

Project Planning and Estimation

September 9, 2019

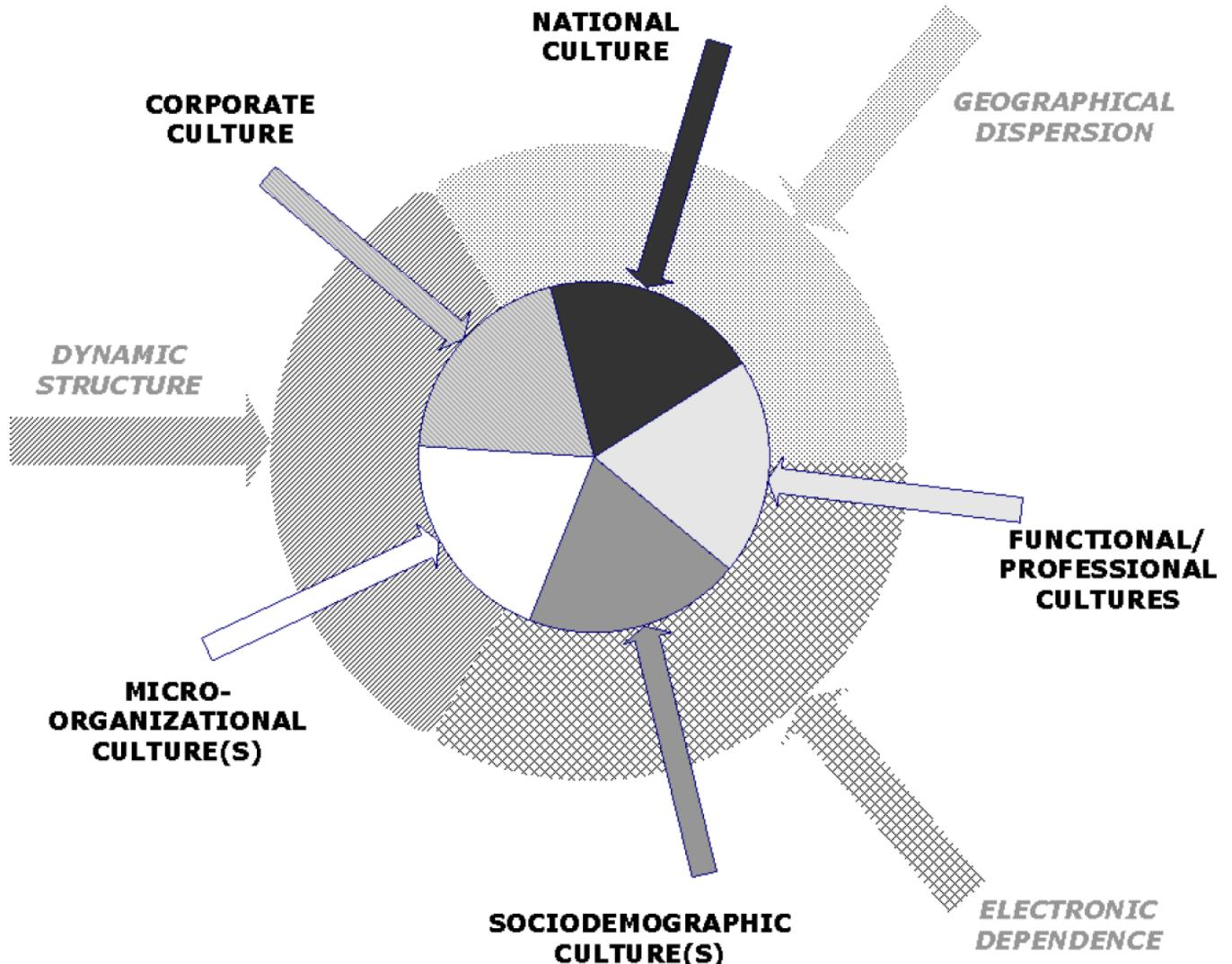
Today's Agenda:

- Review past topics
- Quiz: “Ten Unmyths of Project Estimation”
- Lecture: Project estimation
- Activity: Project estimation
- Introduction: Global Project 1
- Next class

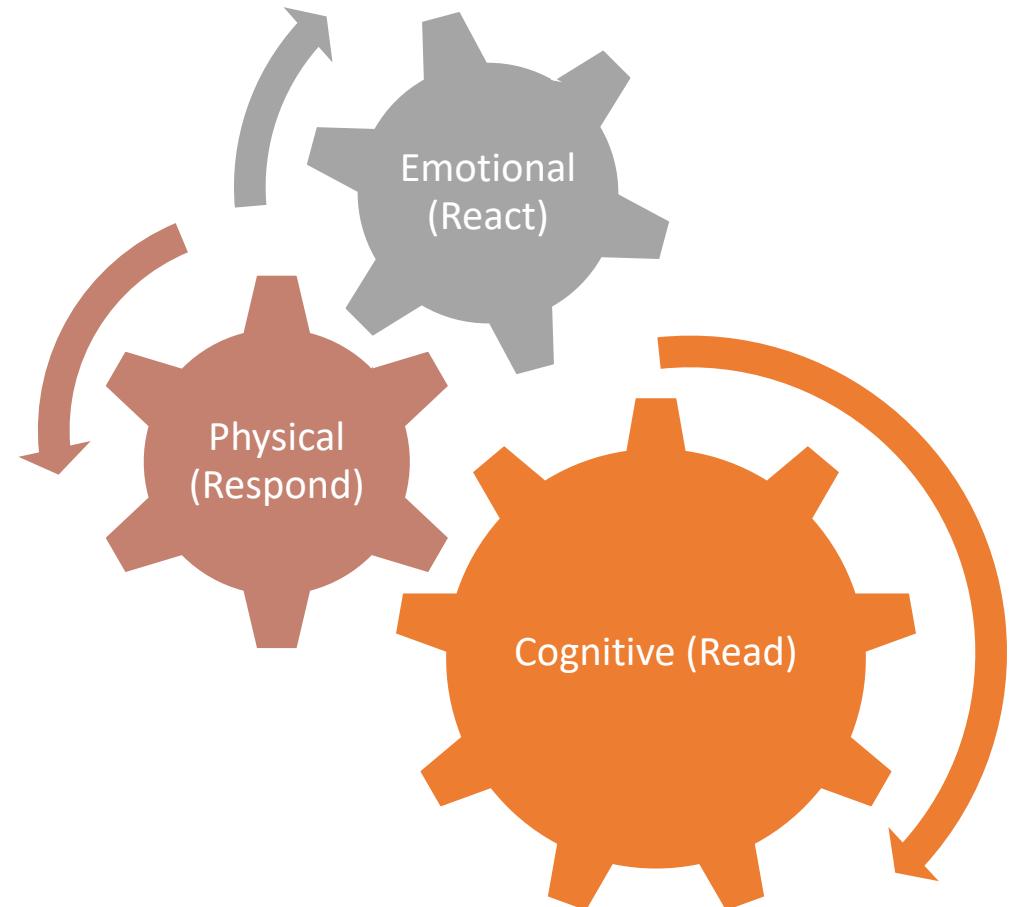
Culture as a Kaleidoscope?

“Culture is not an isolated variable with predictable outcomes or something that can be managed but a root metaphor, something that is continually shaped and reshaped through the symbolic interactions, rituals, and narratives of all organizational members.”

(Gibbs, 2009)



*Cultural intelligence (CQ) –
an outsider's seemingly
natural ability to interpret
someone's unfamiliar and
ambiguous gestures the
way that person's
compatriots would.*



Managing Cross-Cultural Issues (Krishna, Sahay and Walsham)

Strategic choice of projects

- Embedded, middleware, neutral
- Organized as win-win

Manage the relationship

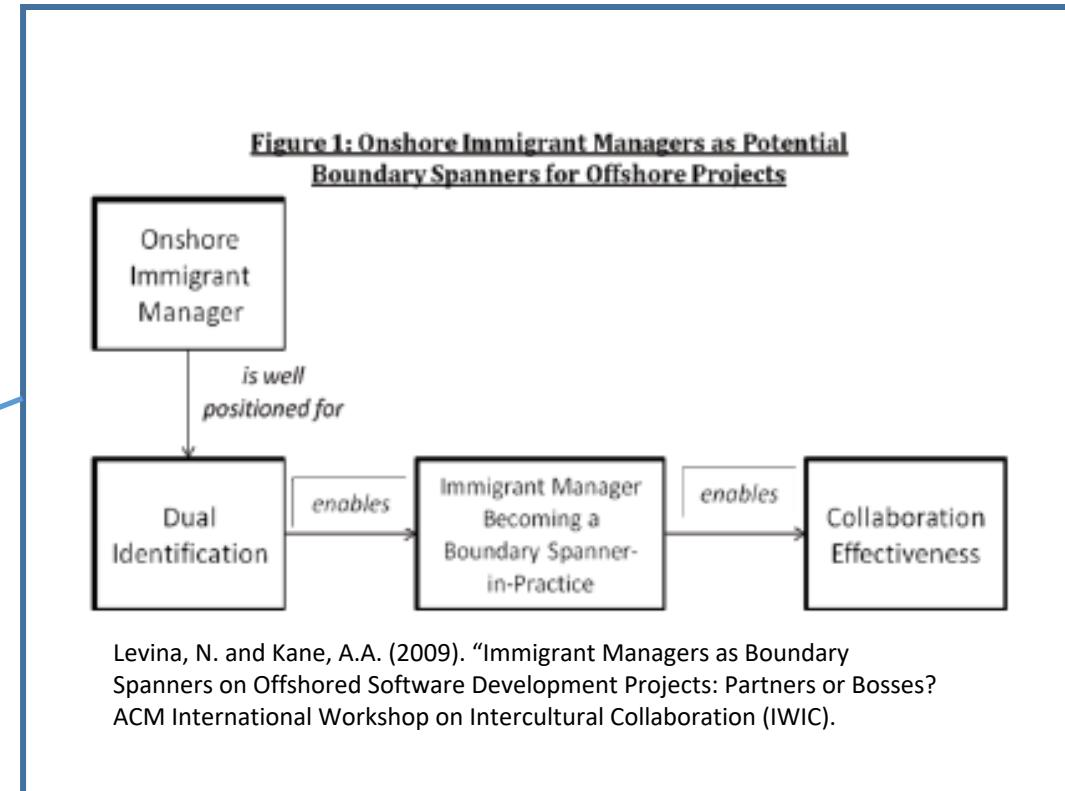
- Use systems to organize
- Understand values and differences in norms
- “Negotiated culture” and “working culture”

Staffing issues

- Cross-cultural matches
- Use “cultural bridging” staff
- Use locally-relevant recruitment and retention strategies

Training

- Cultural training for vendor and client (two-way)
- On the job training



9/9 :: Project Planning and Estimation

Read before class:

[Ten Unmyths of Project Estimation](#)  by Phillip Armour

[Applied Software Project Management: Chapter 3 – Estimation](#)  by Andrew Stellman and Jennifer Greene – optional reading

Materials used during class:

[Quiz 9/9](#)

Quiz 9/9

Access code: estimation

Project Estimation



What is estimation?

When a project manager sets expectations about the time required to complete the project among the stakeholders, the team, and the organization's management.

If those expectations are not realistic from the beginning of the project, the stakeholders may not trust the team or the project manager.

The project manager must set expectations about the time required to complete the project among the stakeholders, the team, and the organization's management.

Are you sure you thought of all the tasks you need for your project?

How do you make sure everybody gets a fair share of the work?

Questions of Estimation...

How do you estimate task durations?

How do you face risks and changes?

How do you assign tasks to people?

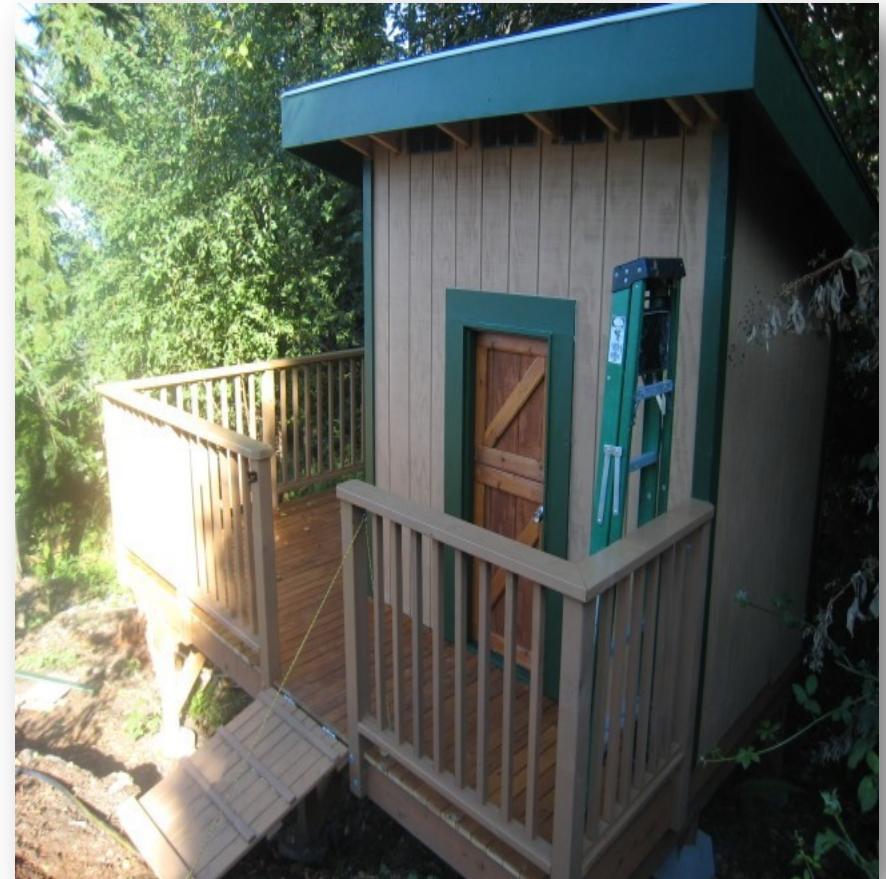
Building a Fort: A Lesson in Estimation

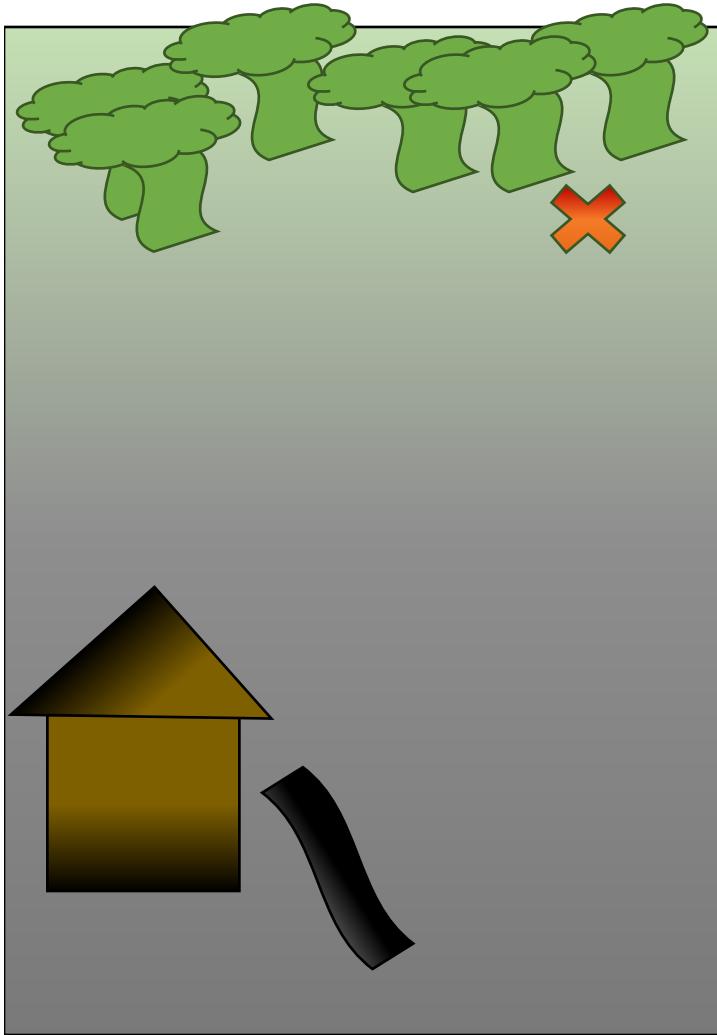
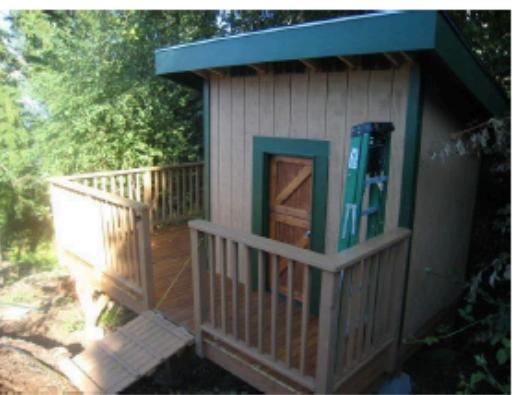
Building a Fort – Steve McConnell

Also Known As - How I Spent My Summer Vacation

My big project this summer was building a fort for my kids. I'd wanted to build a clubhouse or treehouse or fort or something for the past few years, but we didn't have a good place to put it. Then while clearing some blackberries in the spring I discovered that our property extended about 20 feet further into the adjacent overgrown area than I had thought, and that was the perfect place for a fort.

<https://www.se-radio.net/2016/11/se-radio-episode-273-steve-mcconnell-on-software-estimation/>





How do your estimates compare to Steve's?

Steve's Original Work Plan

Day 1: Dig holes for footings, pour concrete for footings, haul building materials from my driveway up the hill to the fort.

Day 2: Cut posts and beams to length. This was planned as a half day because I didn't want to put too much stress on the concrete footings until Day 3.

Day 3: Finish beams and joists and install decking; do some of the deck railings as time permits

Day 4: Complete the fort's framing, minus the roof

Day 5: Frame and install the roof

Day 6: Install door and windows; finish deck railing; install trim boards

Part time the next couple of weeks: Finish loose ends

*So what went wrong –
Why were Steve's estimates so off???*

DAY 1

Task 1.1 Clear brush from site (~1 hour). I'd known that I had a little brush still to clear, but I thought it would take me about 10-15 minutes. Once I started looking at where I needed to put the footings, I found that I really couldn't put them where I'd planned because I would be inside the setback for the property. So I needed to move the fort back about 5 feet, and that meant clearing a bunch of brush including scrubby trees that I hadn't planned to clear.

1.2 Survey the site and determine placement of footings (~3 hours). I'd originally planned to build the deck with 2 beams and 2 posts per beam. After looking at some span tables, I concluded that I could *probably* get away with 2 beams with 2 posts each, but what I was building was right on the border between 2 and 3 beams and between 2 and 3 posts per beam. I decided to err on the side of caution, and that meant I needed 9 footings instead of 4. Meanwhile, I had never really adjusted my time expectations to digging 9 holes instead of 4. Siting the 9 holes also turned out to be an issue because of a big stump in the middle of my area.



The site overall had more of a slope than I had realized. I wanted to stake out the corners and use string to locate the position of each hole and make sure the holes were square. Due to the slope, the stakes I was using weren't tall enough on the downhill side of the site, and I spent time pounding in stakes that ended up not being tall enough, then pulling them out, hammering together makeshift taller stakes, and then pounding those in.

I ended up spending a lot of time moving stakes and string around trying to figure out how to get 9 holes that were (a) not blocked by roots from the stump, (b) not blocked by roots from the tree in back of the fort, (c) far enough back from the property line to meet the setback requirement, (d) square relative to each other (which was hard to determine at this stage because of the slope I was building on).

1.3 Dig post holes (~2 hours). I had to dig 9 holes, 12" in diameter, 24" deep. This actually went quicker than I expected. I used a clamshell digger and for the holes where I didn't run into any roots it was something like 5 minutes per hole. The difficult holes were the holes where I ran into roots partway down and then had to hack them out. Some of the holes had quite a few roots.

1.4 Haul 20 80# bags of concrete up the hill (~1.5 hours). I had originally thought I could haul the concrete up the hill using a wheelbarrow, but the hill was just too steep. So I had to hand carry each 80# bag one at a time. It was also about 80 degrees and 95% relative humidity at this point, which meant I needed to rest and drink water every couple of bags. The change from 4 holes to 9 holes also increased the number of bags I had to haul from about 10 to about 20.



1.5 Pour 2 Footings (1.5 hours). At this point I was pretty worn out, but I also really wanted the feeling of completion from pouring at least one of the footings. So I ended up pouring 2 of the footings and calling it a day since there was no way I was going to complete all 9 of them at that point in the day.

End of Day 1. The picture below shows how far I got at the end of Day 1.



What Went Wrong with My Estimate for Day 1

- I hadn't examined my planned site well enough to know what I didn't know -- i.e., my originally planned site wouldn't work and I didn't understand how much slope there was.
- I never revised the expectations I had created while planning a 4-footing Day 1 to more appropriate expectations for a 9-footing Day 1. That one mistake affected my site layout, concrete hauling, hole digging, and concrete pouring.
- Brush clearing just took longer than I expected, and I hadn't included it in my estimate at all.
- Surveying the site also just took longer than I expected, and would have even without the change from 4 holes to 9.

DAY 2

What I could complete on Day 2 was limited by the fact that hadn't poured all the footings on Day 1, so about all I could do on Day 2 was pour the remaining 7 footings and haul the rest of the building materials up the hill. The rest of the footing pouring went fine and took about 4 hours. Then I needed to haul the materials up from the driveway. The pile of stuff didn't look all that intimidating:



Superficial appearances aside, however, there are 10 16' 2x8 pressure treated joists in that pile, and those suckers are heavy. There are also 3 12' 4x8 pressure treated beams in that pile, and those suckers are *really* heavy! And then there were 70 2x4s and 50 lengths of 5/4" decking, and 100 2x2 balusters for the railing, and about 15 sheets of plywood, and 2 bundles of roofing shingles, and a lot of other stuff, and all this stuff just starts to add up after awhile. It took me at least 50 trips up the hill, and that ended up taking me about 3 hours.

At the end of Day 2 I was about where I thought I'd be at the end of Day 1 after 2 pretty long days. For the record, here's what I had done at the end of Day 2:



What Went Wrong with the rest of My Estimate for Day 1 (i.e., the Work I Did on Day 2)

- Hauling the building materials up the hill took longer than I planned, mostly because I'd never bothered to break down the "hauling" task and realize that it was going to take 50 trips, not 10.

DAYS 3-6

Days 3-6 went about like Days 1 & 2 had gone, which is to say there were lots of little tasks that turned out to be medium-sized tasks, there were little tasks that I just hadn't anticipated, and most things took longer than I had planned. By the end of Day 7 (my buffer day), I was done with the tasks I had planned for Day 3 and had a tiny start on Day 4, which is to say that I'd completed the decking, hadn't started on the railings or framing, and had one wall of the fort framed, but that was all.

DAYS 7 AND FOLLOWING

Since I'd used up my planned full-time days on Day 7, the rest of the fort had to be completed after work, so I had to work on it only a few hours at a time, and I couldn't work on it every day. So my calendar time overrun started stretching out faster than my effort overrun did.

Steve McConnell's Lessons learned in estimation

1. Numerous unplanned problems collectively add up
2. Underestimation of unfamiliar tasks
3. Not decomposing big tasks into smaller subtasks
4. Using overly round time units
5. Substituting a target for an estimate
6. Sweeping numerous little tasks under the estimation rug
7. Never created a *real* estimate

The Fine Art of Estimation, Scheduling and Tracking

Estimating - Methods

Analogous Estimating

Previous
similar
project



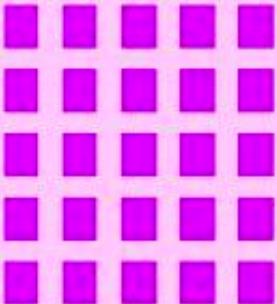
New
project

Bottom-up Estimating



New
project

Parametric Estimating



New
project

Three Point Estimates

Optimistic
Realistic
Pessimistic



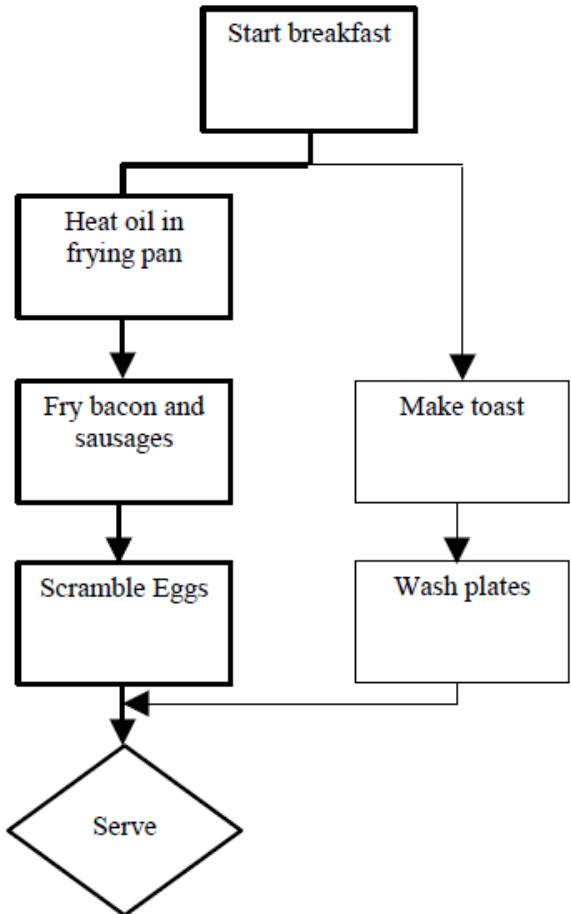
New
project

Principles of Scheduling

(Jenkins)

1. Never give off-the-cuff or unconsidered responses
2. Eliminate uncertainty wherever you can
3. Build in plenty of contingency to cope with variation
4. Pick the right level of granularity
5. Schedule for the unexpected

The Critical Path

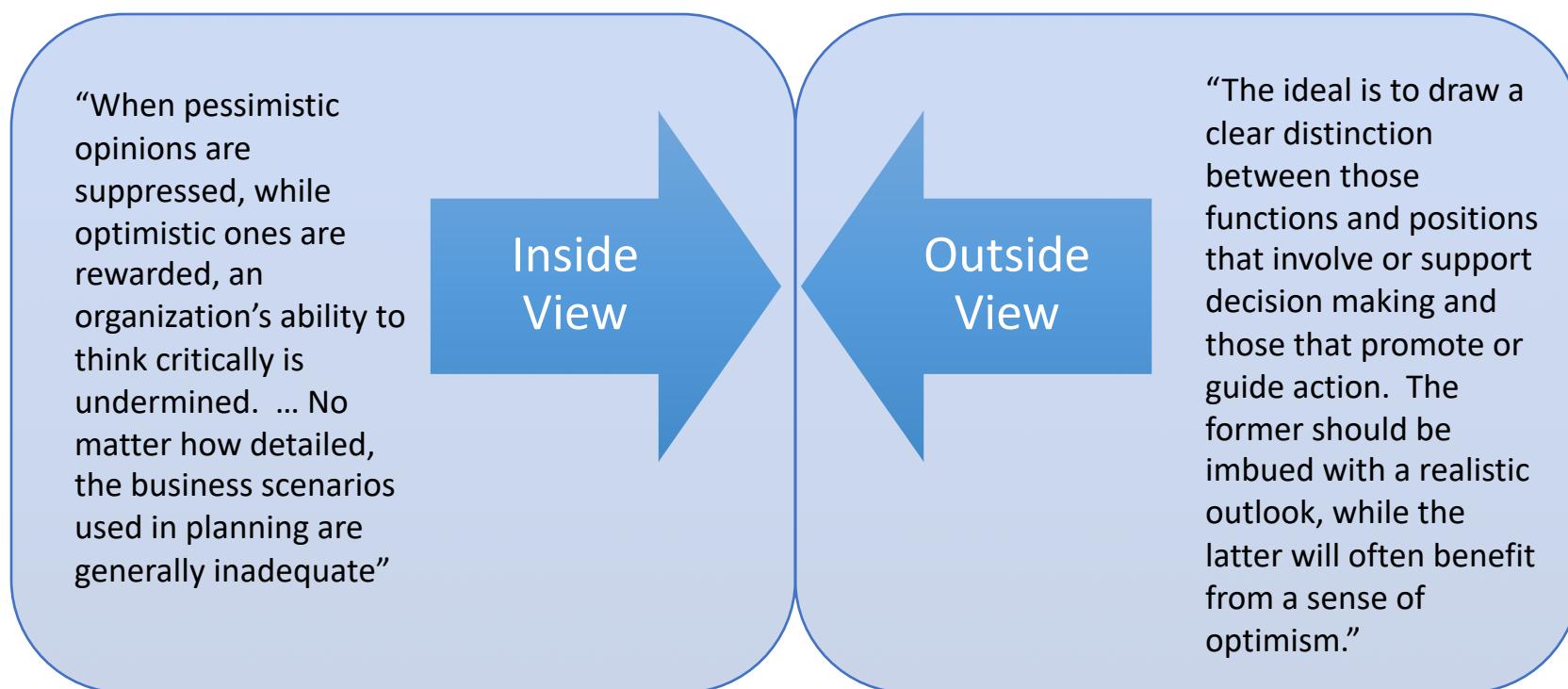


The critical path represents not the *ideal* set of tasks to be complete for your project, but the *minimum* set.

Delusions of Success: How Optimism Undermines Executives' Decisions

(Lovallo and Kahneman)

“We don’t believe that the high number of business failures is best explained as the result of rational choices gone wrong. Rather, we see it as a consequence of flawed decision making.”



Ten Unmyths of Project Estimation (Armour)

1. The Accuracy Unmyth: We can have an “accurate estimate.”
2. The End-Date Unmyth: The job of estimating is to come up with a date for completion.
3. The Commitment Unmyth: The estimate and the commitment are the same.
4. The Size Unmyth: A project estimate is dependent on the size of the final system.
5. The History Unmyth: Historical data is an accurate indicator of productivity.
6. The Productivity Unmyth: Productivity is an accurate indicator of project duration.
7. The LOC Unmyth: A Line of Code (LOC) count is a good way to size a system.
8. The Function Point Unmyth: Function Points are a good way to size a system.
9. The More People Unmyth: We can get the system faster, by assigning more resources.
10. The Defect-Free Unmyth: Given enough time, we can create a defect-free system.

Mythtreating the Unmyths

(Armour)

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 - Use history, productivity, LOC and function points as indicators, rather than explicit predictors
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 - Focus on what people know – not how many you have
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 - Good enough is good enough

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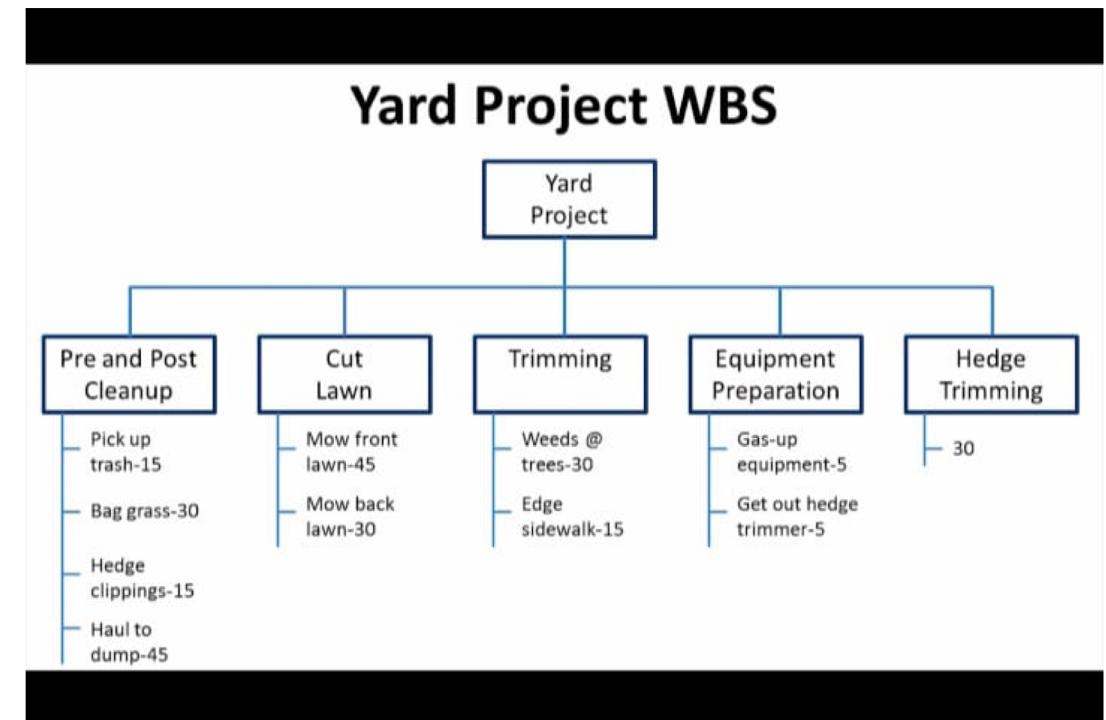
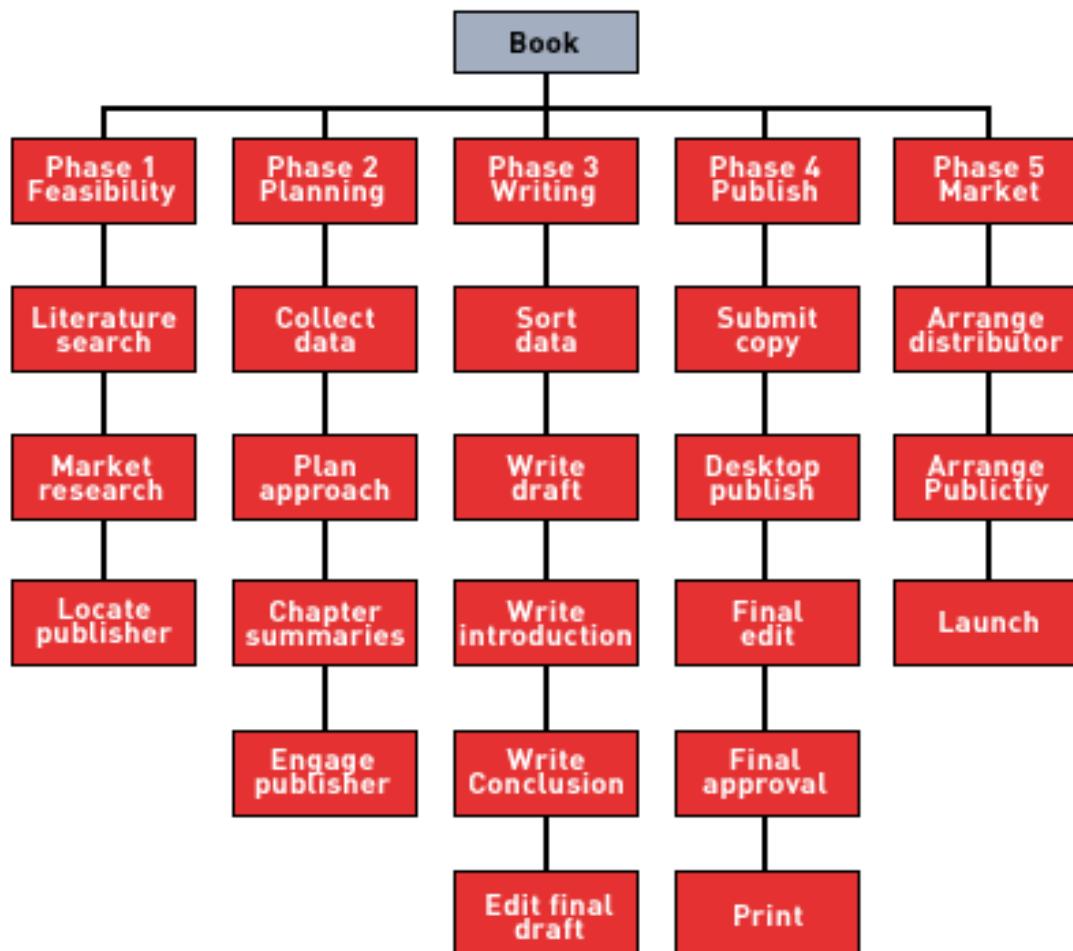
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 - Numerous unplanned problems collectively add up

Wideband Delphi is a process that a team can use to generate an estimate

- The project manager chooses an estimation team, and gains ***consensus*** among that team on the results
- Wideband Delphi is a ***repeatable*** estimation process because it consists of a straightforward set of steps that can be performed the same way each time

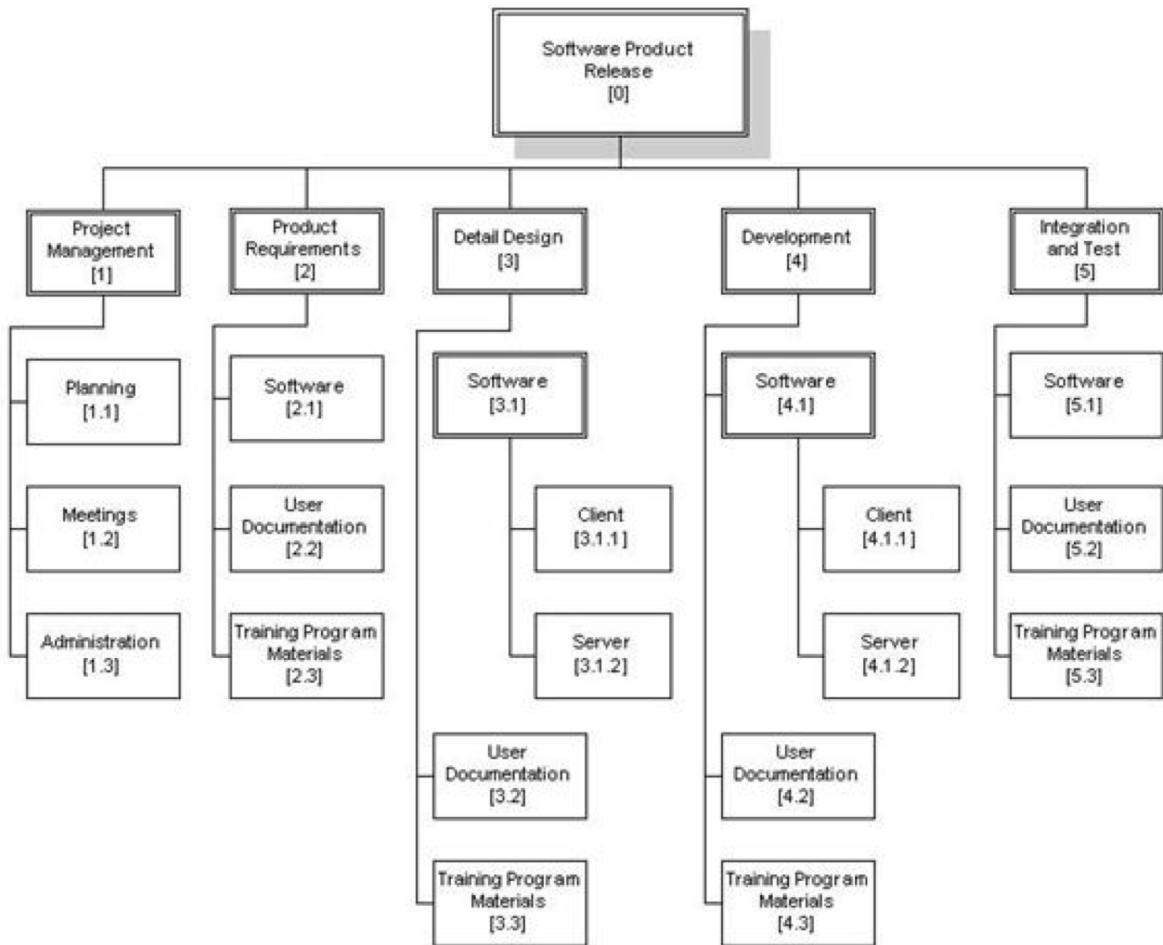
To generate a sound estimate, a project manager must have:

- A work breakdown structure (WBS), or a list of tasks which, if completed, will produce the final product
- An effort estimate for each task
- A list of assumptions which were necessary for making the estimate
- Consensus among the project team that the estimate is accurate

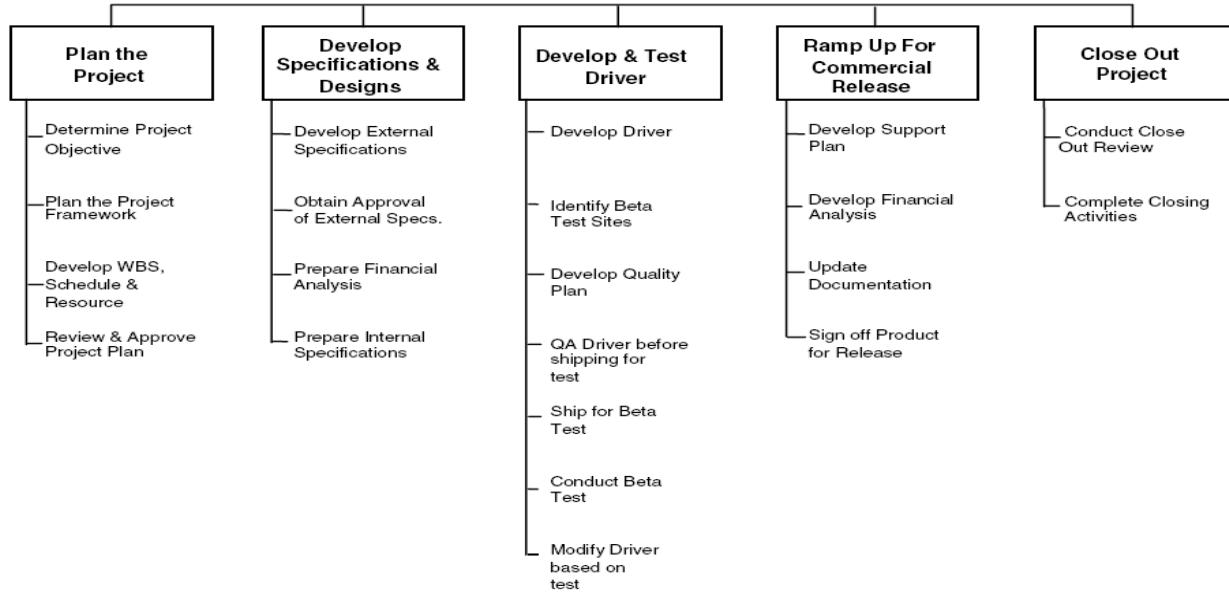


The activity list for the construction of a simple highway project is shown below. Using this information, draw an Activity on Node (AON) project network including all 13 activities. Identify the ES, EF, LS, and LF for each activity as well as the total duration of the project. Identify the activities that are on the critical path and calculate the Total Float, Free Float, and Interfering Float for the non-critical activities.

Activity	Description	Predecessors	Duration
A	Lower 8" Water Main	None	5
B	Demolition and Site Prep	None	4
C	Remove Unsuitable Material	None	18
D	Order and Deliver Pilings	None	15
E	Place Select Backfill	C	6
F	Order and Deliver Sewer Pipe	None	20
G	Drive Pilings	D	10
H	Build Embankment	A, B, E, F	14
I	Lay Sewer Under Embankment	H	6
J	Construct Saddles	G, I	10
K	Place Crushed Rock Base	I	4
L	Place Asphalt Surface	K	8
M	Lay Sewer Not Under Embankment	J	6



Software Driver Project



Wideband Delphi Steps



Step 1: Planning



The project manager selects the estimation team and a moderator. The team should consist of 3 to 7 project team members.

- The moderator should be familiar with the Delphi process, but should not have a stake in the outcome of the session if possible.
- If possible, the project manager should not be the moderator because she should ideally be part of the estimation team.

Step 2: Kickoff Meeting



- The project manager must make sure that each team member understands the Delphi process, has read the vision and scope document and any other documentation, and is familiar with the project background and needs.
- The team brainstorms and writes down **assumptions**.
- The team generates a **WBS** with 10-20 tasks.
- The team agrees on a **unit of estimation**.

Step 3: Individual Preparation



- Each team member independently generates a set of preparation results.
- For each task, the team member writes down an estimate for the effort required to complete the task, and any additional assumptions he needed to make in order to generate the estimate.

Step 3: Individual Preparation

Assumptions

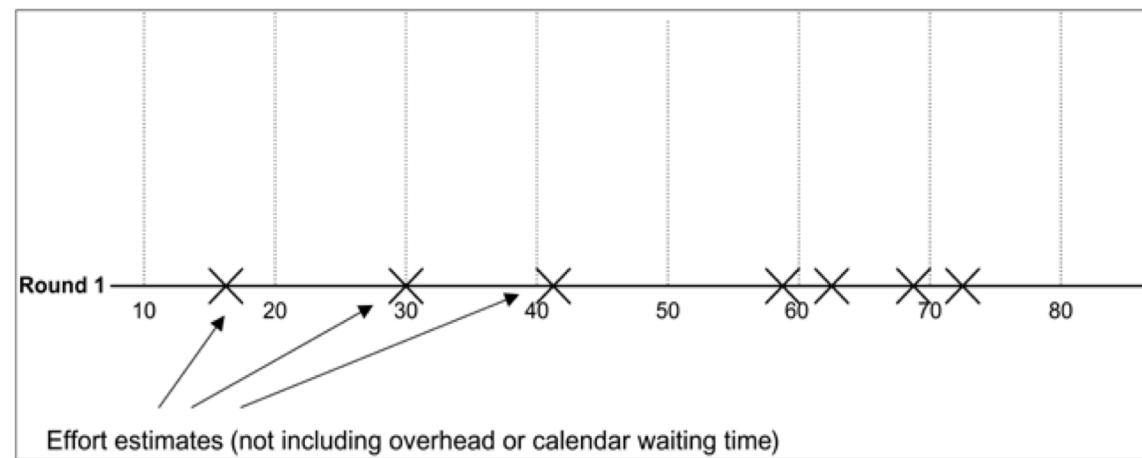
Step 3: Individual Preparation



Step 4: Estimation Meeting



The moderator collects the estimation forms and plots the sum of the effort from each form on a line



Step 4: Estimation Meeting



The team resolves any issues or **disagreements** that are brought up. Individual estimate times are not discussed. These disagreements are usually about the tasks themselves. Disagreements are often resolved by adding assumptions.

The estimation session continues until the estimates converge or the team is unwilling to revise estimates. The estimation session is divided into rounds during which each estimation team member **revises her estimates** based on a group discussion. Individual numbers are not discussed.

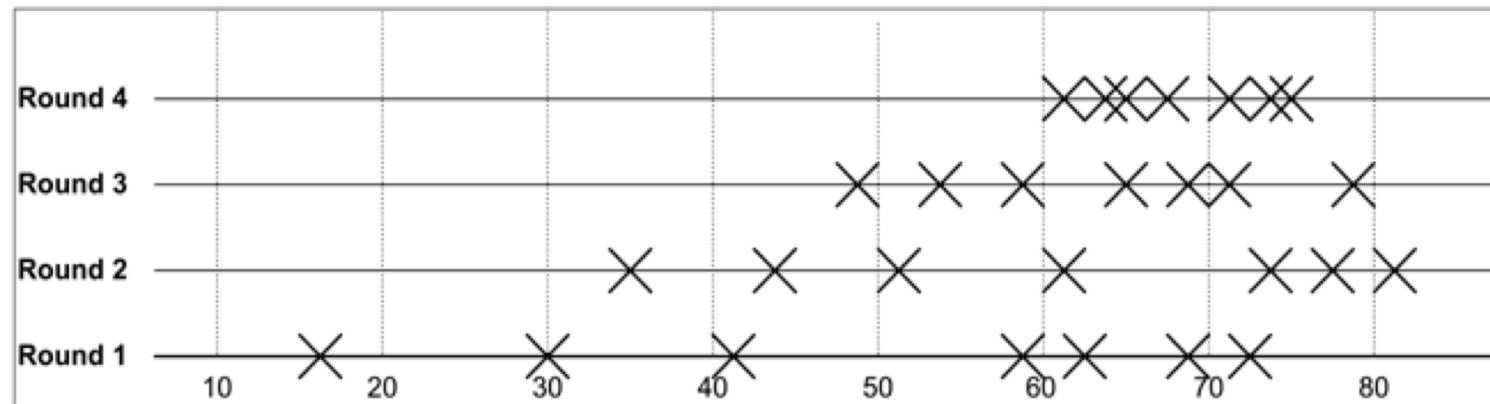
During the estimation session, the goal is for the team comes to a **consensus** on the effort required for each task in the WBS.

Step 4: Estimation Meeting



Name	Mike	Date	4/3/2004	Estimation Form	1 /			
Goal Statement	To estimate the time to develop prototype for customers A & B				Units	days		
Category	<input checked="" type="checkbox"/> goal tasks <input checked="" type="checkbox"/> quality tasks <input type="checkbox"/> waiting time <input type="checkbox"/> project overhead							
WBS# or Priority	Task Name	Est.	Delta 1	Delta 2	Delta 3	Delta 4	Total	Assumptions
1	Interview customers (A+B)	3	+2	+1				Needs offsite trip
2	Develop requirements docs	6	+5	-2	+1			Start from scratch
3	Inspect requirements docs	1	+2	+2	-2			Team of 4 BSAs
4	Do rework	1	+4					
5	Prototype design	20	-3	+4	-2			Includes DB
6	Test design	5	+3					20% exists now
	Delta		+13	+5	-3			
	Total	36	49	54	51			

Step 4: Estimation Meeting



Final Steps



Step 5: Assemble Tasks

- The project manager works with the team to collect the estimates from the team members at the end of the meeting and compiles the final task list, estimates and assumptions.

Step 6: Review Results

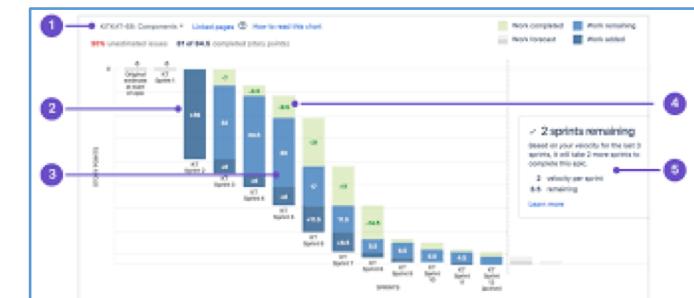
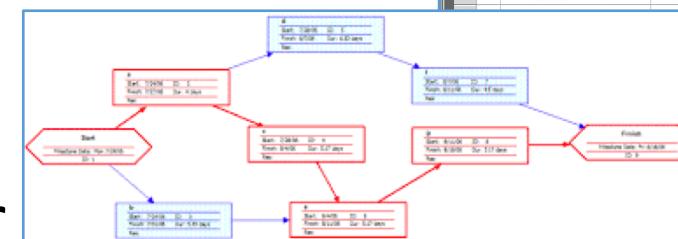
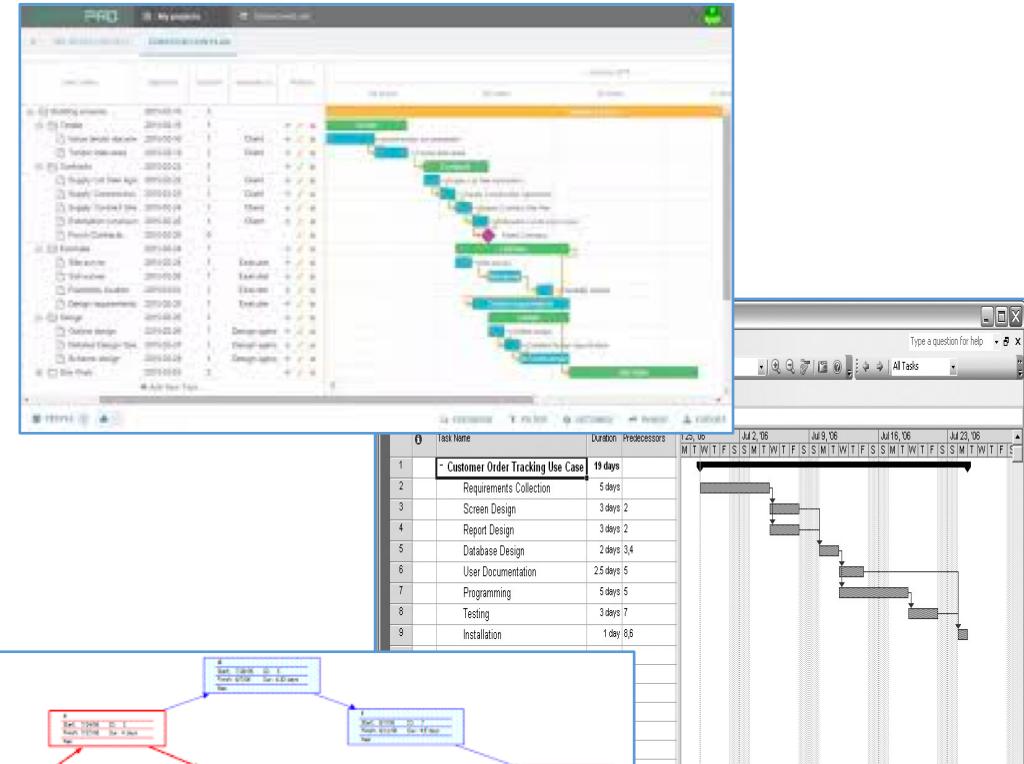
- The project manager reviews the final task list with the estimation team.

What comes next???

Develop the schedule - “When will it be done?”

- Tasks dependencies?
- Tasks start dates and durations?
- Network diagram?
- Gantt Charts?

Develop the GANTT chart or some other scheduling tool for the project



Estimation Activity

Form teams of 3-4 people

Estimation Activity

You and your friends are taking a bicycle tour from Pittsburgh to Washington DC this summer.

Identify all the key factors that will contribute to the success of your trip. What will you need to plan for in advance? What contingencies will you need to think about? What are the risks?

Estimate the following:

- a. Distance to be traveled.
- b. Calendar days for the trip.

Explain your estimates. How did you arrive at these numbers? What are the key unknowns? Once the trip begins, what metrics will you track to follow and manage your progress?

To complete this exercise, your team should implement a Wideband Delphi process.

Let's Practice (5 minutes)

- Step 1: Choose the team roles
 - Moderator + project manager + team members
- Step 2: Kickoff Meeting
 - Discuss vision, scope, plan, etc.
 - Develop the work-breakdown structure. Use:

WBS# or Priority	Task Name	Est.	Delta 1	Delta 2	Delta 3	Total	Assumptions
1							
2							
3							
4							
		Delta					
	Total						

Have you thought about:

- Tasks (obvious and not)?
- Tasks assignments? Who owns it?
- Multiple owners?
- Qualifications?

Let's Practice (3 minutes)

- Step 3: Individual Preparation
 - Estimate effort and write down assumptions made

WBS# or Priority	Task Name	Est.	Delta 1	Delta 2	Delta 3	Total	Assumptions
1							
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		Total					

Name	Mike	
Goal statement	To estimate the time to deve	
Category	<input checked="" type="checkbox"/> goal tasks <input checked="" type="checkbox"/> quality tasks	
WBS# or priority	Task name	Est.
1	Interview customers (A+B)	3
2	Develop requirements docs	6
3	Inspect requirements docs	1
4	D rework	1
5	Prototype design	20
6	T est design	5
	Delta	
	Total	36

Let's Practice (5 minutes)

- Step 4: Estimation Session
 - Step 5: Assemble Tasks
 - Step 6: Review Results

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Global Project 1

▼ Theme 1 - Global Project Management

- 📄 8/26 :: Course Introduction
- 📄 8/28 :: Global Project Management
- 📄 9/4 :: Cultural Aspects of Global Teams
- 📄 9/9 :: Project Planning and Estimation
- 📄 9/11 :: Collaboration and Communication in Global Teams
- 📄 9/16 :: Negotiation Techniques
- 📄 9/18 :: Systems Development Life Cycle (SDLC) Approaches I
- 📄 9/23 :: Systems Development Life Cycle (SDLC) Approaches II
- 📄 9/25 :: Project Risk and Lessons Learned

▼ Global Project 1

- 📎 Global Project 1 Materials



- PDF 1-INSTRUCTIONS-GlobalProject1_2019
- PDF 2-INSTRUCTIONS-Icebreaker_2019
- DOC 3-REFERENCE-CulturalDimensionsGlobalWebDesign.docx
- PDF 4-REFERENCE-Shen_et.al.pdf
- PDF 5-REFERENCE-Sandrini.pdf
- 📁 6-REFERENCE-intechnic templates
- PDF 7-RUBRIC-Icebreaker
- PDF 8-RUBRIC-GP1
- DOC 9-RUBRIC-PeerRating.doc
- PDF TEAMS-GlobalProject1_2019-FINAL.pdf

Deliverables

Icebreaker

- Due Sunday, September 22nd at 6:00 AM GMT
- Brief team activity and submitted written report

Global Web Design Analysis, Prototypes and Report

- Due Wednesday, October 9th at 6:00 AM GMT
- Web design analysis (4 types of evaluation, SWOT analysis with interviews, and recommendations)
- Web design prototype (2 rounds with user reviews)
- Team reflection
- Submitted as a report (including supporting materials)

Peer Rating of Team Members

- Due Thursday, October 19th at 6:00 AM GMT
- One page review of team members (used for grade adjustments)

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Next Class - Wednesday, September 11th

Guest Speaker: Joanna Wolf

Director, Global Communication Center (GCC)

Five strategies to keep your team and project on task:

1. Layer tasks, building the project incrementally
2. Develop and maintain a layered task schedule
3. Document meetings
4. Develop a team charter
5. Have a project manager to keep things on task

Due before class in Canvas - GCC Team Communication Strategies Canvas Module