SWINBURNE UNIVERSITY OF TECHNOLOGY

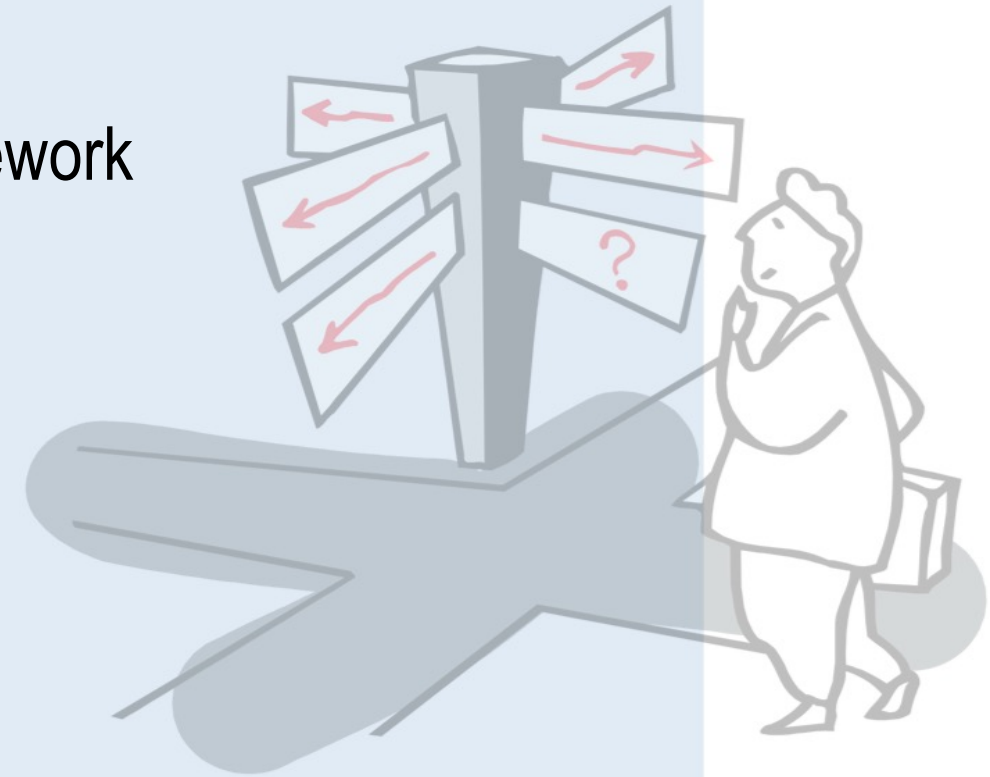
SWE20001
Managing Software Projects

Lecture 6a

Tracking and Monitoring

Roadmap

- Overview, General Framework
- Tracking (and how often)
- Monitoring



Principal References

- Bob Hughes and Mike Cotterell, *Software Project Management* (4th Edition), Wiley, 2006, Chapter 9.
- Kent Beck, Martin Fowler, *Planning Extreme Programming*, Addison-Wesley, 2001, Chapters 19 and 21.
- Pankaj Jalote, *Software Project Management in Practice*, Addison-Wesley, 2002, Chapter 11.
- Ian Sommerville, *Software Engineering* (8th Edition), Addison-Wesley, 2007, Chapter 28.

Driving in the dark…

How would you feel about driving in the dark, without a dashboard?

Why Tracking and Monitoring?

- If we know, during the progress of a project, that something is not “quite right”, there is hope that we can do something about it!
  - ☞ *If we do not know in advance, we can only count the costs at the end…*

- Tracking and Monitoring are *risk mitigation strategies*.

What can go wrong in a project?

- Inadequate functionality of a product
  - Related to SRS
- Poor quality of a product
  - Related to quality management
- Late delivery of the product
  - Related to scheduling and scoping
- Exceeding the budget
  - Related to staffing and scheduling
- You name it!!!

Example : Basic Philosophy in XP

1. Smell a Problem*
2. Devise a Measurement
3. Display the Measurement
4. Take Corrective Action
5. If the problem does not go away, Goto 2

Source: Kent Beck, Martin Fowler, *Planning Extreme Programming*, Addison-Wesley, 2001

*** Sometimes it may just be a "whiff" of a smell; other times, it may be an obvious deviation from clearly identified expected progress**

It's reasonable to apply this philosophy in other process models too!

Planning, Tracking and Monitoring

- Planning: ***know where we want to go***

(Melbourne, Australia)

- Tracking: ***know where we are (now)***

(Melbourne – Florida!)

- Monitoring: ***determine whether we are where we want to be***

Planning, Tracking and Monitoring

- Planning: ***know where we want to go***
  - Task decomposition, allocating resources to tasks etc.
  - Scheduling, milestones etc.
- Tracking: ***know where we are (now)***
  - Finding out what is happening
  - Collect data about current state of project
- Monitoring: ***determine whether we are where we want to be***
  - Comparing the current status with the targets/initial plans
  - Need a plan, a schedule, and collected data during the execution
  - To exercise control over the project
  - To ensure the targets are met
  - Might require contingency plans to address any issues! (part of Risk Management)

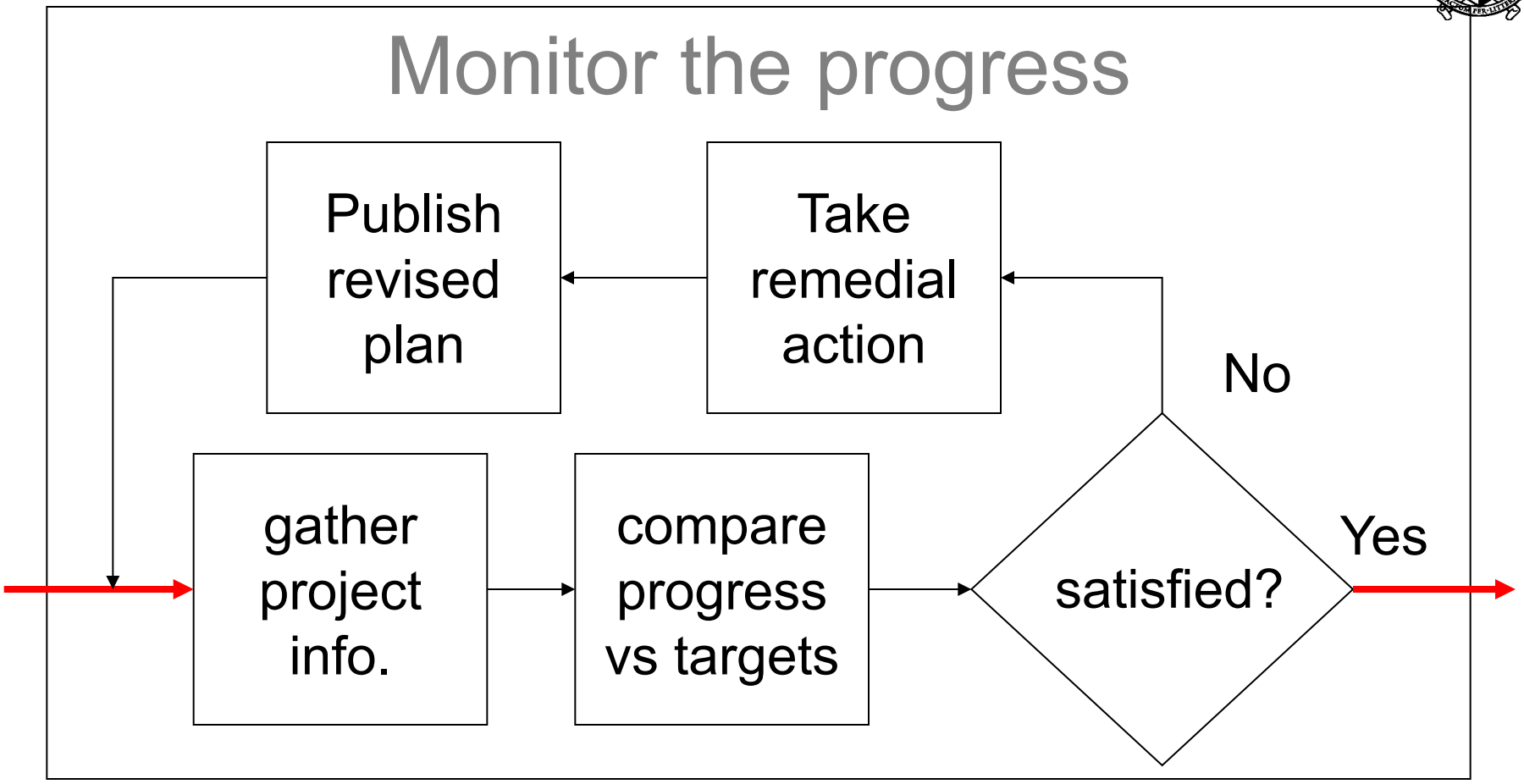
Planning, Tracking and Monitoring (cont.)

- Are in essence "meta-activities"
  - ☐ no *direct* benefit for project progress,
  - ☞ but needed to ensure project progress!
- Disrupt from "real" project work
  - ☐ Take time!
  - ☐ have to be scheduled carefully
  - ☐ Should not distract project workers from their real purpose
  - ☐ need to collect *important* information/measures
  - ☞ *should never become the end, always the mean!*
- KISS: Keep It Simple and Short !

Importance of Tracking and Monitoring

- Helps ensure (but *not* guarantee) that the project
  - Can be delivered on time and within budget
    - Or ensure that adjustments are recognised and agreed as early as possible
    - Avoid "surprises" at the end!
  - Meets the predefined quality
  - Meets clients needs
  - …
- *But: it cannot address fundamental problems of a project - it makes these problems very visible!*

Tracking and Monitoring: Framework



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Roadmap

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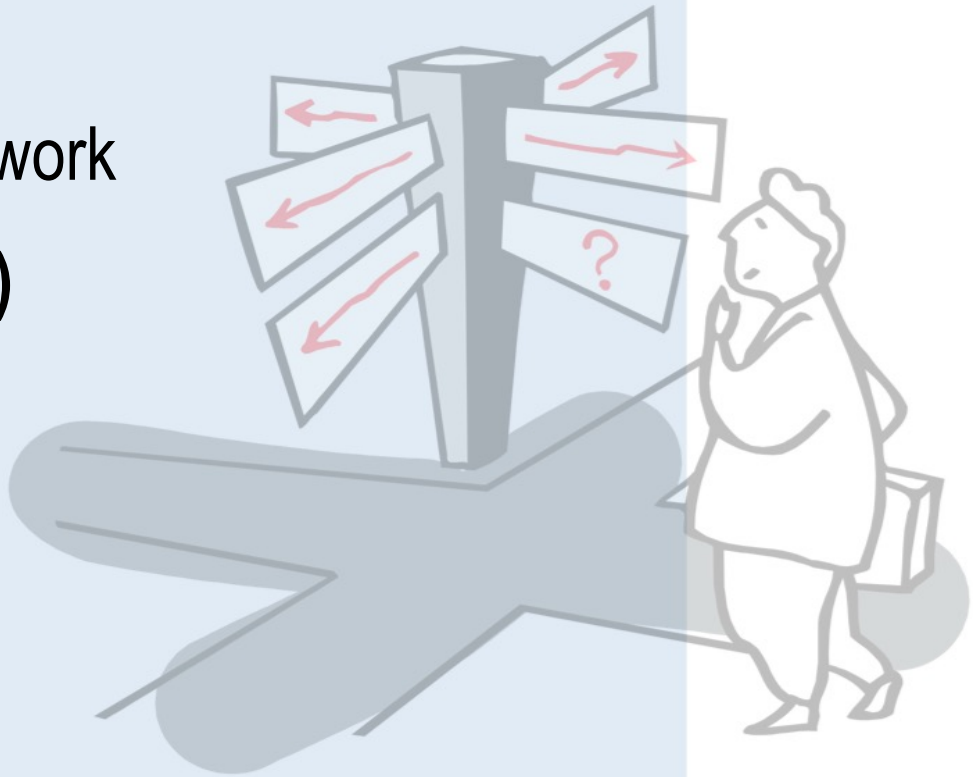
- Monitoring

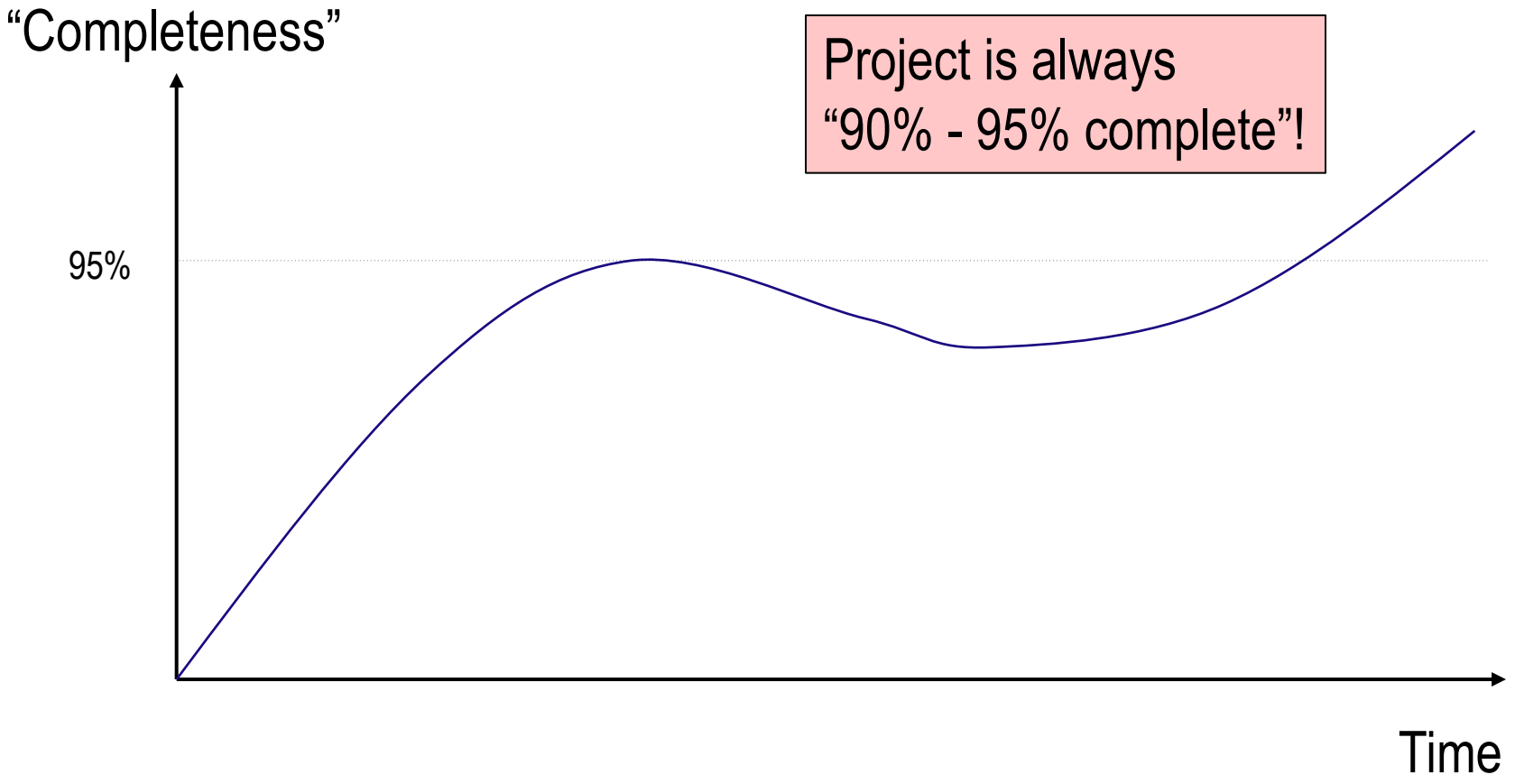


Tracking Current State of Project

This involves the following steps

- Setting *check points* {in advance}
  - Good candidates: Milestones and deliverables
  - eXtreme Programming: 1 - 2 times per week
  - Scrum: (informally) at daily Scrum meetings
- Collecting data
  - Collect data *relevant* to the current progress of the project
    - Might be worth/necessary tracking risks probabilities/impacts!
  - Make sure relevant units are used to collect data!
    - *"Percent complete"* is a bad unit to measure progress!

Percent Complete - the CS Paradox



Check Points – Different Strategies

- Based on regular time intervals
  - Can be weekly or monthly or quarterly (dangerous!)
  - Depend on what to check and how to check it
- Based on a particular event
  - At the end of each activity
  - In the "middle" of an activity that falls in a critical path
  - In the middle of an activity that produces a high quality work product which are important to the success of the project
- Based on work product
  - Milestones and deliverables
- **Should be set *before* the project plan is published**
  - **Make sure everyone knows when and what the check points are!**

☞ *Checkpoints should be risk driven!*

Example : XP - Iteration Progress Check

Dedicated project role (i.e. *Tracker*) asks two questions about each task signed up by a developer:

- *How many ideal days have you worked on this task?*
  - Not directly relevant for monitoring, but useful for calibrating "Yesterday's Weather"
- *How many more ideal days do you need before completion?*

☞ Note the unit (*ideal days* vs. percentage complete)!

☞ "Yesterday's weather" is best estimator

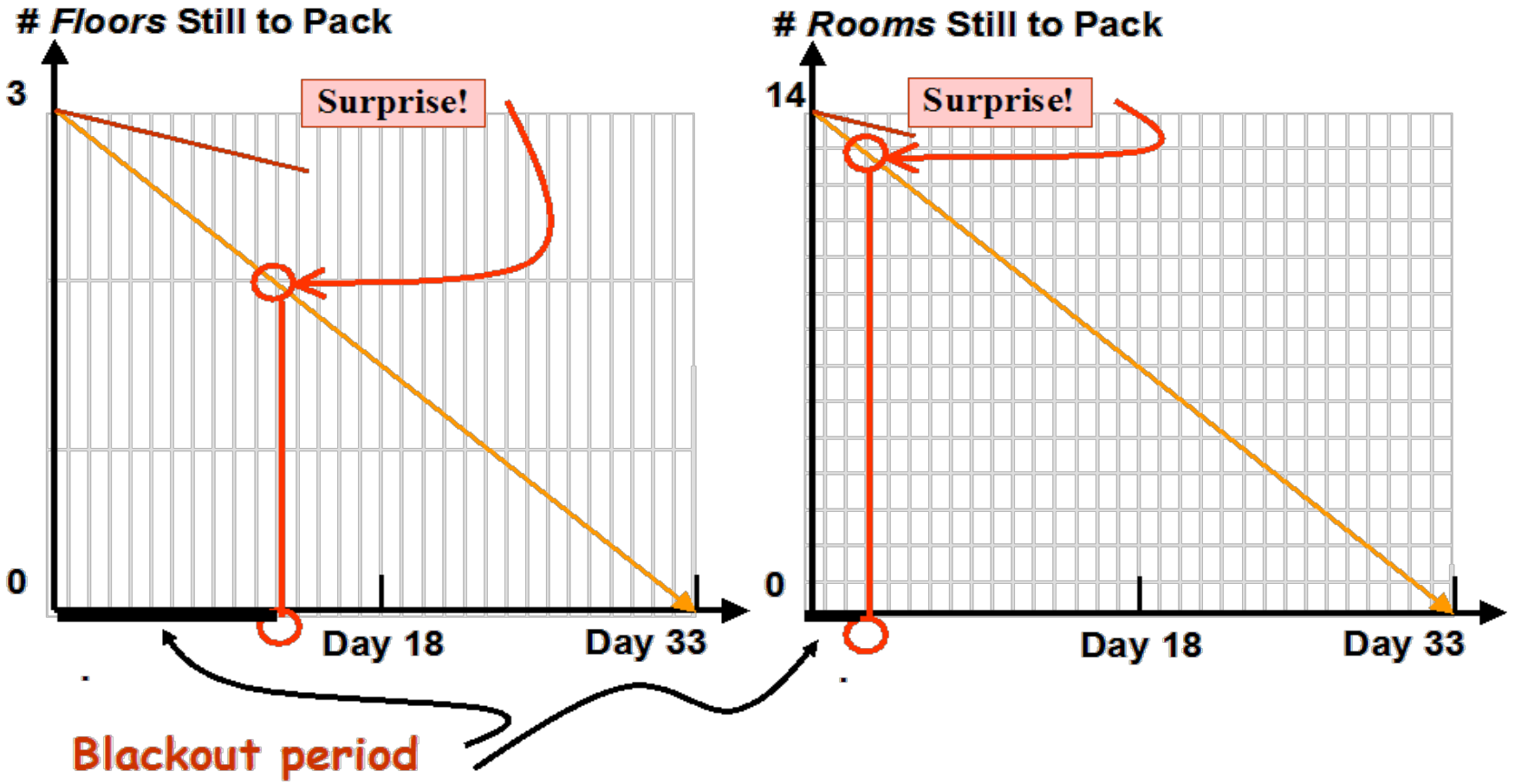
Issues with Tracking

- Data collected must be *honest* and *accurate*
  - ☞ Data should *never* be used to assess performance of teams!
  - ☞ Otherwise, you will be told what you "want" to hear…
- 3-Point time tracking:
  - ☐ Planned vs. Unplanned vs. Ongoing work
- State of progress not always easy to determine
  - ☐ When is a task "really" complete?
  - ☐ Who makes this decision (developer, client, project manager, team, …)?
  - ☐ This is a BIG ISSUE

Issues with Tracking (cont.)

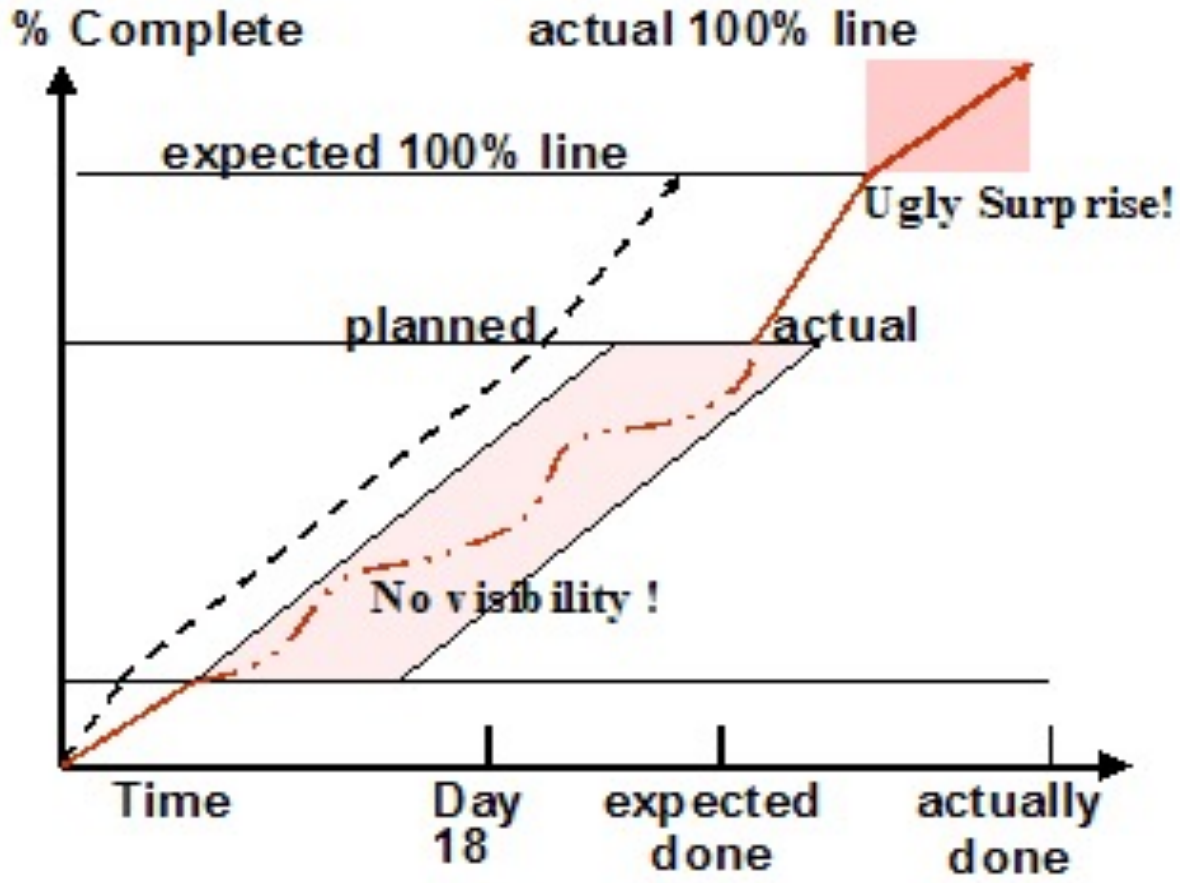
- Choose metrics that reflect the *actual state of progress*
- Estimates might be wrong
  - report progress based on *adjusted* estimates
- Units of measurement do matter
  - Choose units that cannot expand ("days" not as good as "hours"!)

Short vs. Long Time Intervals



Source: Alistair Cockburn, *Crystal Clear*, Addison-Wesley, 2004

Lack of Intermediate Check Points



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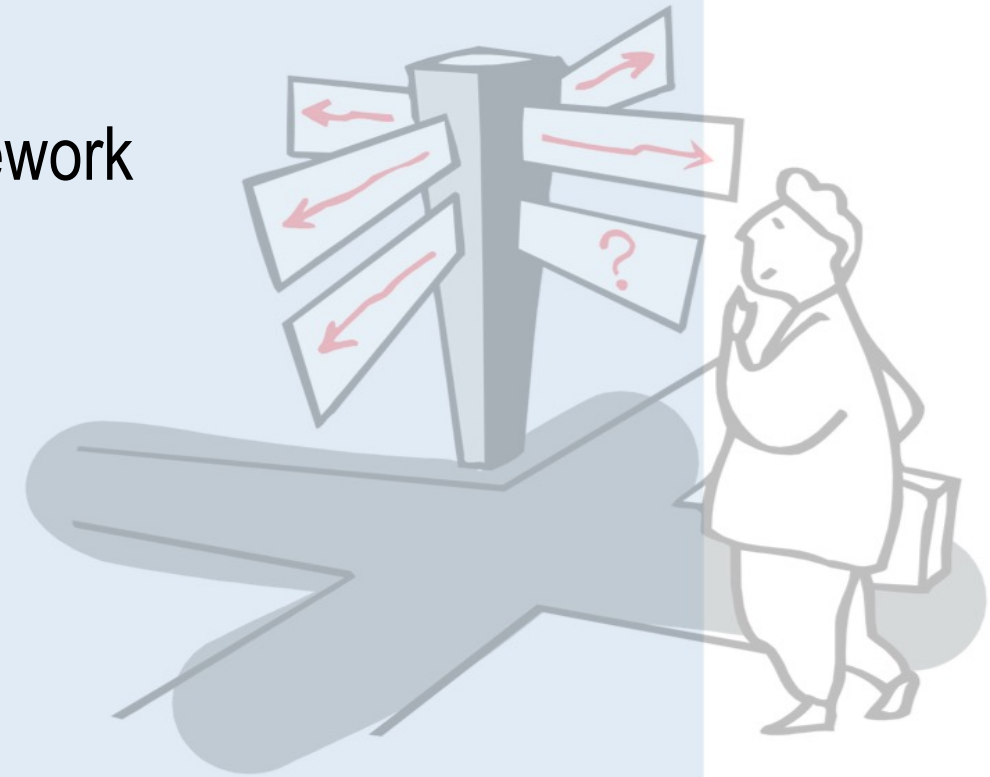
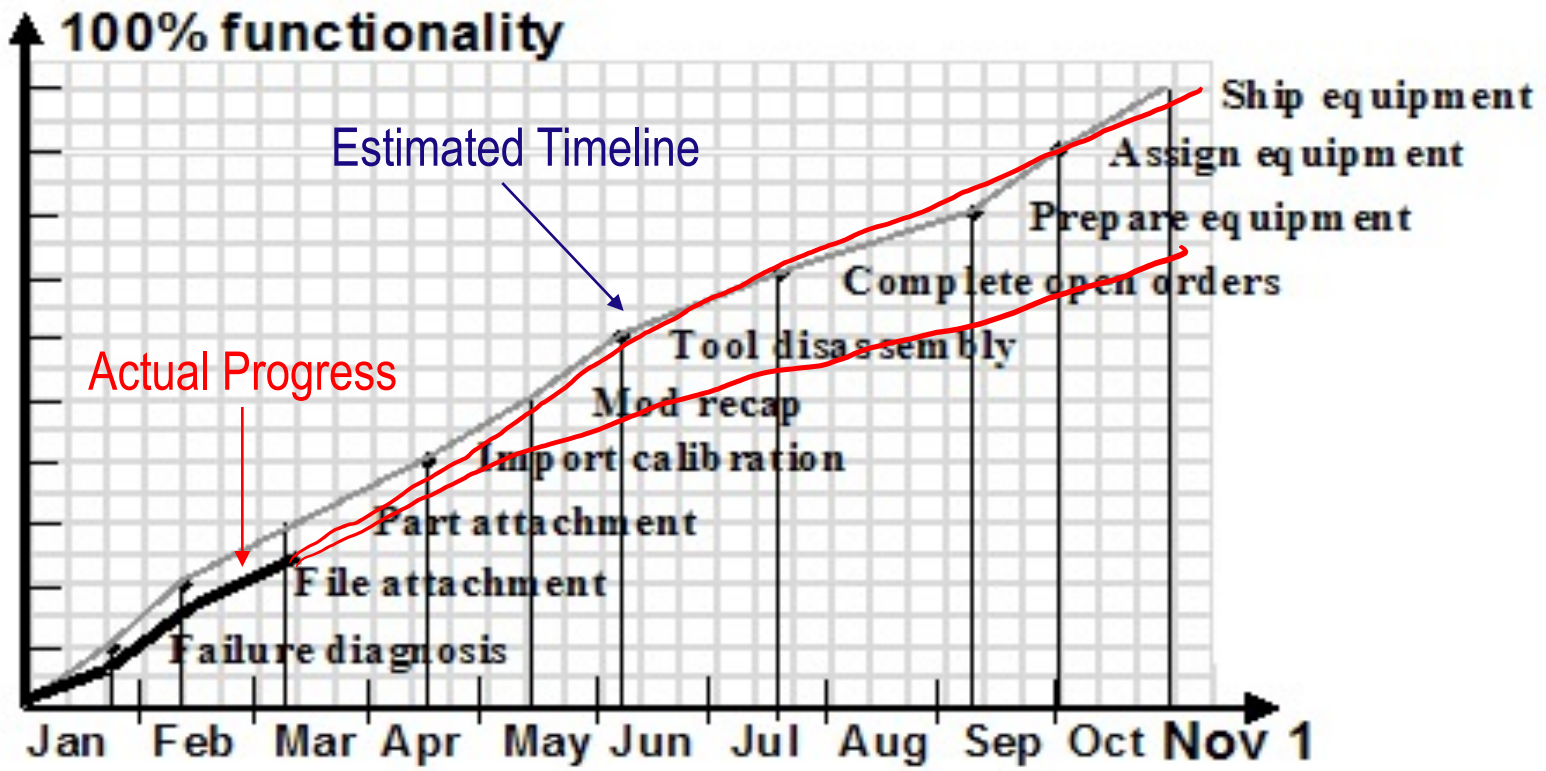


Monitoring Progress

- Need a plan, a schedule, and collected progress data
  - The "fuzzier" the plan/schedule, the more difficult to assess progress!
- Need tools for *visualizing* progress
  - Graphs are (often) easier to understand than tables
  - "One picture can say more than a thousand words"
- Need to monitor both time and cost
  - Cost in general easier to monitor than time.
- *But what kind of visualizations help?*

Burn-up Charts



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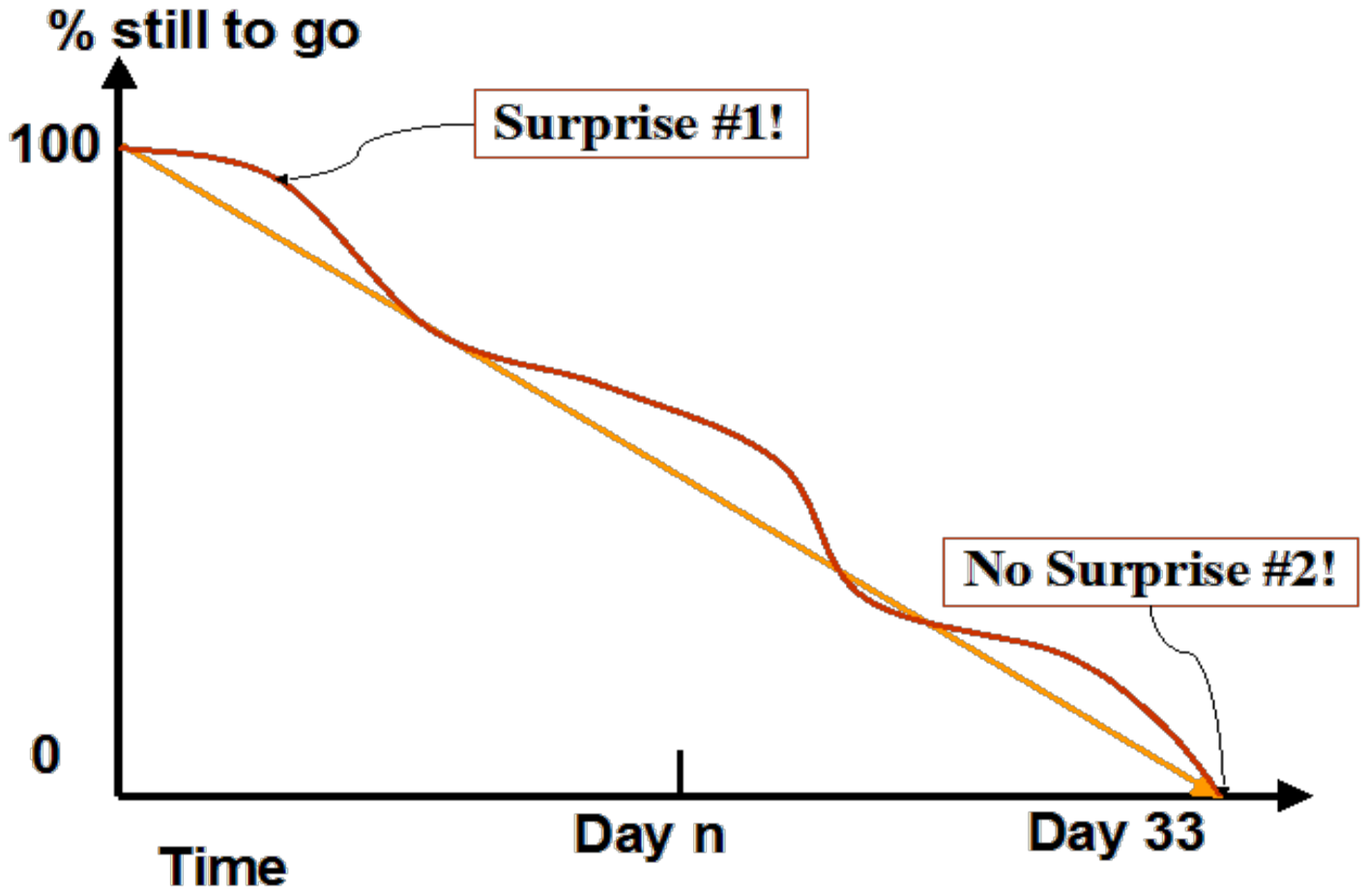
Burn-down Charts



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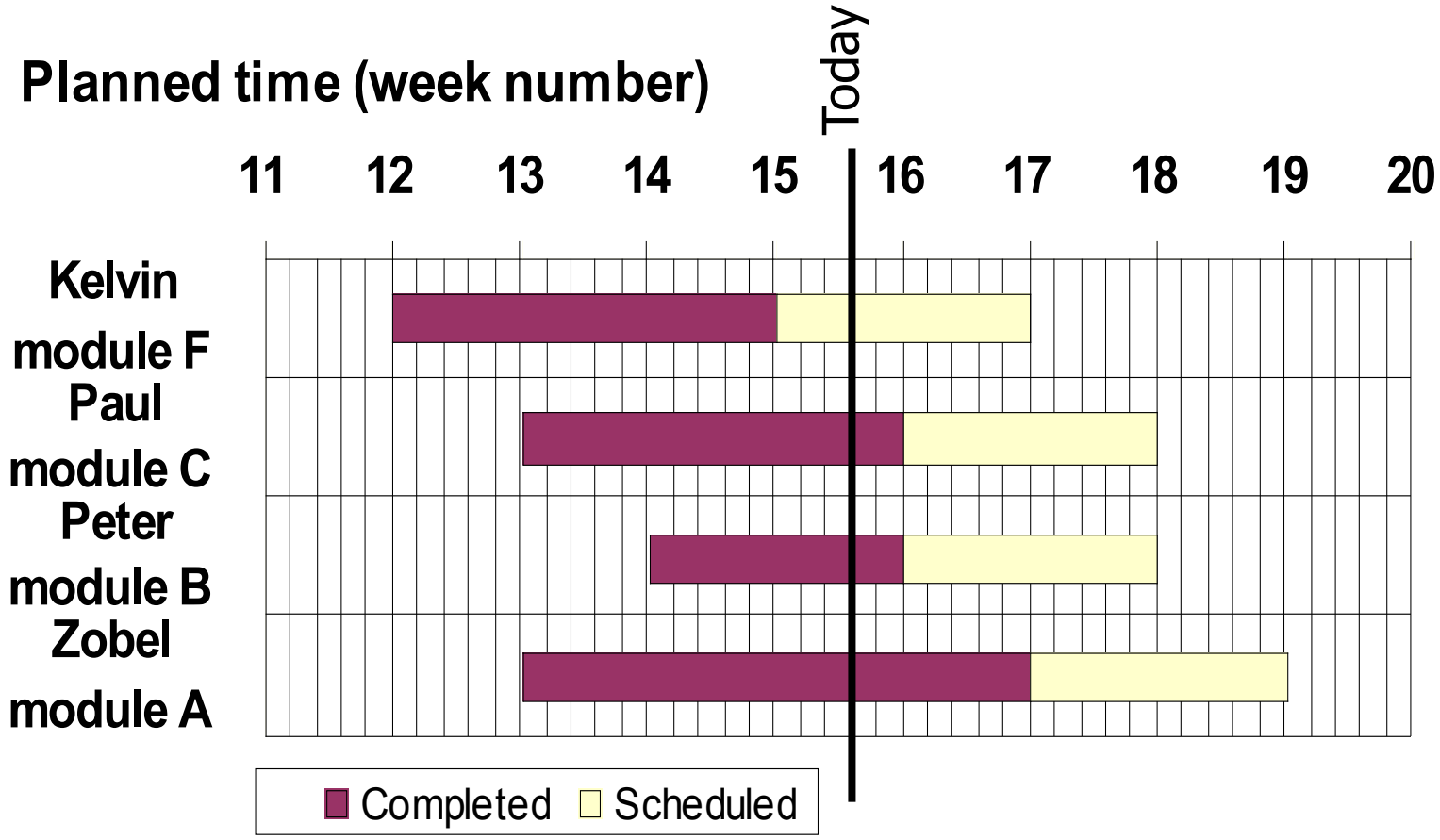
Gantt Charts… and why they are dangerous!



Measures to Visualize

In essence, anything that is of interest for project team!

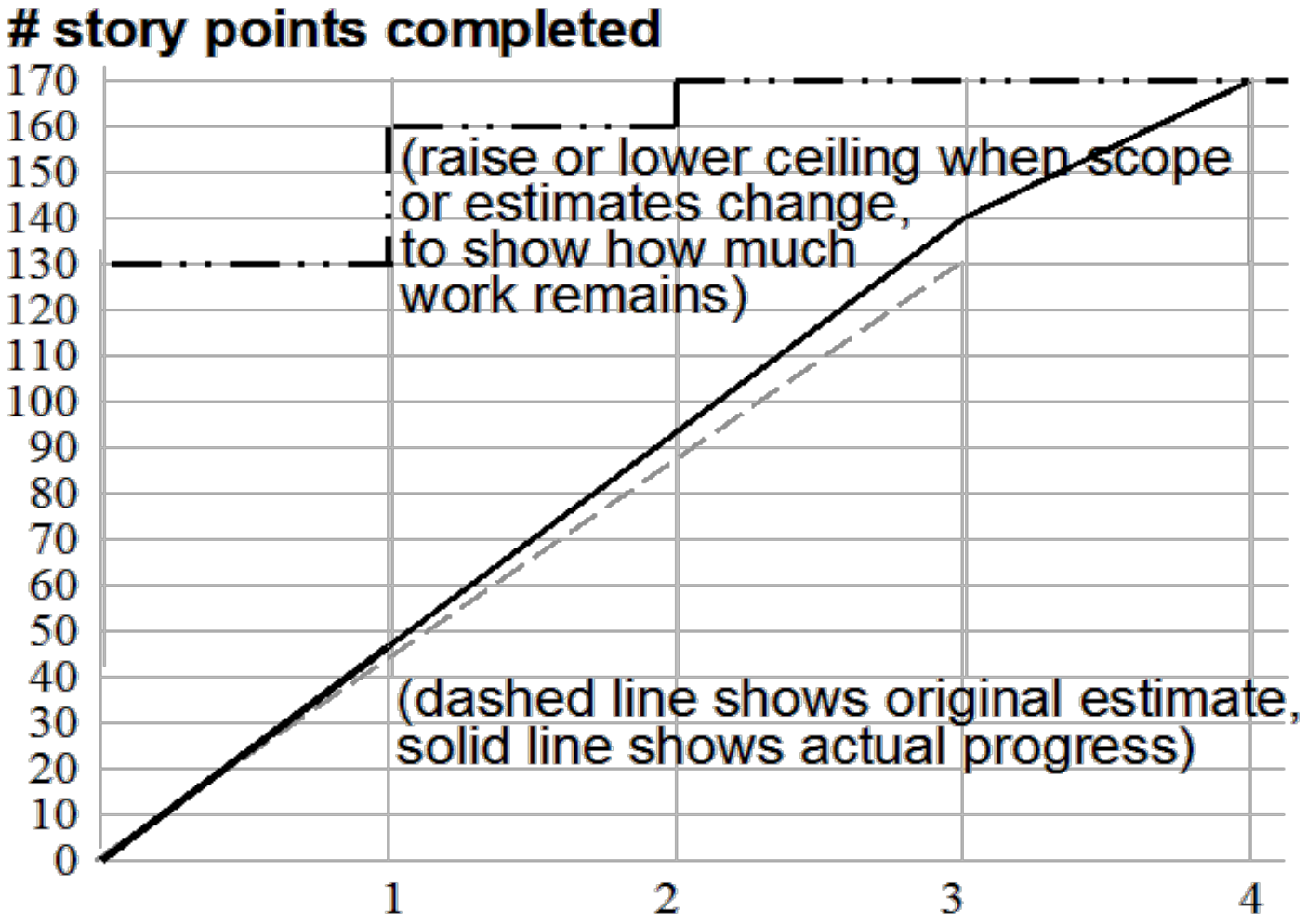
- Tasks completed vs. tasks still outstanding
- (Real) time spent vs. (ideal) time still needed to complete task
- “Size” of functionality completed vs. estimated size
- Risk assessments
- Number of bugs still to be addressed
- Amount of money from budget already spent
- …

Simple “Visualization” to Track XP Progress

- Get a big pin-board into the project room, place *visible to everybody*
  - preferably next to the coffee machine, fridge etc.
- Create four clearly visible areas on pin-board:
  1. User stories *signed up* (but not yet started)
  2. User stories *currently being worked upon*
  3. User stories *completed*
  4. User stories *accepted* by the customer (or the customer representative)
- All story cards of user stories to be completed in current iteration are initially pinned to Area 1.
- Only once user story is fully implemented (and accepted by on-site customer), move corresponding card to Area 4.
- Simple, but effective way to visualize project progress

☞ *Note: does not work on a web-page (pull vs. push-flow)*

Do not Hesitate to Adjust Graphs!



Hierarchical Traffic-light Method

For assessing progress:

- Identify the key (first-level) tasks that are to be completed
- Break them into smaller, more manageable tasks
- Assess each (lower-lever) task by
  - Green as 'on target'
  - Amber as 'not on target but recoverable'
  - Red as 'not on target and recoverable only with difficulty'
- Assess the first-level tasks based on the assessments of their lower-level tasks.
- Assess the overall progress based on all the assessments

☞ Note: a similar approach can be used to monitor quality.

Iceberg List

Iceberg List (cont.)

- Ordered list of (all) features that need to be completed for the project
  - Includes brief description, relative business value/priority
  - Estimated development time (ideal days)
  - Time already used for development (calendar days)
  - May also include dependencies between tasks
- Based on estimates, draw a visible line to separate tasks of current iteration ("above water") from future iterations ("below water").
- If changes are made to list, adjust separation line accordingly
- Use color coding (**Green**, **Amber**, **Red**) to highlight status of tasks.

☞ *Can be used both as a planning and reporting tool!*

Reporting

Progress Report:

- Indicate the work done by the personnel and the time spent on the work
- Indicate how much work still needs to be done
  - ☞ *Use suitable estimates here!*
- Optional items
  - ☐ Likelihood of failing to complete the task by the scheduled date
  - ☐ Estimated time of completion

Risk Report:

- Indicate the likelihood of meeting the scheduled target date
  - ☐ Instead of asking the estimated completion date
- Risk Reporting Technique
  - ☐ The traffic-light method

Important to Consider

- Report the *true* state of the project, not wishful thinking!
- Make graphs *visible* to development team
  - Webpages are not necessarily a good idea!
  - Pinboard with task-cards work quite well
- Display graphs/reports only as long as they are useful
  - once out of date, discard them
- Monitoring as a "meta-activity" that assists development
  - It is *not* a primary activity and should not "hinder" development.
- Not to be used as a tool to assess individual's performance!
- If problems are detected
  - Identify root cause, not only its effect.

“Exercise for the Reader”

- What would you do to track and monitor *quality* in a software project?
- What kind of metrics/measures are useful? How can you best visualize them?