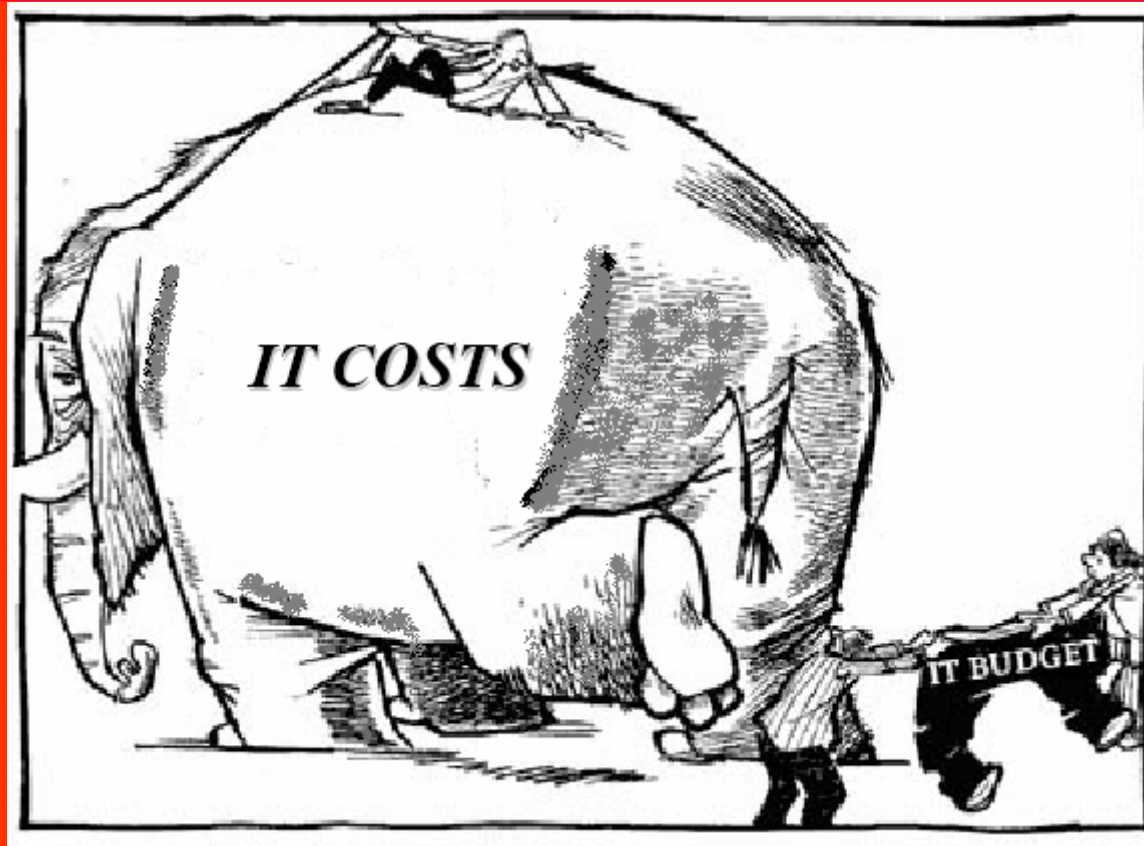

Software Project Management

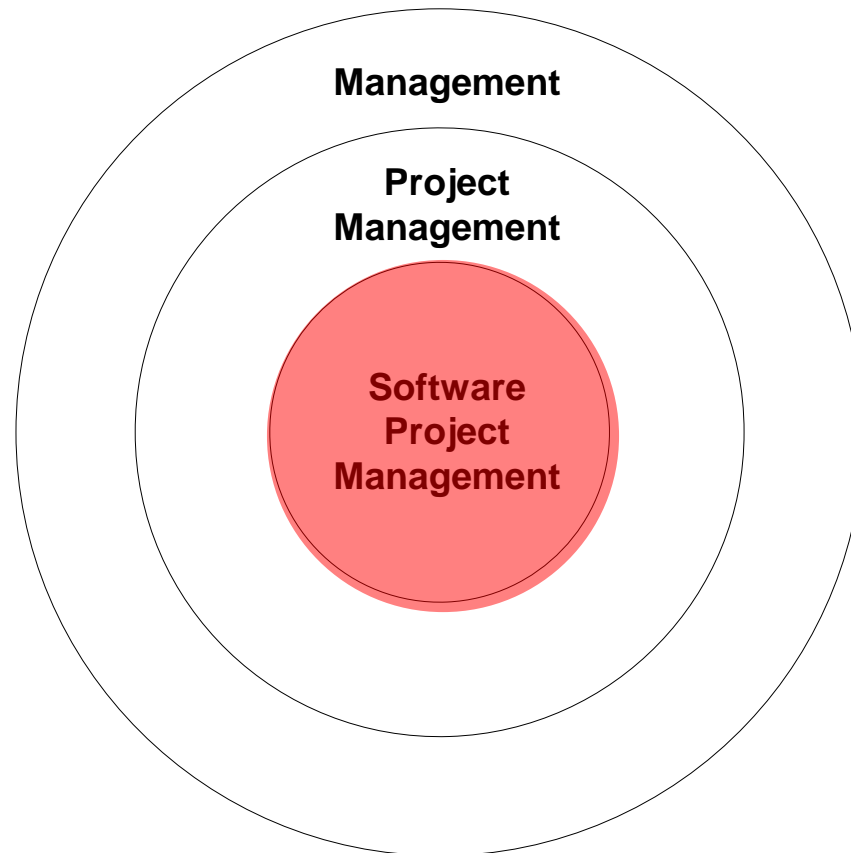
Objectives

- To introduce software project management
- and to describe its distinctive characteristics
- Explain the advantages of Using Formal Project Management
- To discuss project planning and the planning process
- To explain the responsibilities of software managers
- To introduce the different types of Project Plans
- Management activities
- Project planning
- Project scheduling

IT: Budget & Cost



Management, PM & Software PM



What is Software Engineering?

Developing software having:

- High **quality**
- Within **budget**
- On **schedule** (time)
- Satisfying client's **requirements**

What Is a Project? *

- “a temporary endeavor undertaken to create a unique product, service, or result.”*
- **Temporary:** A project has a definite beginning and a definite end.
- The result (product or service) is **unique:** it is distinguishable from all other results.

*PMI, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)* (2004), p. 5.

What Is a Project?

- A project ends
 - ✚ when its objectives have been reached,
 - ✚ or the project has been terminated.
- Project's Results are **not** Temporary
 - ✚ The result of the project (product or service) may outlive the project.

Project Attributes

A project:

- Has a unique purpose.
- Is temporary.
- Is developed using progressive elaboration.
- Requires resources, often from various areas.
- Should have a primary customer or sponsor.
 - ✚ The **project sponsor** usually provides the direction and funding for the project.
- Involves uncertainty.

Failure Statistics of SW Projects

- Success



On-time,



On-budget,



and scope-coverage (with Most of the Features & Functions)

- Failed



Over-budget,



Over-time,



and/or with less scope (Fewer Features & Functions)

- Impaired

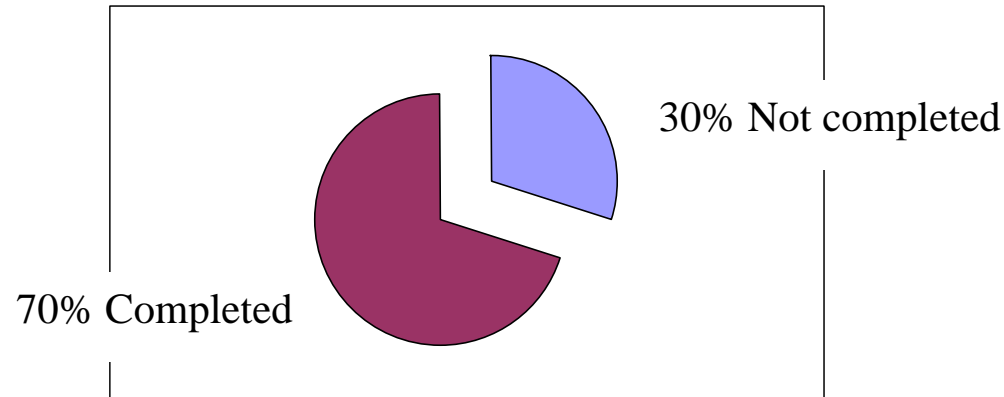


Cancelled & Unused

Why Projects Fail?

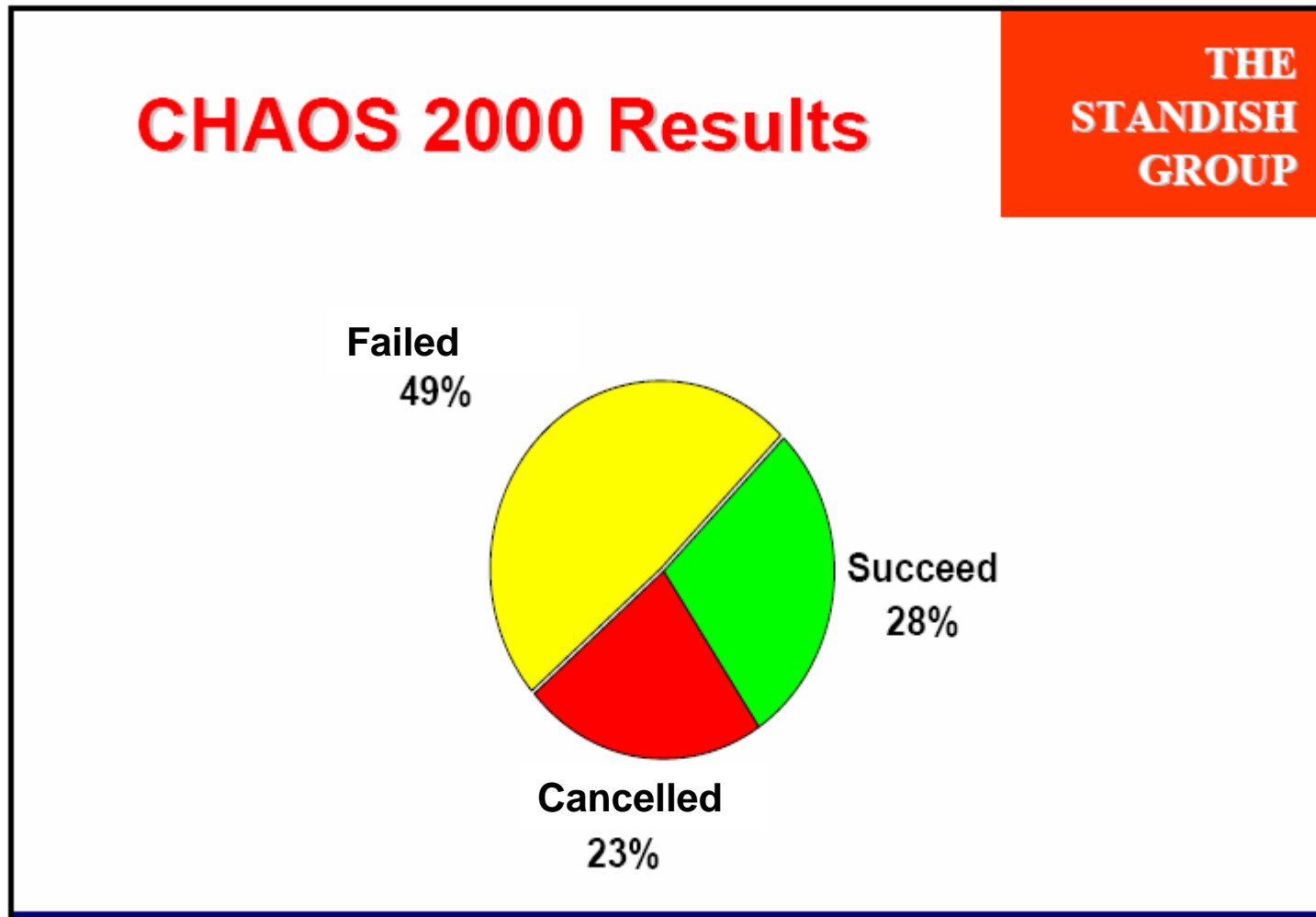
- an unrealistic **deadline** is established
- changing customer **requirements**
- an honest underestimate of **effort**
- predictable and/or unpredictable **risks**
- **technical** difficulties
- **miscommunication** among project staff
- failure in project **management**.

A S/W project is a *Risky Business*



- All surveyed SW projects used **waterfall** lifecycle.
- 53% of projects cost almost 200% of original estimate.
- Estimated \$81 billion spent on failed U.S. projects in 1995.

Failure Statistics of SW Projects

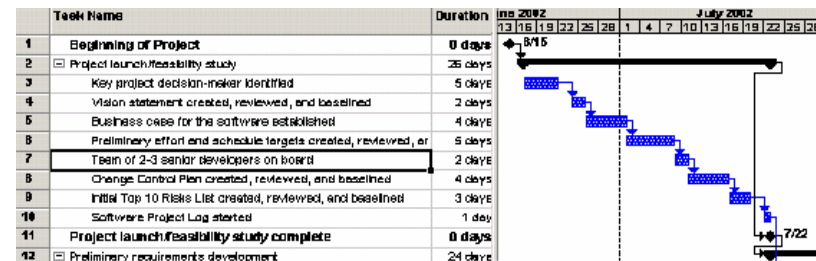
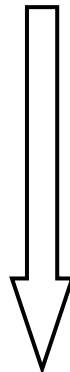


PM History

- Old PM: 5000 B.C ‘The Egyptian Pyramids’
- Birth of modern PM: Manhattan Project (military)
‘development of the atomic bomb’
- 1917: **Henry Gantt ‘Gantt chart’**

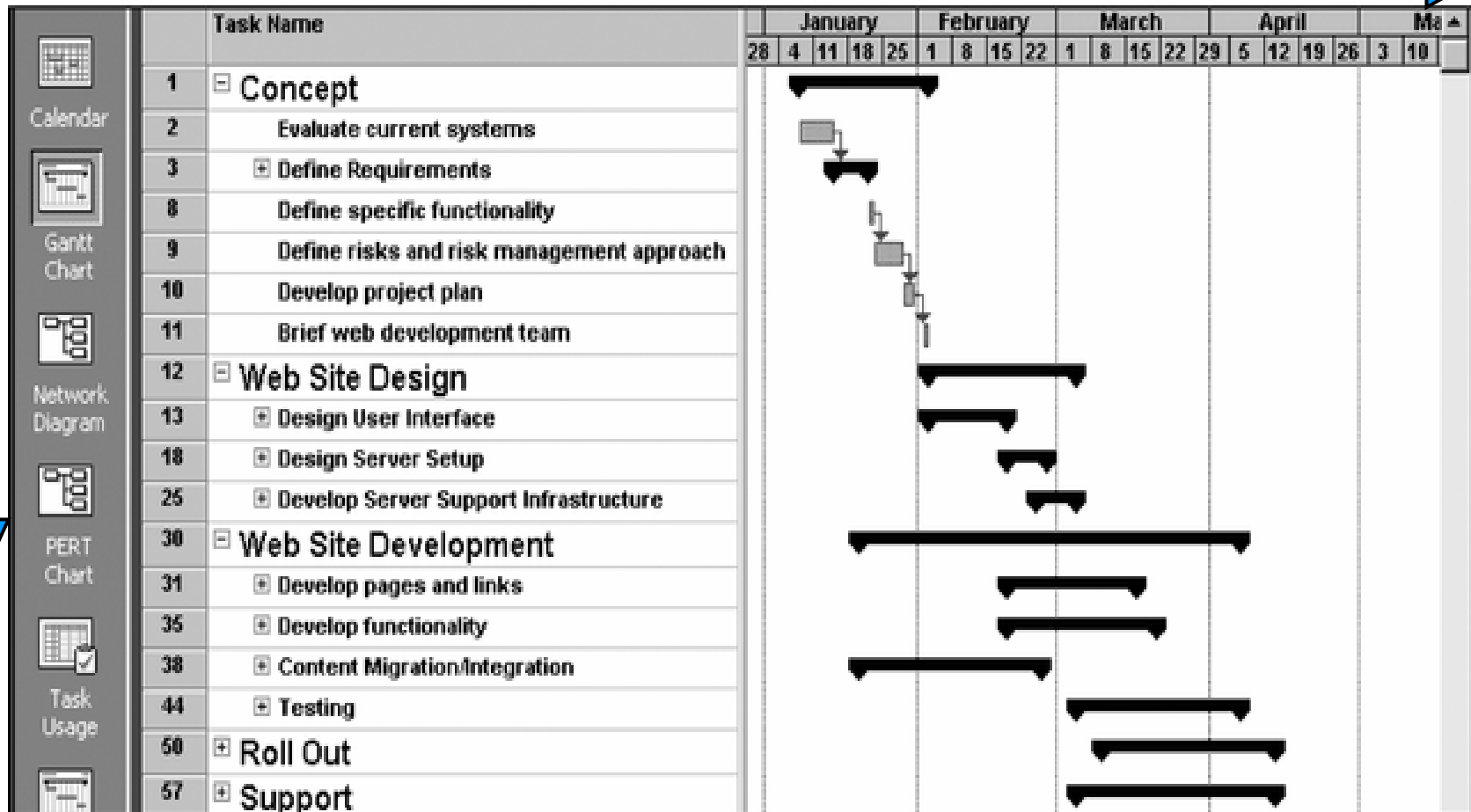
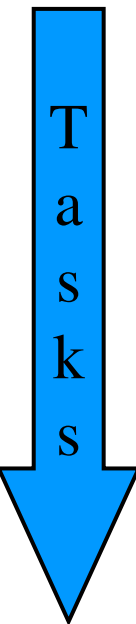
Gantt chart
for
scheduling

Tasks



PM History - Gantt chart Example

Web-Software development



PM History

1970's

- Use of PM software:
 - ✚ military, defense,
 - ✚ construction industries,
 - ✚ Aircraft construction

1990's: large shift to PM-based models

- 1985: TQM 'Total Quality Management'
- 1990-93: Re-engineering
- 1996-99: Risk management, project management offices (PMO)

Project Management Offices (PMO)

- An organizational group responsible for coordinating the project management function throughout an organization.
- Possible goals of PMO:
 - ✚ Collect, organize, and integrate project data
 - ✚ Develop and maintain templates for project documentation
 - ✚ Develop and coordinate training needs
 - ✚ Provide project management consulting services

Failure Statistics of SW Projects

- Success

- ✚ **On-time,**
- ✚ **On-budget,**
- ✚ **and scope-coverage** (with Most of the Features & Functions)
- ✚ **High quality**

- Failed

- ✚ **Over-budget,**
- ✚ **Over-time,**
- ✚ **and/or with less scope (Fewer Features & Functions)**

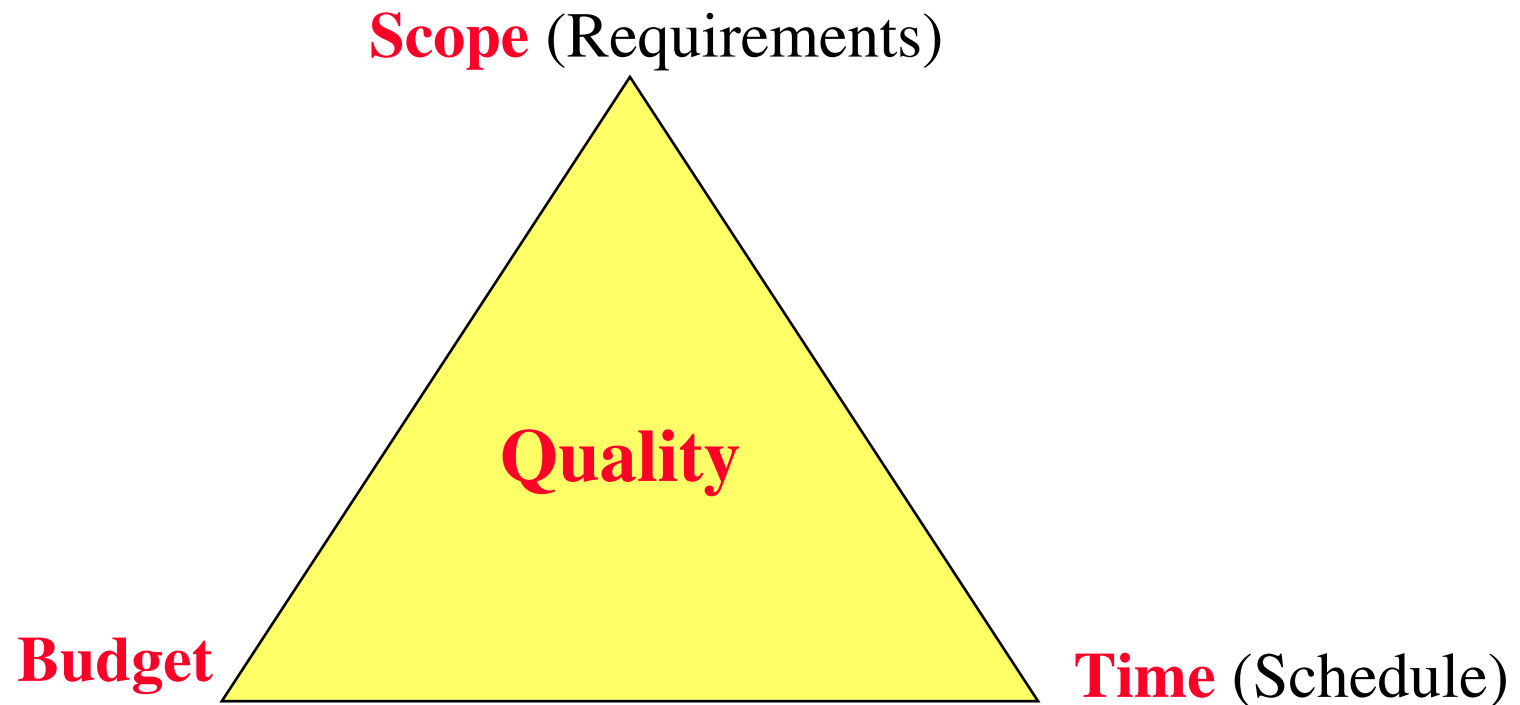
- Impaired

- ✚ **Cancelled & Unused**

Software Project Management

- Why S/W Project Management ?
- Because software development is always subject to
 - ✚ **budget** and
 - ✚ **schedule** constraints
 - ✚ **quality** constraints
 - ✚ Satisfying all **requirements**that are set by the organisation developing the software
- ✚ Minimise **risk** of failure

Quality & The Triple constraint



Advantages of Using Formal Project Management

- Better control of financial, physical, and human resources
- Improved customer relations
- Shorter development times
- Lower costs
- Higher quality and increased reliability
- Higher profit margins
- Improved productivity
- Better internal coordination
- Higher worker morale (less stress).

Software Project Management

(Cont.)

- Amateur programmer:
 - ✚ No need for s/w project management
- Professional s/w developer:
 - ✚ Needs for s/w project management

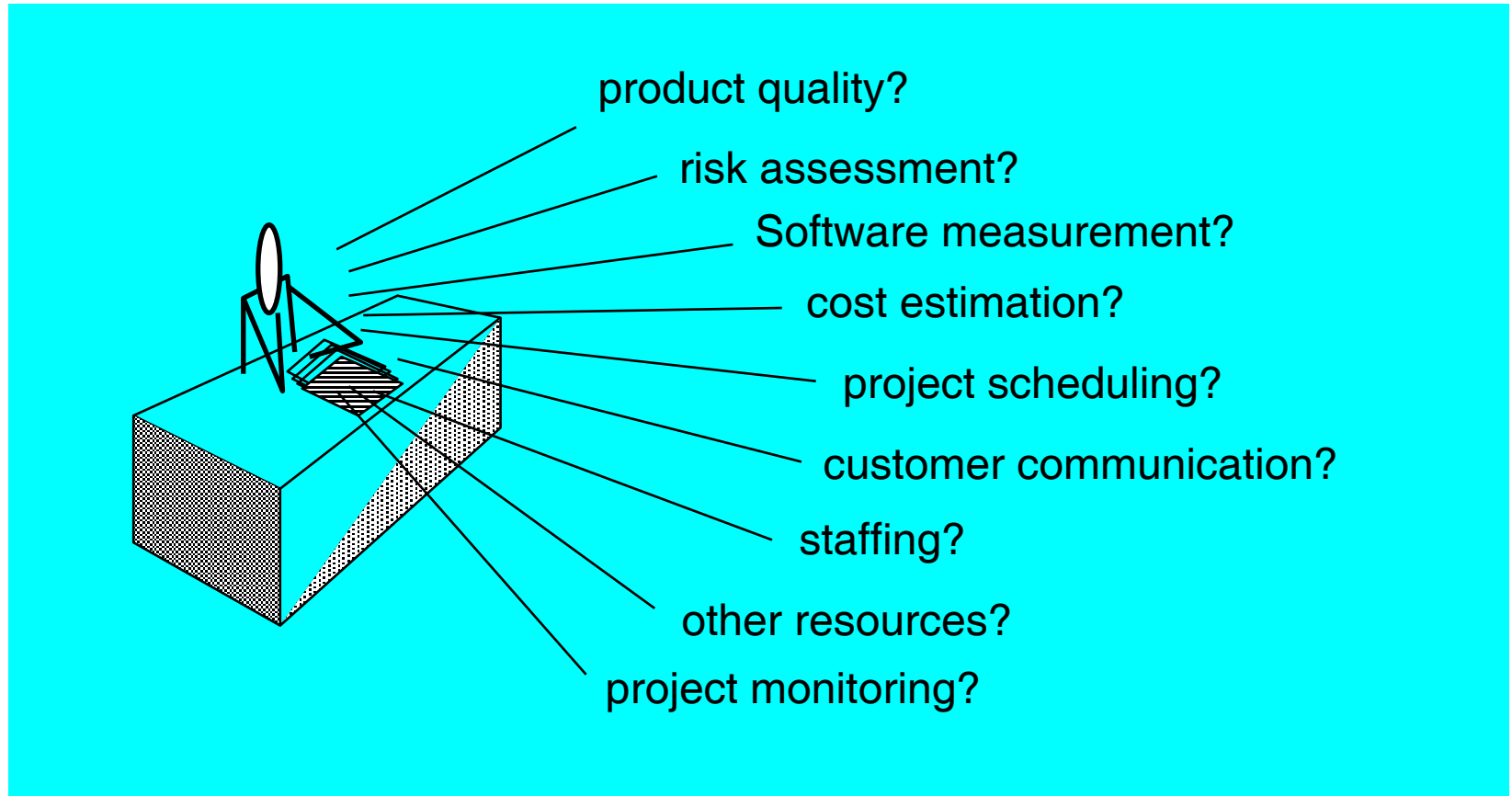
- **Good s/w project management**
 - ✚ Will not guarantee project success

- **Bad s/w project management**
 - ✚ Will certainly result in project failure !!!

Management Activities

- S/W manager responsibilities include:
 - ✚ **Proposal writing:** Objectives, methodology, deliverables, cost & schedule estimates
 - ✚ **Project planning and scheduling:** Goals, activities, resources, milestones
 - ✚ **Project costing:** Resources needed for activities
 - ✚ **Project monitoring and reviews:** Track actual versus planned cost and time
 - ✚ **Personnel selection and evaluation**
 - ✚ **Report writing and presentations**

Project Management Concerns



Project Staffing

- May not be possible to appoint the ideal people to work on a project
 - ✚ Project **budget** may not allow for the use of highly-paid staff
 - ✚ Staff with the appropriate experience may not be available
 - ✚ An organisation may wish to develop employee skills on a software project
- Managers have to work within these **constraints** especially when (as is currently the case) there is an international shortage of skilled IT staff

Project Planning – the 3 W's

- S/W project planning describes
 - ✚ project breakdown activities/tasks (WHAT)
Top Down approach
 - ✚ Resources needed to carry out activities/tasks (WHO)
 - ✚ Schedule the execution of activities (WHEN)

Project Planning

- Main software project plan that is concerned with **schedule and budget**
- Probably the most time-consuming project management activity
 - ✚ Continuous activity from initial concept through to system delivery.
 - ✚ Plans must be regularly revised as new information becomes available
- Various different plans may be developed to support the main software project plan that is concerned with schedule and budget

Types of Project Plans

| Plan | Description |
|-----------------------------------|---|
| Development process project plan | Describes project breakdown activities/tasks, resources needed, schedule of activities |
| Quality plan | Describes the quality procedures and standards that will be used in a project |
| Validation plan | Describes the approach, resources and schedule used for system validation |
| Configuration management plan | Describes configuration management procedures and structures to be used. |
| Maintenance plan | Predicts the maintenance requirements of the system, maintenance cost and effort required |
| Staff development plan (Training) | Describes how the skills and experience of the project team will be developed |

Project Planning Process

Establish the project constraints

Make initial assessments of the project parameters

Define project milestones and deliverables

while project has not been completed or cancelled **loop**

 Draw up project schedule

 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

Project Plan Structure

1. Introduction

- ✚ Project objectives – constraints (budget, time, etc.)

2. Project organisation

- ✚ People involved, roles

3. Risk analysis

- ✚ Projects risks, Risk reduction strategies

4. Resource requirements:Hardware and software

5. Work breakdown

- ✚ Activities, milestones, deliverables

6. Project schedule (3W: What activity, when, who)

- ✚ Activities dependencies, activities time, allocate people to activities

7. Monitoring and reporting mechanisms

- ✚ What management reports and when

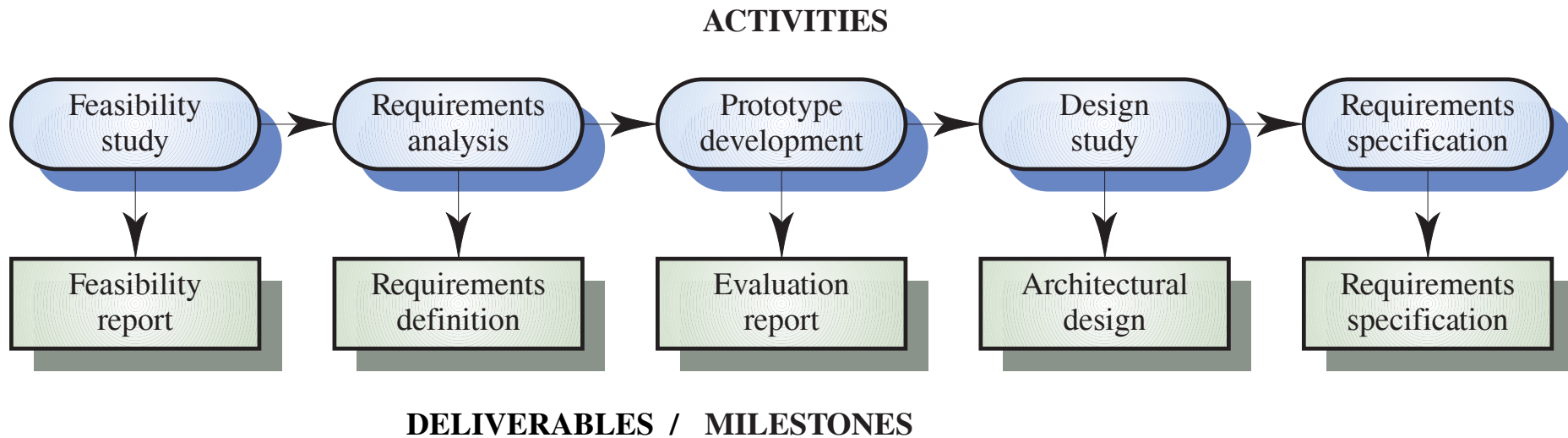
- ✚ Monitoring mechanism used

- ✚ ~~Revise plan, update schedule~~

Activity organization: Milestones & Deliverables

- Activities in a project should be organised to produce **tangible outputs** for management to judge progress
- **Milestones**
 - ✚ Check point based on :
 - Time
 - Budget
 - Deliverable
 - ✚ End-point of logical stage (activity) in the project
 - ✚ **Has no duration**
 - ✚ **At each milestone there should be a formal output** (report) presented to management
 - Management needs documentation & information to judge project progress
- **Deliverables**
 - ✚ Are project results delivered to customers
 - ✚ Deliverables are usually milestones but milestones need not be deliverables

Milestones Example: Requirements Engineering process (prototyping)

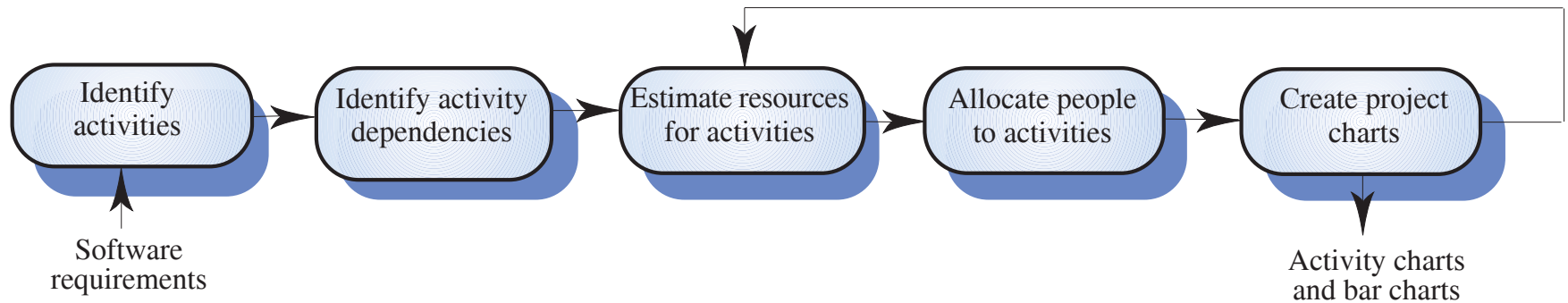


Deliverables are usually milestones

Planning

- Without a plan we do not know:
 - ✚ What we are going to do
 - ✚ How we are going to do it
 - ✚ How long it will take
 - ✚ The resources required
 - ✚ The cost
- **If you do not plan, you are planning for failure**

The Project Scheduling Process



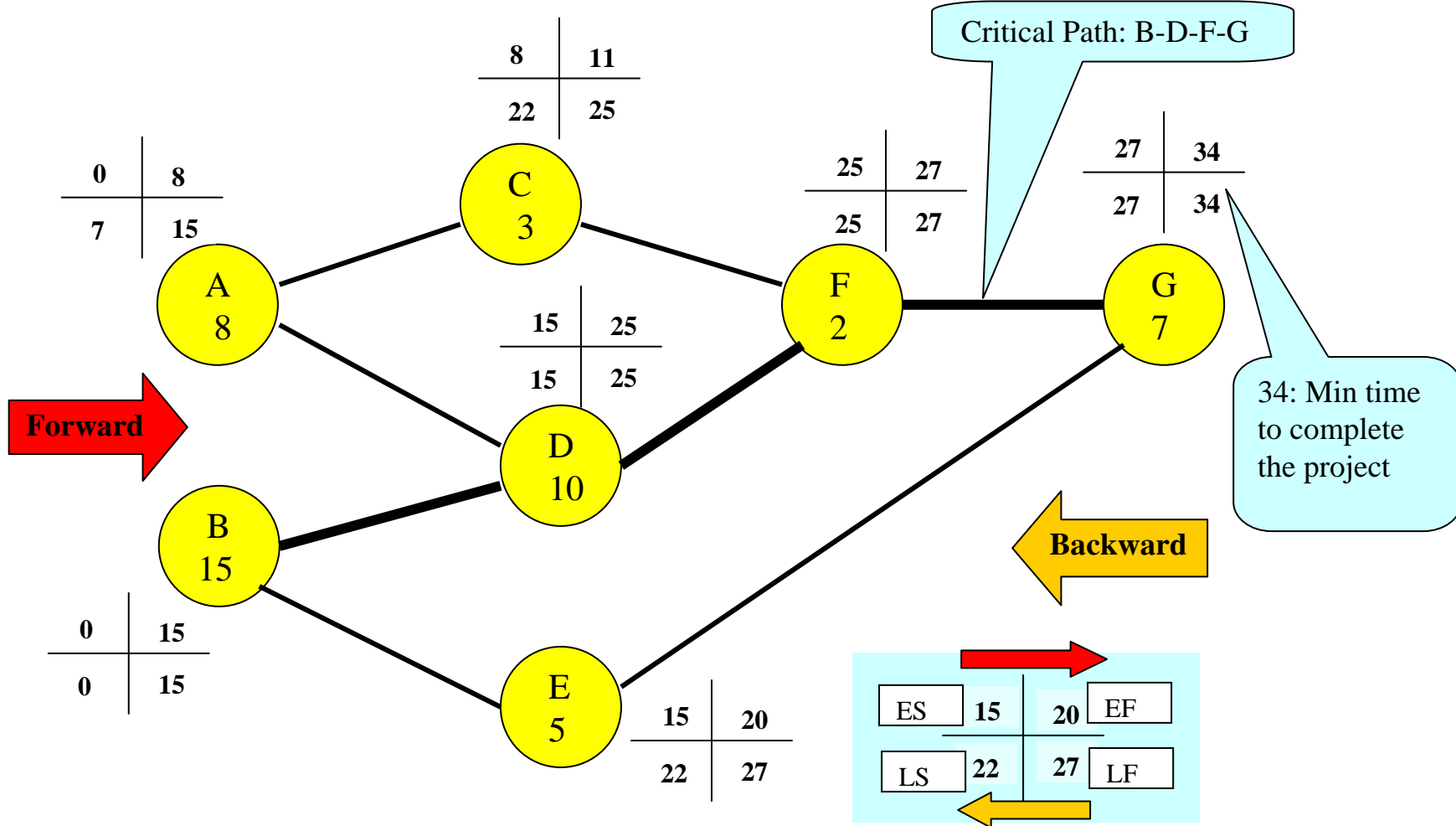
Project Scheduling

- Identify activities
- Estimate activity effort
- Estimate resources needed per activity
- An activity
 - ✚ At least one week duration
 - ✚ Maximum 8-10 weeks.
If greater subdivide into sub activities
- Increase your original estimate to cover anticipated & unanticipated problems
 - ✚ Add 30% for anticipated problems
 - ✚ Add 20% for ommissioning (unanticipated problems)

Project Precedence Table

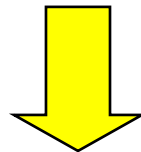
| Task | Duration (Weeks) | Precedence |
|----------|------------------|-------------|
| A | 8 | - |
| B | 15 | - |
| C | 3 | A |
| D | 10 | A, B |
| E | 5 | B |
| F | 2 | C, D |
| G | 7 | E, F |

Project Network – Critical Path



Project Precedence Table

| Task | Duration (Weeks) | Precedence | Earliest start | Earliest finish | Latest start | Latest finish | Slack |
|------|------------------|------------|----------------|-----------------|--------------|---------------|-------|
| A | 8 | - | 0 | 8 | 7 | 15 | 7 |
| B | 15 | - | 0 | 15 | 0 | 15 | 0 |
| C | 3 | A | 8 | 11 | 22 | 25 | 14 |
| D | 10 | A, B | 15 | 25 | 15 | 25 | 0 |
| E | 5 | B | 15 | 20 | 22 | 27 | 7 |
| F | 2 | C, D | 25 | 27 | 25 | 27 | 0 |
| G | 7 | E, F | 27 | 34 | 27 | 34 | 0 |

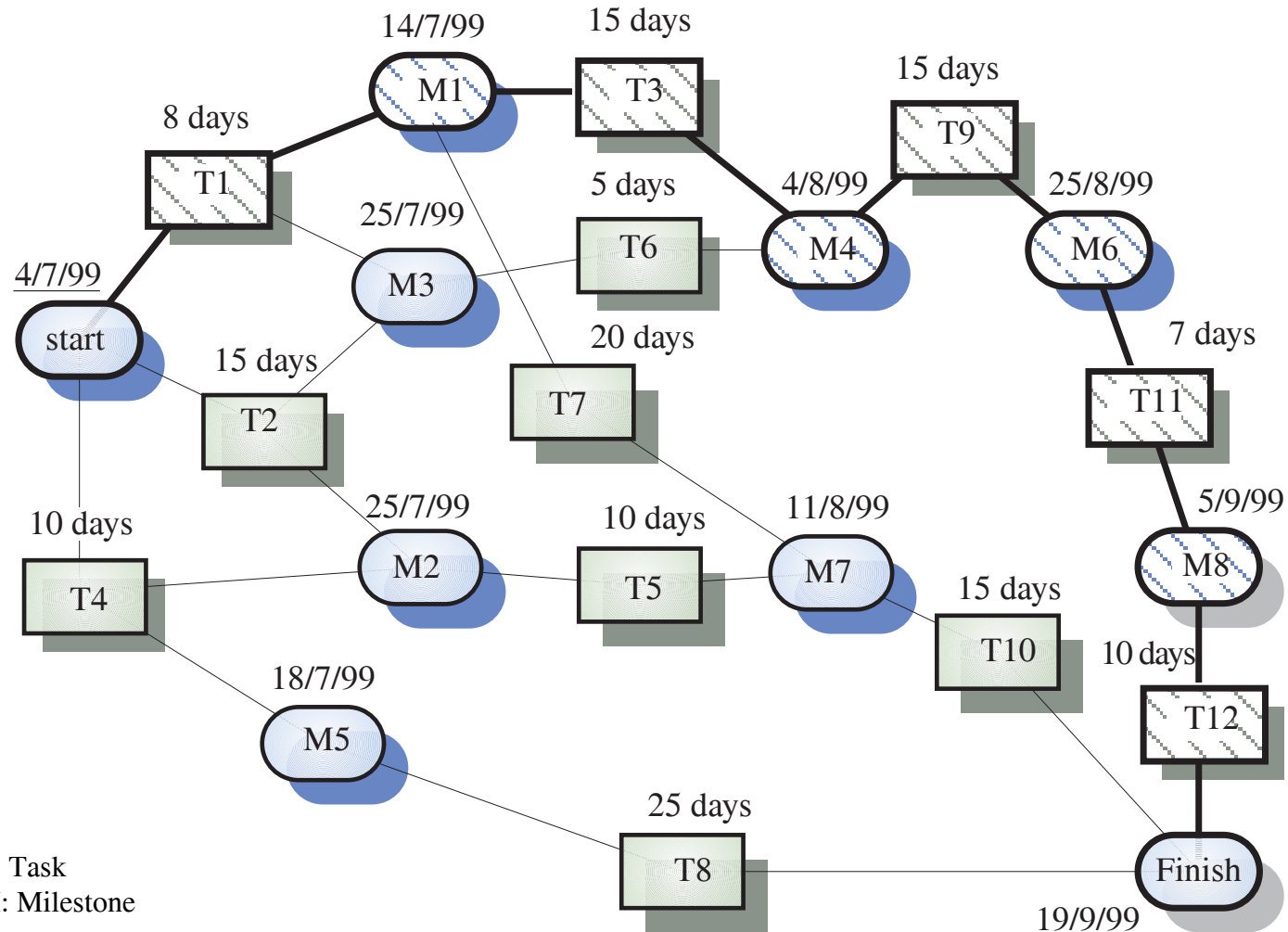


Critical task

Task durations and dependencies: Precedence Table

| Task | Duration (days) | Dependencies (Precedence) |
|-------------|------------------------|-------------------------------------|
| 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 (Task dependency)



The PM Field

Professional Organizations

- ✚ Project Management Institute (PMI) (pmi.org)
 - ✚ Software Engineering Institute (SEI)
 - ✚ IEEE Software Engineering Group
-
- Certifications
 - ✚ PMI PMP
 - The “PMBOK” – PMI Body of Knowledge

PM Tools: Software

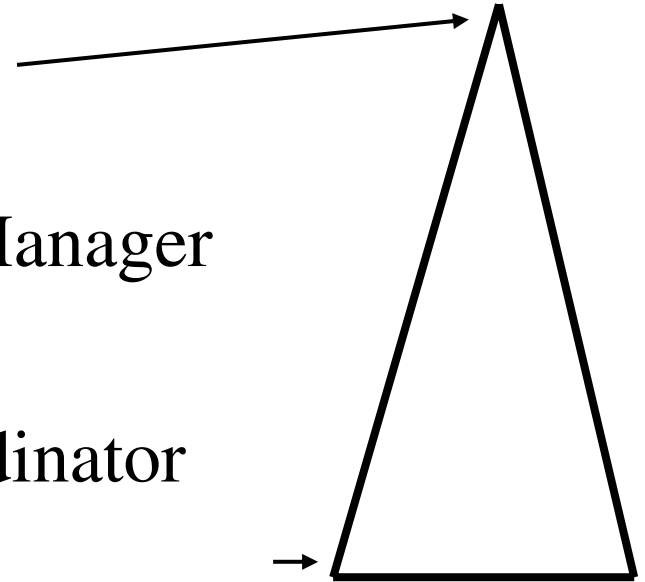
- PM software survey ‘1999’:
 - ✚ Describes & compares more than 200 software tools
- PM resources:
 - ✚ See ‘www.allpm.com/links/products’
- Software Tools
 - ✚ MS Project, Time Line, Primavera, ...

PM Tools: Software

- Low-end
 - + Basic features, tasks management, charting
 - + MS Excel, Milestones Simplicity
- Mid-market
 - + Handle larger projects, multiple projects, analysis tools
 - + MS Project (approx. 50% of market)
- High-end
 - + Very large projects, specialized needs, enterprise
 - + AMS Realtime
 - + Primavera Project Manager

Project Manager Positions

- V.P. Program Development
- Executive Program Manager
- Project Manager / Program Manager
- Assistant Project Manager
- Project Administrator / Coordinator



The Project Management (PM) Field

- Professional Organizations
 - ✚ Project Management Institute (PMI) (<http://www.pmi.org>)
 - ✚ Software Engineering Institute (SEI)
 - ✚ IEEE: Software Engineering Group
- Certifications
 - ✚ PMI PMP
- The “PMBOK” – PMI Body of Knowledge

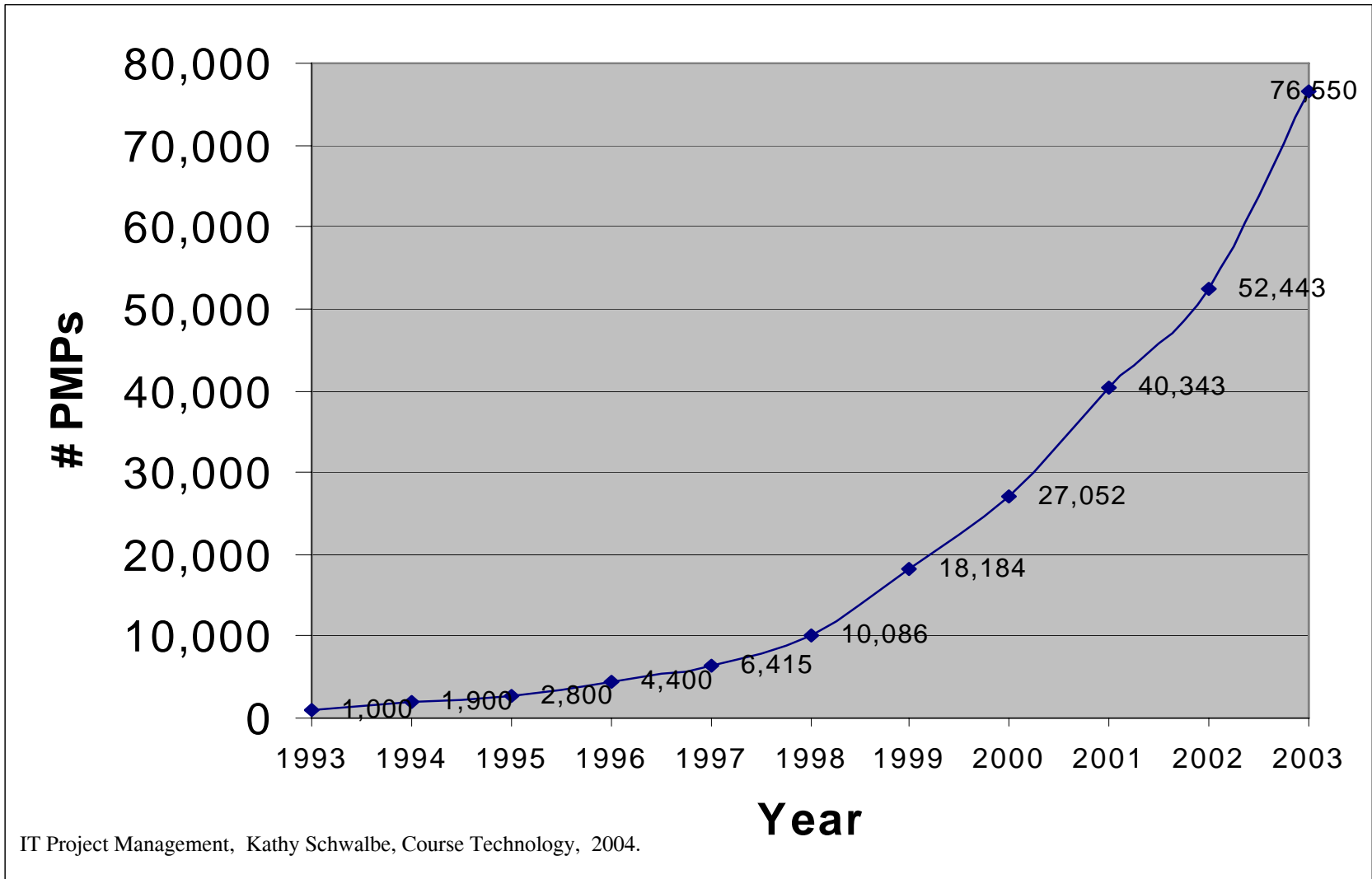
Project Management Body of Knowledge (PMBOK) Guide

- PMBOK Guide is
 - ✚ approved by the American National Standards Institute (ANSI),
 - ✚ recognized by the Institute of Electrical and Electronics Engineers (IEEE) as an IEEE standard,
 - ✚ used as an underlying reference in an International Organization for Standardization (ISO) Technical Report on managing software projects.
- PMBOK Guide is similar to the IEEE's "Guide to the Software Engineering Body of Knowledge (SWEBOK)," which focuses on the software engineering profession.

PM Certification

- In 2003, Average senior PM salary: \$90,000 per year !!
- **PMI certification** adds average 14% to salary
- Progress in PMI # of certs:
 - ✚ Year 1993: 1,000 certs
 - ✚ Year 2004: 81,913 certs

PMP Certification, 1993-2003



IT Project Management, Kathy Schwalbe, Course Technology, 2004.