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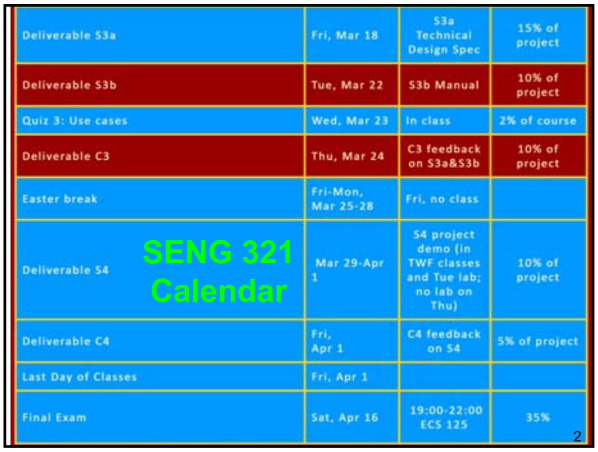
www.engr.uvic.ca/~seng321/
courses1.csc.uvic.ca/courses/201/spring/seng/321



SENG 321
Calendar

Deliverable S3a	Fri, Mar 18	S3a Technical Design Spec	15% of project
Deliverable S3b	Tue, Mar 22	S3b Manual	10% of project
Quiz 3: Use cases	Wed, Mar 23	In class	2% of course
Deliverable C3	Thu, Mar 24	C3 feedback on S3a&S3b	10% of project
Easter break	Fri-Mon, Mar 25-28	Fri, no class	
Deliverable S4	Mar 29-Apr 1	S4 project demo (in TWF classes and Tue lab; no lab on Thu)	10% of project
Deliverable C4	Fri, Apr 1	C4 feedback on S4	5% of project
Last Day of Classes	Fri, Apr 1		
Final Exam	Sat, Apr 16	19:00-22:00 ECS 125	35%

Announcements

- Tue, March 22
  - S3b due
  - User manual due
- Wed, March 23
  - Quiz 3
- Fri, March 25
  - Good Friday
  - No class
- Tue/Wed/Fri, March 29/30, April 1
  - In class and Tue lab demos
  - No labs on Thu
  - 3 presentations per hour
  - 15 mins per presentation

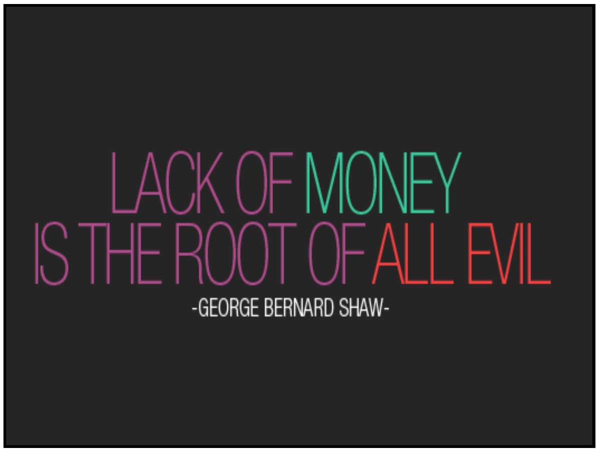
Final Exam
- Sat, April 16
- 19:00-22:00
- ECS 125

Project Cost and Effort Estimation

- Project costs
  - Cost components
  - Techniques
  - Advantages and disadvantages
- Algorithmic cost modeling
- COCOMO model

Project Cost and Effort Estimation

- Software project managers
  - Given specification for software system
  - Responsible for controlling project budgets
  - Must be able to estimate cost of development
- Principal project costs
  - Hardware
  - Travel and training
  - Effort (paying software engineers and others)
- Dominant cost: effort cost
  - Most difficult to estimate and control
  - Has most significant effect on overall costs

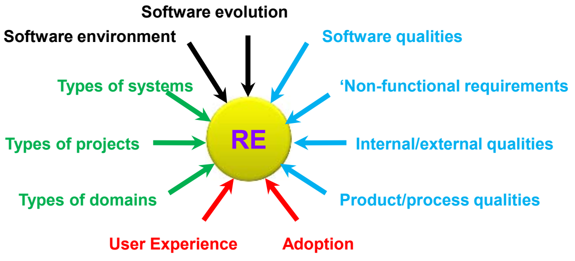


LACK OF MONEY
IS THE ROOT OF ALL EVIL
-GEORGE BERNARD SHAW-

Project Cost and Effort Estimation

- Objective
  - Rational costing
- Software costing should be carried out objectively
- Accurately predict contractor's development cost
- Software cost estimation is continuous:
  - Starts at proposal stage
  - Continues throughout lifetime of project
    - Projects have budgets …
    - … thus cost estimation determines if spending is in line with budget
- Measure-of-effort unit
  - Staff-hour or staff-month

Requirements Engineering Many Forces at Work



Types of Projects

Project types	Customer	Supplier
In-house	User department	IT department
Product development	Marketing/sales department	Software department
COTS-Commercial-of-the-shelf components or products	Company	COTS vendor
Tender	Company	Supplier
Contract development	Company	Software house
Sub-contracting	Supplier	Software house
Other types		

Project Cost and Effort Estimation Techniques

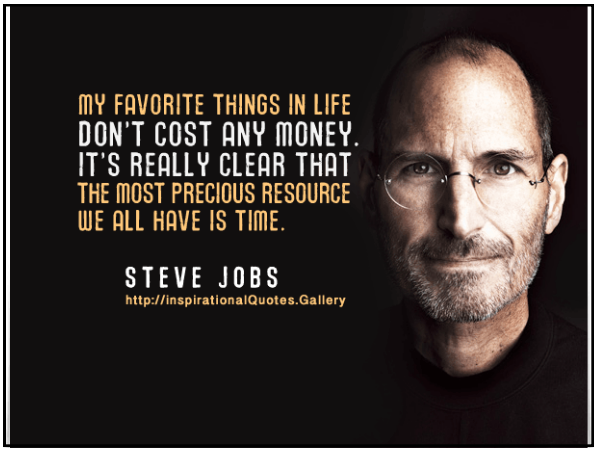
- Seven traditional techniques for software cost estimation
  1. Algorithmic cost modeling
  2. Expert judgment
  3. Estimation by analogy
  4. Parkinson's law
  5. Pricing to win
  6. Top-down estimation
  7. Bottom-up estimation
- Some of these techniques are pathological (i.e., have problems built-in)!
  - ➔ Use more than one method

Project Cost and Effort Estimation Techniques

1. Algorithmic cost modelling
   - Model developed using historical cost information
   - Relates some software metric, usually the size (e.g., KLOC), to project cost
   - Estimate made of that metric ➔ model predicts effort required
   - For example, COnstructive COst MOdel (COCOMO) model
2. Expert judgement
   - One or more experts of proposed development technique are consulted (ideally three experts)
   - Should not only be expert in cost modelling, but also expert in application domain
   - Estimate project cost
   - Final cost is derived by consensus

Project Cost and Effort Estimation Techniques

3. Estimation by analogy
   - Applicable when other projects in same application domain have been completed.
   - Cost estimated by analogy with completed projects.
4. Parkinson's Law
   - Parkinson's Law was first articulated by Cyril Parkinson in a humorous essay in The Economist in 1955:
     "Work expands so as to fill the time available for its completion."
   - Cost determined by available resources rather than by objective assessment
     - If software must be delivered in 12 months …
     - and 5 people are available …
     - The technique estimates an effort of 60 person-months


MY FAVORITE THINGS IN LIFE
DON'T COST ANY MONEY.
IT'S REALLY CLEAR THAT
THE MOST PRECIOUS RESOURCE
WE ALL HAVE IS TIME.
STEVE JOBS
http://inspirationalQuotes.Gallery

Mythical Man-Month (Brooks)

- Assigning more programmers to a project running behind schedule will make it even later, due to the time required for the new programmers to learn about the project, as well as the increased communication overhead.
  - When *N* people have to communicate among themselves (without a hierarchy), as *N* increases, their output *M* decreases and can even become negative (i.e., the total work remaining at the end of a day is greater than the total work that had been remaining at the beginning of that day, such as when many bugs are created).
  - Group Intercommunication Formula: $n(n - 1) / 2$
  - Example: 50 developers give 50 · (50 – 1) / 2 = 1225 channels of communication.

http://en.wikipedia.org/wiki/The_Mythical_Man-Month#The_Mythical_Man-Month

Project Cost and Effort Estimation Techniques

5. Pricing to win
   - Cost estimated ← what customer has available to spend
   - Estimate depends on customer's budget, not on functionality
6. Top-down estimation
   - Estimate established by considering overall functionality
   - Also determine how functionality provided by interacting sub-functions
   - Estimates made on basis of logical function rather than with
   - components implementing function.
7. Bottom-up estimation
   - Cost of each component estimated
   - All costs totalled → final cost estimate

Comparing Techniques

Method	Strengths	Weaknesses
Algorithmic models	•Objective, repeatable, analyzable formula •Efficient, good for sensitivity analysis •Objectively calibrated to experience	•Subjective inputs •Assessment of exceptional circumstances •Calibrated to **past**, not future
Expert judgment	•Assessment of interactions, representativeness, exceptional circumstance	•No better than participants •Biases, **incomplete recall**
Analogy	•Based on representative experience	•How representativeness is the experience?
Parkinson's Law	•Correlates with some experience	•Reinforces poor practice
Price to win	•Often gets the contract	•Generally produces large cost overruns and losses
Top-down	•System level focus •Efficient	•Less detailed based •Less stable
Bottom-up	•More detailed basis •More stable •Fosters individual commitments	•May overlook system level costs •Requires more effort