SWEN90016

Software Processes & Project Management

Project Planning & Scheduling

2021 – Semester 2
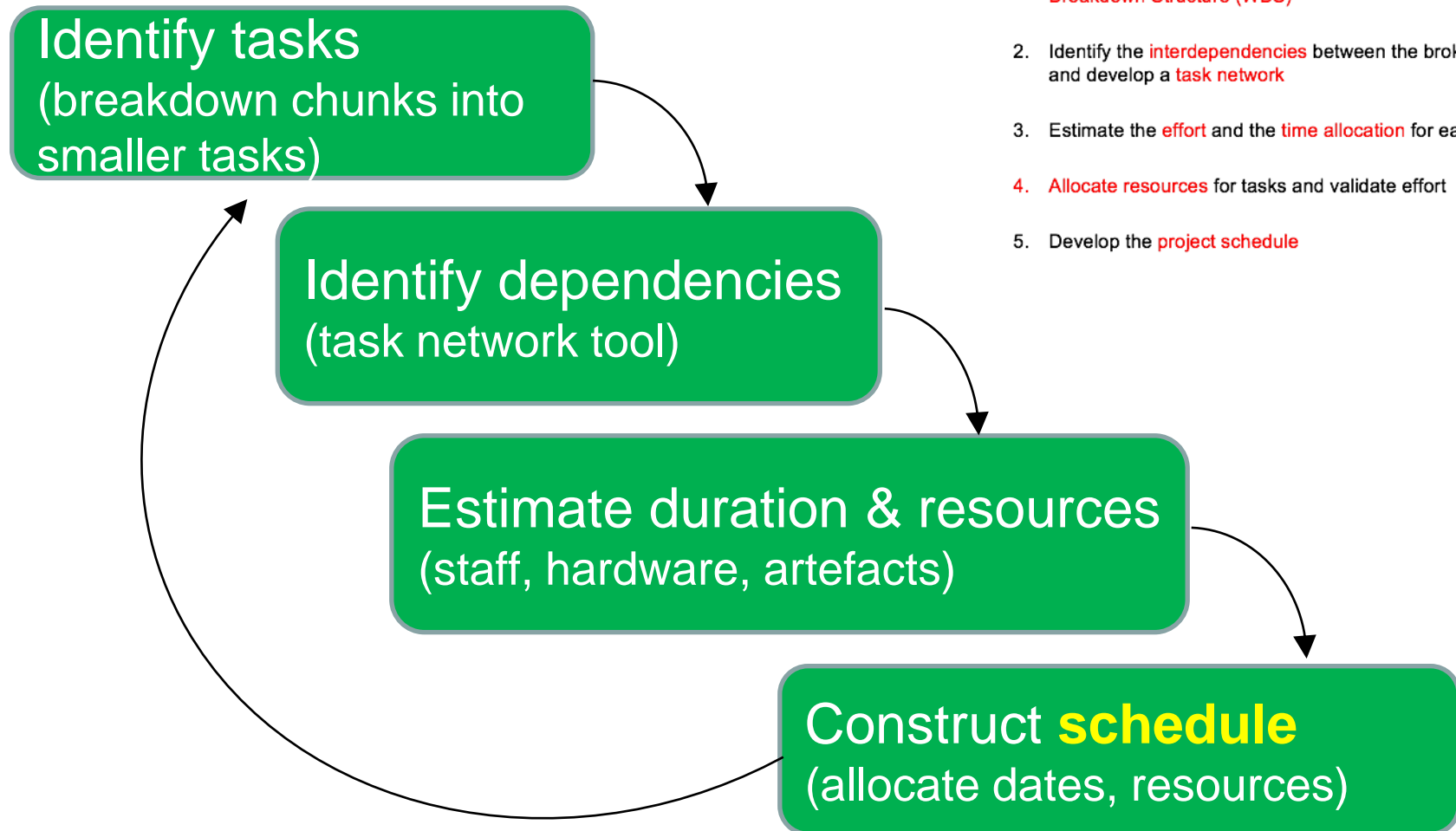
Tutorial 5

Become familiar with

Scheduling – PERT and GANTT charts

Cost Function Point Analysis and COCOMO II

Charter

business value
constraints
challenges

Tutorial 5:
schedule

Communication

Schedule

Project
Planning

Resources

Risks

Budget &
Costs

Tutorial 5:
cost

Quality

Formal Project Schedule

What steps are involved in developing a project schedule?

Identify tasks
(breakdown chunks into smaller tasks)

Identify dependencies
(task network tool)

Estimate duration & resources
(staff, hardware, artefacts)

Construct schedule
(allocate dates, resources)

1. Breakdown the task into small chunks you can deal with – Work Breakdown Structure (WBS)

2. Identify the interdependencies between the broken down tasks and develop a task network

3. Estimate the effort and the time allocation for each task

4. Allocate resources for tasks and validate effort

5. Develop the project schedule

1. Work Breakdown Structure
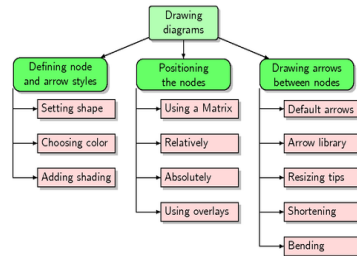
planning tools
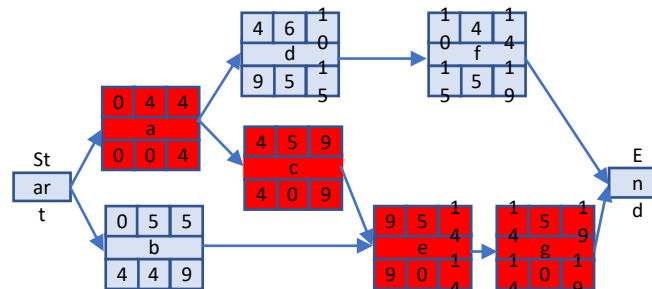
2. PERT Chart

3. Gantt Chart

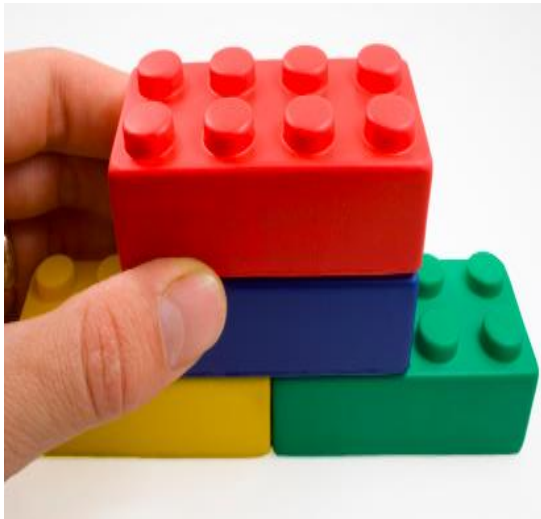| ID	Task Name	Predecessors	Duration
1	Start		0 days
2	a	1	4 days
3	b	1	5.33 days
4	c	2	5.17 days
5	d	2	6.33 days
6	e	3,4	5.17 days
7	f	5	4.5 days
8	g	6	5.17 days
9	Finish	7,8	0 days
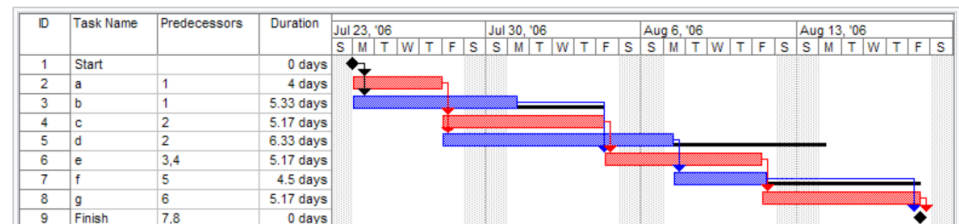
A Gantt chart created using Microsoft Project (MSP). Note (1) the critical path is in red, (2) slack is the black lines connected to non-critical activities, (3) since Saturday and Sunday are not work days and are thus excluded from the schedule, some bars on the Gantt chart are longer if they cut through a weekend.
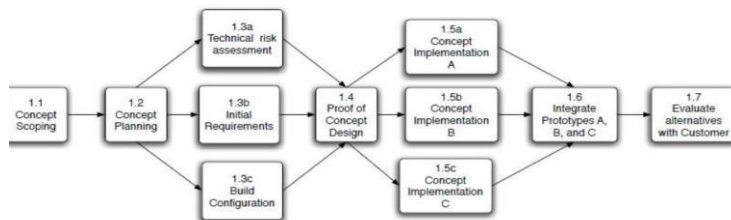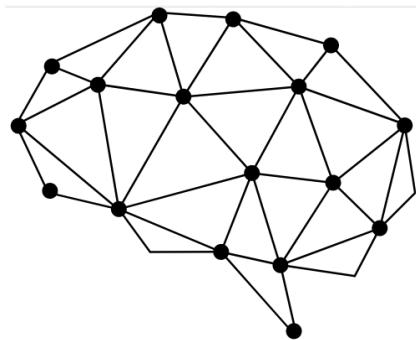
	Activity	Work Breakdown
1.		**Concept Phase**
	1.1	Concept Planning
	1.2	Initial Research
	1.3	Problem definition with client
	1.4	Initial Project Plan
2.		**Requirements**
	2.1	Requirements Iteration 1
		2.1.1 Requirement Elicitation
		2.1.2 Requirements Analysis
		2.1.3 Requirement Model
	2.2	Requirements Iteration 2
		2.2.1 Requirement Elicitation
		2.2.2 Requirements Analysis
		2.2.3 Requirement Model
	2.3	Requirements Specification
	2.4	Requirements Validation
	2.5	Requirements Sign-off
3.		**Project Planning**
	3.1	Technological Risk Assessment

Identify Dependencies

Activity	Work Breakdown	Dependencies predecessor	Duration
1.	**Concept Phase**		
1.1	Concept Planning		1
1.2	Initial Research		4
1.3	Problem definition with client		2
1.4	Initial Project Plan	1.1, 1.2, 1.3	1
2.	**Requirements**		
2.1	Requirements Iteration 1		
	2.1.1 Requirement Elicitation	1.4	2
	2.1.2 Requirements Analysis	2.1.1	3
	2.1.3 Requirement Model	2.1.2	3
2.2	Requirements Iteration 2		
	2.2.1 Requirement Elicitation	2.1.2	3
	2.2.2 Requirements Analysis	2.2.1	3
	2.2.3 Requirement Model	2.2.2	4
2.3	Requirements Specification	2.2.3	5
2.4	Requirements Validation	2.3	4
2.5	Requirements Sign-off	3.1, 2.4	4
3.	**Project Planning**		
3.1	Technological Risk Assessment	2.1.2	4

Develop a task network

(activity on node)

given dependencies

	activity	predecessor	duration
1	1.1		1
2	1.2		4
3	1.3		2
4	1.4	1.1 1.2 1.3	1
5	2.1.1	1.4	2
6	2.1.2	2.1.1	3
7	2.1.3	2.1.2	3
8	2.2.1	2.1.2	3
9	2.2.2	2.2.1	3
10	2.2.3	2.2.2	4
11	2.3	2.2.3	5
12	2.4	2.3	4
13	2.5	2.4 3.1	4
14	3.1	2.1.2	4

	activity	predecessor	duration
1	1.1		1
2	1.2		4
3	1.3		2
4	1.4	1.1 1.2 1.3	1
5	2.1.1	1.4	2
6	2.1.2	2.1.1	3
7	2.1.3	2.1.2	3
8	2.2.1	2.1.2	3
9	2.2.2	2.2.1	3
10	2.2.3	2.2.2	4
11	2.3	2.2.3	5
12	2.4	2.3	4
13	2.5	2.4 3.1	4
14	3.1	2.1.2	4

Identify dependencies
(task network tool)
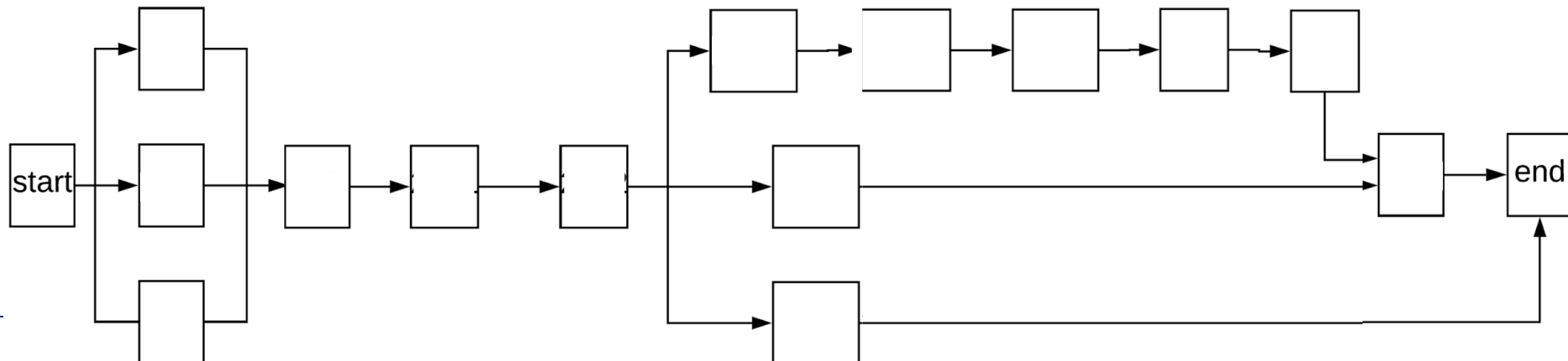
Network Diagram

- Sequential nodes
- Few details
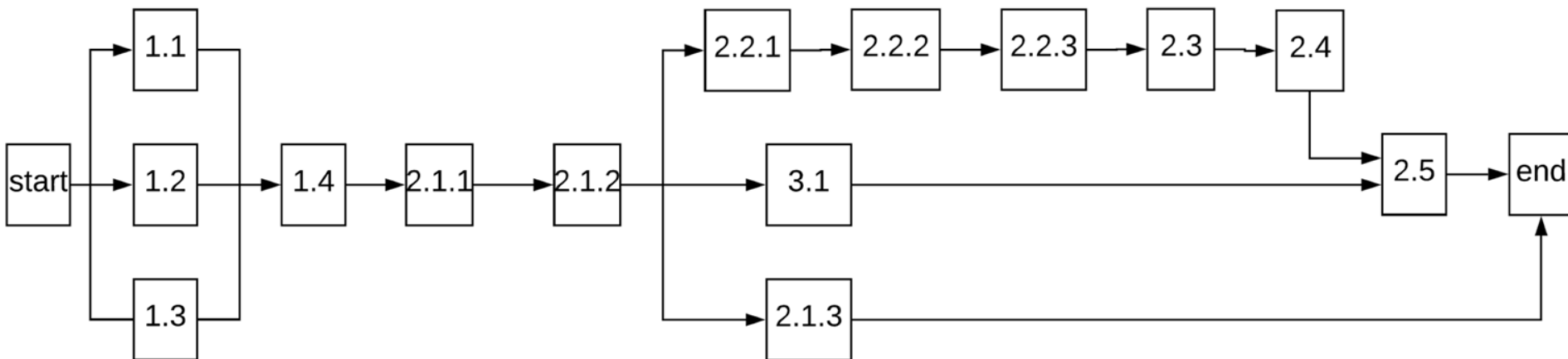
PERT: Program Evaluation & Review Technique

ES	Duration	EF
	Task Name	
LS	Slack	LF

The activity node

Earliest start time (ES)
Duration in people days
Earliest finish time (EF)

Latest start time (LS)
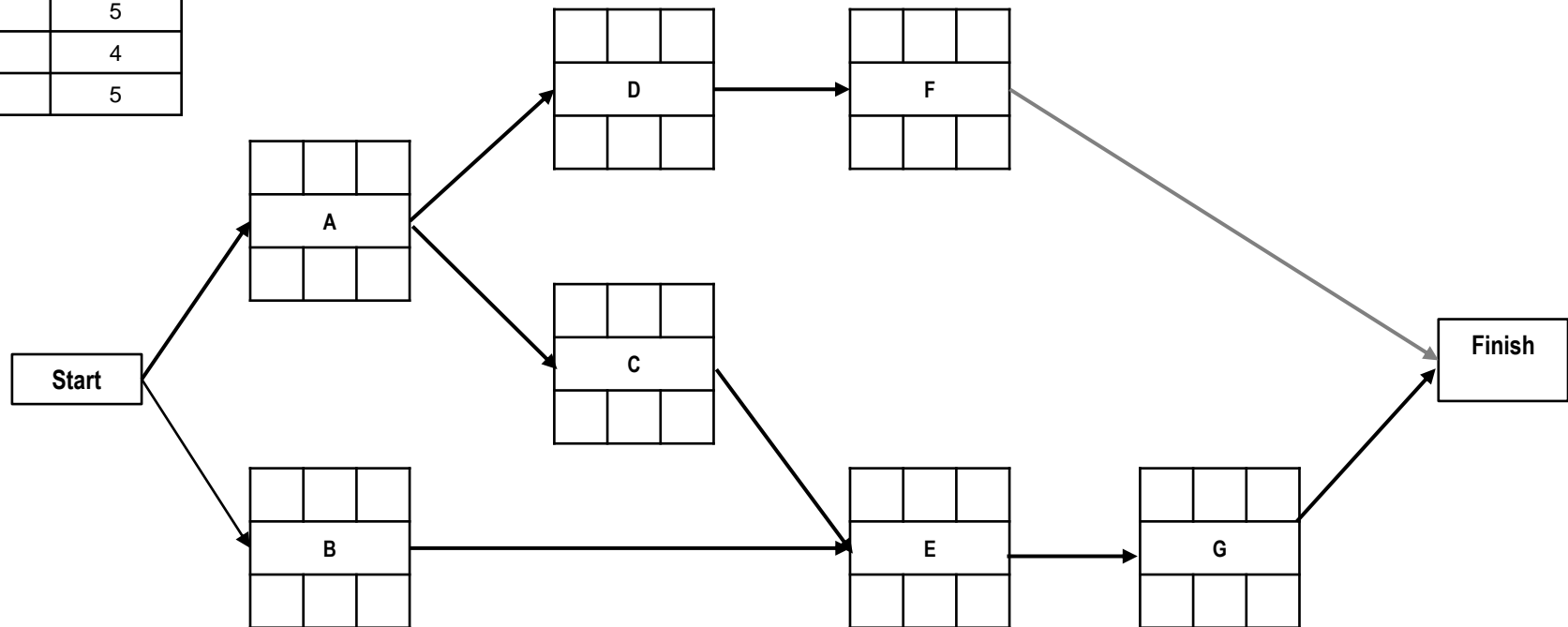Slack time
Latest finish time (LF)

Pert Chart: example

Show a PERT chart: use task durations & task network diagram

Activity	Duration
A	4
B	5
C	5
D	6
E	5
F	4
G	5

ES	Duration	EF
	Task Name	
LS	Slack	LF

Task Network Diagram

Forward Pass

Activity	Duration
A	4
B	5
C	5
D	6
E	5
F	4
G	5

ES	Duration	EF
	Task Name	
LS	Slack	LF

Backward Pass

Activity	Duration
A	4
B	5
C	5
D	6
E	5
F	4
G	5
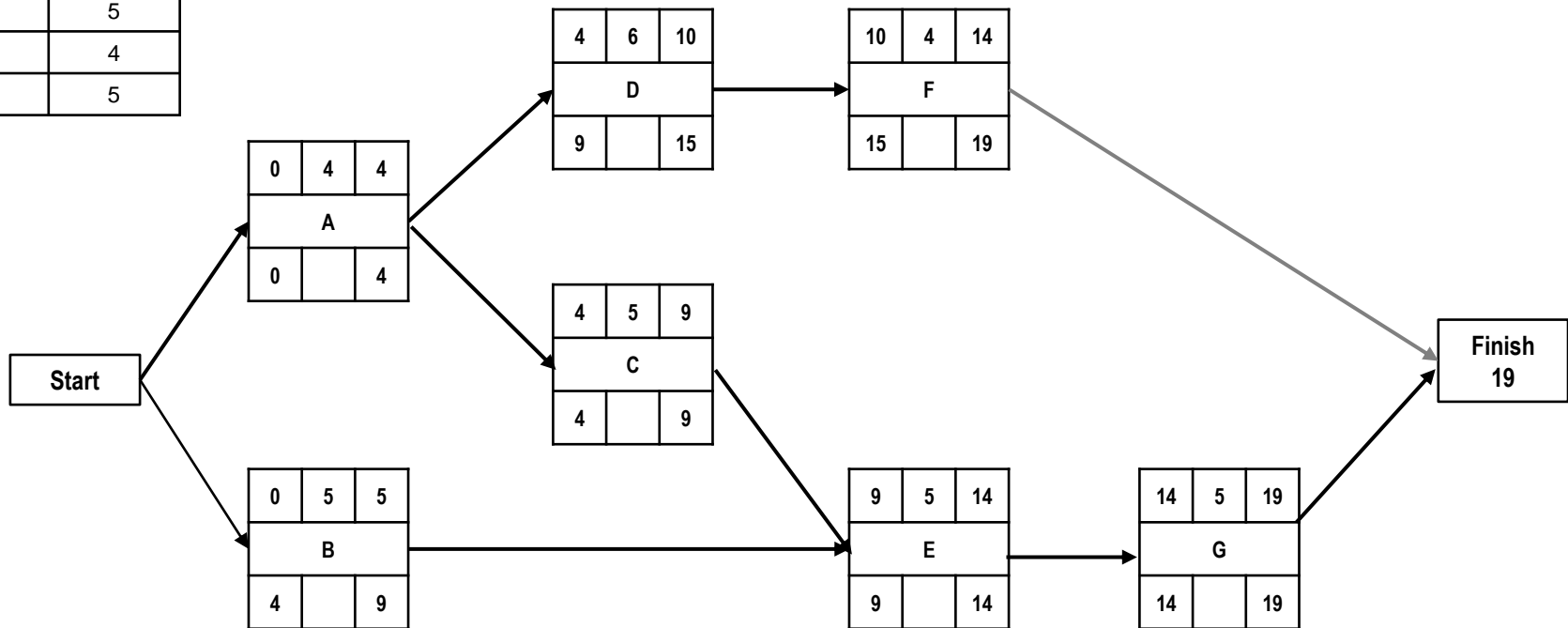
ES	Duration	EF
	Task Name	
LS	Slack	LF

D: 4 | 6 | 10 / 9 | | 15

F: 10 | 4 | 14 / 15 | | 19

A: 0 | 4 | 4 / 0 | | 4

C: 4 | 5 | 9 / 4 | | 9

Start

B: 0 | 5 | 5 / 4 | | 9

E: 9 | 5 | 14 / 9 | | 14

G: 14 | 5 | 19 / 14 | | 19

Finish 19

Slack

Activity	Duration
A	4
B	5
C	5
D	6
E	5
F	4
G	5

ES	Duration	EF
	Task Name	
LS	Slack	LF

4	6	10
	D	
9	5	15

10	4	14
	F	
15	5	19

0	4	4
	A	
0	0	4

4	5	9
	C	
4	0	9

Start

0	5	5
	B	
4	4	9

9	5	14
	E	
9	0	14

14	5	19
	G	
14	0	19

Finish
19

Critical Path

Critical Path = A + C + E + G
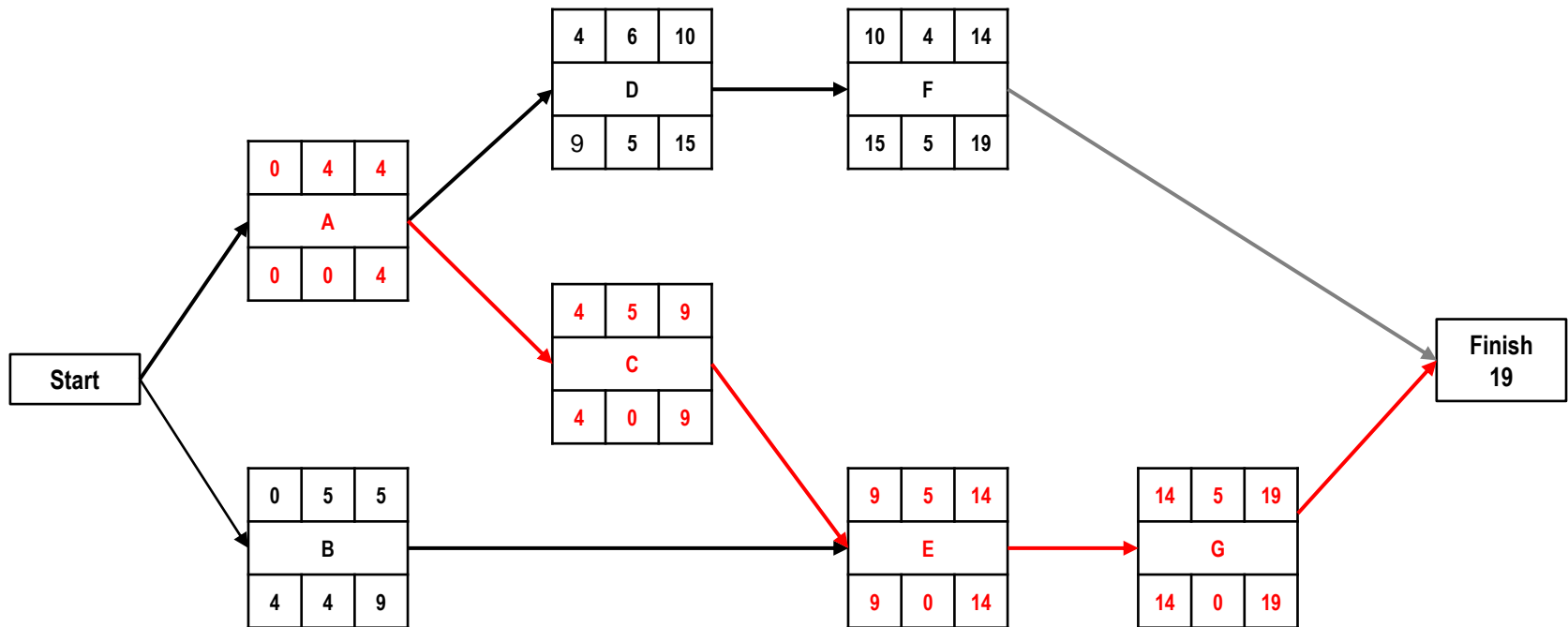
Use duration estimates & task network to construct PERT chart

activ	durn
1.1	1
1.2	4
1.3	2
1.4	1
2.1.1	2
2.1.2	3
2.1.3	3
2.2.1	3
2.2.2	3
2.2.3	4
2.3	5
2.4	4
2.5	4
3.1	4
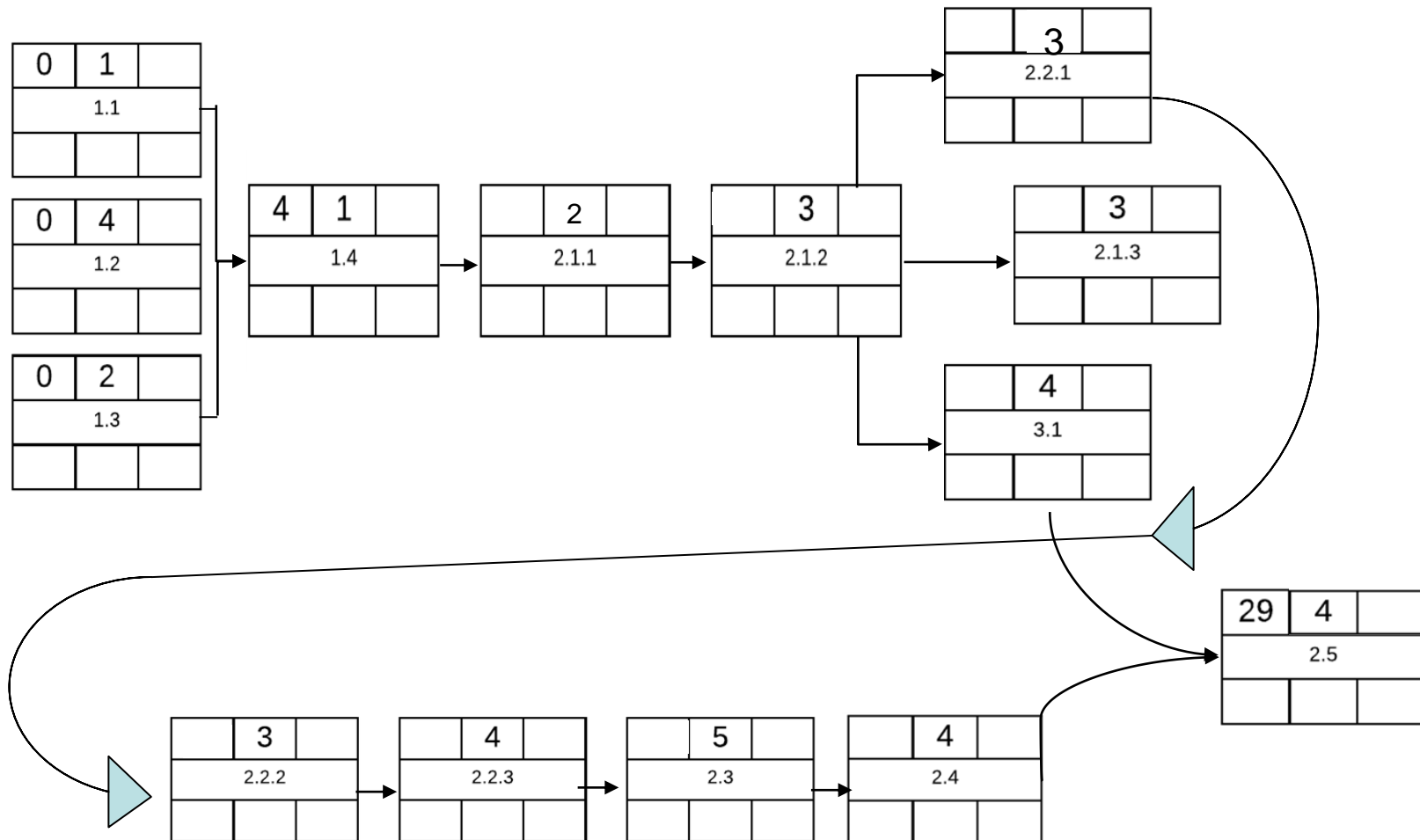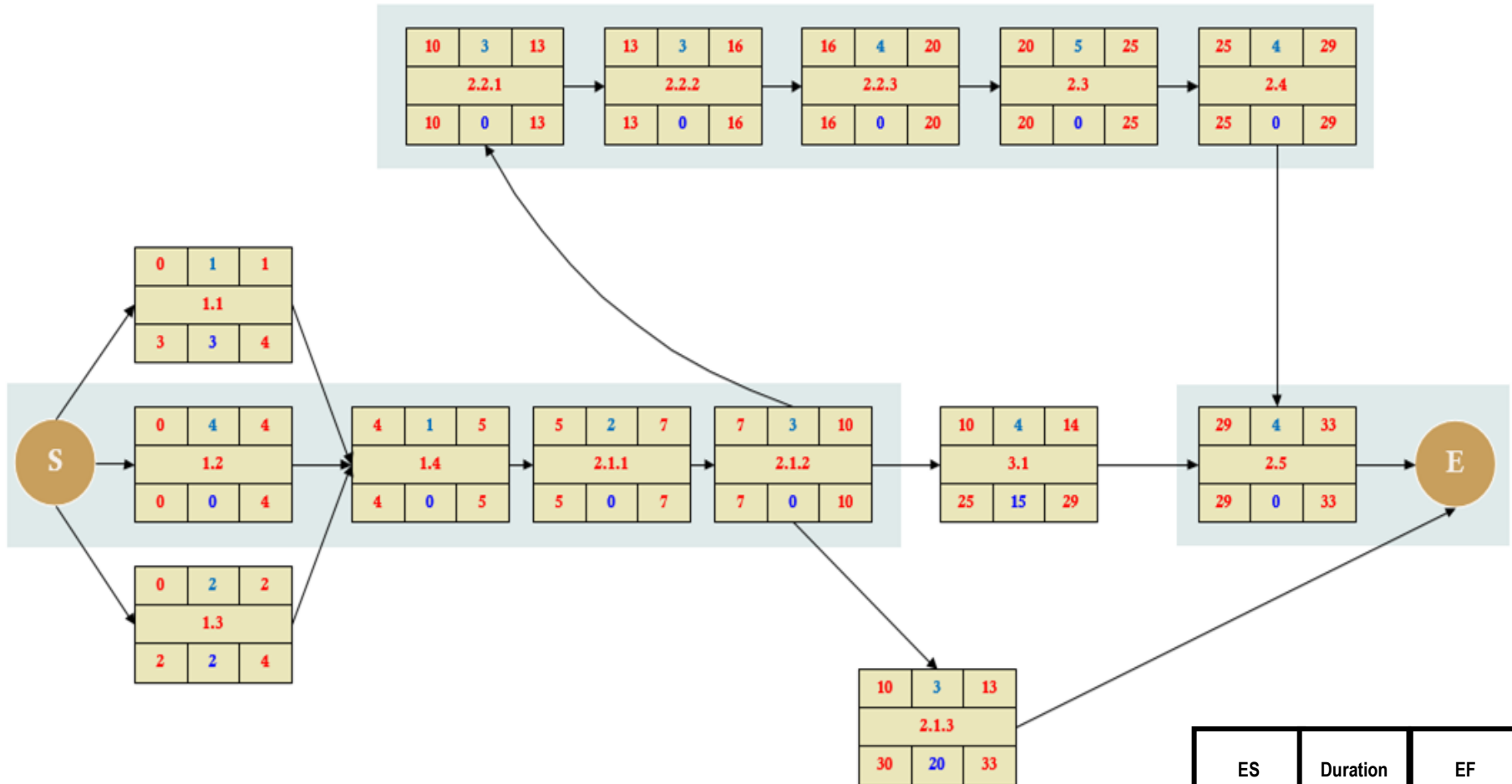
Critical Path = 1.2 + 1.4 + 2.1.1 + 2.1.2 + 2.2.1 + 2.2.2 + 2.2.3 + 2.3 + 2.4 + 2.5

ES	Duration	EF
	Task Name	
LS	Slack	LF

Play the Project Management Game:

http://thatpmgame.com/
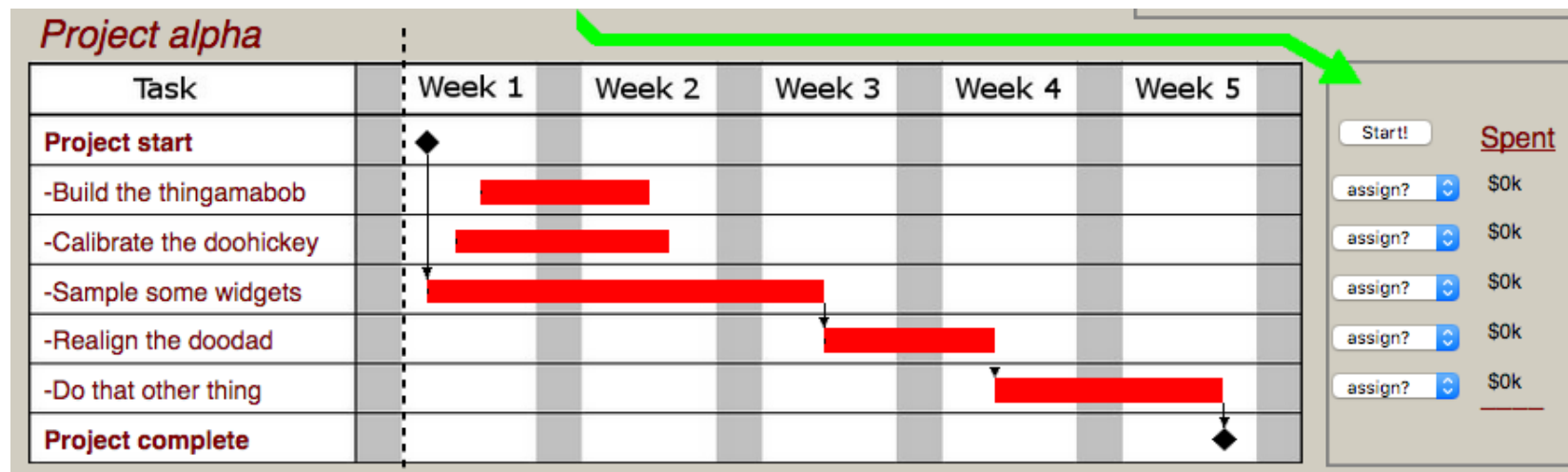
Use a Gantt chart to assign staff to various tasks.

Is the project completed on time and on budget?
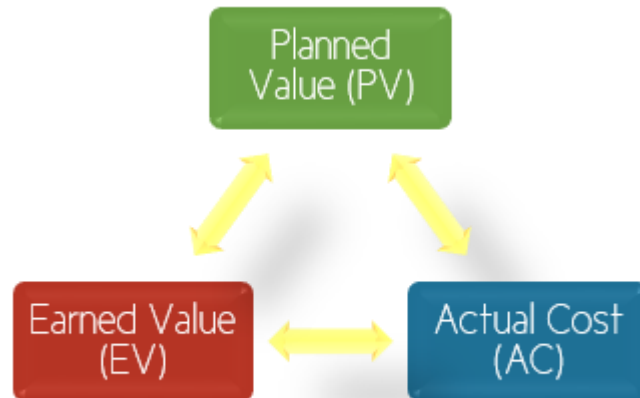
how to control

Planned Value
E.G assignment 2= 120 marks

assigned *value* of activity

Earned Value
assignment neglected, …

　　- what is it worth ?

the *current value* of the work,
given 1) the expected work rate,
　　and 2) the work done up until now

Actual Cost ☹

final *actual value* of activity

Given Assignment 2, Section 7: (monitor, control & build website) has 3 milestones of one-week duration, a Planned Value of 120 marks & an estimate of 60 hours work. What is the Planned Value of each milestone?

8 marks

15 marks

40 marks

marks are not an appropriate unit

None of the above

Your team worked for 15 hours on Section 7.1, what is the Expected Value of this work?

25 marks

30 marks

15 marks

40 marks

None of the above

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

SWEN90016 Software Processes and Project Management   -24-   Project Scheduling

Your team has only completed 20% of the features during the first milestone. What is the Earned Value of the work done?

20% **A**

20 marks **B**

24 % **C**

24 marks **D**

None of the above **E**

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

SWEN90016 Software Processes and Project Management   -25-   Project Scheduling
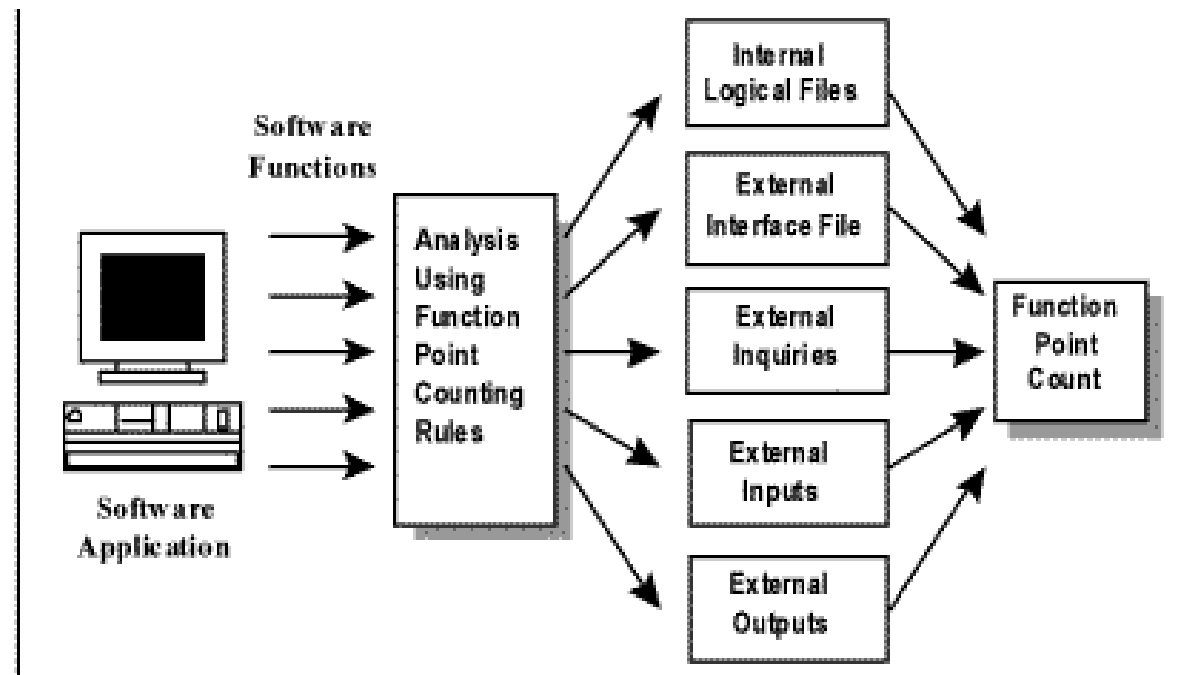
Become familiar with

Formal

Function Point Analysis and COCOMO II

What are they?

PMBOK

Historic Data

Done at any time in project lifecycle

FP Computation Steps

1. Categorize functional requirements and count

Example: *Category* = {internal file, external file, input, output, query}

2. Estimate a *Complexity Level* for each category

Complexity Level = {simple, average, complex}

3. Compute *count total* of Function Points, (see next slide)

Unadjusted Function Points = sum (functions * complexity value)

4. Estimate *Value Adjustment Factors*

Value Adjustment Factor = apply expert opinion to your project estimates

5. Compute *total function point count*

**Adjusted Function Points** = multiply business function by VAF

1. Categorize functional requirements and count

Example: *Category* = {internal file, external file, input, output, query}

2. Estimate a *Complexity Level* for each category
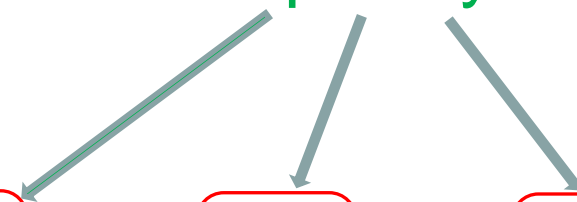
Complexity Level = {simple, average, complex}

Count functions from the Software Requirements Specification (SRS)

Function

Data

Transaction

Data elements
Record elements
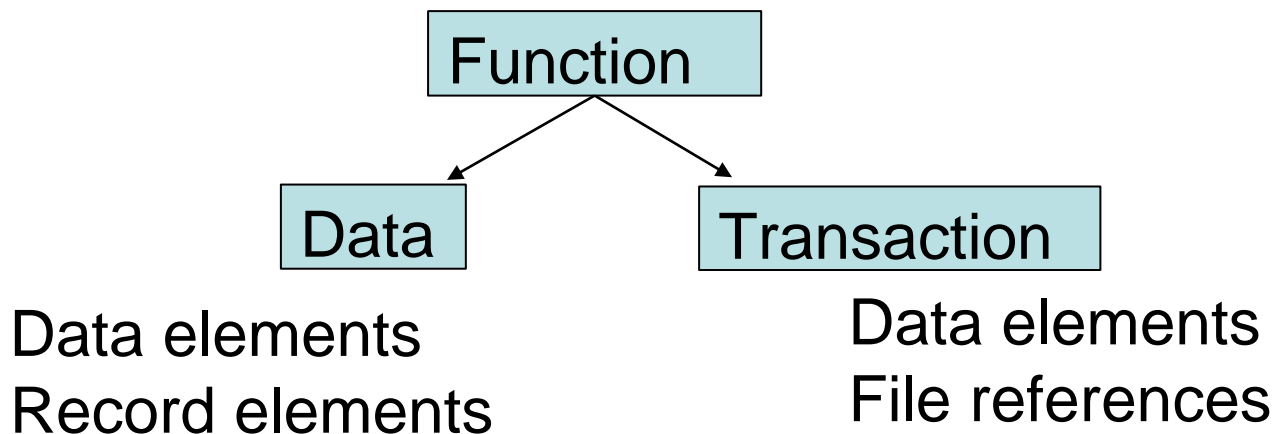
Data elements
File references

Historic Data

complexity values

Category	Simple Function Count	Weight	Average Function Count	Weight	Complex Function Count	Weight	Sub total
Internal Logical File	5	3		4	2	6	
External Interface File`		4		5	1	7	
External Input	2	3		4		6	
External Output	5	7	2	10	2	15	
External Inquiries/Queries	2	5		7		10	
Unadjusted Total							

Factors published from 2,192 recent Function Point projects

http://www.qsm.com/resources/function-point-languages-table

Given the following business functions,

how many *Unadjusted* Function Points exist?

Fill in the table.

Category	Simple Function Count	Weight	Average Function Count	Weight	Complex Function Count	Weight		Sub total
Internal Logical File	5	3		4	2	6		
External Interface File`		4		5	1	7		
External Input	2	3		4		6		
External Output	5	7	2	10	2	15		
External Inquiries/Queries	2	5		7		10		
Unadjusted Total								

Category	Simple Function Count	Weight	Average Function Count	Weight	Complex Function Count	Weight	Sub total
Internal Logical File	5	3		4	2	6	27
External Interface File`		4		5	1	7	7
External Input	2	3		4		6	6
External Output	5	7	2	10	2	15	85
External Inquiries/Queries	2	5		7		10	10
Unadjusted Total							135

Historic Data

Give the 14 system characteristics, estimate how relevant they are to your system, use the *typical weights*

- 0 = no effect
- 1 = incidental
- 2 = moderate
- 3 = average
- 4 = significant
- 5 = essential

Total VAF = 40

TABLE 6-2 Function Point System Characteristics	
System Characteristic	
Data communications required	2
Distributed processing	1
Performance needs	5
Heavily utilized operating environment	4
On-line data entry	4
Backup and recovery	4
Master file access online	3
Transaction input complexity	2
Internal processing complexity	2
Reusable code	2
Input, outputs, files, inquiries complex	2
Designed for multiple sites	4
Designed to facilitate change	3
Installation complexity	2
Total	40

Compute **Adjusted** Function Points using formula:
Unadjusted FP * (0.65 + 0.01 * VAF)

Project Approval Board

Don't worry! My team is hard at work coming up with an accurate cost estimation for the project.

I say we each get 3 tries and then we average the results.

= 135 * (0.65 + 0.01 * 40)

= 135 * (0.65 + 0.40)

= 135 * (1.05)

= 141.75 Adjusted Functional Points

The Constructive Cost Model:

Here is a playpen to try: http://softwarecost.org/tools/COCOMO/

Fill in the details for the VR simulator (Medic case study)

Extra details to get started: let there be:
   Sizing method: 135 Function Points
   The Java development language
   The cost per person-month is $1500

Thank You!