



SOFTWARE ENGINEERING LECTURE 5

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Project Planning

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1. Software pricing

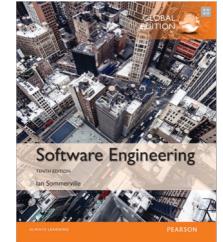
- Price is affected by (list is not complete)
 - Estimate of cost to build
 - Overhead
 - Management
 - Building, offices, training
 - Expenses to write bid
 - Discount – search for price that will beat competitive offers
 - What is the value for the customer (as opposed to production cost)



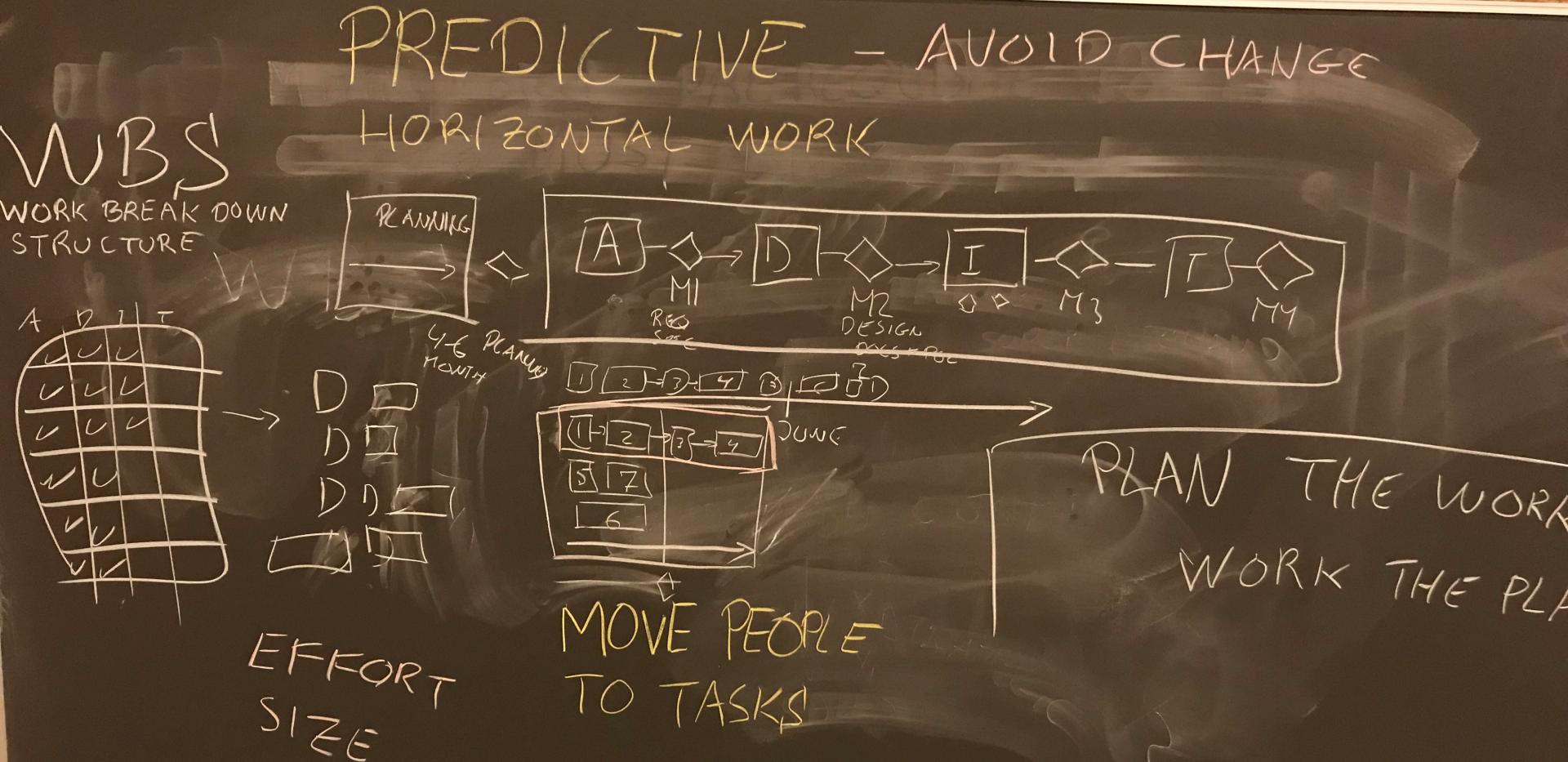
PLAN-DRIVEN PLANNING

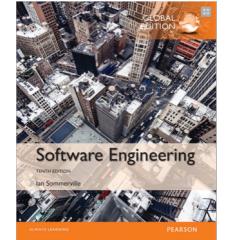


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Waterfall planning



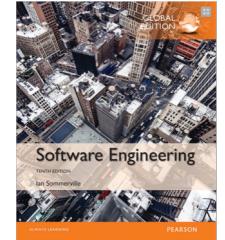


Plan-driven development

- ✧ Plan-driven or plan-based development is an approach to software engineering where the development process is planned in detail.
 - Plan-driven development is based on engineering project management techniques and is the ‘traditional’ way of managing large software development projects.
- ✧ A project plan is created that records the work to be done, who will do it, the development schedule and the work products.
- ✧ Managers use the plan to support project decision making and as a way of measuring progress.

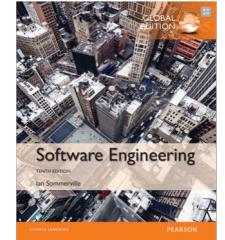
Project planning

- Project planning involves:
 - breaking down the *work* into parts
 - assign these to project team members
 - anticipate problems that might arise
 - prepare tentative solutions to those problems.
- The project plan is used to:
 - communicate how the work will be done to the project team and customers
 - to assess progress on the project.



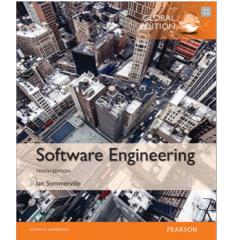
Project startup planning

- ✧ At this stage, you know more about the system requirements but do not have design or implementation information
- ✧ Create a plan with enough detail to make decisions about the project budget and staffing.
 - This plan is the basis for project resource allocation
- ✧ The startup plan should also define project monitoring mechanisms
- ✧ A startup plan is still needed for agile development to allow resources to be allocated to the project

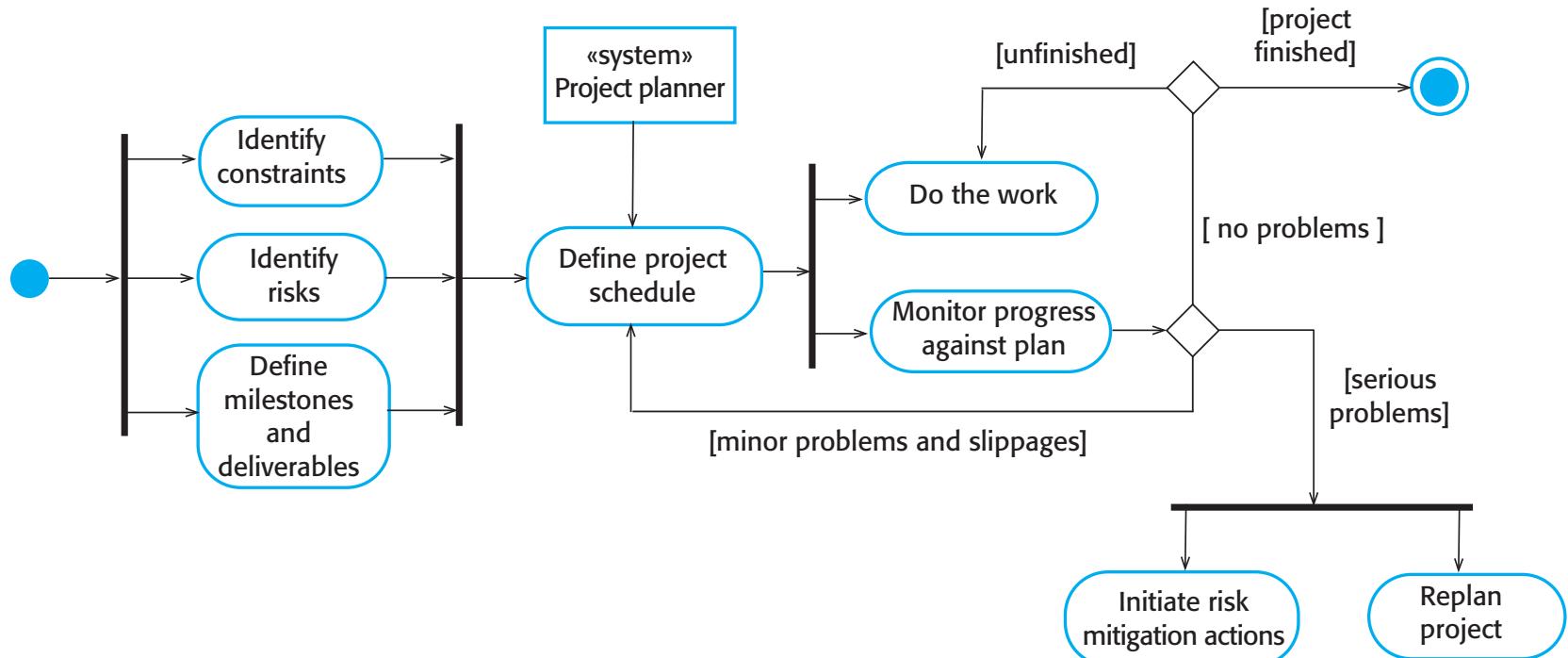


Plan-driven development – pros and cons

- ✧ The arguments in favor of a plan-driven approach are that early planning allows organizational issues (availability of staff, other projects, etc.) to be closely taken into account, and that potential problems and dependencies are discovered before the project starts, rather than once the project is underway.
- ✧ The principal argument against plan-driven development is that many early decisions have to be revised because of changes to the environment in which the software is to be developed and used.



The project planning process



Project plans



- ✧ In a plan-driven development project, a project plan sets out the resources available to the project, the work breakdown and a schedule for carrying out the work.
- ✧ Plan sections
 - Introduction
 - Project organization
 - Risk analysis
 - Hardware and software resource requirements
 - Work breakdown
 - Project schedule
 - Monitoring and reporting mechanisms



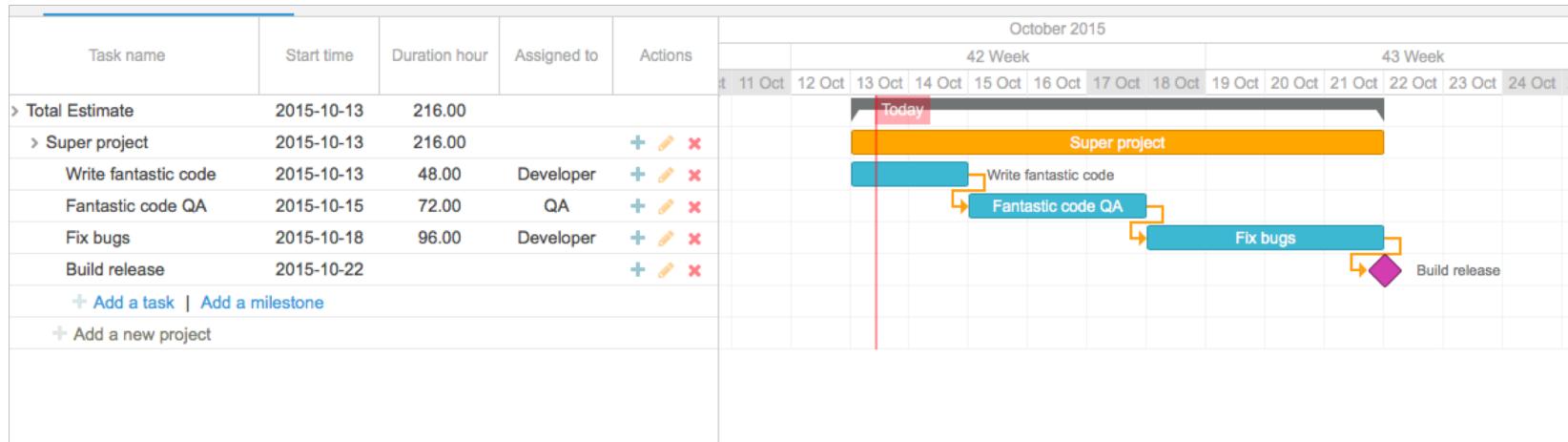
Work breakdown

- Break the work into activities and sub activities
 - Gantt charts
 - PERT diagrams
 - Text
- Progress measured against milestones (project monitoring):
 - Milestone specification
 - Assessing whether the milestone has been reached



Work breakdown structures (WBS)

- Gantt chart



Milestones

- Specify products and results
 - Which product?
 - What state?
 - When?
- Specify the assessment criteria and process

Examples of products in milestones:

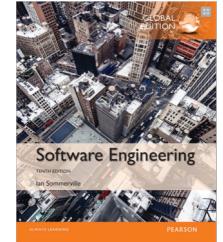
- Project plan
- Requirements specification
- Prototype of ...
- Software architecture
- Detailed design
- User interface
- Test plans
- Test reports
- Program
- Database design
- Data conversion
- Release 1, 2, ... N
- Project evaluation



AGILE PLANNING



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Agile Planning

EMPIRICAL - WELCOME CHANGE
MOVE TASKS TO PEOPLE

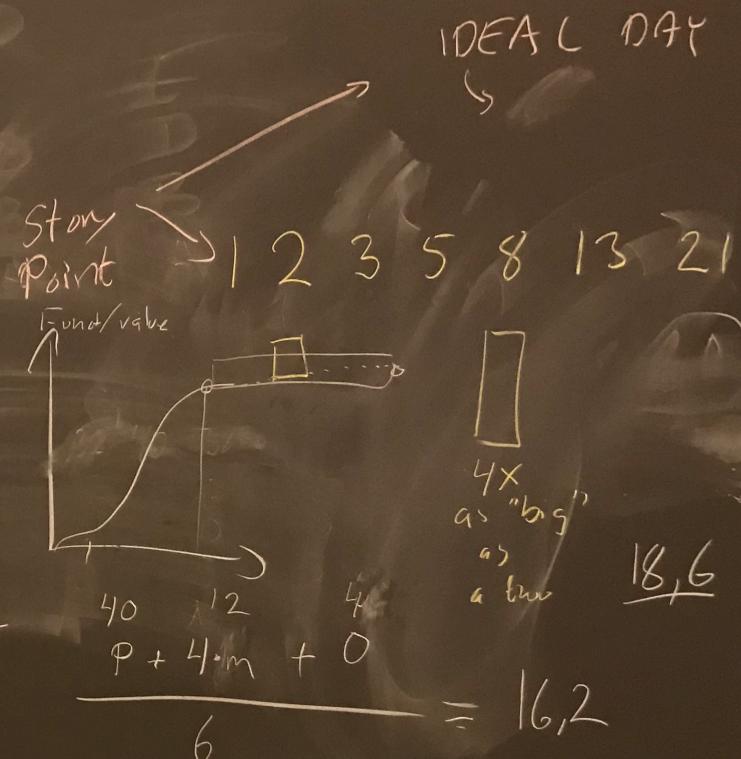
INSPECT + ADAPT TO DISCOVER WORK
VERTICAL SLICES (USER STORIES)



PRODUCT BACKLOG

2-4 weeks

PRODUCT INCREMENT



Agile planning

- Agile methods of software development are iterative approaches where the software is developed and delivered to customers in increments/iterations.
- The functionality of increments is not planned in advance but is decided during the development.
 - The decision on what to include in an increment depends on progress and on the customer's priorities.
- The customer's priorities and requirements change so it makes sense to have a flexible plan that can accommodate these changes.

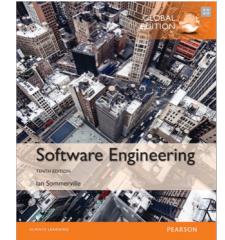


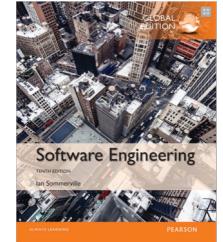
XP: Story-based estimation and planning

- The planning game is based on user stories that reflect the features that should be included in the system.
- The project team read and discuss the stories and rank them in order of the amount of time they think it will take to implement the story.
- Stories are assigned ‘effort points’ (also called story points) reflecting their size and difficulty of implementation
- The number of effort/story points implemented per day/sprint is measured giving an estimate of the team’s ‘velocity’
- This allows the total effort required to implement the system to be estimated



XP: The planning game





Agile planning applicability

- ✧ Agile planning works well with small, stable development teams that can get together and discuss the stories to be implemented.
- ✧ However, where teams are large and/or geographically distributed, or when team membership changes frequently, it is practically impossible for everyone to be involved in the collaborative planning that is essential for agile project management.

Agile estimation

- Based on requirement items
- XP: story points as demonstrated on the video in Moodle
- Scrum: Planning poker
- Experience-based

Scrum: Product backlog and owner

ID	Title	Importance	Estimate	How to demo	Notes
1	Deposit	30	?	Log in, open deposit, deposit €10, go to balance and check it has increased	
2	View transaction history	10		Log in, click on 'transactions', do a deposit, go back to transactions, check that new deposit shows up with right date and amount	Design similar to view users page

design

Product Owner is a well-defined role (pig). The one that adds items to the product backlog

XP: User story (iLearn)



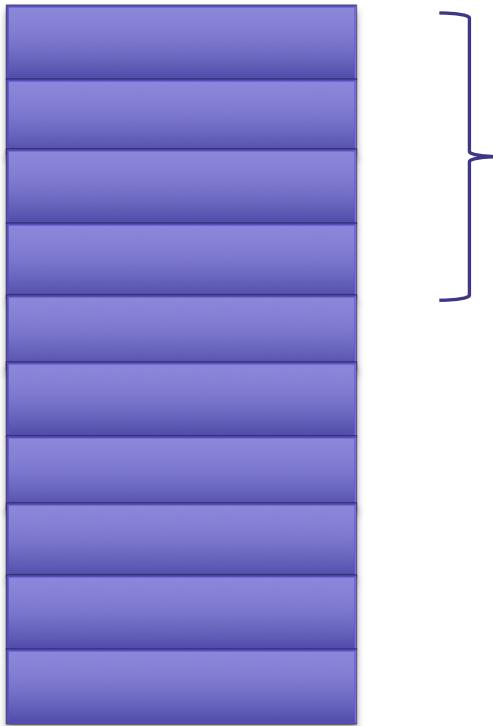
❖ Jack is a primary school teacher in Ullapool (a village in northern Scotland). He has decided that a class project should be focused around the fishing industry in the area, looking at the history, development and economic impact of fishing. As part of this, pupils are asked to gather and share reminiscences from relatives, use newspaper archives and collect old photographs related to fishing and fishing communities in the area. Pupils use an iLearn wiki to gather together fishing stories and SCARAN (a history resources site) to access newspaper archives and photographs. However, Jack also needs a photo sharing site as he wants pupils to take and comment on each others' photos and to upload scans of old photographs that they may have in their families.

Jack sends an email to a primary school teachers group, which he is a member of to see if anyone can recommend an appropriate system. Two teachers reply and both suggest that he uses KidsTakePics, a photo sharing site that allows teachers to check and moderate content. As KidsTakePics is not integrated with the iLearn authentication service, he sets up a teacher and a class account. He uses the iLearn setup service to add KidsTakePics to the services seen by the pupils in his class so that when they log in, they can immediately use the system to upload photos from their mobile devices and class computers.



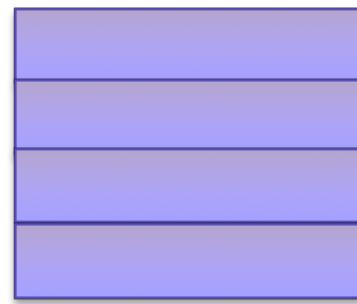
Scrum: Sprint planning

Product backlog



Assigned value
(importance) by the
Product Owner

Sprint backlog



Estimated by the
Team to fit the
sprint

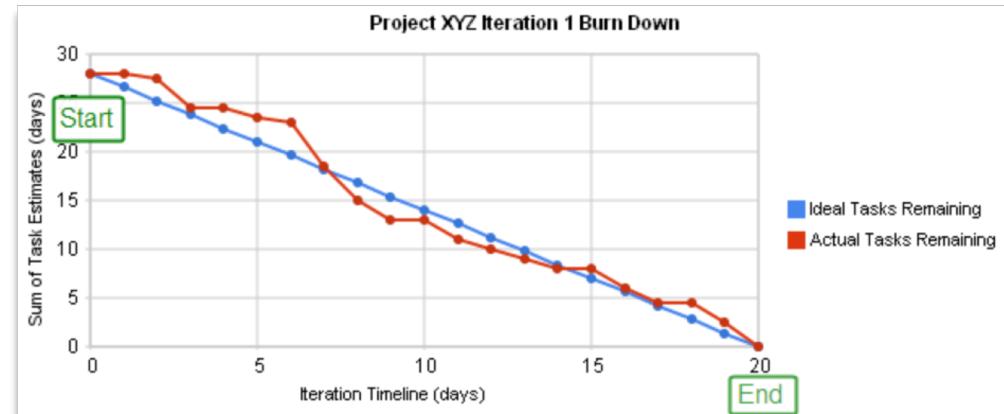
Try 2 weeks sprints



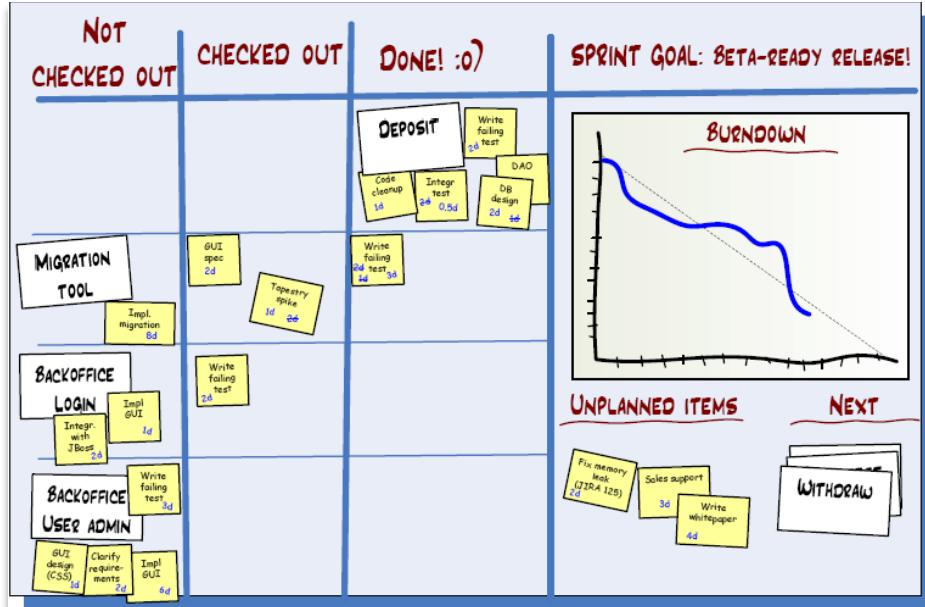
Planning poker

Scrum: monitor progress

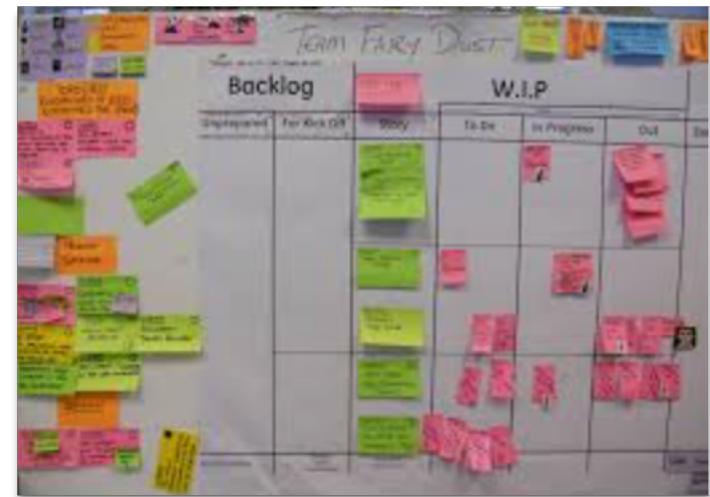
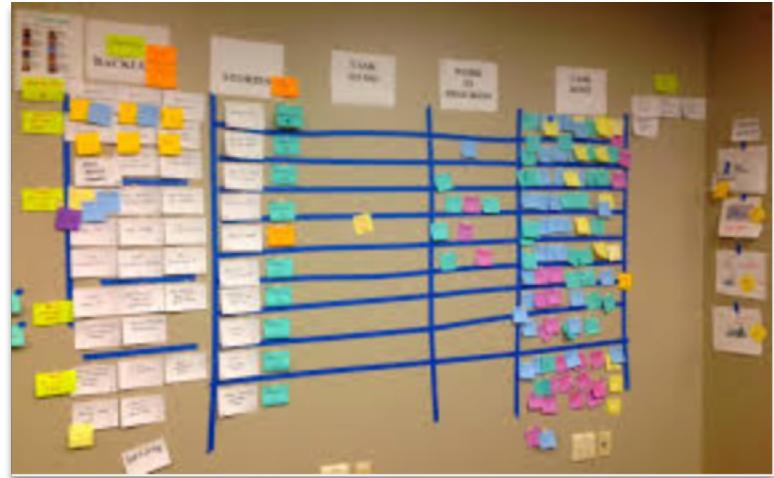
- Daily scrum:
 - Stand-up meeting every morning
 - Organised by the Scrum Master
 - Update the scrum board
 - Move items
 - Update estimates on items
 - Remove obstacles
- Update burn-down chart



Scrum boards



TY



Trello: half a Scrum board

The screenshot shows the Trello interface for the 'Welcome Board'. The top navigation bar includes 'Boards' and a search icon. The board title is 'Welcome Board' with a star icon and a 'Private' button. On the right, there's a '+ Add a list...' button.

Basics

- Welcome to Trello!
- This is a card.
- Click on a card to see what's behind it.
≡ ①
- You can attach pictures and files...
≡ ①
- ... any kind of hyperlink ...
①
- ... or checklists.
- Add a card...

Intermediate

- Invite your team to this board using the Add Members button
- Drag people onto a card to indicate that they're responsible for it.
- Use color-coded labels for organization
- You can change the board background.
- Make as many lists as you need!
- Try dragging cards anywhere.
- Finished with a card? Archive it.
- Add a card...

Advanced

- Use as many boards as you want!
- Want tips, usage examples, or API info?
- Want to use keyboard shortcuts? We have them!
- Get the apps for iOS, Android, and Windows 8!
- Want updates on new features?
- Need help?
- Add a card...



Project Planning

- Plan-driven planning
 - Project plan is a key tool to control the project
 - Estimation is guess work (experience-based or algorithmic)
 - Work breakdown structure with milestones are used to monitor progress
- Agile planning
 - Estimation with story points and planning poker
 - Sprint planning in Scrum
- Tool support



ESTIMATION

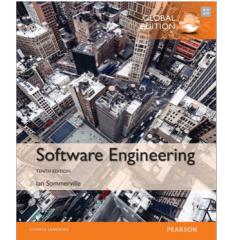


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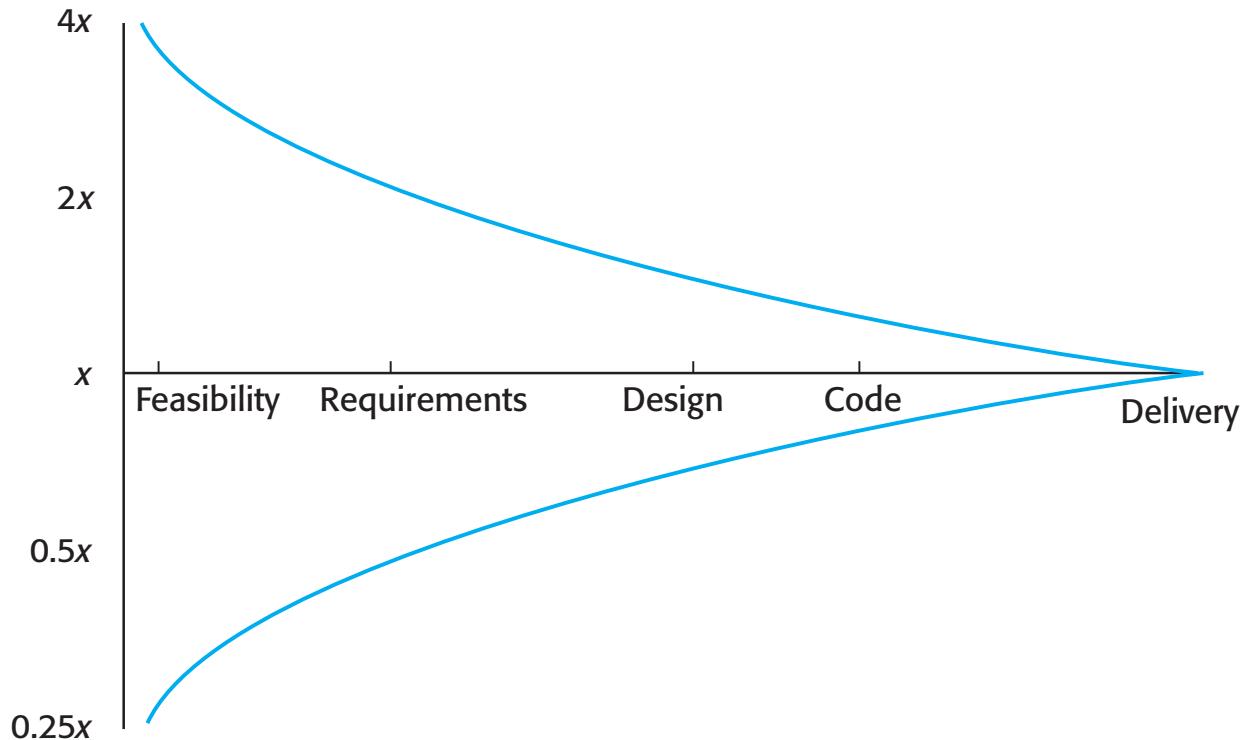
Estimation techniques

- Organizations need to make software effort and cost estimates
 - *Experience-based techniques*
 - *Algorithmic cost modeling*





Estimate uncertainty



Experience-based estimation

- Based on a triangular distribution:
 $E = (a + m + b) / 3$
- Based on a double triangular distribution:
 $E = (a + 4m + b) / 6$
 $SD = (b - a) / 6$

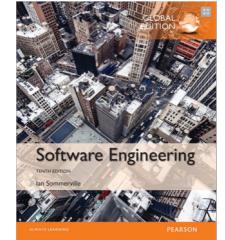
Where:

a is best-case estimate

m is most likely estimate

b is worst-case estimate

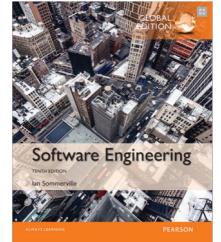




Algorithmic cost modelling

- ✧ Cost is estimated as a mathematical function of product, project and process attributes whose values are estimated by project managers:
 - Effort = A \cdot Size^B \cdot M
 - A is an organisation-dependent constant, B reflects the disproportionate effort for large projects and M is a multiplier reflecting product, process and people attributes.
- ✧ The most commonly used product attribute for cost estimation is *code size*, (lines of code: LOC)
- ✧ Most models are similar but they use different values for A, B and M.

COCOMO cost modeling



- ✧ An empirical model based on project experience.
- ✧ Well-documented, ‘independent’ model which is not tied to a specific software vendor.
- ✧ Long history from initial version published in 1981 (COCOMO-81) through various instantiations to COCOMO 2.
- ✧ COCOMO 2 takes into account different approaches to software development, reuse, etc.

COCOMO estimation models

