Tids- och kostnads-uppskattning av RUP Projekt

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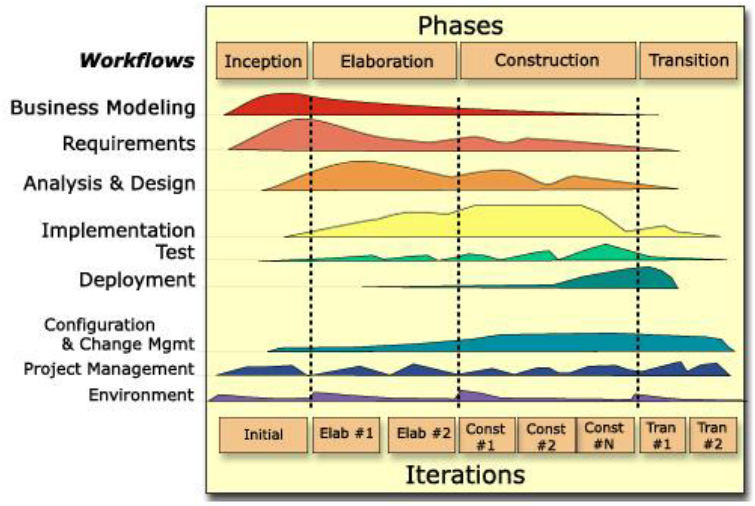
Content

- **Context: RUP & Project Management Models**
- **Project Phases & Iteration**
- **Definitions**
- **What to Estimate**
- **Estimation Methods overview**
- **Practical examples**
- **Next step**

Rational Unified Process (RUP)



Source: RUP2000, Rational Software

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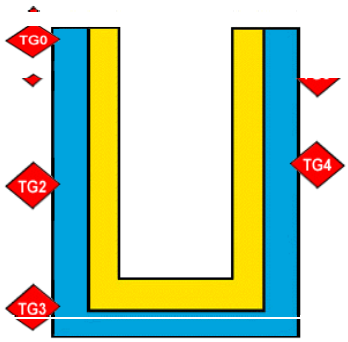
PROPS

- **PROPS is a generic project model, developed by Ericsson Project Management Institute**

PROPS consists of three parts:

- ***Blue U*, project management**
- ***Yellow U*, development process**
- ***Red tollgates*, commercial decision points**



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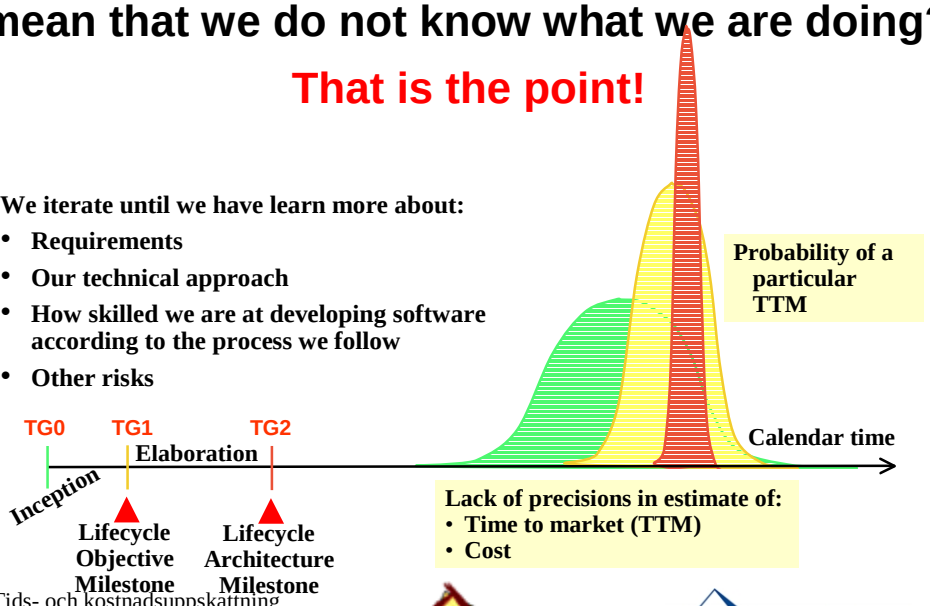
Does not the Iterative Approach simply mean that we do not know what we are doing?

That is the point!

We iterate until we have learn more about:

- **Requirements**
- **Our technical approach**
- **How skilled we are at developing software according to the process we follow**
- **Other risks**



Lack of precisions in estimate of:
- **Time to market (TTM)**
- **Cost**

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Estimation

Estimate, Guess, Guestimate, …

People are
Optimistic, Scared, Want to look good,
Forget the history, Have selective memories, and
Think in single point numbers

We do better if we
Get a *clear picture*
Use *Team* and several experts,
Use *range estimates and statistics*,
Use a formal *estimation method*, and
Insist on *realistic estimates*

We assume you're
in control of your *requirements*, and
have a sound *Project Management process*

Unit of estimation:
- **Sweden: man-hours**
- **US: size**

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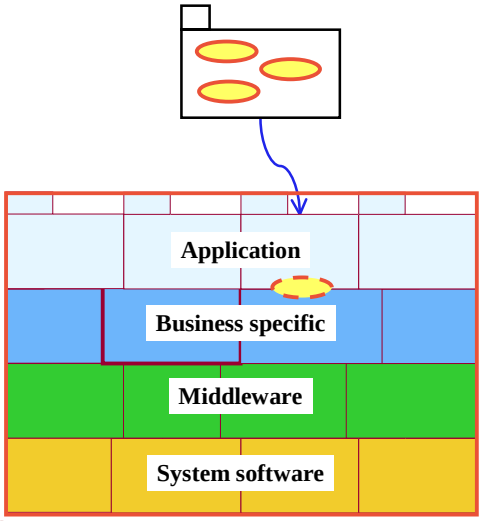
What to estimate for?

Everything that moves ☺

- **The complete system**
  - **Rough estimates**
- **Use Cases**
  - **A good foundation for estimation. Important to include challenges with the technology**
- **Use Case Realizations**
  - **We know more than the requirements**
- **Subsystems**
  - **The chosen technology is integrated in the sub-systems.**



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Real world case 1

- **Estimates done with a matrix containing modules (part of the architecture) and use cases**
- **Estimates in execution**
  - **Chief architect (1)**
  - **Module responsibles (2)**
  - **Estimates 100%-400% larger**
- **Positive**
  - **Project Managers can easily plan which use cases to implement**
- **Negative**
  - **New method -> hard to determine if the estimates are resonable**
- **No outcome yet**

Module/ Req	A	B	C	D	E	F	Σ
UC1	32				8		40
UC2			45				45
UC3			23		10		33
UC4		37					37
R5			23			28	51
R6					34		34
R7					92		92
Σ	32	37	91		144	28	332

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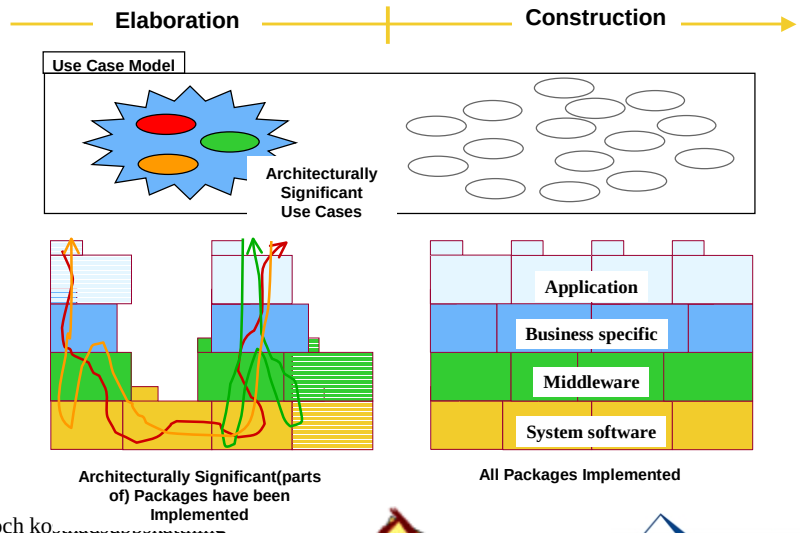
Use Cases Realizations connect Subsystems



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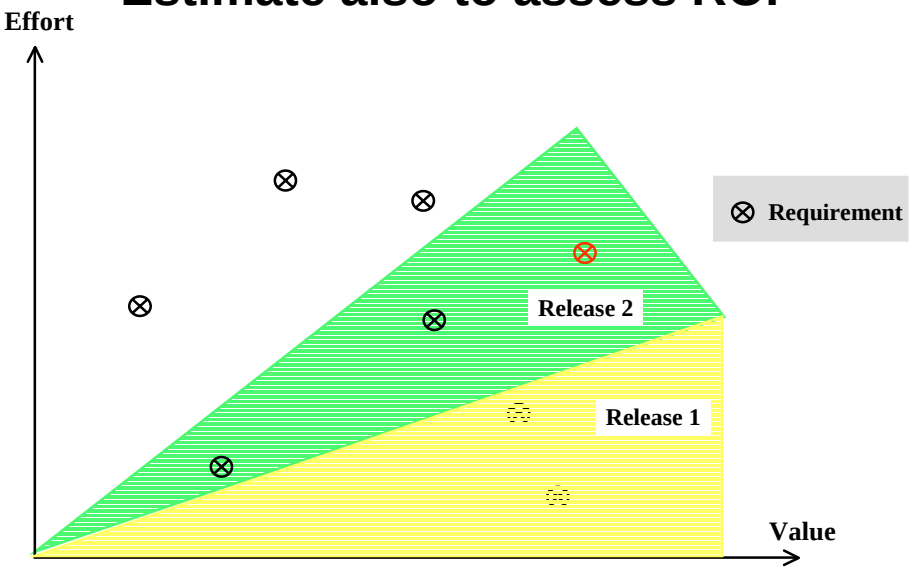
Estimate also to assess ROI



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Methods overview

- **Expert Judgements**
- **Analogy**
- **Delphi**
- **Algorithmic Models**
  CoCoMo, Function Points, Object Points, UC Points
- **Lichtenberg**
- **Paired Comparison**
- **Critical Chain**

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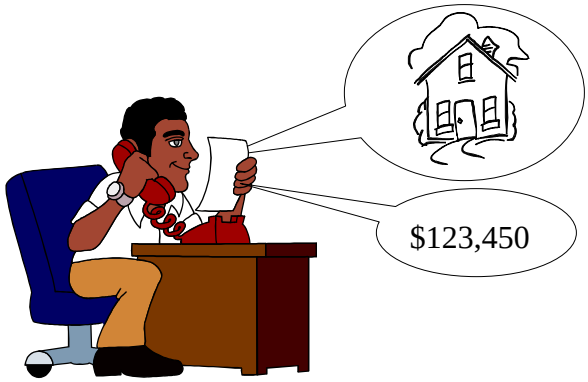
Expert judgements



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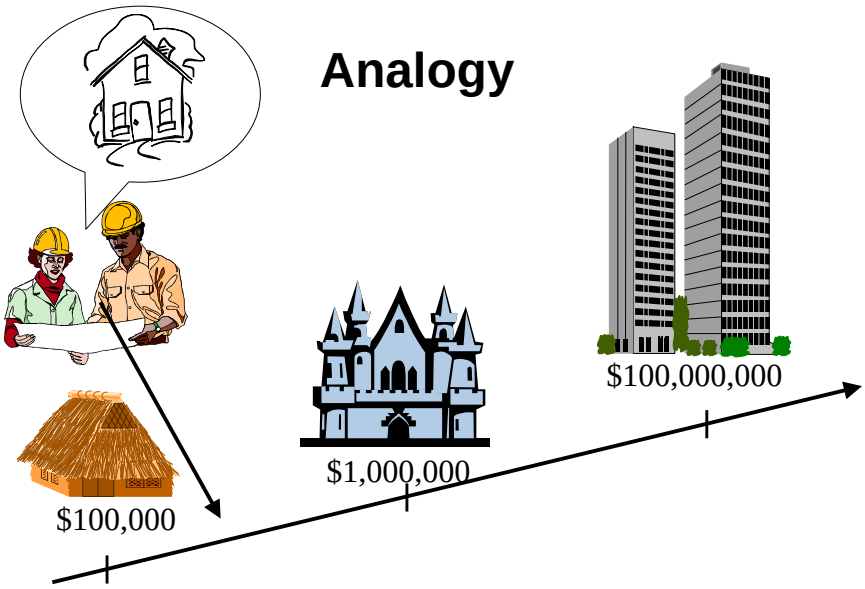
Analogy



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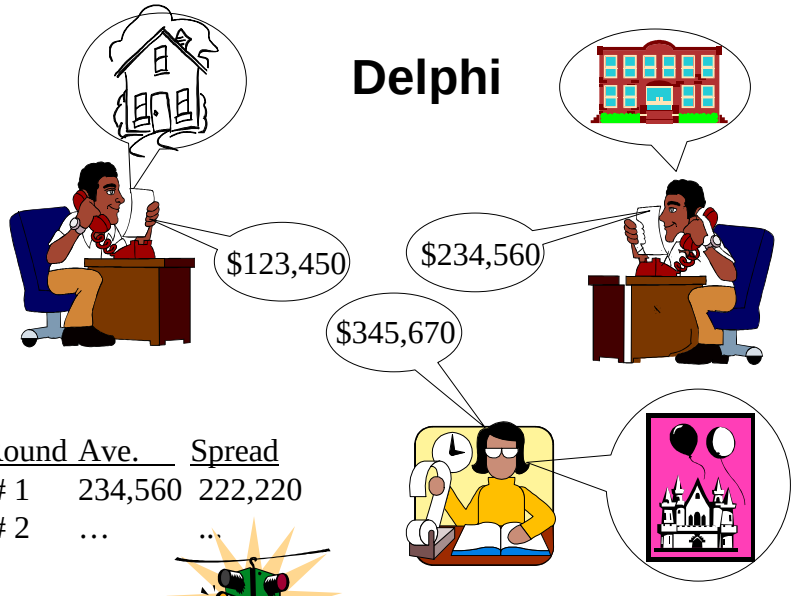
Delphi



Round	Ave.	Spread
# 1	234,560	222,220
# 2	…	…

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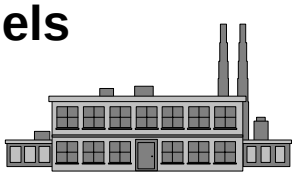
Algorithmic Models

Scaling Factor

Effort Multiplier



$$PM = A \times Size^{E} \times \prod_{i=1}^{n} EM_i + PM_{Auto}$$

- **Cost in Effort (Person Months), Calendar Time, or Size (CoCoMo II)**
- **Function Points, Object Points, Use Case Points, Boehm, …**
- **Up to within 20% in 70% of the cases**

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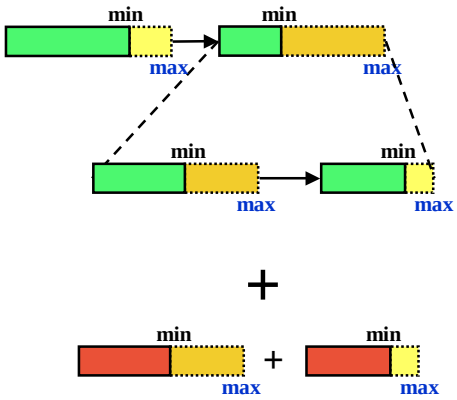
”Lichtenberg-method”

- **Estimate with uncertainty :**
  - **Min, max, most likely**
  - **Average = (min+max+3*likely)/5**
  - **Standard deviation = (max-min)/5**
- **Successive break-down**
  - **Break-down the activities with the largest uncertainty**
  - **Estimate the parts and add up:**
    - » ***Schedules***
    - » ***Costs***
    - » ***Standard deviations***
- **The Red/Green world**
  - **Ignore risks and crucial uncertainties first, then**
  - **Add the corresponding activities**



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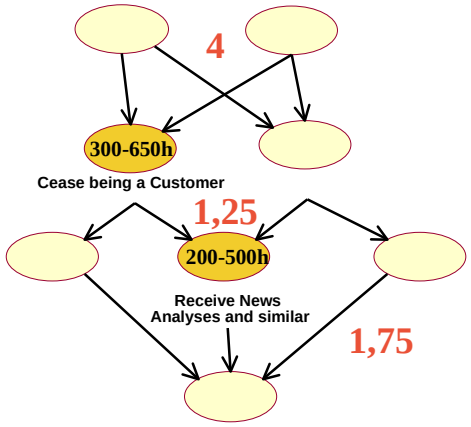
Paired Comparison

- Compare pairwise all ”objects” that we estimate for X_i and X_j – are they:
  - $X_i >> X_j$
  - $X_i > X_j$
  - $X_i = X_j$
- This yields a *relative comparison* of sizes
- Estimate the absolute value for a number of ”fix points”
- Calculate the *total*, here:

  +350/1,75
  +3*350
  +2*475
  +2*4*475
  = 6000h



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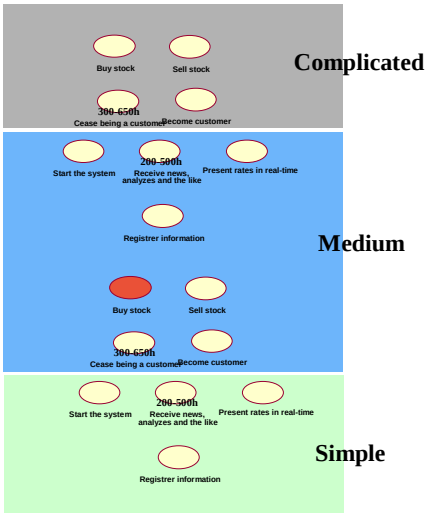
Real world case 2

- Administrative system with 110-120 use cases
- Migrating legacy to modern framework
- Implemented *1 use case* and measured time for that
- Arranged all use cases i 3 sets:
  - Complicated
  - Medium
  - Simple
- Compared to implemented use case and developed estimates during Elaboration
- Adjusted new estimates to the fact that next use cases should be quicker since experience with new framework was building
- Presented estimates to management
- Project was cancelled – should have taken to much time and effort!



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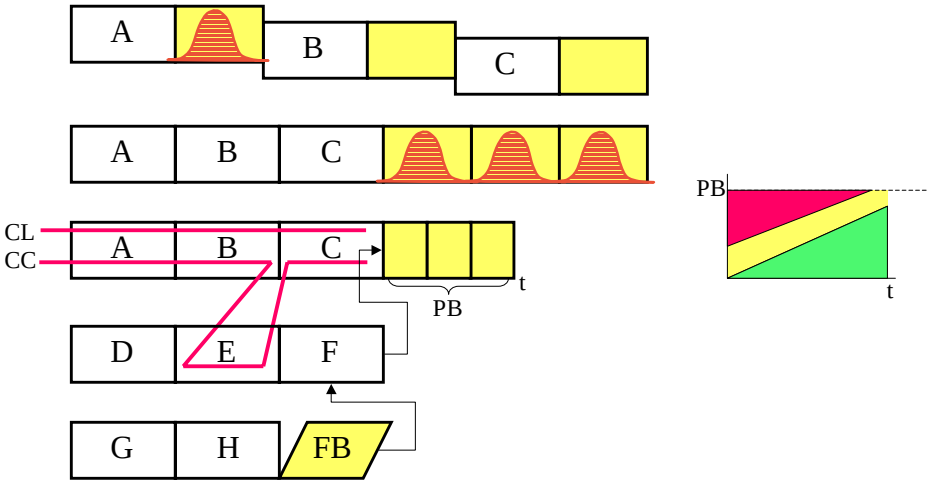
Critical Chain



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Critical Chain

- **Based on Critical Chain by Goldratt**
- **Theory of constrains**
- **Aggressive planning & Reduce Multitasking**
- **Critical Chain vs. Critical Line**
- **Buffer management**
  - **The Project Buffer protects the delivery date**
  - **The Feeding Buffer protects the Critical Chain**
  - **The Capacity Buffer protects the critical resources in a multi-project environment**

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Technique	Advantage	Disadvantage
Analogy	Experience Based	Standard project?
Expert judgement	Fast, compensates for circumstances	Biases, incomplete recall of experiences
Delphi	Formal, Can use a mix of methods	As good as the experts
Algorithmic Models	Objective, Efficient, Calibrated	Subjective inputs, Inflexible, Must be calibrated
Critical Chain	Reduced time schedule	Extra pressure (?)
Lichtenberg	Top-down view, Risk Focus	Mentally demanding
Paired Comparison	Suggests high fidelity. Practical if comparisons can be reduced.	Cumbersome? Unproven in academia

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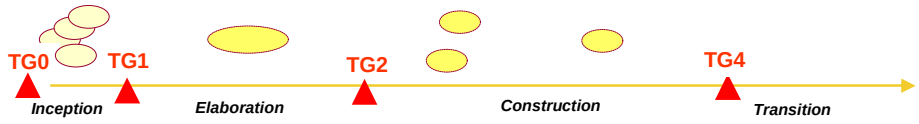
Real world case 3

- **Estimated effort for each use case during Inception:**
  - **Requirements**
  - **Design**
  - **Implementation**
  - **Test**
- **Allocated use cases to iterations**
- **Experiences – Sufficiently good. Precision mostly OK, large deviations (up to +100%) sometimes due to:**
  - **New architecture**
  - **Use cases with complex business rules**
  - **Most deviations struck execution of Elaboration phase – iteration 1**
- **Caution:Early estimates may turn out to be completely wrong if elaboration fails to stabilize architecture**



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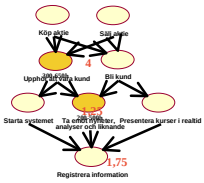
A sketch of a practical method for *Inception*

- **Order use cases with *paired comparison* according to effort**
- ***Detail a few use cases*, and analyze them in detail – estimate with Lichtenberg**
- **Use paired comparison to *estimate rest* of use cases**
- **Estimate *impact of mechanisms, risks and missing use cases* with Lichtenberg**
- **Make an iterative plan for use case and mechanism realizing**
- **Make schedule based on plan**
- **No commitment yet!**



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Missing use cases: + 10%
Non-functional requirements: 690h
Mechanisms: 1550h
Technical risk impact: 1300h
Non-technical risk impact: 1200h

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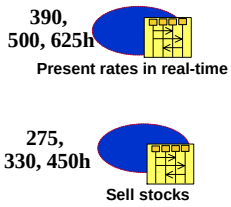
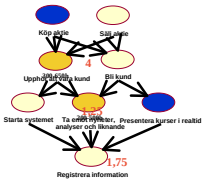
A sketch of a practical method for *Elaboration*

- **Learn from Inception time spent vs plan**
- **Improve estimates when there are use case realizations available**
- **Adjust to current knowledge of risks**
- **Study trends in growth in number of use cases**
- **Let the developers do the estimates!**
- **Manage the trend estimates**





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Non-functional requirements: 470h
Mechanisms: 250h
Technical risk impact: 3500h
Non-technical risk impact: 1000h

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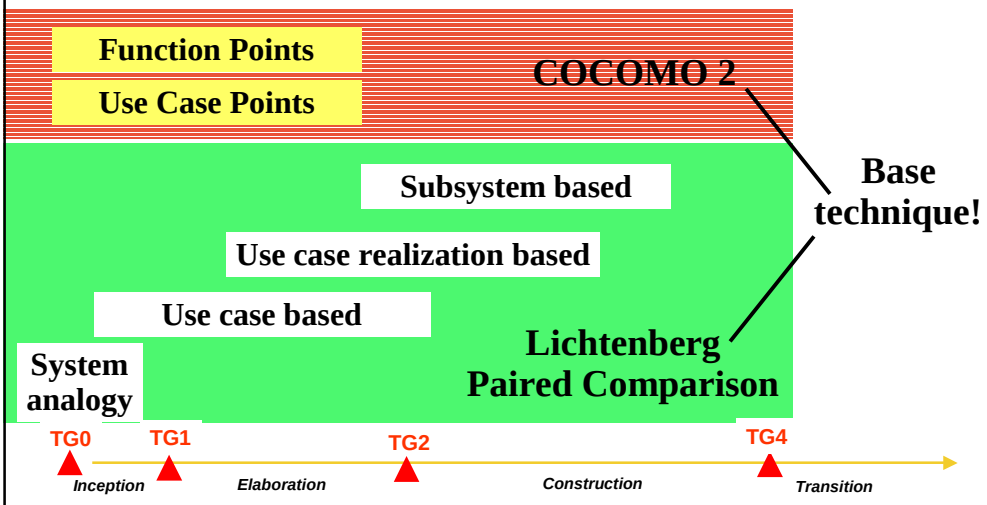
When to use different techniques?



TG = Tollgate i PROPS

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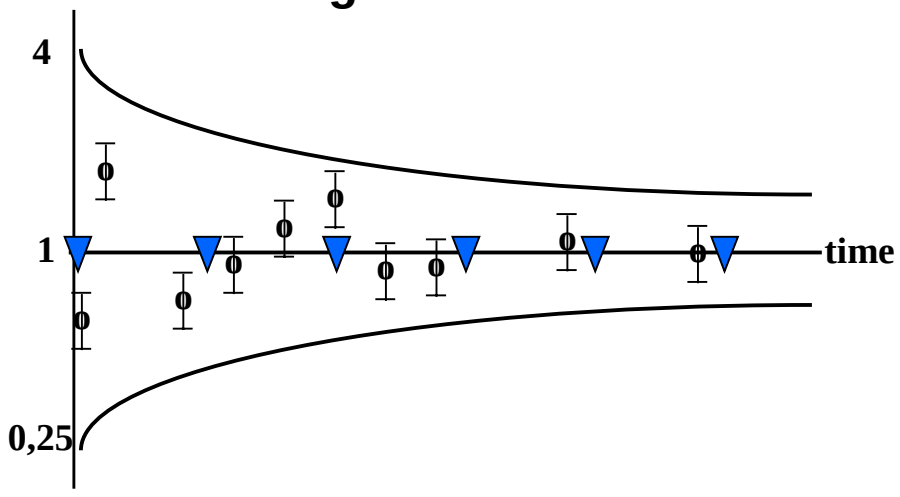
Manage the trends!



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Next steps

- **Start using one technique**
- **Use it from day one in your project**
- **Let the project members do the estimation**
- **Collect experiences and improve**
- **Call us if you need more**

- **Thanks for your time!**

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