phase wraps up the project, completes required documentation such as system help frames and user manuals and assesses the lessons learned from the project.

Scrum terminology (a)



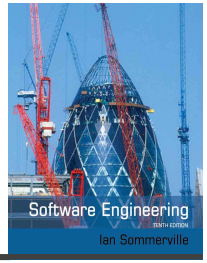
Scrum term	Definition
Development team	A self-organizing group of software developers, which should be no more than 7 people. They are responsible for developing the software and other essential project documents.
Potentially shippable product increment	The software increment that is delivered from a sprint. The idea is that this should be 'potentially shippable' which means that it is in a finished state and no further work, such as testing, is needed to incorporate it into the final product. In practice, this is not always achievable.
Product backlog	This is a list of 'to do' items which the Scrum team must tackle. They may be feature definitions for the software, software requirements, user stories or descriptions of supplementary tasks that are needed, such as architecture definition or user documentation.
Product owner	An individual (or possibly a small group) whose job is to identify product features or requirements, prioritize these for development and continuously review the product backlog to ensure that the project continues to meet critical business needs. The Product Owner can be a customer but might also be a product manager in a software company or other stakeholder representative.

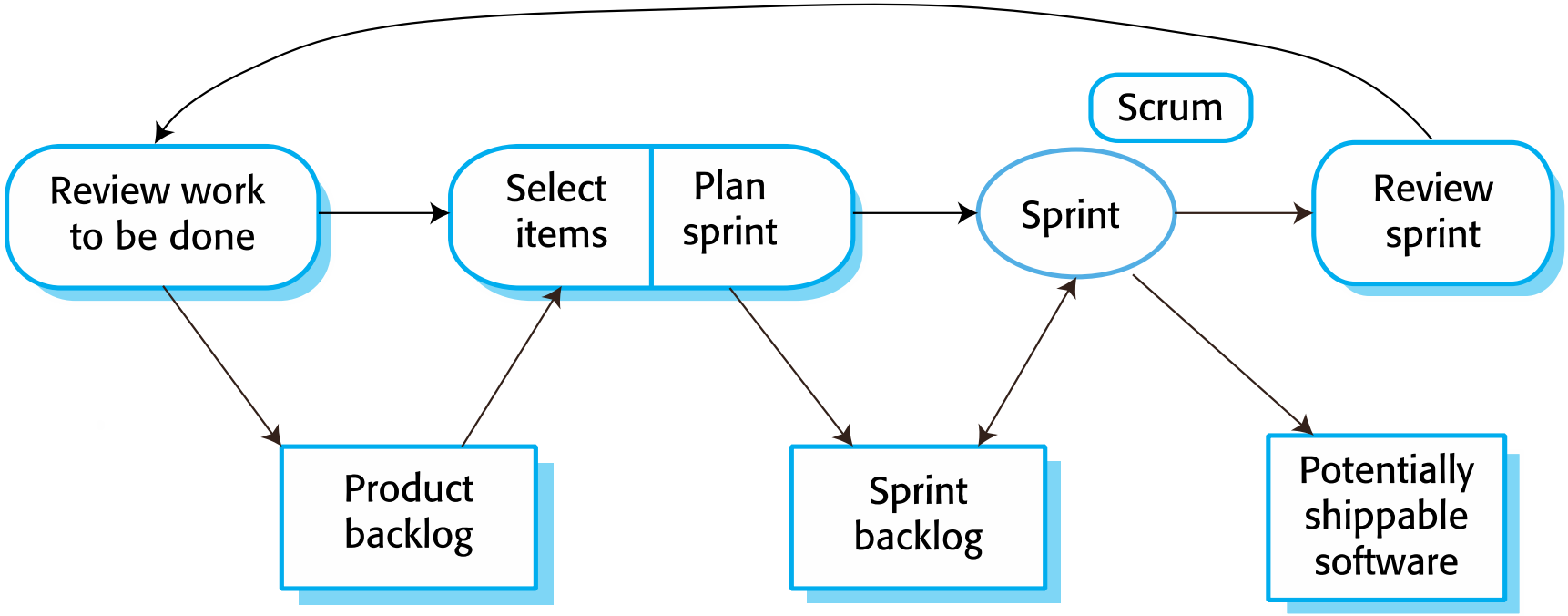
Scrum terminology (b)



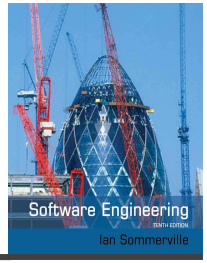
Scrum term	Definition
Scrum	A daily meeting of the Scrum team that reviews progress and prioritizes work to be done that day. Ideally, this should be a short face-to-face meeting that includes the whole team.
ScrumMaster	The ScrumMaster is responsible for ensuring that the Scrum process is followed and guides the team in the effective use of Scrum. He or she is responsible for interfacing with the rest of the company and for ensuring that the Scrum team is not diverted by outside interference. The Scrum developers are adamant that the ScrumMaster should not be thought of as a project manager. Others, however, may not always find it easy to see the difference.
Sprint	A development iteration. Sprints are usually 2-4 weeks long.
Velocity	An estimate of how much product backlog effort that a team can cover in a single sprint. Understanding a team's velocity helps them estimate what can be covered in a sprint and provides a basis for measuring improving performance.

Scrum sprint cycle



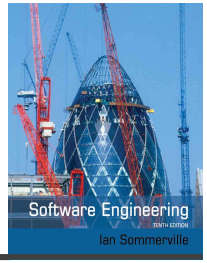


The Scrum sprint cycle



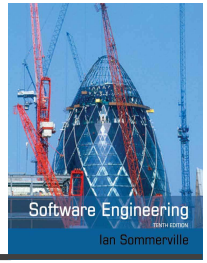
- Sprints are fixed length, normally 2–4 weeks.
- The starting point for planning is the product backlog, which is the list of work to be done on the project.
- The selection phase involves all of the project team who work with the customer to select the features and functionality from the product backlog to be developed during the sprint.

The Sprint cycle



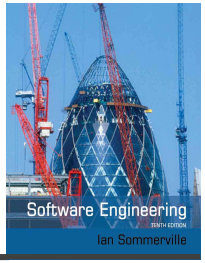
- Once these are agreed, the team organize themselves to develop the software.
- During this stage the team is isolated from the customer and the organization, with all communications channelled through the so-called ‘Scrum master’.
- The role of the Scrum master is to protect the development team from external distractions.
- At the end of the sprint, the work done is reviewed and presented to stakeholders. The next sprint cycle then begins.

Teamwork in Scrum



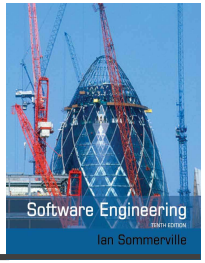
- The ‘Scrum master’ is a facilitator who arranges daily meetings, tracks the backlog of work to be done, records decisions, measures progress against the backlog and communicates with customers and management outside of the team.
- The whole team attends short daily meetings (Scrums) where all team members share information, describe their progress since the last meeting, problems that have arisen and what is planned for the following day.
  - This means that everyone on the team knows what is going on and, if problems arise, can re-plan short-term work to cope with them.

Scrum benefits



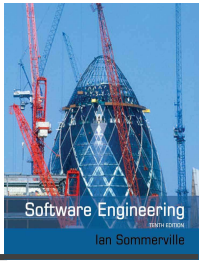
- The product is broken down into a set of manageable and understandable chunks.
- Unstable requirements do not hold up progress.
- The whole team have visibility of everything and consequently team communication is improved.
- Customers see on-time delivery of increments and gain feedback on how the product works.
- Trust between customers and developers is established and a positive culture is created in which everyone expects the project to succeed.

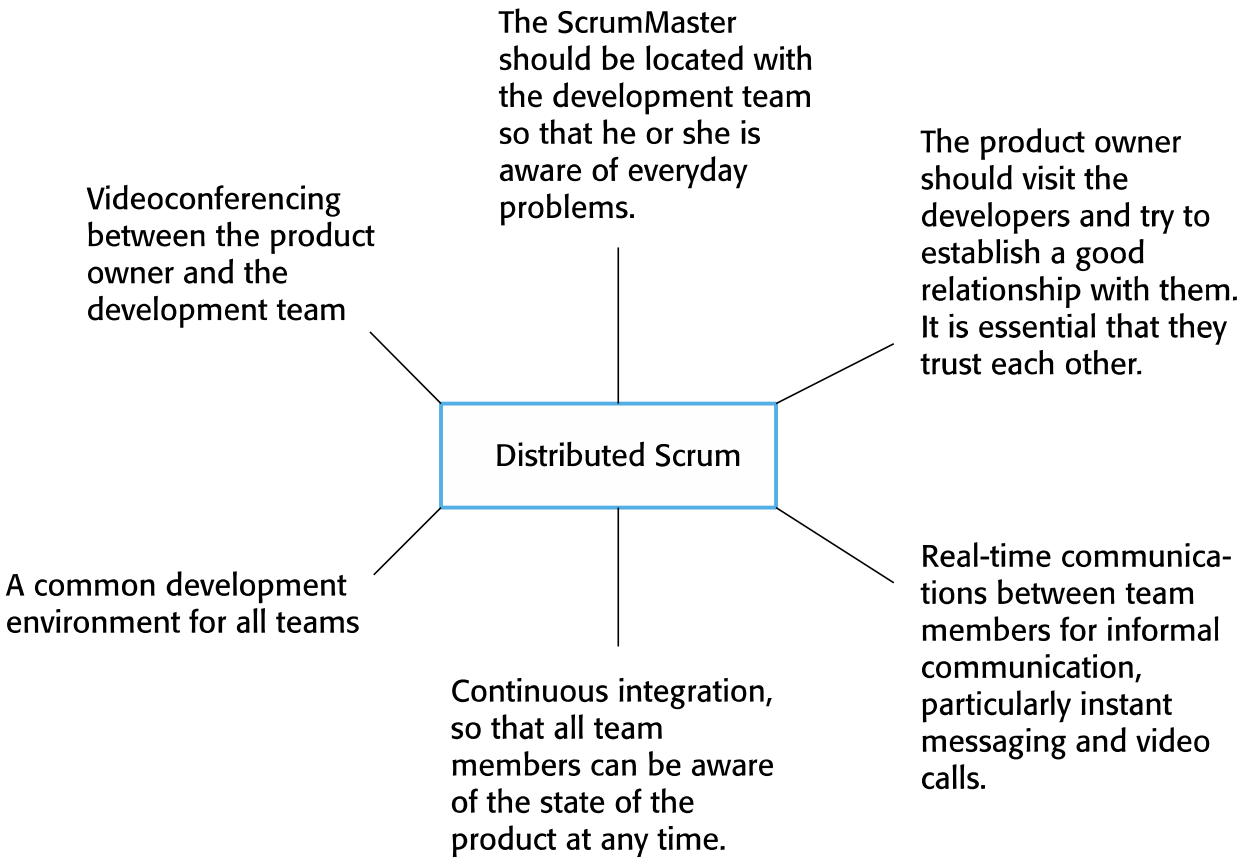
Agile Stakeholders



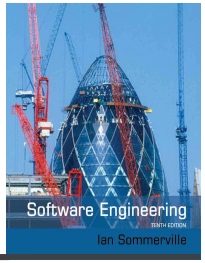
Product Manager	Product Owner	Team
Market/Customer facing. Identifies market needs. Collocated with marketing/ business.	Solution, technology, and team facing. Collocated with team(s).	Customer/stakeholder facing.
Owns vision and roadmaps, program backlog, pricing, licensing, ROI.	Contributes to vision and program backlog. Owns team backlog and implementation.	Owns story estimates and implementation of value.
Drives PI objectives and release content via prioritized features and enablers.	Defines iterations and stories. Accepts iteration increments.	Contributes to intentional architecture. Owns emergent design.
Establishes feature acceptance criteria.	Drives iteration goals and iteration content via prioritized stories.	Contributes to backlog refinement and creation of stories.
	Establishes story acceptance criteria, accepts stories into the baseline.	Integrates with other teams.

Distributed Scrum



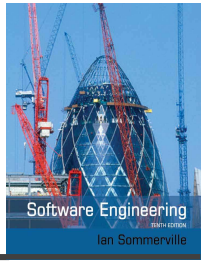


Scrum vs. Extreme Programming



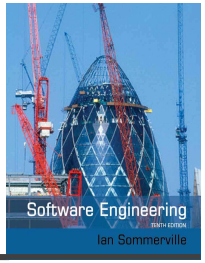
Scrum	XP
• Changes in sprint are not allowed • Once tasks for a certain sprint are set, the team determines the sequence in which they will develop the backlog items • The Scrum Master is responsible for what is done in the sprint, including the code that is written • The validation of the software is completed at the end of each sprint, at Sprint Review	• As long as the team hasn't started working on a particular feature, a new feature, of equivalent size can be swapped into the interation in exchange for an un-started feature • Tasks are taken in a strict priority order • Developers can modify or refactor parts of code as the need arises • The software needs to be validated at all time, to the extent that tests are written prior to the actual software

Agile project management



- The principal responsibility of software project managers is to manage the project so that the software is delivered on time and within the planned budget for the project.
- The standard approach to project management is plan-driven. Managers draw up a plan for the project showing what should be delivered, when it should be delivered and who will work on the development of the project deliverables.
- Agile project management requires a different approach, which is adapted to incremental development and the practices used in agile methods.

Exercise



- Go through a list of free Agile Project Management tools.
- Select a tool of your choice for your project.
- https://www.daxx.com/blog/development-team/free-agile-project-management-tools-for-your-scrum