

Software Process and Project Management

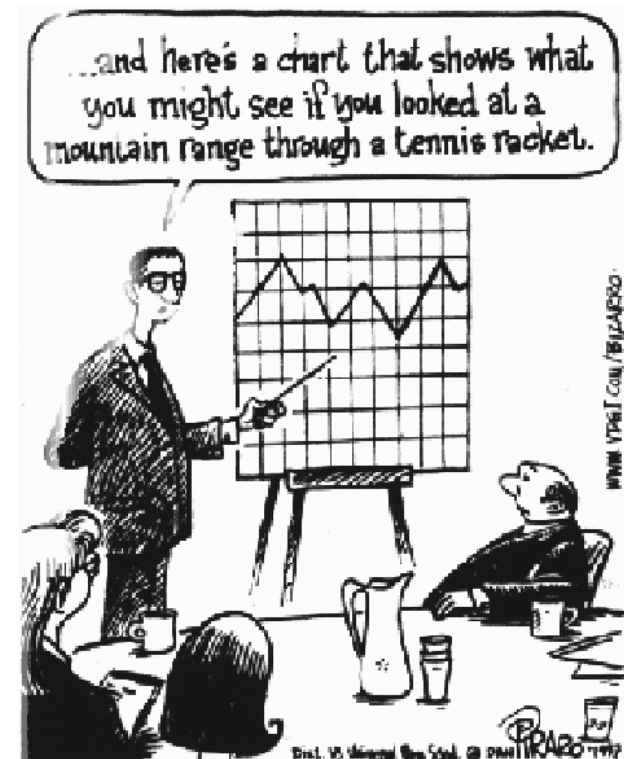
Sommerville, Chapters 4, 17
Pressman

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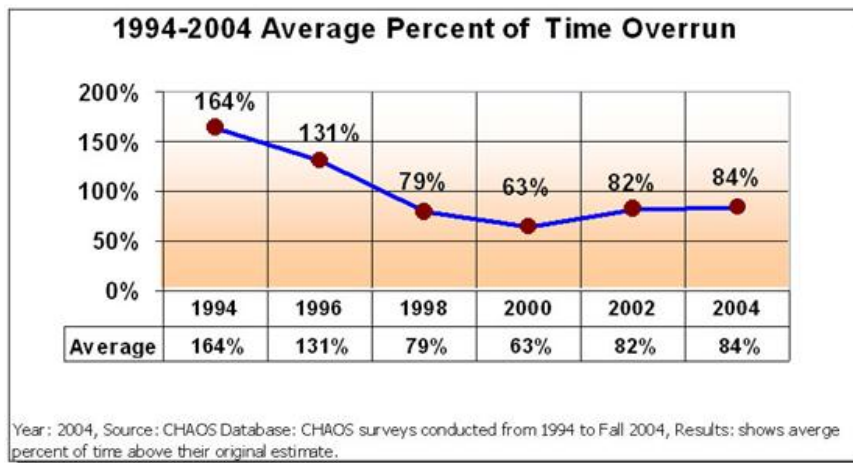
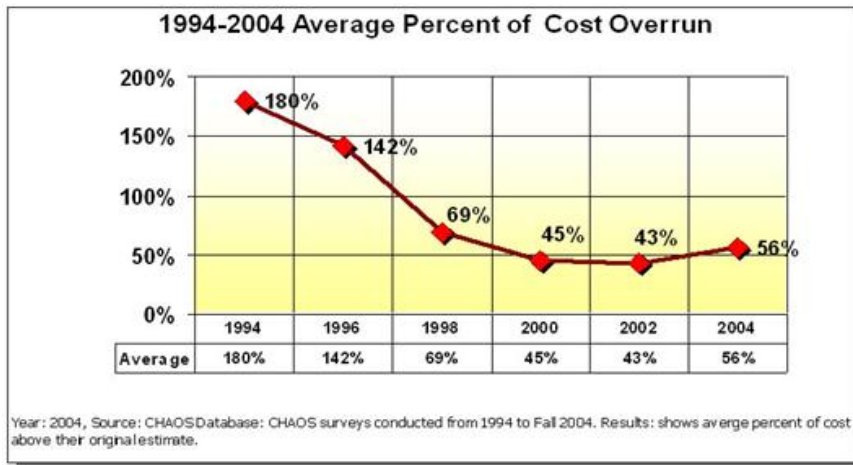
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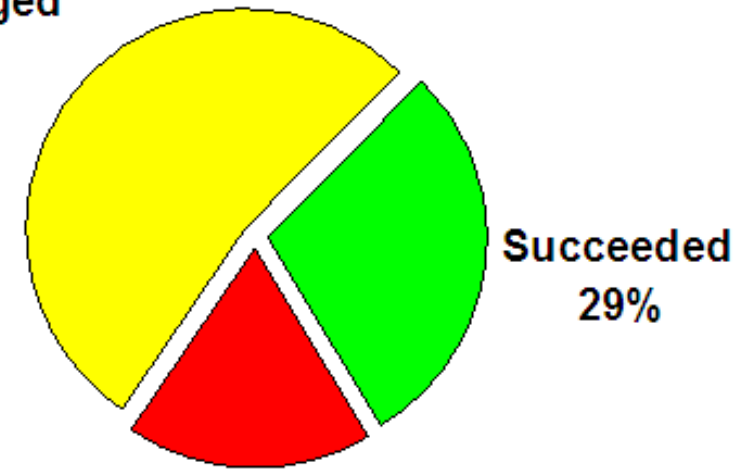


Project Success/Failure Rate

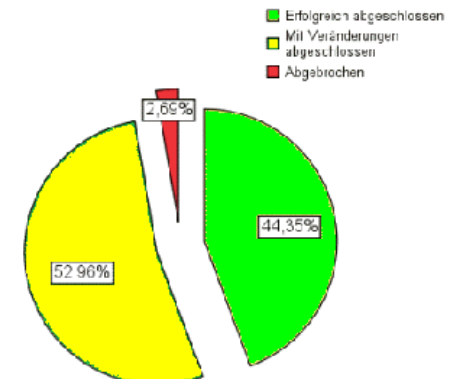
[CHAOS Report, Standish Group]



**Challenged
53%**



**Failed
18%**

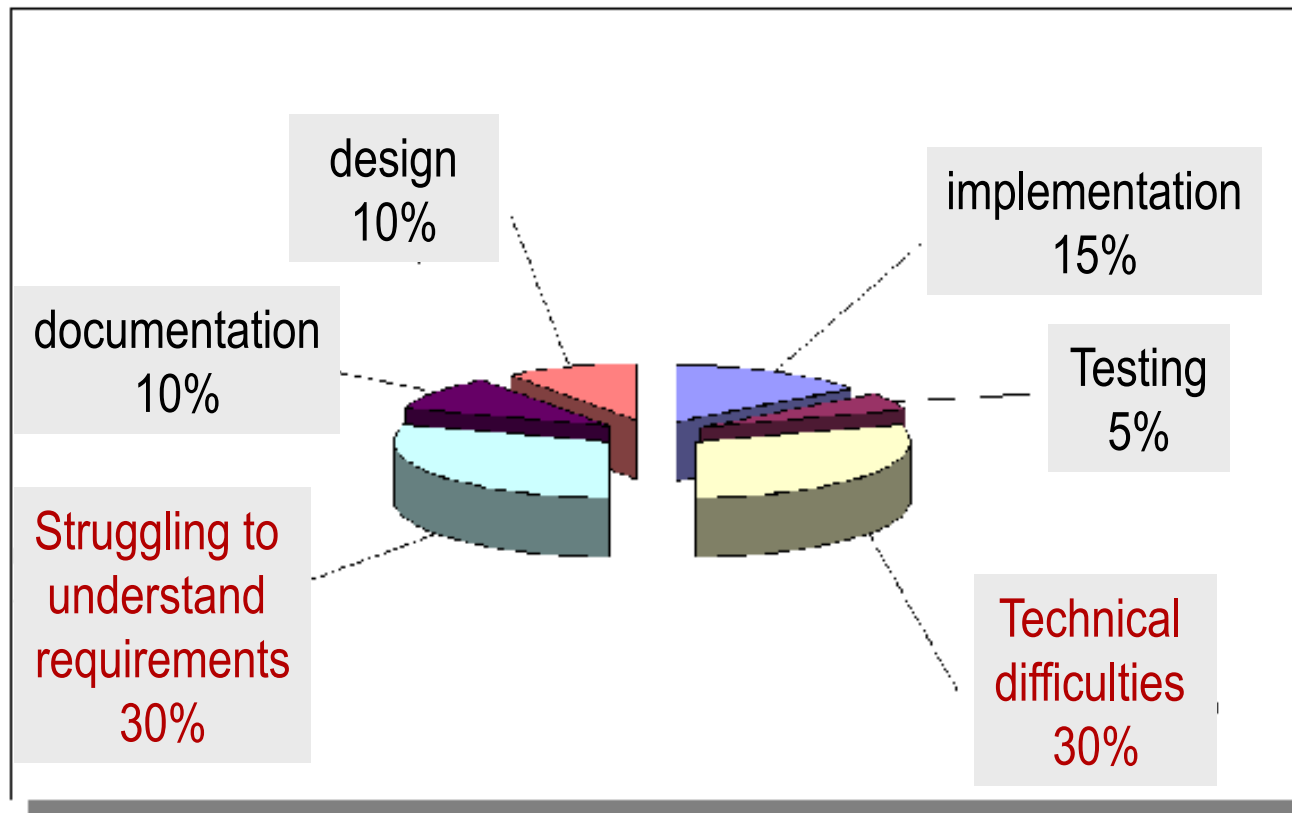


Top 10 Project Failure Factors: *Lack of...*

- | | |
|-------------------------------------|-------|
| 1. Executive support | (18%) |
| 2. User involvement | (16%) |
| 3. Experienced project manager | (14%) |
| 4. Clear business objectives | (12%) |
| 5. Minimized scope | (10%) |
| 6. Standard software infrastructure | (8%) |
| 7. Firm basic requirements | (6%) |
| 8. Formal methodology | (6%) |
| 9. Reliable estimates | (5%) |
| 10. Other criteria | (5%) |

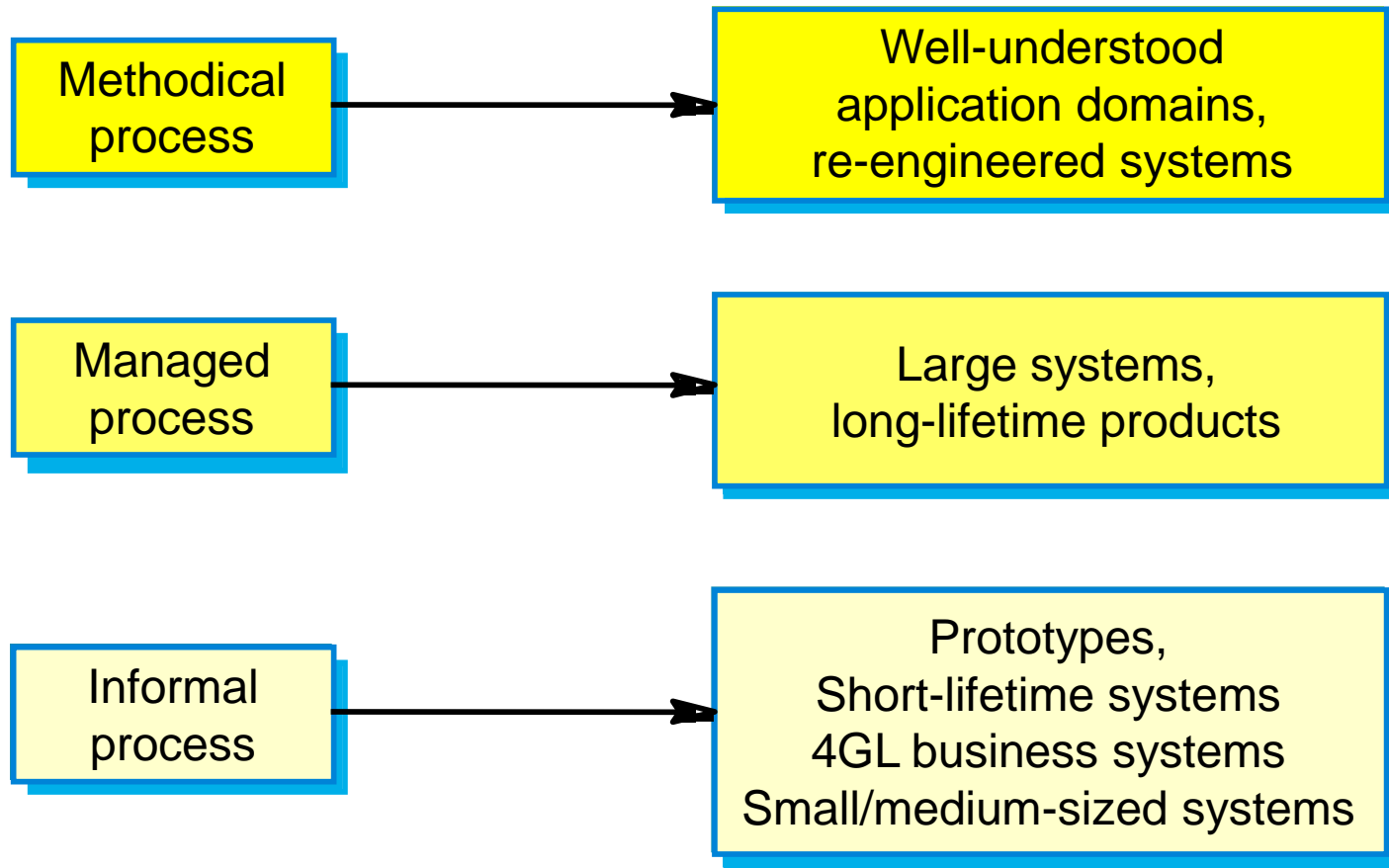
[CHAOS Report,
Standish Group International, Inc.]

Where Time Really Is Spent In Practice



Source: unknown

Process Applicability: Right-Sizing Mgmt



Roadmap

- Project management
- Project planning
- Risk management

"Failing to plan is planning to fail."

Software Project Management (PM)

- Project Management = activities to ensure that result is delivered
 - on time
 - on schedule
 - in accordance with requirements of customer and vendor (!)
- Core: planning & monitoring
- needed because software development always subject to
 - vendor budget & schedule constraints
 - changes

What Fills a PM's Day

- Proposal writing
- Customer (and sales, and marketing) communication
- Project planning and scheduling
 - Probably most time-consuming activity
 - Continuous, regularly revisited
 - Various types of plan
- Project costing
- Project monitoring and reviews
- Personnel selection and evaluation
- Report writing and presentations

The Project Plan

- Project plan sets out:
 - The **resources** available to the project
...who?
 - The **work breakdown**
...what?
 - A **schedule** for the work
...when?
- Project plan **structure**:
 - Introduction
 - Project organisation
 - Risk analysis
 - Hardware & software resource requirements
 - Work breakdown
 - Project schedule
 - Monitoring & reporting mechanisms

Types of Project Plan

Plan	Description
Quality plan	Describes the quality procedures and standards that will be used in a project. See Chapter 27.
Validation plan	Describes the approach, resources and schedule used for system validation. See Chapter 22.
Configuration management plan	Describes the configuration management procedures and structures to be used. See Chapter 29.
Maintenance plan	Predicts the maintenance requirements of the system, maintenance costs and effort required. See Chapter 21.
Staff development plan.	Describes how the skills and experience of the project team members will be developed. See Chapter 25.

cf. Sommerville Chapters!

Project Planning Process

Establish project constraints

Make initial assessments of the project parameters

Define project milestones and deliverables

Draw up project schedule

while project has not been completed or cancelled

loop

 Initiate activities according to schedule

Wait (for a while)

 Review project progress

 Revise estimates of project parameters

 Update the project schedule

 Re-negotiate project constraints and deliverables

if (problems arise) **then**

 Initiate technical review and possible revision

end if

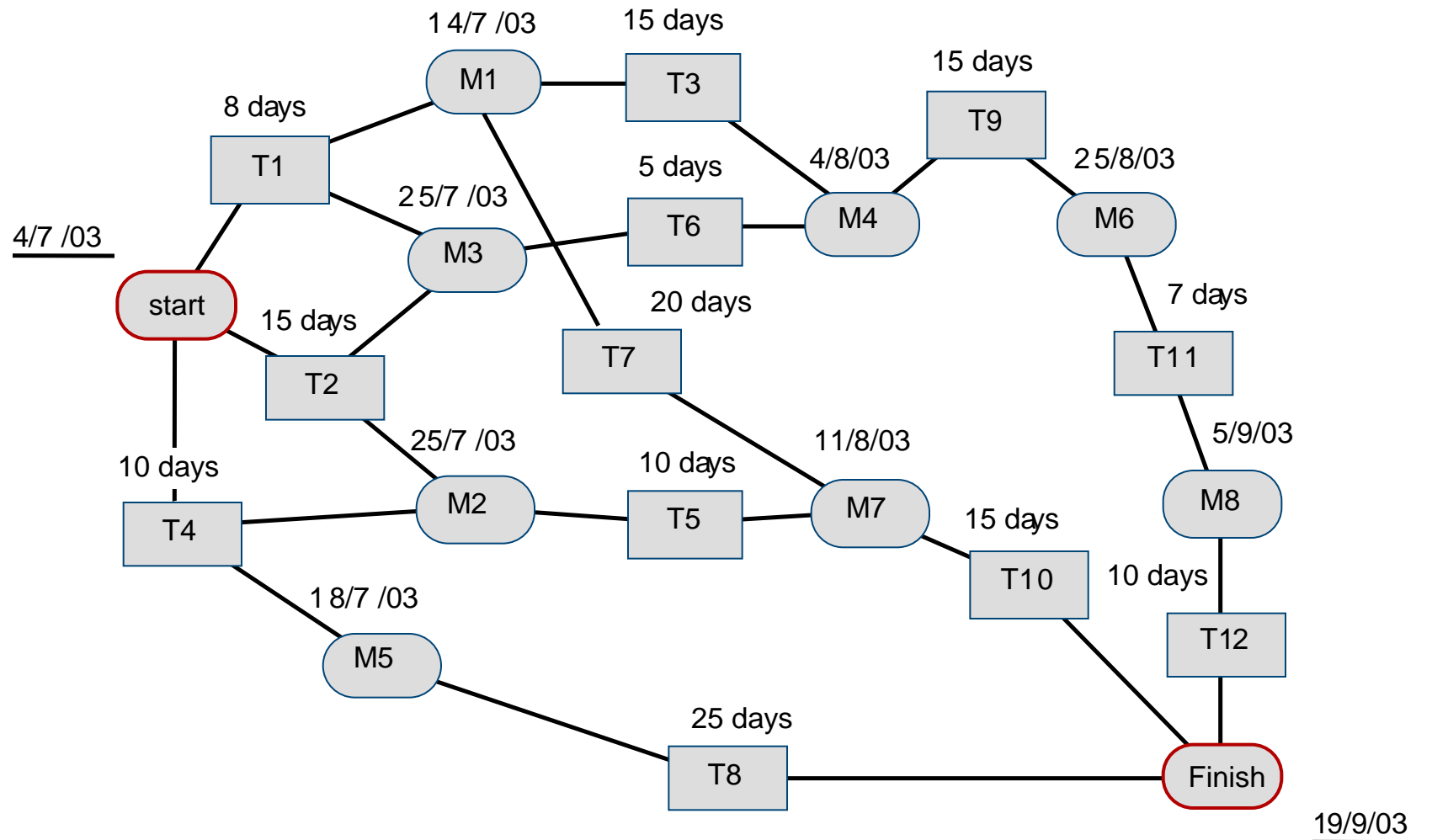
end loop

- Activities in a project should be **organised to produce tangible outputs at well-defined points** for management to judge progress
 - **Tasks (Work packages)** with **subtasks** organize work to be done, and responsibilities
 - **Milestones** = end-point of a process activity
= predictable state where a formal report of progress is presented to management
 - **Deliverables** = project results delivered to customers (or management)
- Good rules:
 - Design task as **self-contained** units with **clear goal**
 - **Concurrent** tasks → optimal use of workforce
 - **Minimize dependencies** → no waiting → no delays
- waterfall process allows for straightforward definition of progress milestones

Tabular Task Durations & Dependencies

Activity	Duration (days)	Dependencies
T1	8	
T2	15	
T3	15	T1 (M1)
T4	10	
T5	10	T2, T4 (M2)
T6	5	T1, T2 (M3)
T7	20	T1 (M1)
T8	25	T4 (M5)
T9	15	T3, T6 (M4)
T10	15	T5, T7 (M7)
T11	7	T9 (M6)
T12	10	T11 (M8)

Activity Network



Potential Scheduling Problems

- Estimating **difficulty** of problems (hence, costs)
- **Productivity** !~ **#people** working on a task
- **Adding** people to a late project makes it **later**

- communication overheads!

- The **unexpected** always happens!

- Always allow contingency in planning



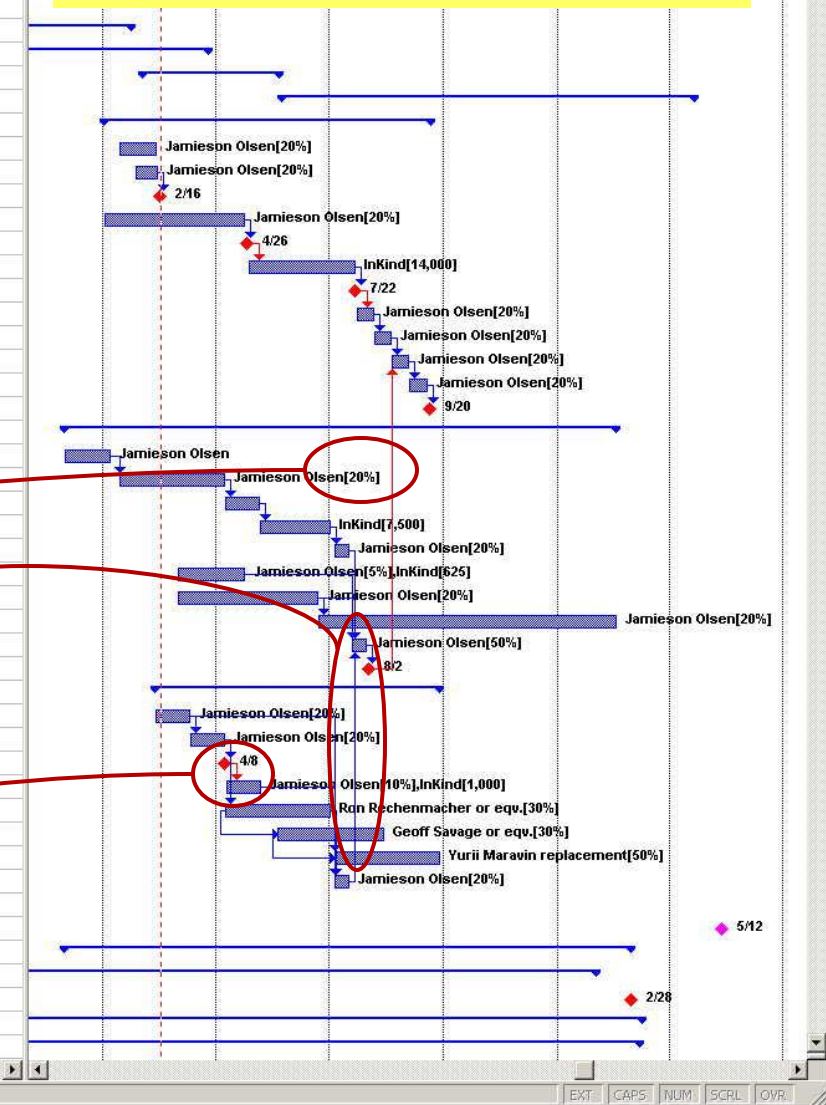
- *...as a partial little remedy, let's seek (tool) support*

Activity Timeline (aka Gantt Chart)

	2nd Quarter			3rd Quarter			4th
	Dec	Jan	Feb	Mar	Apr	May	Jun

124	1.2.2	Level 1 Calorimeter Track Matching	590 d	Thu 8/1/02	Tue 12/14/04	
180	1.2.3	Level 1 Tracking	604 d?	Thu 11/7/02	Wed 4/20/05	
181	1.2.3.1	Prototype L1 Central Track Trigger Algor	0 w	Thu 11/7/02	Thu 11/7/02	220SF,228SF,219SF
182	1.2.3.2	Develop Target CTT Algorithm	154 d	Thu 11/7/02	Wed 6/25/03	191,185,197
185	1.2.3.3	Target L1 Central Track Trigger Algorith	0 w	Wed 6/25/03	Wed 6/25/03	187,188
186	1.2.3.4	Develop Test Procedures	140 d	Thu 6/26/03	Fri 1/23/04	
189	1.2.3.5	DFEA Preproduction I	184 d	Thu 6/26/03	Thu 3/25/04	
201	1.2.3.6	DFEA Preproduction II	80 d	Mon 2/2/04	Fri 5/21/04	
217	1.2.3.7	DFEA Production	225 d	Mon 5/24/04	Wed 4/20/05	
239	1.2.3.8	DFEA Backplane (BP)	183 d?	Fri 1/2/04	Mon 9/20/04	
240	1.2.3.8.1	hardware spec	21 d	Wed 1/14/04	Thu 2/12/04	
		C/BP/DFEA)	14 d	Tue 1/27/04	Fri 2/13/04	242
		(hardware+timing)	1 d?	Mon 2/16/04	Mon 2/16/04	
		ction	4 mons	Fri 1/2/04	Fri 4/23/04	244
			1 d?	Mon 4/26/04	Mon 4/26/04	245
245	1.2.3.8.6	production + vendor checkout	3 mons	Tue 4/27/04	Wed 7/21/04	246
246	1.2.3.8.7	first BP received	1 d?	Thu 7/22/04	Thu 7/22/04	247
247	1.2.3.8.8	FNAL checkout	2 w	Fri 7/23/04	Thu 8/5/04	248
248	1.2.3.8.9	crate assembly + bench test	2 w	Fri 8/6/04	Thu 8/19/04	249
249	1.2.3.8.10	test with CC	2 w	Fri 8/20/04	Thu 9/2/04	250
249	1.2.3.8.11	test with CC + DFEA	2 w	Fri 9/3/04	Fri 9/17/04	251
249	1.2.3.8.12	delivered to Boston	1 d?	Mon 9/20/04	Mon 9/20/04	
249	1.2.3.9	DFEA Crate Controller (CC)	207 d?	Mon 12/1/03	Wed 2/16/05	
250	1.2.3.9.1	interface specs	1 mon	Mon 12/1/03	Tue 1/6/04	254
254	1.2.3.9.2	schematic + layout; order long leadtime	3 mons	Wed 1/14/04	Wed 4/7/04	255
255	1.2.3.9.3	PCB production + vendor testing	1 mon	Thu 4/8/04	Wed 5/5/04	256
256	1.2.3.9.4	assembly (vendor)	2 mons	Thu 5/6/04	Thu 7/1/04	257
257	1.2.3.9.5	checkout	2 w	Mon 7/1/04	Fri 7/16/04	261
258	1.2.3.9.6	optical Serial Command Link Receiver pr	2 mons	Mon 3/1/04	Fri 4/23/04	261
9.8		test software/firmware	4 mons	Mon 3/1/04	Mon 5/21/04	260,261
9.9		finish software/firmware	8 mons	Tue 6/22/04	Wed 2/16/05	
9.10		bench test	2 w	Mon 7/19/04	Fri 7/30/04	262
9.11		CC ready	1 d?	Mon 8/2/04	Mon 8/2/04	249
263	1.2.3.10	optical Download and Control Link (DCL)	160 d?	Thu 2/12/04	Mon 9/27/04	
		interface specs	1 mon	Thu 2/12/04	Wed 3/10/04	265,270
		hardware specs	1 mon	Thu 3/11/04	Wed 4/7/04	266,268
		specs done	1 d?	Thu 4/8/04	Thu 4/8/04	267
		hardware procurement	1 mon	Fri 4/9/04	Thu 5/6/04	271
		software: Linux driver	3 mons	Thu 4/8/04	Thu 7/1/04	271,269SS+1.5 mons
		software: EPICS driver + integration	3 mons	Thu 5/20/04	Fri 8/13/04	270SS+1.5 mons
		software: dfe_ware integration	3 mons	Mon 7/5/04	Mon 9/27/04	
		bench test PC - CC	2 w	Mon 7/5/04	Fri 7/16/04	261
269	1.2.3.10.5					
269	1.2.3.10.6					
270	1.2.3.10.7					
271	1.2.3.10.8					
272						
273	1.2.9	L1 Trigger Upgrade Production and Testing Co	0 w	Thu 5/12/05	Thu 5/12/05	
274	1.2.4	Level 2 Beta Processor	305 d	Mon 12/1/03	Mon 2/28/05	
315	1.2.5	Silicon Track Trigger Upgrade	504 d	Tue 1/21/03	Mon 1/31/05	
300	1.2.9	L2 Trigger Upgrade Production and Testing Co	0 w	Mon 2/28/05	Mon 2/28/05	
		Trigger Simulation	827 d	Thu 11/1/01	Wed 3/9/05	
		Administration	520 d	Mon 2/3/03	Mon 3/7/05	

Henry L. Gantt (1861-1919)



Task (Work package)

Subtask

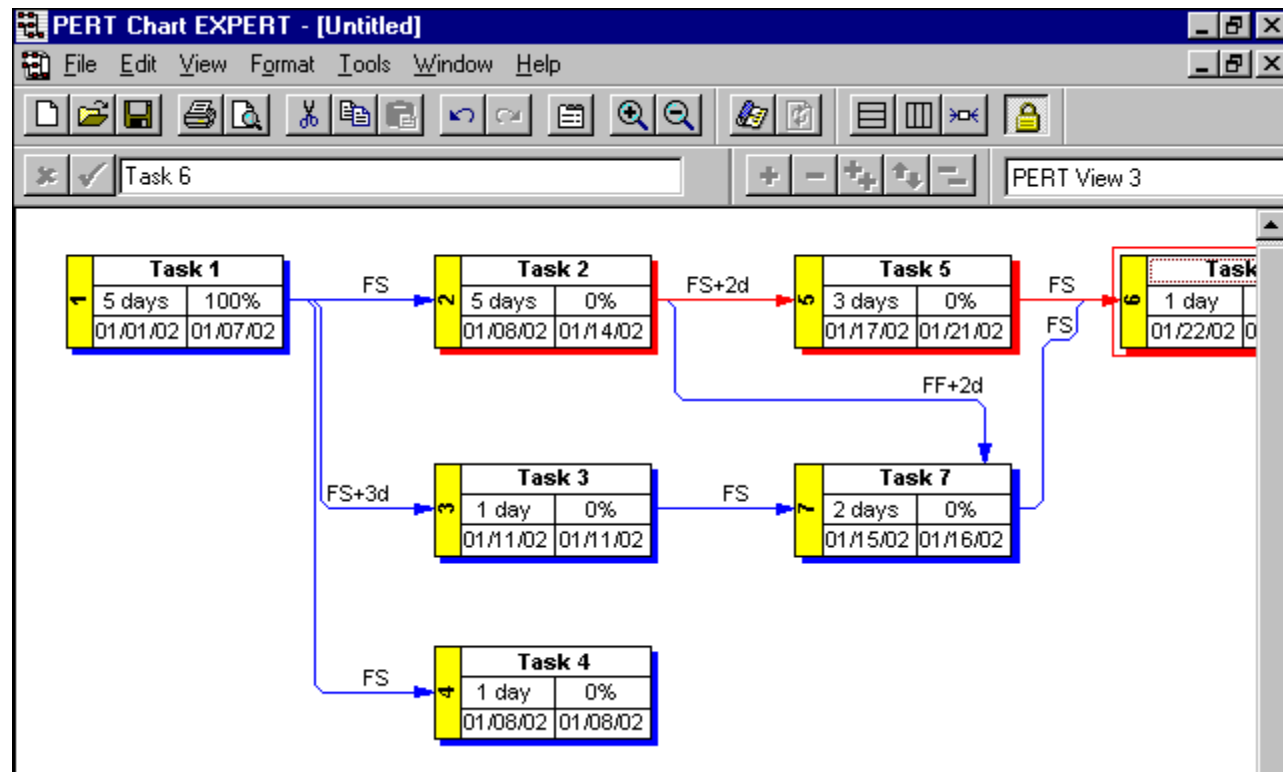
Progress

Dependency

Milestone

Task & Activity Flow Chart (PERT Chart)

- **PERT** = Project Evaluation and Revision Technique
 - Aka flowchart
- Shows **relationships** between activities
- Can attach to each task:
 - completion times
 - names of persons assigned
 - milestones; ...



- Risk management =
 - identify risks
 - draw up plans to minimise their effect
- Risk = probability that some adverse circumstance will occur
 - Project risks affect schedule or resources
 - Product risks affect quality or performance
 - Business risks affect organisation

*read Sommerville
Chapter 5!*

Wrap-Up: Project Management

- Good project management essential for project success
 - intangible nature of software → extra challenges for management
- Managers have diverse roles
most significant activities are **planning, estimating and scheduling**
 - iterative processes, continue throughout project
- Projects broken into **tasks** with **deliverables** at predefined **milestones**
 - **Gantt chart, PERT chart** for project activities, their durations and staffing
- Risk management for
 - identifying risks which may affect the project
 - planning → risks do not develop into major threats

Commonalities & Differences

- SW & other engineering projects share **commonalities**:
 - Many activities not peculiar to software management
→
many techniques of engineering PM **equally applicable** to sw PM
 - Technically complex engineering systems tend to suffer from **same problems** as software systems:
collaboration; deadlines; customers; ...
- On the other hand, software projects are **different** from projects in other disciplines:
 - product is **intangible**
 - product is uniquely **flexible**
 - Software engineering **not recognized** as an engineering discipline with the same status as mechanical, electrical engineering, etc.
 - software development process **not standardised** (well, not completely)
 - Many software projects **'one-off'** projects