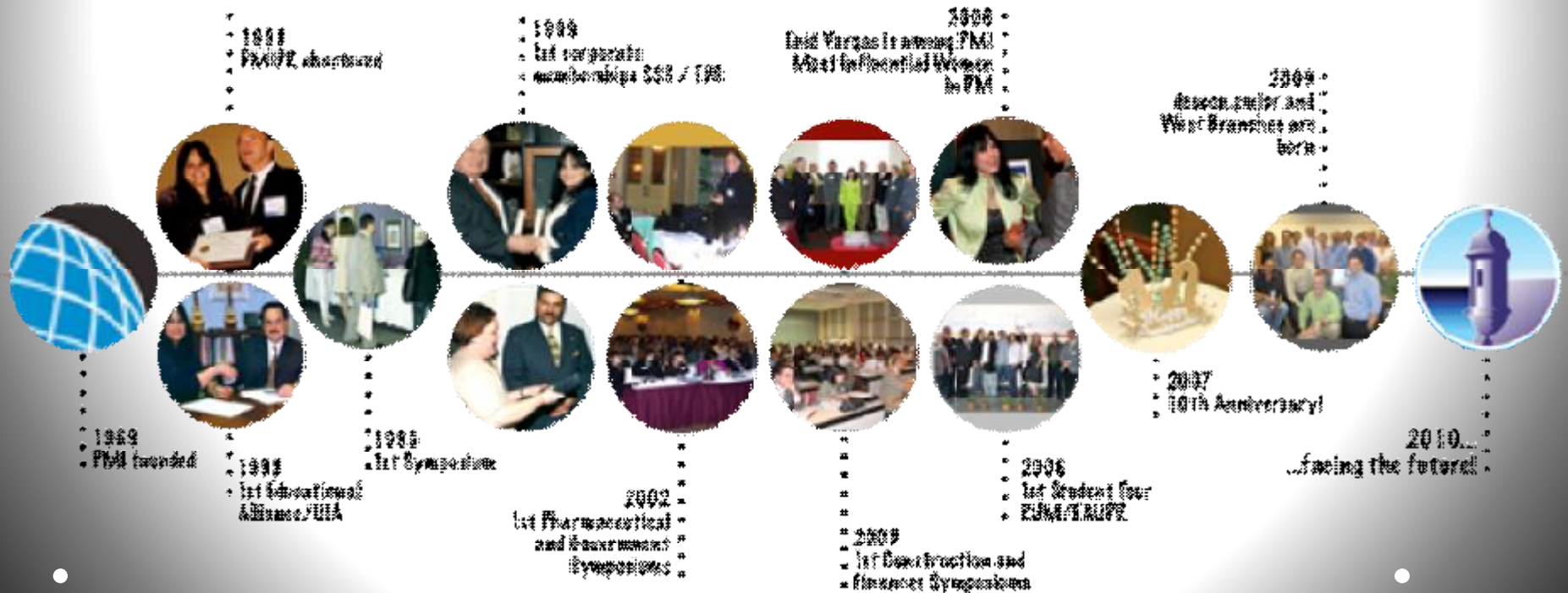




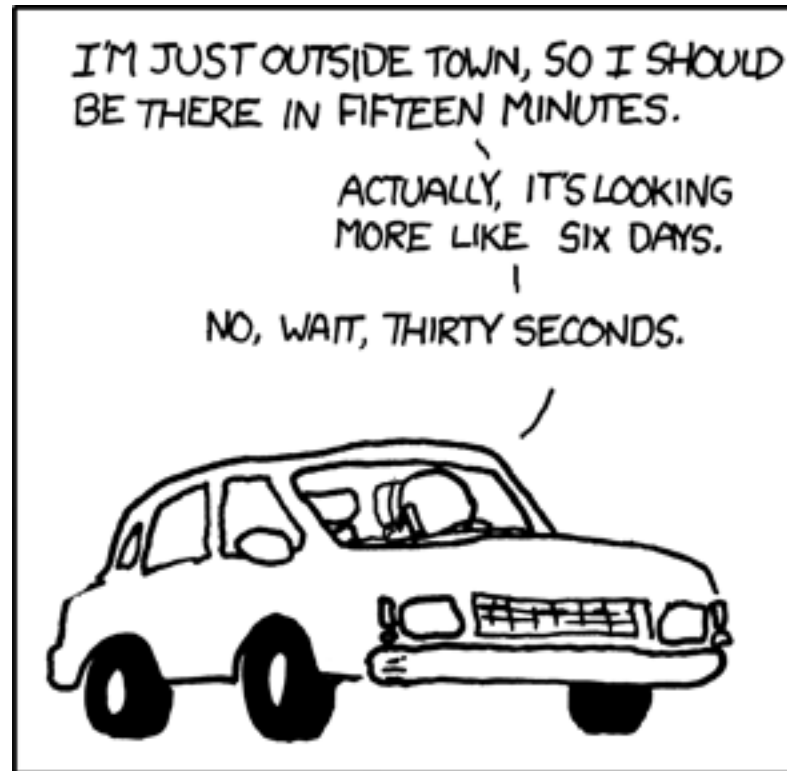
2010 Symposium  
 The Evolution of a Profession  
 Project Management: Past, Present and Future

# Setting up your Organization for (Expert) Estimation Success

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# The Challenge?



THE AUTHOR OF THE WINDOWS FILE COPY DIALOG VISITS SOME FRIENDS.

# Presentation Overview

- Estimation within the Project Management Framework
  - Why do we estimate?
  - Which project management processes hinge on estimates?
  - What is expected of estimates?
- Estimation Techniques
  - What options for estimation are available?
- A closer Look at Expert Estimation
  - Personal factors of expert estimation
  - But it's also the organization
- Takeaways

# Why do we estimate?

- Planning future work

....nobody knows what's in the future

- PMBoK

A project is a temporary endeavor undertaken to create a unique product, service or result."

....since it is unique, there are not always deterministic planning helps available, thus we need to estimate likely outcomes

# Estimation within the Project Management Framework

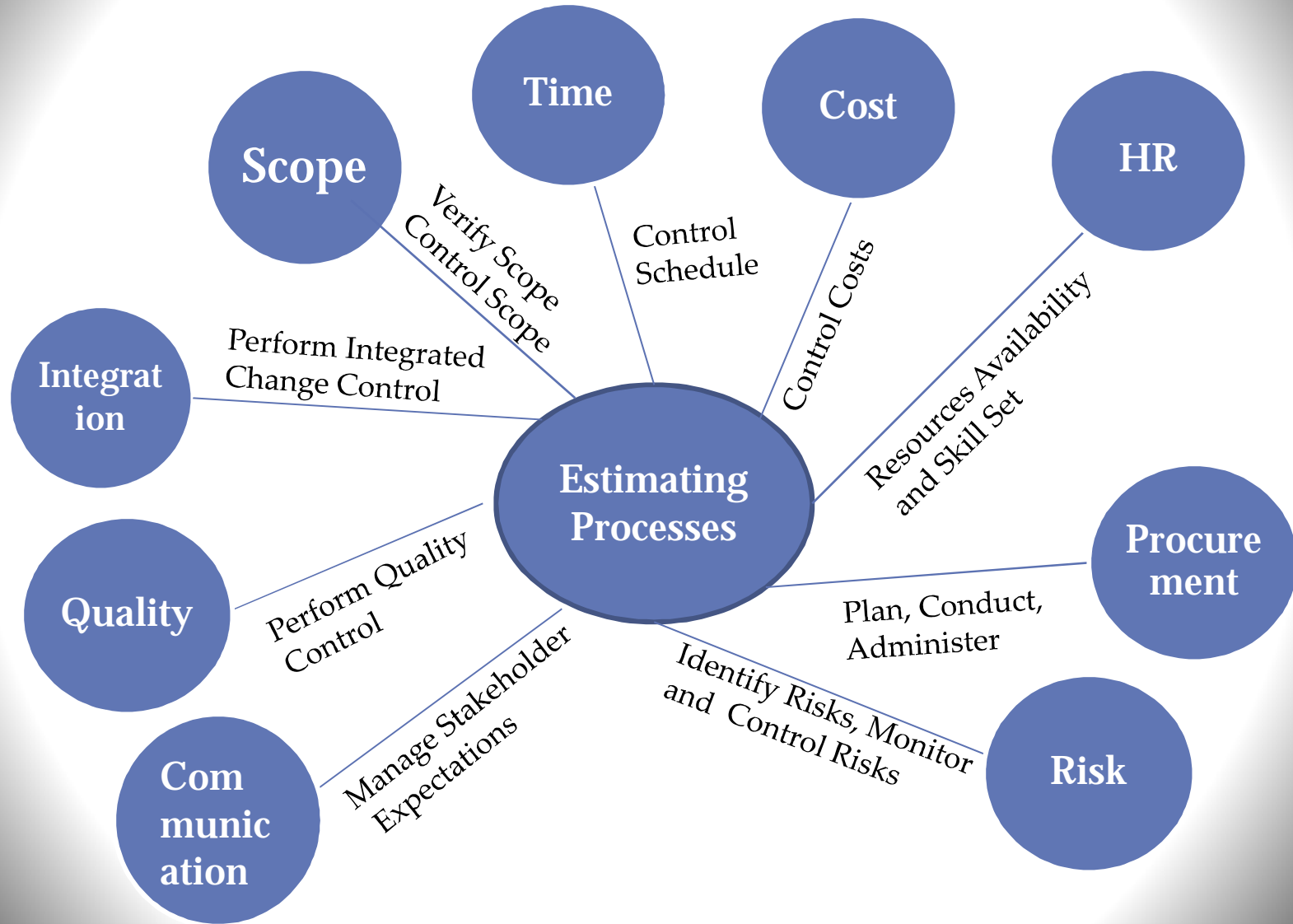
- PMI is currently working on the Practice Standard for Project Estimation
  - (all following comments on that standard refer to the exposure draft; the final published version might still contain changes)
- Practice standards are guides to the use of a tool, technique or process identified in the PMBOK® Guide or other PMI general standards.
- Estimation is an integral part to the project management methodology; key contributor to successful planning

# Practice Standard for Project

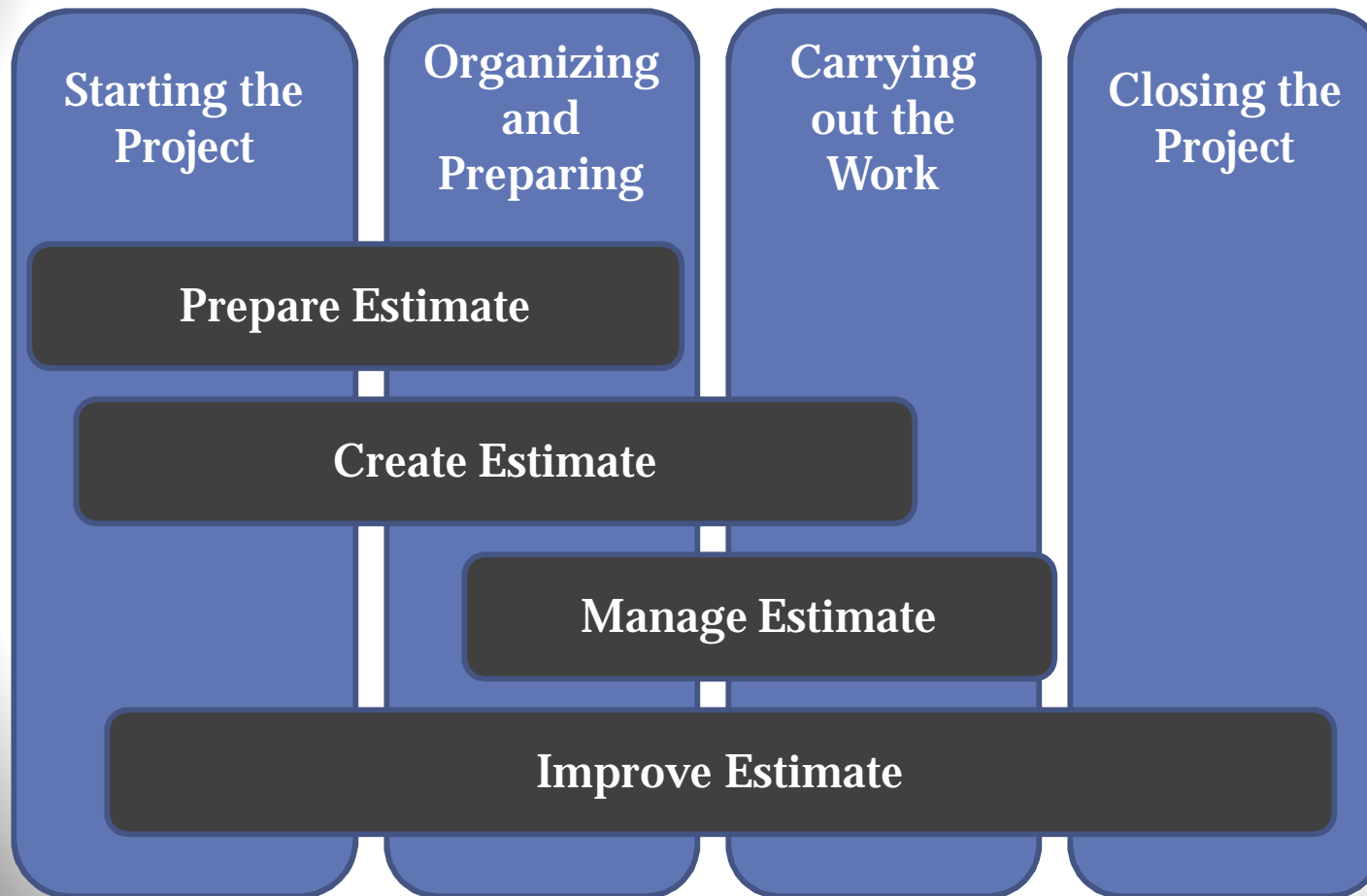
## Estimation: Concepts & Definitions

- *Estimate* –is a quantitative assessment of the likely amount and outcome
- Within the PM methodology estimates of *effort, resources, costs and duration* are *inputs to planning processes and basis of control processes*.
- Estimates are *progressively elaborated* throughout the project
- *We need to be aware of purpose and scope of an estimate.*
- *Estimates must not be confused with other related activities*
  - *Determine Contingency Reserve (based on expected risk)*
  - *Organizational Budgeting and Allocation*
  - *Contractor Bid and Analysis*

# Estimation and PMBoK Processes



# Estimating Life Cycle



# Common Causes for Deviation from Baseline

- Evolution of Requirements: as more becomes known about the requirements, some assumptions might have to be adjusted
- Changes in Requirements
- Operational Problems: resources are not available or diverted, the assumed level of efficiency cannot be achieved
- Faulty Estimates are caused by:
  - Use incomplete information, miscommunication of requirements/assumptions
  - Omitted tasks
  - Overconfidence
  - Too Little time and thought spent on estimates
  - Use of inappropriate techniques/miscalibrated models
  - Lack of estimation knowledge

# Characteristics of a Good Estimate and Estimation Process

- Clear Identification of Tasks
- Broad Participation of in Preparing Estimates
- Availability of Valid Data
- Standardized Structure for the Estimate
- Provision for Program Uncertainties
- Recognition of Inflation
- Recognition of excluded costs
- Independent Review of Estimates
- Revision of Estimates for Significant Project Changes

# Estimation Techniques

- Estimation Approaches
  - Top Down
  - Bottom Up
- Technique Categories
  - Analogous Techniques
  - Parametrical Techniques
  - Expert Estimation

# Expert Estimation, Defined

- *Expert estimation- is an estimation strategy driven by knowledge and experience of a person.*
- Expert Estimation encompasses estimation strategies on the spectrum of
  - pure intuition,
  - recall of past experience from memory,
  - expert judgment with reference to historical data and/or industry benchmarks,
  - and expert judgment with the support of templates, checklists and estimation guidelines.

○ Pure Intuition,  
Recall



Structured, supported  
estimation

# Why Expert Estimation?

## Advantages

Easy to use,  
easily  
accessible

Relatively  
Cheap

But  
remember...

Estimation is a  
skill that has to  
be learned and  
developed

Also depends  
on  
organizational  
factors

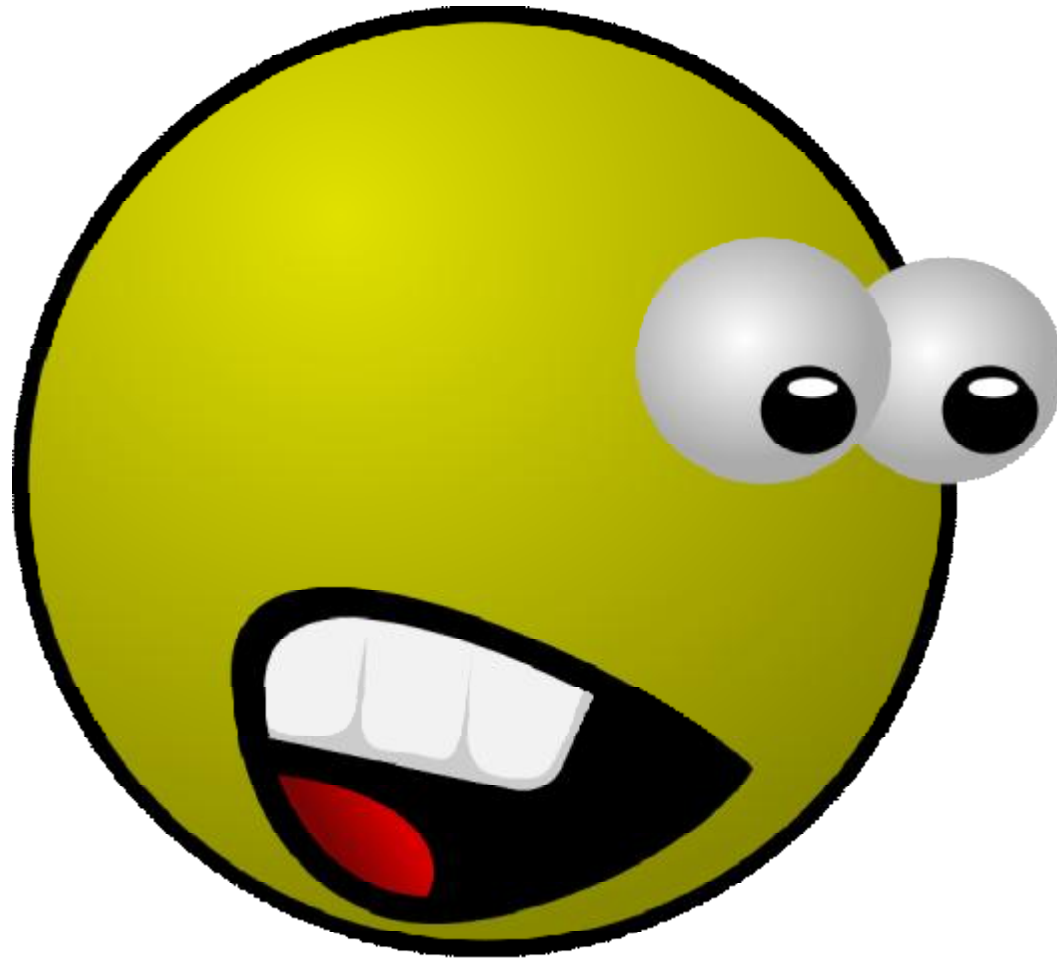
# Is Expert Estimation a Relevant Subject for you?

- Availability and reliability of (parametric) estimation models differ between industries and types of projects.
  - Example:
    - In the case of software development projects, expert estimation is the most frequently used estimation technique.
    - Research is inconclusive about whether expert estimation techniques perform better or worse in comparison to estimation models.
    - Expert estimation appears to be more accurate when models are not calibrated with domain knowledge, historic information or environmental changes.
- Calibration of models often contains expert assessments.

# Aspects of Expert Estimation

- Expert Estimation is skill that needs to be learned and developed
  - Simply having more work experience does not improve estimation performance; it isn't until estimation is developed as a skill that performance improves
- Expert Estimation is an activity carried out by humans:
  - It is inherently inconsistent between different estimators
  - Even the same estimator might give different estimates on the same item at different times
  - It is vulnerable to biases, wishful thinking and other psychological factors

Does any of this  
ever happen to you?



# We need this yesterday ...but no pressure

- The effects of not spending sufficient time on effort estimates:
  - Estimators will not duly reflect on their estimates
  - Estimators are less likely to take a structured approach to estimation
  - Estimators are more likely to use pure intuition
  - It is less likely that more than one estimate is produced instead of combining estimates from various sources and reconciling their differences
  - Estimations made too early in the project life cycle are mostly based on incomplete information, thus inherently not as reliable

# We need this yesterday ...but no pressure

- The effects of not spending sufficient time on effort estimates...what you can do about it:
  - Accept that estimation is a process that takes time and has a cost
  - Invest more time and effort in up front business analysis and discovery of requirements, assumptions and constraints
  - Try to estimate as late as possible
  - Support the estimation process by providing a structured approach to estimation
  - Have historic information for comparison well categorized, thus quickly searchable and available

# We need to win this bid ...but no pressure

- The effect of conflicting estimation goals on the estimation process:
  - Estimates for a *Bid*, *Planned Effort* and *Most Likely Effort* have conflicting goals and should not be covered by one estimate
  - Overoptimism is a common problem when people estimate their own performance (wishful thinking vs realism)
  - An estimator that has a vested interest in a project being approved will be biased towards a low estimate

# We need to win this bid ...but no pressure

- The effect of conflicting estimation goals on the estimation process...what you can do about it:
  - *Assess most likely effort, planned effort and the bid estimate in separate processes.*
  - Avoid estimators with a vested interest in projects where possible.
  - Where possible, have several experts (a peer group) estimate a task and have them explain and justify their estimate and reconcile differences in a consensus technique.

# The client will never accept this ...but no pressure

- The effect of irrelevant information on the estimation process:
  - Studies show that estimators cannot effectively filter out irrelevant information, even if they know it is irrelevant.
  - Example: The knowledge of the client's expectation of price/duration skews estimators' assessments towards these numbers.



# The client will never accept this ...but no pressure

- The effect of irrelevant information on the estimation process...what you can do about it:
  - Completely avoid estimators' exposure to irrelevant information



# This is part of your evaluation ...but no pressure

- The effect of evaluation pressure on the estimation process:
  - Studies show that high motivation for estimation accuracy might actually decrease the accuracy of the estimate.
  - Evaluation Apprehension causes people to rely more on instinct than on reflection.
  - Evaluation pressure encourages improper reporting of actual effort invested.
    - Underestimated tasks might be concealed (e.g. report effort in other tasks that still had wiggle room, or registered to another project altogether, simply not bill overtime, sacrifice scope or quality etc.).
      - Distorts historic information that is then used for future reference or to calibrate models
      - Prevents billing of hours worked in time and material contracts

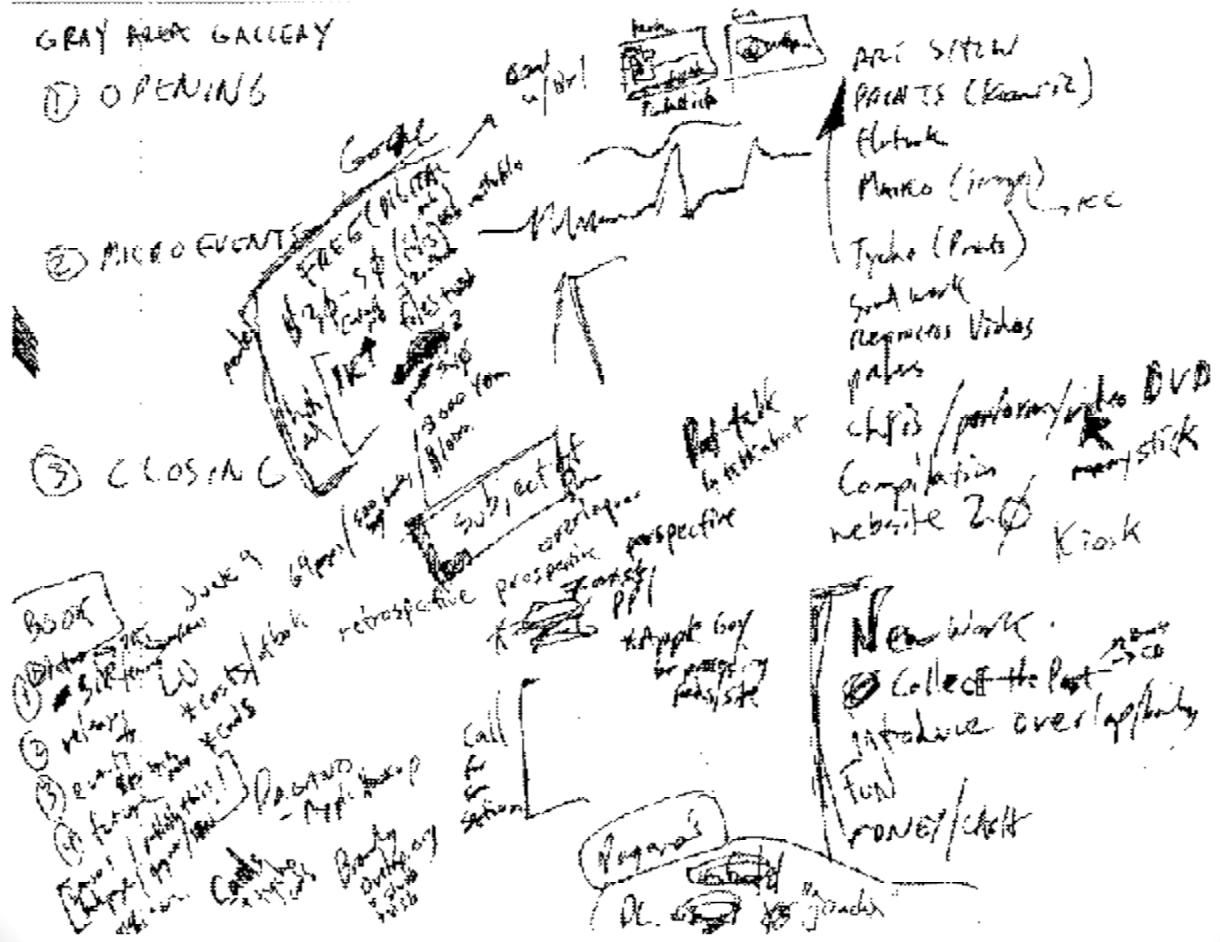
# This is part of your evaluation ...but no pressure

- The effect of evaluation pressure on the estimation process...continued
  - Evaluation pressure encourages padding in order to be able to later meet evaluation criteria.
  - Detection of overestimated tasks is not always easy because:
    - Overestimated tasks would be used to pick up the slack for underestimated tasks
    - Parkinson's law might drive gold plating or inefficiencies in implementation
      - The historic records produced contain padding, but the padding is not identified as such
      - Causes the efficiency of work to decrease

# This is part of your evaluation ...but no pressure

- The effect of evaluation pressure on the estimation process...what you can do about it
  - While strong evaluation pressure can bring about the dynamics explained in the previous slides, some sense of responsibility for the estimates will encourage efficient work on the tasks in order to meet the estimates, especially in tasks that allow for flexibility in their execution.
  - Do:
    - Create some sense of ownership for the estimates in estimators
    - Give estimators feedback on estimate and actual effort during and after the project
  - Don't
    - Create so much evaluation pressure to create evaluation apprehension or encourage avoidance tactics
      - e.g. do not tie estimation performance to bonuses or promotion

# Takeaways



# Expert Estimation Depends on Organizational and Process Features

- Expert estimation does not only depend on the estimator, but is a function of personal skills and the organizational support structure
- Therefore, in order to improve estimation, measures must work at personal and organizational level

# Support the Estimator

- Provide feedback during and after project execution
- Provide access to historic data
- Have historic data easily searchable and accessible
- Provide estimation checklists
- Estimate as late as possible
- Base estimates on as comprehensive of business analysis possible
- Allow the proper time and effort to be invested in producing the estimate

# Avoid Biases

- Where possible combine several estimates and estimation techniques
  - Use expert consensus techniques
  - Combine expert estimates with parametric models
  - Estimate top down and bottom up
- Avoid conflicting estimation goals
- Avoid irrelevant information
- Ask experts to explain and criticize their estimates

# Know your Estimators

- Know estimators with a good estimation track record within your company
- Make sure estimators have relevant experience for the task to be estimated

# Train your Estimators

- More years of work experience do not necessarily translate to better estimation performance:
  - Give feedback to estimators
  - Invest in training on estimation techniques

# Work with your expectations

- Not all estimates can be expected to have the same level of accuracy.
  - For instance, an estimate will have less accuracy if
    - Little was known about the requirements
    - It is a complex project
    - The project involves a new technology, materials, etc.
    - The estimator lacks experience with this type of project
    - Etc
- Thus, an estimate must be accompanied by an assessment of its reasonable accuracy.

# Realize an estimate is a probability

- An effort estimate of X hours, actually means:
  - When somebody says:  
“I estimate, this activity will required 25 hours of effort”

What they really mean is something like:

“There is a probability of 75% for the effort invested in this task to fall into the interval of 15 to 35 hours”

An estimate needs to be interpreted as a probability interval with an alpha and boundary assigned to it.

- Humans are not good at thinking within probabilities and interpret estimates as a straightforward number
- So do many accounting systems

# Leverage Project Portfolio Management

- Project Portfolio Management
  - defines project categories and properties
  - defines measure and collects them
  - is the source of standards within the organization
  - allows for evaluation of metadata about project management processes, among them, estimation performance

# Leverage Project Portfolio Management

- Thus PPM will enable you to:
  - Archive and find relevant reference projects for comparisons
  - Track estimation performance in order to give estimators feedback
  - Create estimation checklists and frameworks
  - Track estimation process performance

# Get serious about learning about estimation

- Sources of information on estimation and expert estimation:
  - PMI Standards and Communities of Practice
    - [www.pmi.org](http://www.pmi.org)
  - BEST Web, collection and categorization of research papers on (software) estimations. Available at:
    - BESTweb - Better Estimation of Software Tasks, <http://www.simula.no/~simula/se/bestweb/>, 2007
  - Research papers on expert estimation and effort estimation of software projects published by Magne Jørgensen can be downloaded at:
    - <http://simula.no/people/magnej/bibliography>



*That's all Folks!*

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