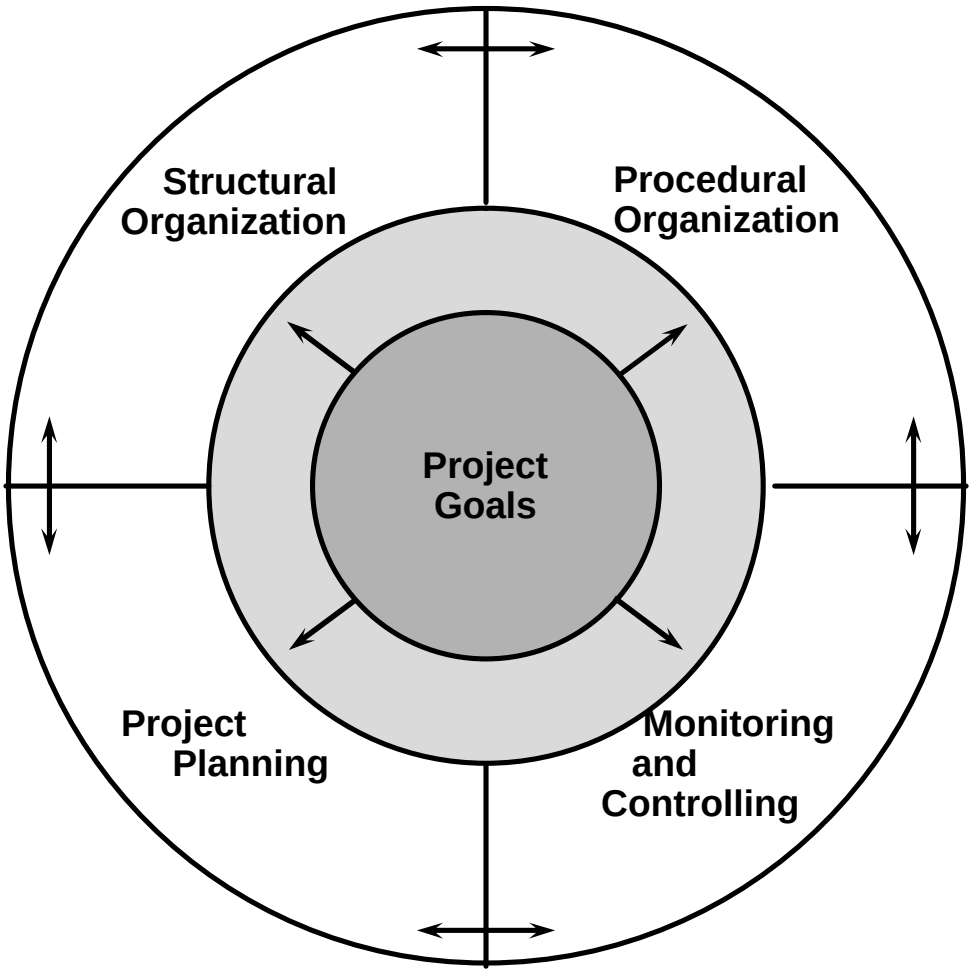
SIEMENS

Corporate Technology



Joint Advanced Student School (JASS 2004)

State University St. Petersburg –Technische Universität München

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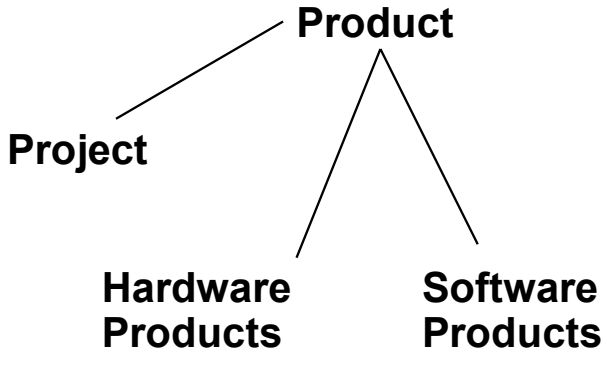
Project Management

Overview

Project

- Specific Goal
- Limited Resources
- Defined End Date

- Unique
- Complex
- Risky
- Dynamic
- Inter-disciplinary

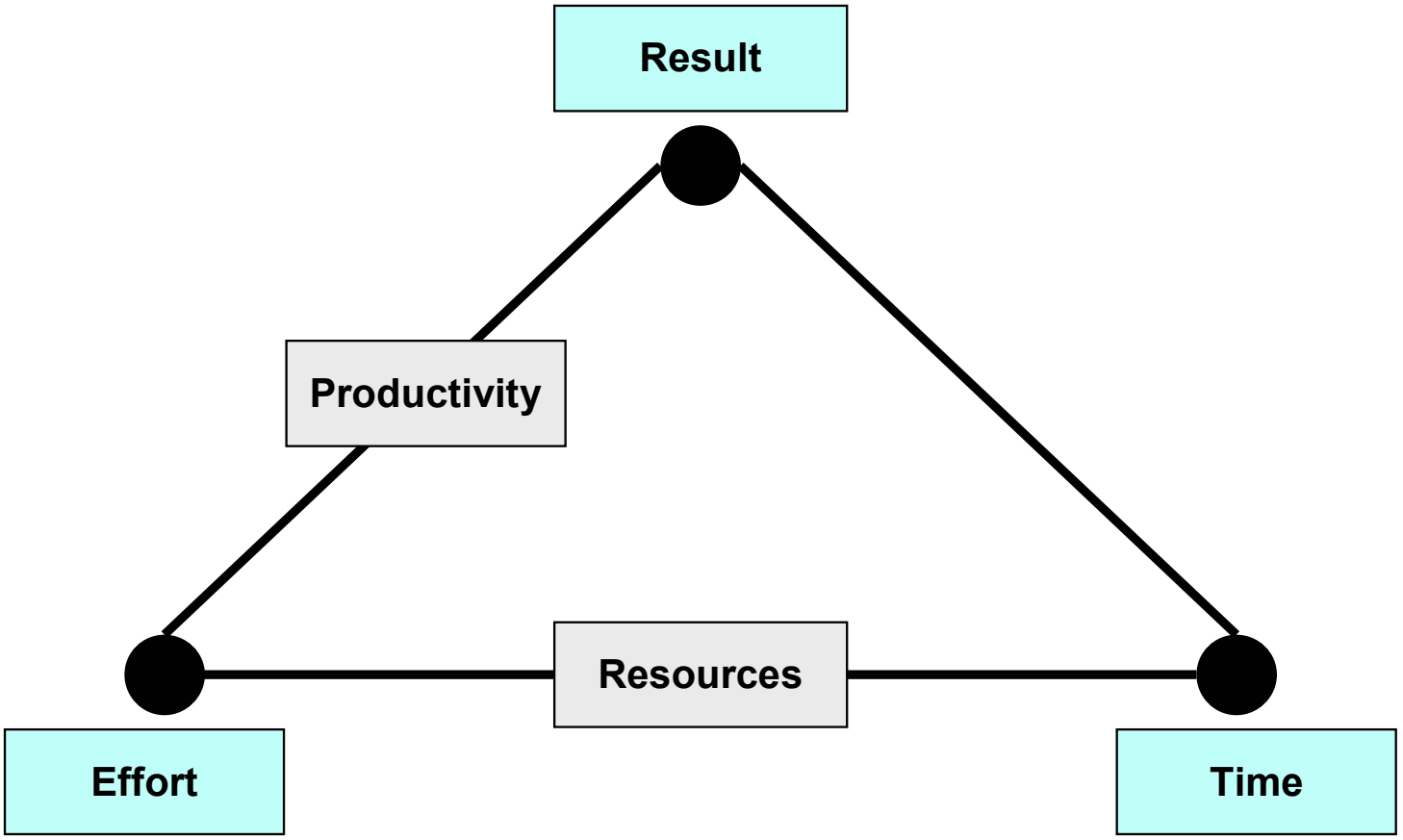


Characteristics of a Project

- Objectives not clearly defined when project begun
- Methods/operations still being planned
- High innovation level
- Frequent changes
- Tight deadlines
- Predefined resource capacities
- Cross-functional collaboration
- Creative flexibility required

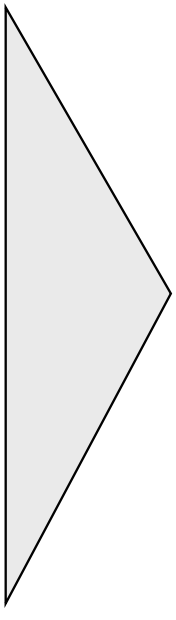
- Responsibilities, information paths and decision process not sufficiently defined
- No clear-cut definition of the work to be done
- Requirements not sufficiently investigated
- New demands change / endanger the original project goals
- Illusive deadlines (wishful thinking)
- Rough cost estimates
- Deviations (results, deadlines, costs) from project objectives perceived too late
- Problems solved when they occur: People react when it is too late
- Slip-ups "caused" by "unforeseeable" technical constraints

(Source: Reschke, Svoboda, 1983)



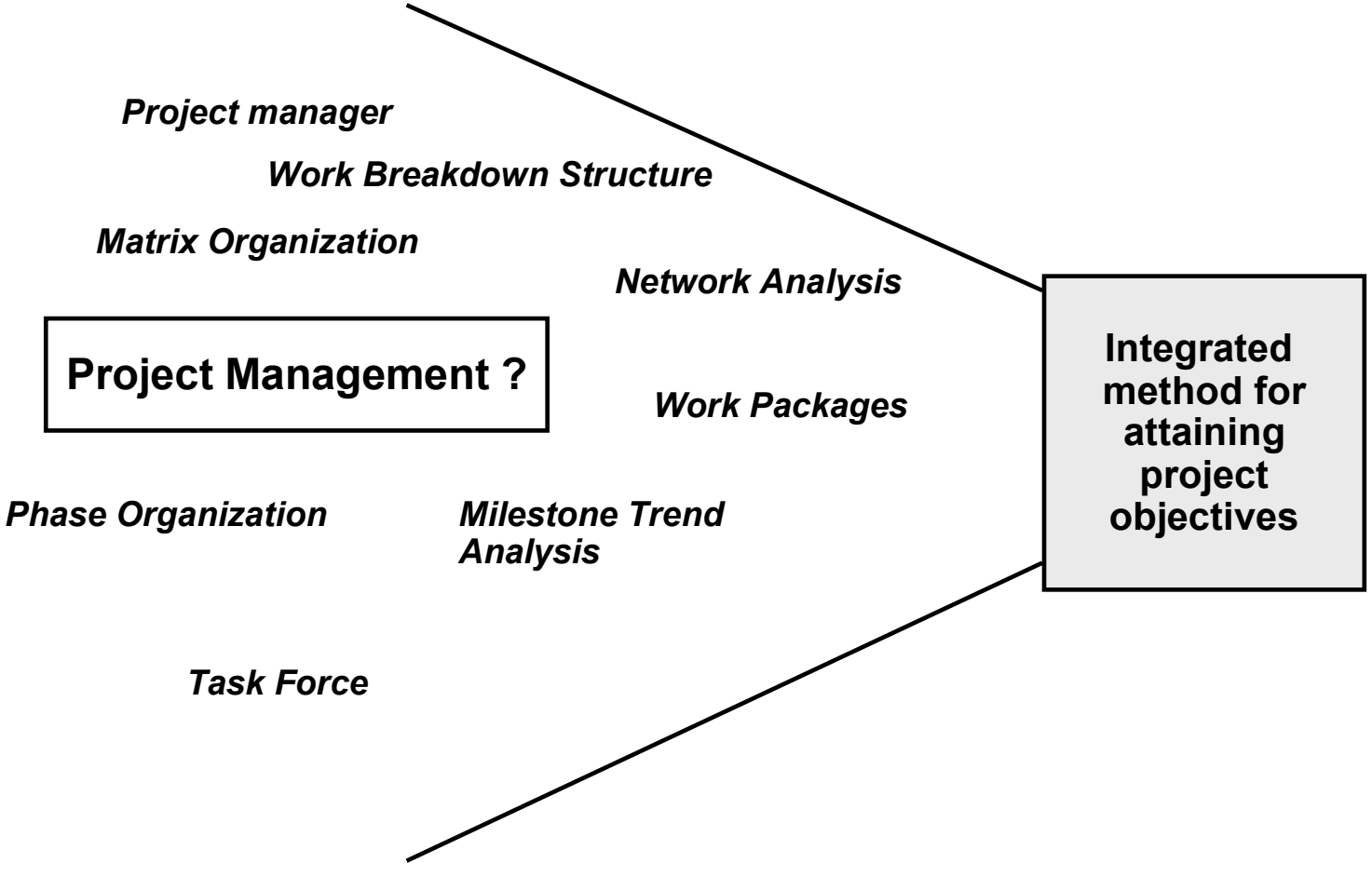
The "Magic Triangle"

- Achieve project objectives
- Minimize risks
- Attain level of quality required
- Reduce turnaround time
- Stay within budgeted costs
- Continuous transparency
- Dependable information



How can these goals be attained?
Project management

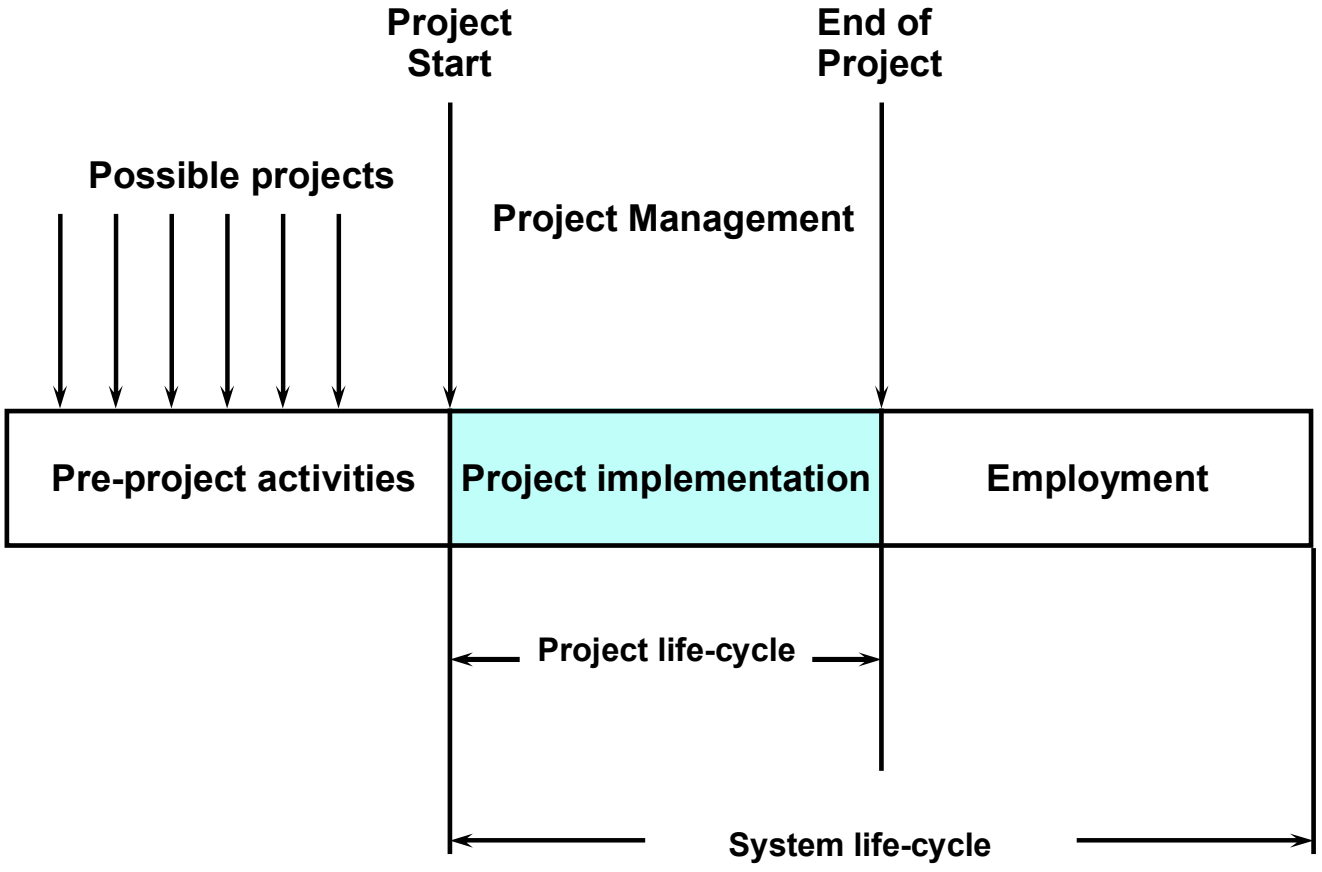
Goals for a Successful Project

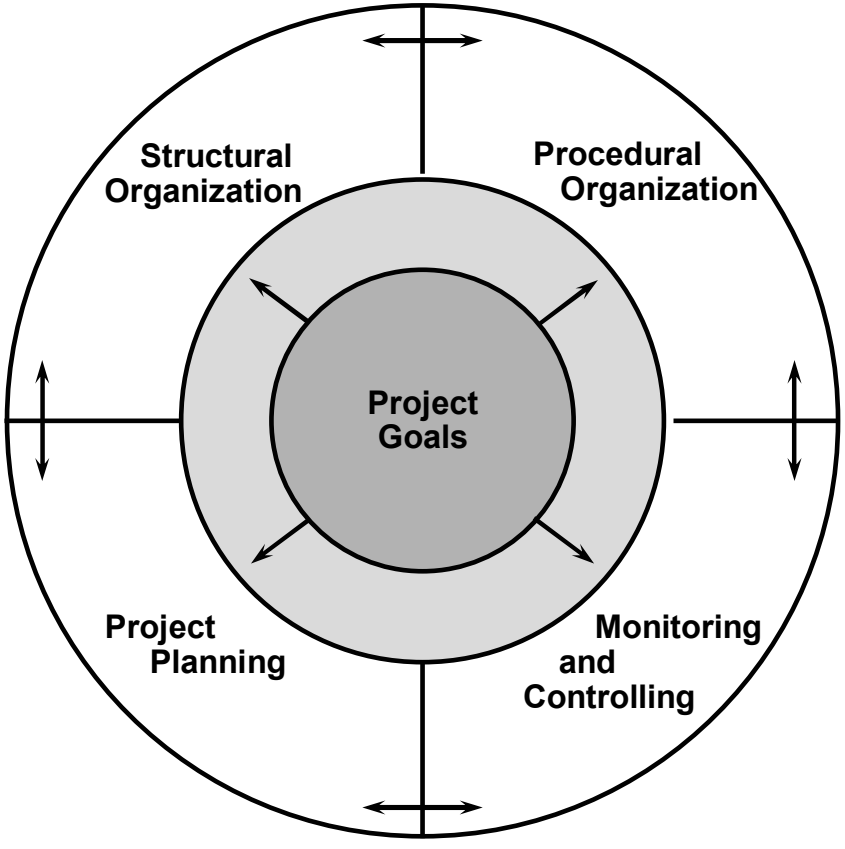


Integrate:

Management tasks	**– Define goals** **– Maintain goals** **– Make decisions**
Management functions	**– Project planning and coordination** **– Project monitoring**
Management techniques	**– Motivation techniques** **– Discussion methods** **– Presentation methods** **– Decision-making techniques**
Management methods	**– Product / project structure planning systems** **– Time / Resource / Cost analysis and controlling systems**

Definition of Project Management (DIN 69 901)





Structural Organization
- Project Functions
- Project Organization
- Project Committees

Procedural Organization
- Milestones and Phases
- Phase Organization
- Configuration Management

Defining Project Goals
- Project Goals
- Requirements

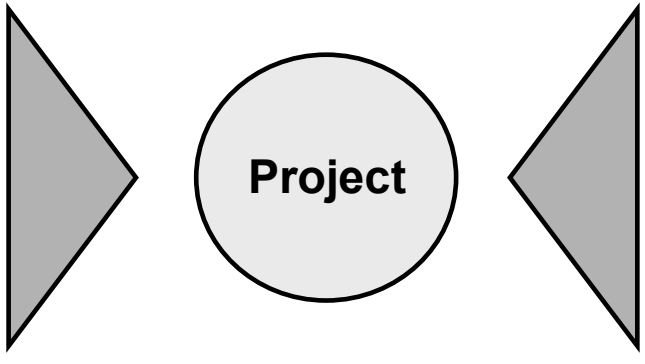
Planning
- Structure Planning
- Effort Estimation
- Sequence Planning
- Scheduling

Project Monitoring and Controlling
- Project Reporting
- Project Review
- Control Measures

Components of Project Management

Increasing product requirements!

- Complexity
  - Size
  - Integration
- Innovation
- Quality

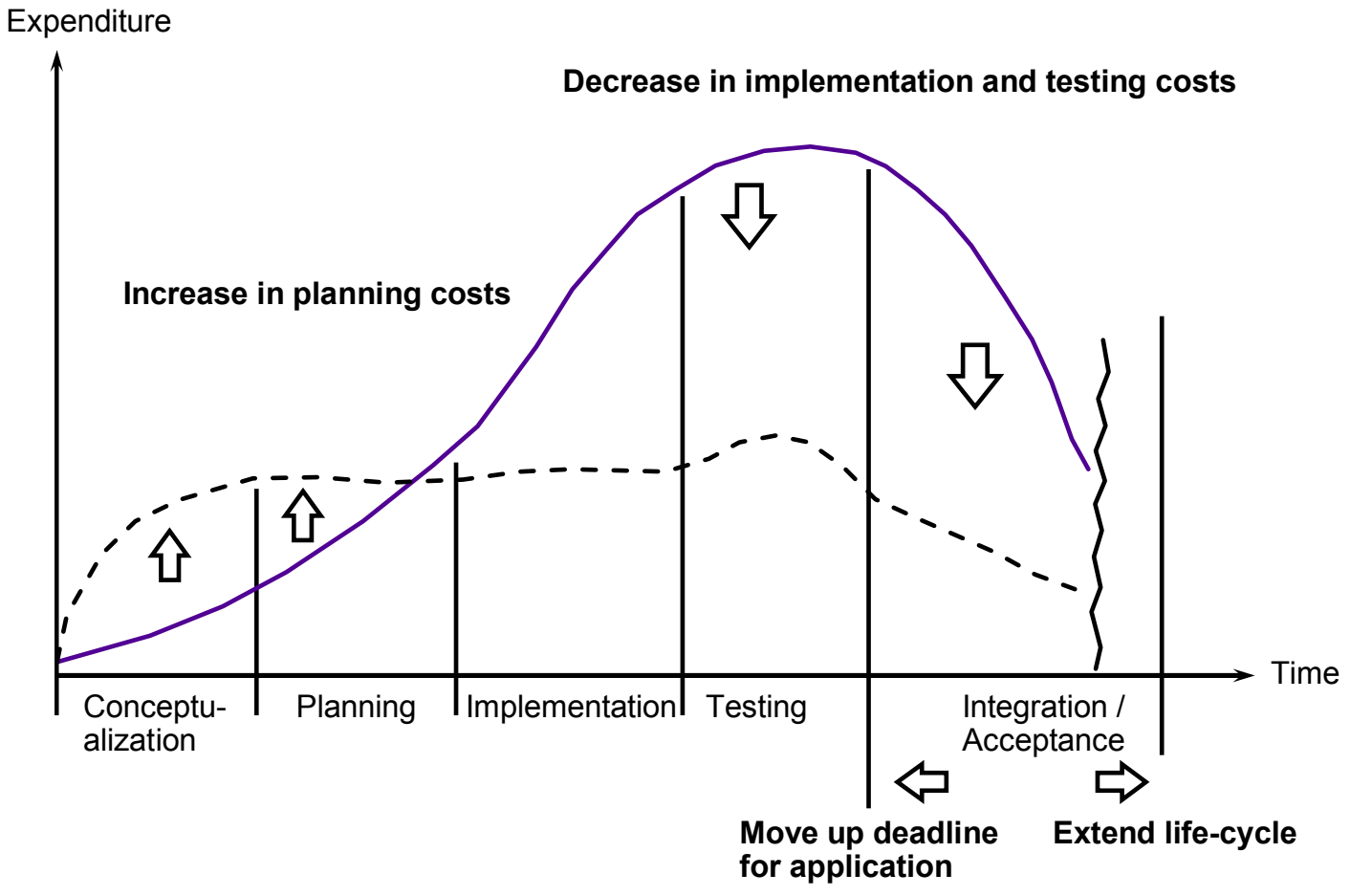


Increasing project requirements!

- Time
- Resources
- Productivity
- No. of participants

Mastering the complexity!

Demands Placed on Projects



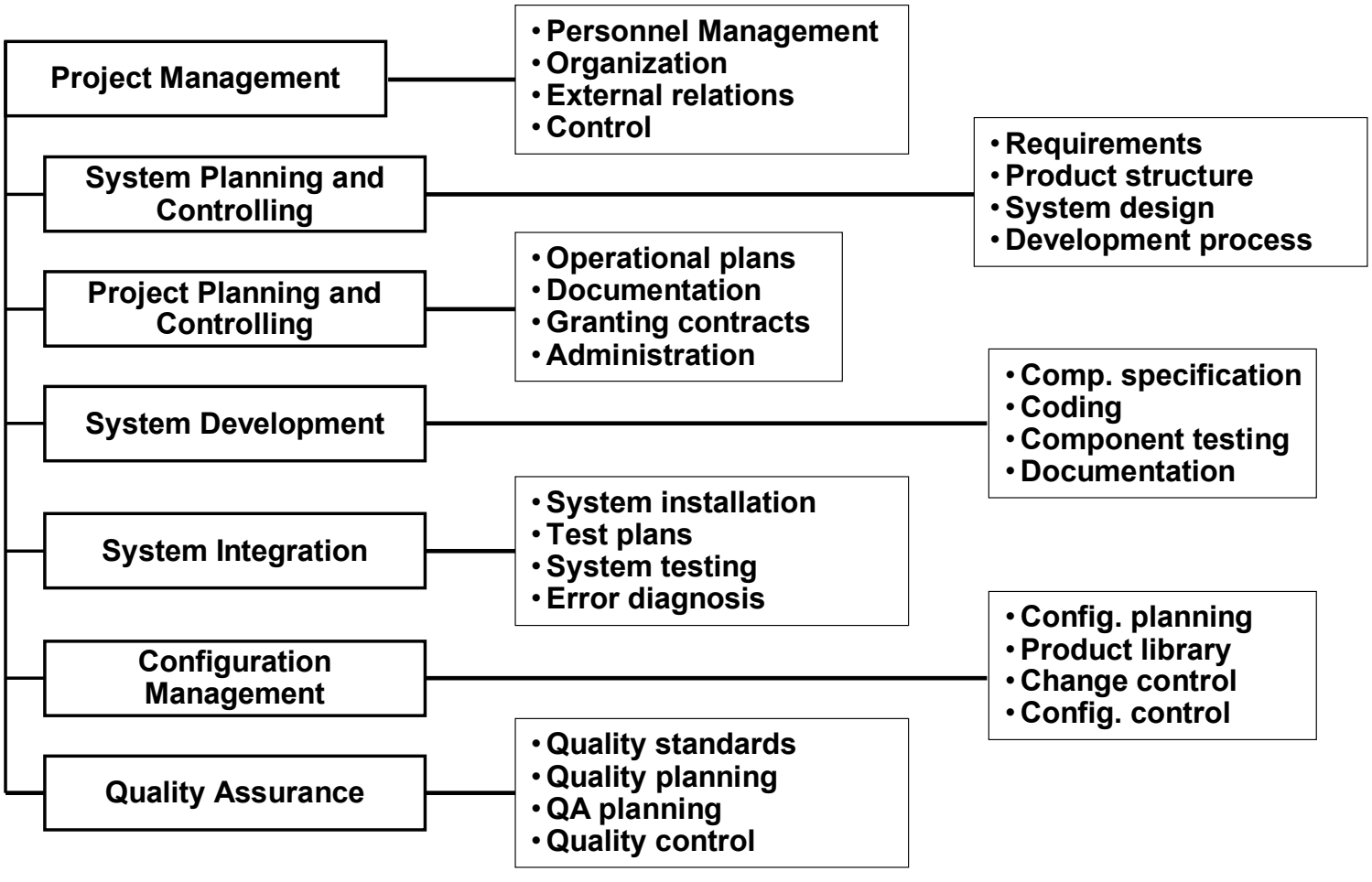
Life-cycle Costs for Software Projects

- Clear-cut, acceptable and realistic project objectives
- Tailor-made project organization for specific project RQ
- Personal responsibility
- Subdivide tasks into discrete manageable packages
- Intensive communication between all project participants
- Maintain flexibility in task
- Motivated and goal-conscious staff
- Sufficient know-how

Organization

1 Project Functions

2 Organizational Structures



Project Organization Chart (Project Functions)

Project Management

- Clarify project objectives and marginal conditions; define internal objectives for the project,
- Control over achievement of objectives,
- Definition of the structural and procedural organization,
- Delegate tasks; award sub-contracts,
- Coordinate all departments involved in project,
- Procurement (Resources, personnel),
- Personnel management,
- Decisions concerning alternative solutions / methods,
- Set priorities for development activities,
- Define release process (planning and development),
- Management information,
- Communication with the customer,
- External representation (project representative, promotion & marketing).

Project Manager

- **is personally responsible for attaining project objectives by**
  - **Fulfilling technical objectives**
  - **Adhering to deadlines**
  - **Maintaining planned costs**
- **must be vested with adequate rights and authority in respect to:**
  - **Authority to make decisions, give orders, and monitor activities within the project**
  - **Control of the project's budget**
  - **Right to delegate assignments or tasks**
  - **Authority to access all information necessary for carrying out the project**

Rights and Responsibilities of the Project Manager

System Planning and Controlling

- Analyze the technical requirements (Requirements Engineering),
- Define and analyze the technical problems to be solved and break them down into sub-problems (work packages),
- Formulate and assess alternative ways of accomplishing objectives,
- Perform a feasibility study,
- Draft a comprehensive system design,
- Specify internal and external system interfaces,
- Define product hierarchy (structure charts),
- Plan configurations, components to be delivered, and versions (strictly coordinated with configuration management),
- Define detailed development plan (organization, scheduling, etc.),
- Select the development tools to be used,
- Specify the project control plan (QA and test plans),
- Specify technical guidelines for design, implementation, tests, documentation, administration, etc.,
- Monitor staff compliance to standards (guidelines, interfaces, etc.),
- Define sub-tasks in detail.

Project Planning and Controlling *

- Plan Project's Work Breakdown Structure,
- Define work packages,
- Detailed development plan (detailed development of milestones & work packages, network chart),
- Define development contract with sub-contracts,
- Plan and monitor the following:
  - Technical performance (final results and intermediate results) to be strictly coordinated with system planning and quality assurance,
  - Resources (personnel, computer time, etc.),
  - Deadlines,
  - Costs,
- Documentation / reports (results, costs, deadlines),
- Contract management.

* In small projects these tasks are usually performed by the project manager

System Development

- Define and analyze requirements placed on the sub-systems,
- Project planning and design of sub-systems / components,
- Develop and test models, prototypes,
- Perform simulations, trial runs, experiments,
- Detailed specification,
- Implement components (modules, module groups) with technical descriptions and affiliated documentation,
- Test the components,
- Make necessary changes and corrections,
- Develop manuals (user documentation).

System Integration and Testing

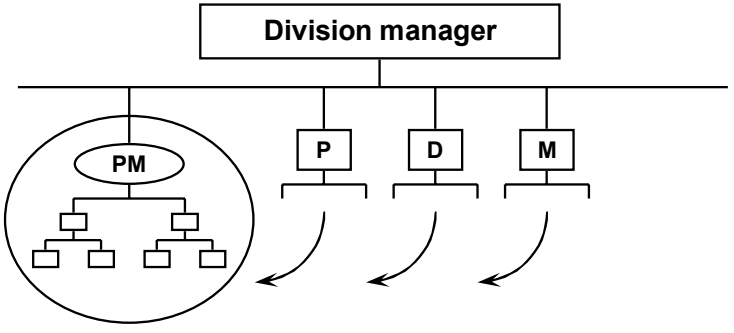
- Test plans (test drivers, test procedures, test tools, test data, test cases)
- Plan and complete the test systems for integration test, system test and regression test,
- System integration: Integrate the sub-systems into the overall system,
- Integration test: Test if the integrated system functions properly,
- System test: Verify if the integrated system satisfies the system requirements,
- Regression test: Test the previously verified system for effects caused by correcting errors, extensions and changes.

Configuration Management

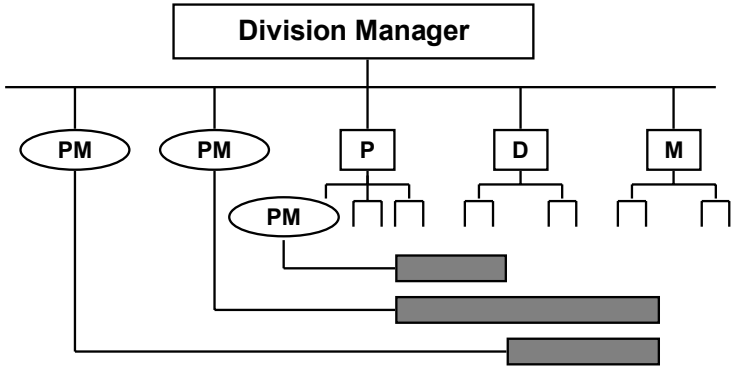
- Administrate the development results (systems, sub-systems, elements, structures, documents, etc.) and project data in a project library
- Error message and change control: Account for and control change requests and diagnostics,
- Define necessary controls or limitations for changes to system,
- Maintain and assemble components for system integration and system test,
- Release and distribute completed systems,
- Analyze the project library, status accounting.

Quality Assurance

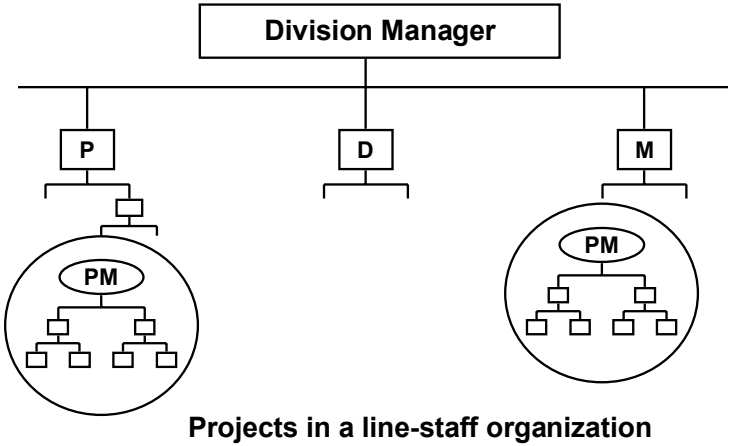
- Define quality objectives and requirements,
- Strategic quality planning:
  - Objects: Documents, code, tools, etc.
  - Procedures: Development Document Control (DDC)
    Structured Walk Through (SWT)
    Code Review, etc.
  - Criteria: Functional performance (requirements), reliability,
    Customer satisfaction (user friendly), performance, etc.
  - Dates: End of phase, milestones, etc.
- Perform quality audit,
- Quality control reports:
  Document effects of quality assurance improvement measures.



Projects in a pure project organization



Projects in a matrix organization



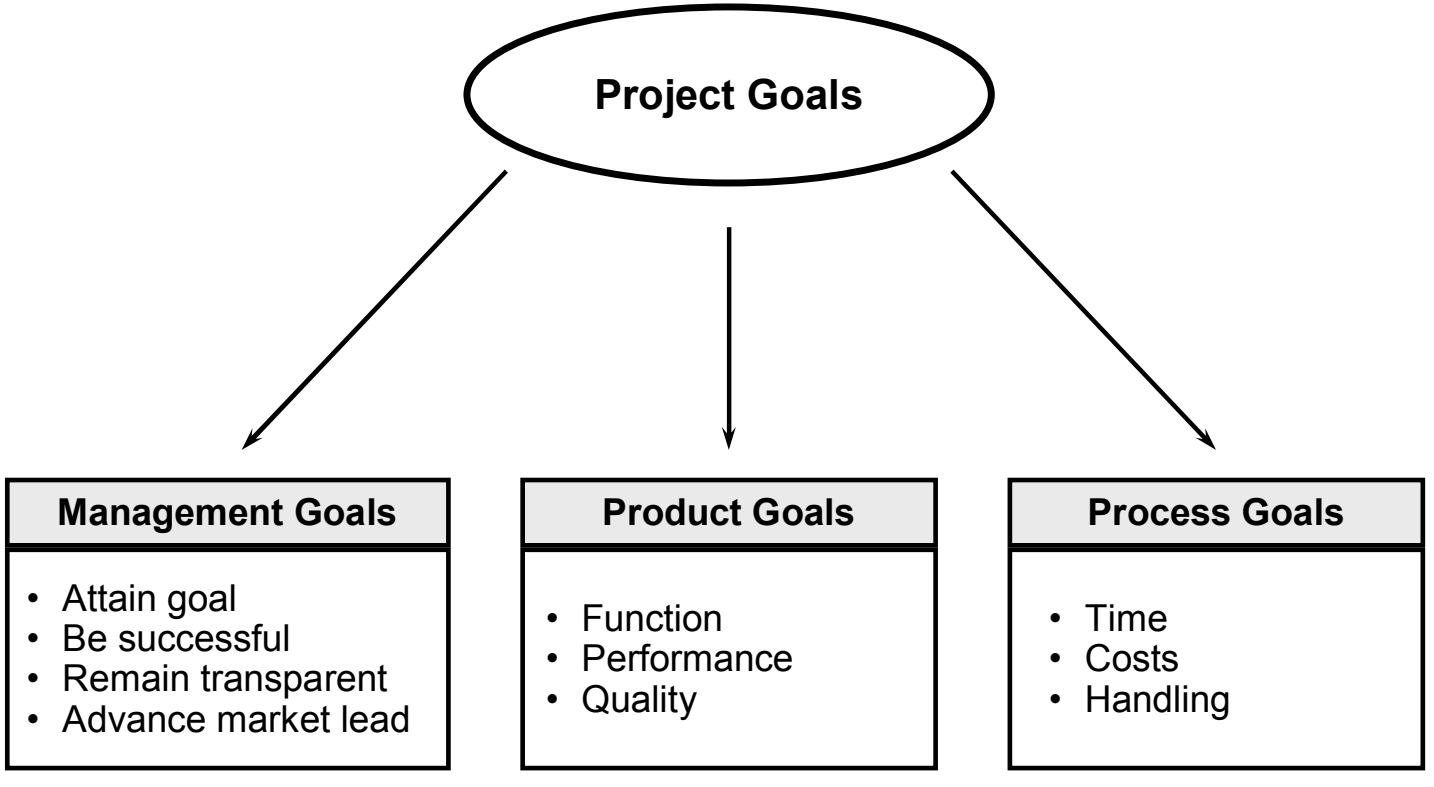
Projects in a line-staff organization

Organizational Structures

• **Projects in a line-staff organization**	• Project within one specific (project) line • No / very few cross-departmental tasks; little interface between organizational units • Project manager usually team / laboratory supervisor • Application areas: small, isolated projects or sub-projects
• **Matrix organization form**	• Cooperative project made up of several groups within a product line and / or temporary groups; several sub-projects • Cross-functional (groups / laboratory) effort; numerous interfaces between organizational units • Project manager: (project) line manager or member of a group not connected with the project line • Application areas: middle-size or large projects
• **Pure project organization**	• Project within a specially-created, independent organizational unit (a division within a division) made up of one or more temporary project groups • Clear-cut, well-defined tasks; little interface between organizational units • Project manager is also the manager of the organizational unit • Application areas: small, middle-size or large projects; often used in high-risk projects

Comparison of Organizational Structures

Project Goals



Project Goal Classifications

1. Objectives

- 1.1 Define target product
- 1.2 Targeted market
- 1.3 Competition
- 1.4 System environment
  - 1.4.1 Hardware environment
  - 1.4.2 Software environment

2. Product Requirements

- 2.1 Design methods
- 2.2 Process operations
- 2.3 Technical functions
  - 2.3.1 Cell components
  - 2.3.2 Gate arrays
  - 2.3.4 User interface
  - ..
  - ..
- 2.4 Quality
  - 2.4.1 Reliability
  - 2.4.2 Time factors
  - 2.4.3 Performance factors
  - 2.4.4 Serviceability
  - 2.4.5 Portability
- 2.5 Documentation

3. Project implementation

- 3.1 Deadlines
- 3.2 Costs, expenditures
- 3.3 Project organization

Structure of a Requirements Catalogue (Example)

Requirements

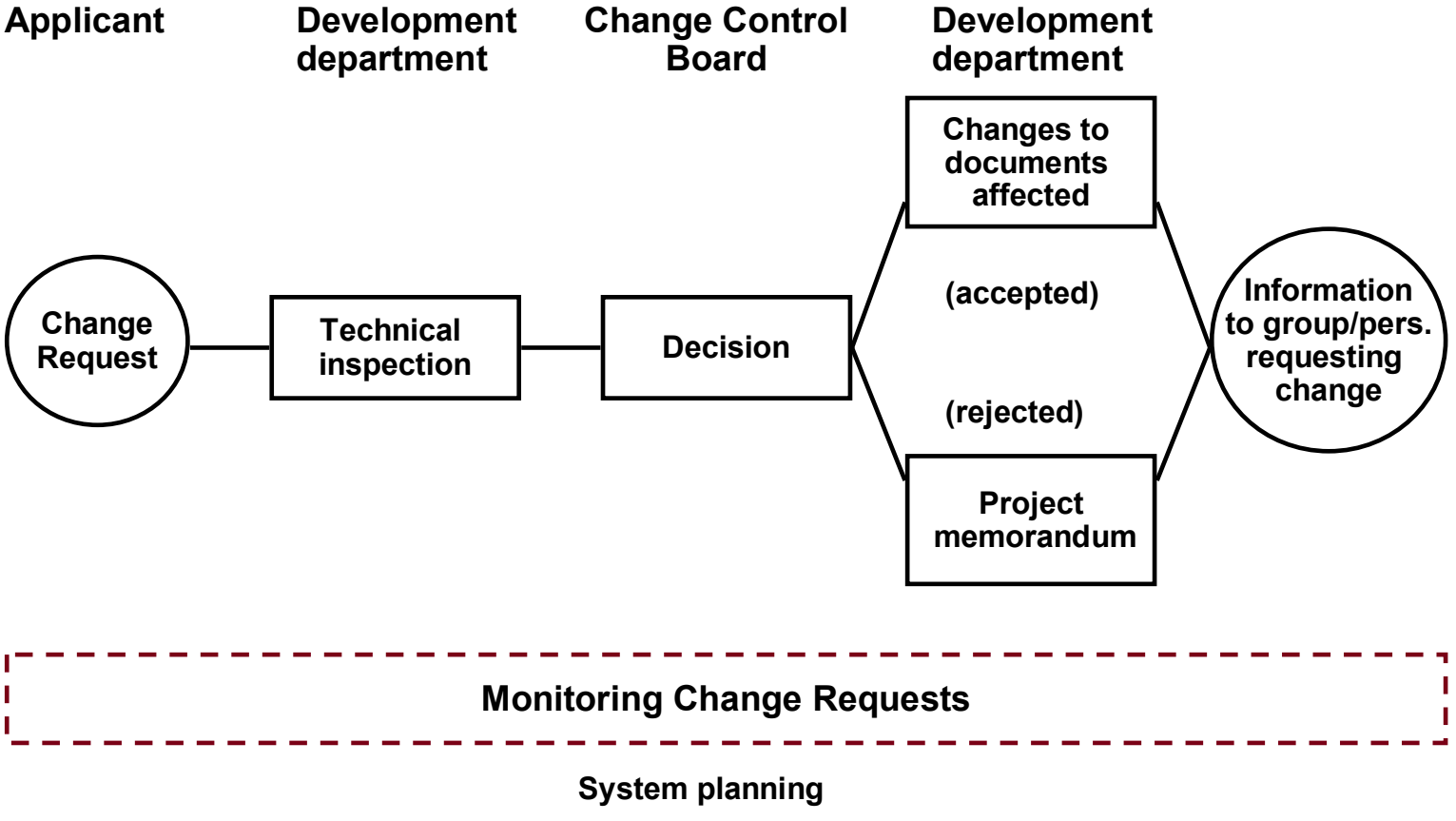
- are the demands placed on the product / project / process from the user's / customer's standpoint
- form the basis for agreements with the customer
- are dealt with by the customer and the development department
- formal responsibility for them borne by the development department
- content, controls or limitations accepted by customer and development department
- are handled in the beginning phases of the project
- constitute initial basis for development efforts

- Changes to development results cannot be avoided
  - Changes to originally formulated concept
  - New considerations in product development
  - Errors during product development

- The objective of formalized change control (Change Requests) is to maintain consistency in the developed system

- Changes apply to defined development results (Baselines) and affect
  - Present process-phase
  - Previous baseline results (backtracking)
  - Subsequent baseline results

- Changes are made as single solutions or are added as components in new (or revised) versions



Change Request Procedure

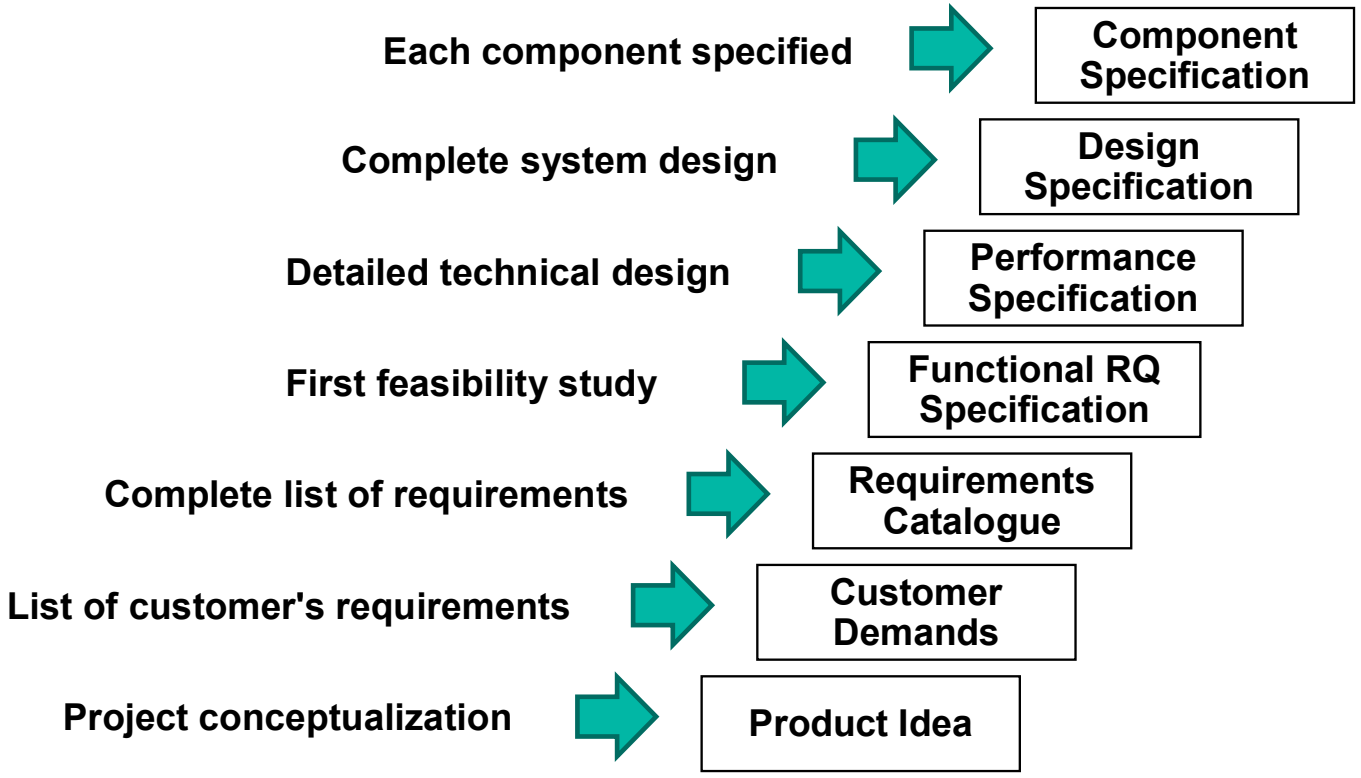
Phase Organization

- Milestones specify
  - Controlled (intermediate) results and
  - Completion dates

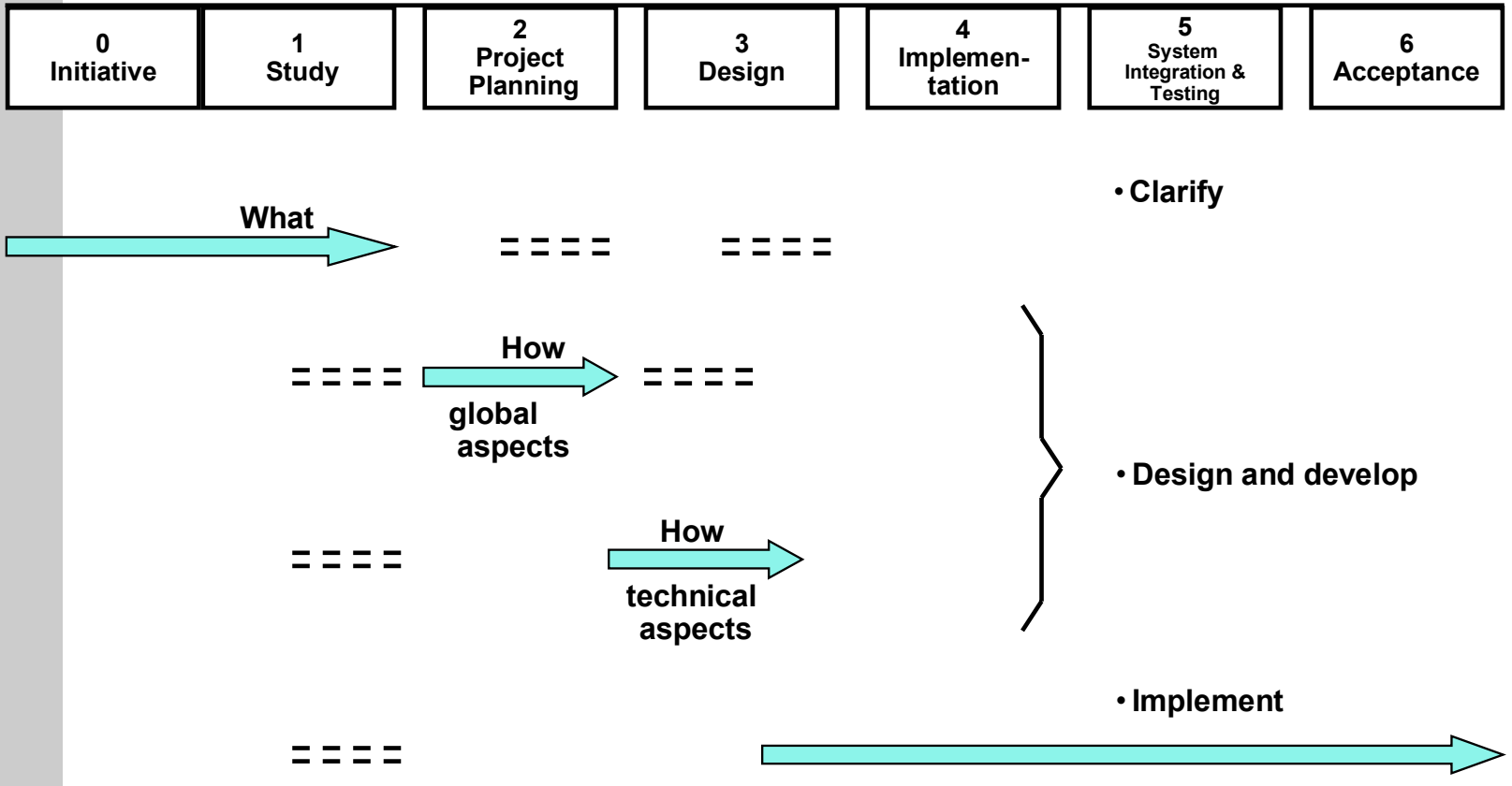
- A milestone should be:
  - essential
  - checkable
  - transferable
  - deliverable
  - fixed
  - predefined

- Milestones are specified during the planning stage of the project

- What is the problem?
- What are the objectives?
- What are the possible solutions?
- Which solution should be selected?
- How can the solution be implemented?
- Design and develop the components
- Component integration
- Overall system testing
- System installation
- System operations and maintenance

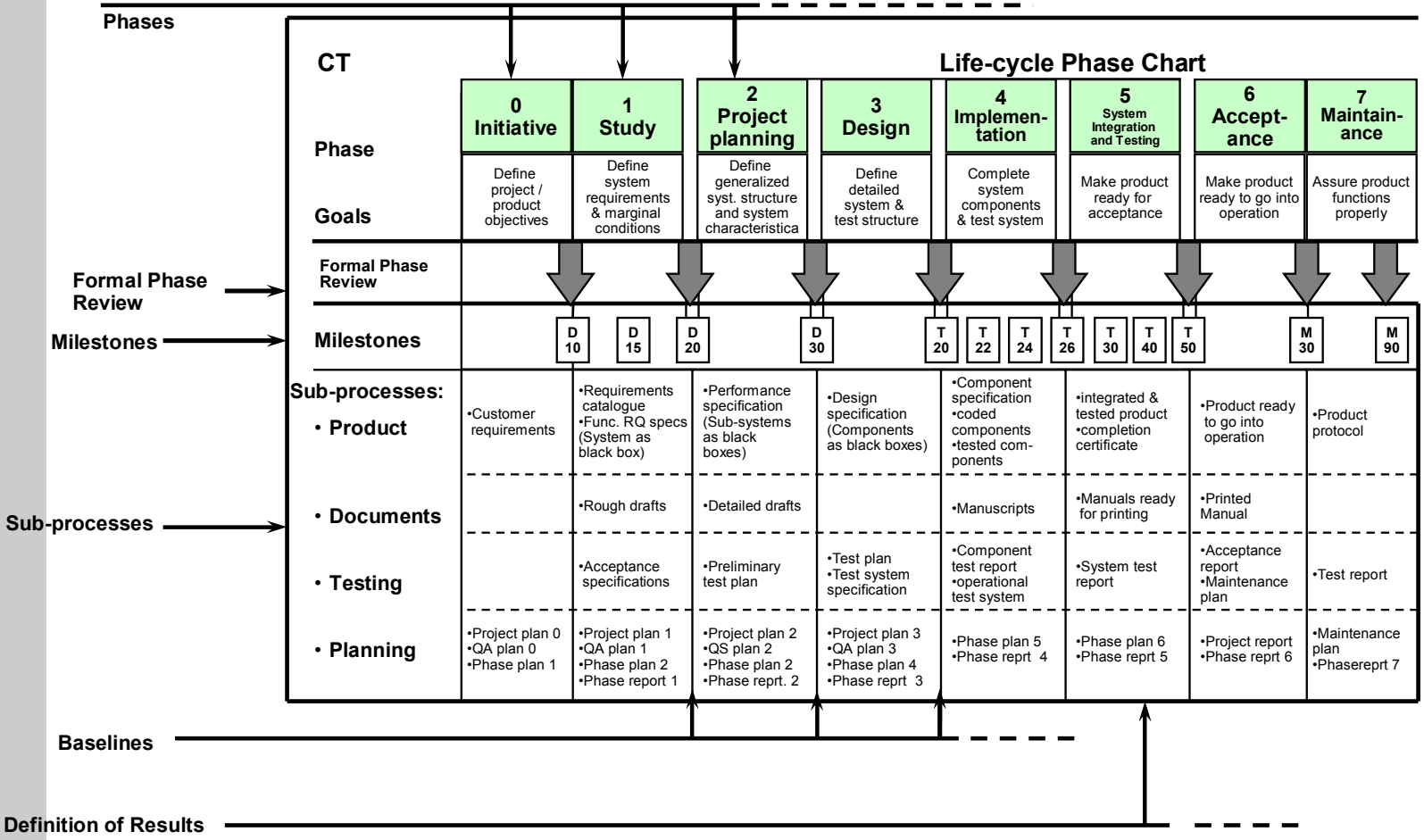


Sequence of Design Documentation

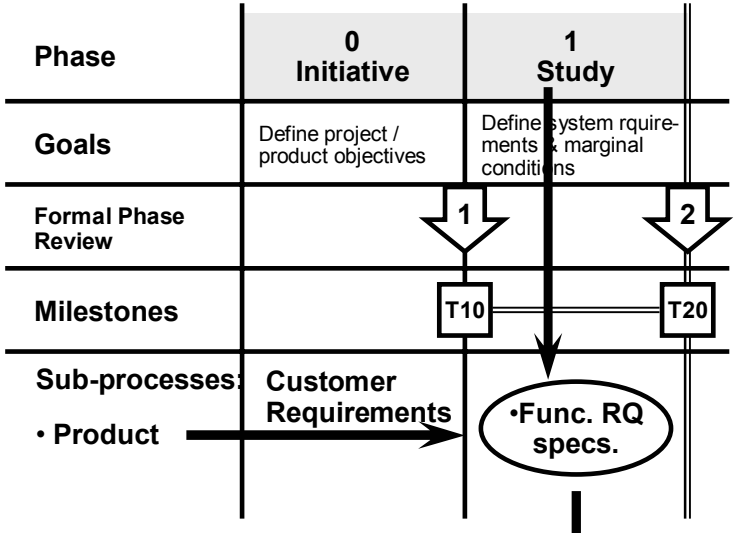


Product Development

- A phase organization defines a sequence of successive milestones which are logically dependant.
- The phases are composed of all of the activities which take place between the milestones.
- Product size and project size are important in every distinct phase organization.
- A phase organization aims at reducing technical, economic and scheduling risks by:
  - using a step-by-step methodology
  - stipulating and monitoring intermediate results (milestones)
  - increasing transparency in regard to the status of the project.
- The use of a phase organization is standard practice in modern product development.



Elements of the Phase Organization



Example of a Requirement Catalogue

2.1	Define objectives
2.1.1	Define target product
2.1.1.1	Development results
2.1.1.2	Main priorities
2.1.2	Targeted market
2.1.2.1	Define targeted customer
2.1.2.2	Define target objects
2.1.2.3	Define user
2.1.2.4	User's requirements
2.1.3	Competition
2.1.4	Product life-cycle
2.1.5	Delivery and maintenance plan
2.1.6	System environment
2.1.6.1	Hardware environment
2.1.6.2	Software environment
2.1.7	Compatibility
2.1.7.1	Software
2.1.7.2	Technology
2.1.8	Portability
2.1.9	Marginal conditions

Example of Functional RQ Specifications

1.	Summary
1.1	Description of problem
1.2	Brief description of the performance characteristics
1.3	Technical requirement analysis
1.4	Project requirement analysis
1.5	Possible solutions with associated costs
2.	Requirements catalogue
3.	Technical requirement analysis
4.	Project requirement analysis
4.1	Cost analysis
4.2	Cost-benefit analysis
5.	First system design
5.1	Overall system
5.2	Functional groups
5.2.1	User interfaces
5.2.2	Interfaces to other functional groups
6.	Possible solutions with associated costs
7.	Acceptance requirements
7.1	Software system
7.2	Elements within project library
8.	Rapid prototyping
9.	Marginal conditions

Stipulate the activities / events required in
- separate steps (phases)
- sub-processes

Definition of Phase Activities / Results

1. Overview
1.1 Changes made to product deviating from func. specs.
1.2 Changes made to project deviating from func. specs.
1.3 Product development phase
1.4 Classification of the product in a system environment

2. Detailed technical design
2.1 Overview
2.1.1 Complete system solution
2.1.2 Functional structure
2.1.3 Sequence of functions
2.2 Individual functions (Rep. dep. on subject matter)
2.3 Data
2.3.1 Data library
2.3.2 Data structure
2.3.3 Data streams

3. User interface
3.1 General controls
3.2 Masks
3.3 Specialist / beginner mode
3.4 Lists
3.5 User guidance
3.6 Help function
3.7 Error diagnostics

4. System design (DP rough draft)
4.1 System base (HW, SW)
4.2 External interfaces
4.3 Product structure
4.4 Component specification, including component / function matrix
4.5 Internal interfaces
4.6 Operating mode
4.7 System operations, system control
4.8 Error handling
4.9 Restart capability
4.10 Data integrity
4.11 Data protection
4.12 Storage technology design

5. Quality characteristics
5.1 Reliability
5.2 Time factors
5.3 Performance factors
5.4 Maintainability
5.5 Portability
5.6 User-friendliness
.. etc.

6. Implementation specification
6.1 Version planning
6.2 Implementation procedure
6.3 Risk analysis

7. Additional specifications
7.1 Tools
7.2 Production guidelines
7.3 etc.

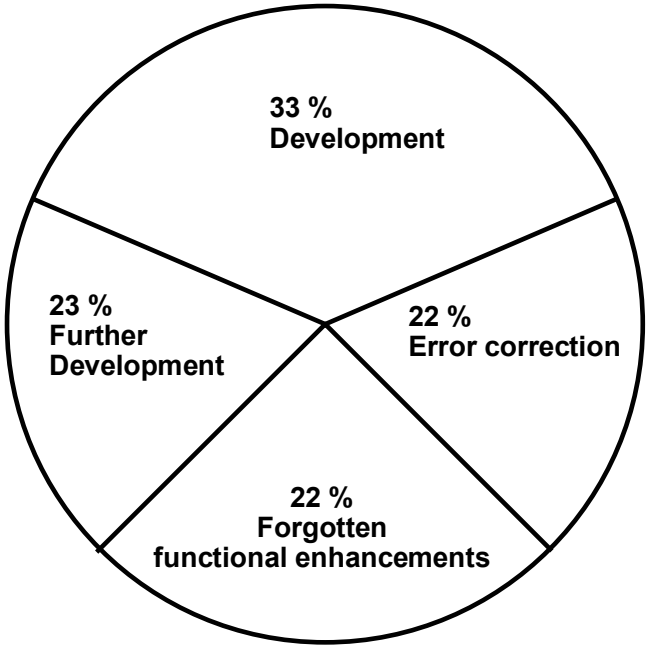
Appendix: List of associated documents

Example of a Performance Specification

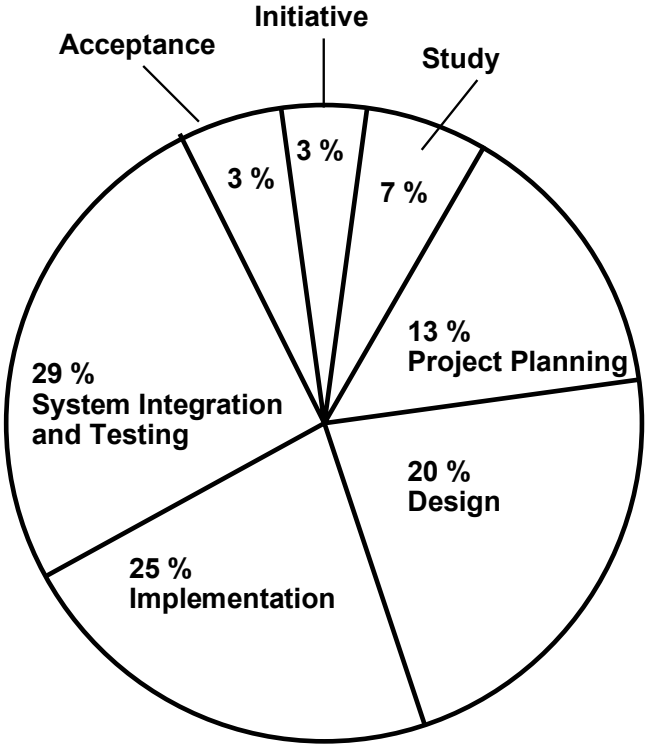
Those taking part in formal phase reviews

- Each phase is concluded by an explicit decision.
- Risks are considered and then decisions made about:
  - Technical alternatives
  - Releasing results
  - Continuing the project.
- The project manager relies upon test results provided by quality assurance and business integrity controlling (when available).
- The decision is binding for all those taking part in the project.

Examining and Approving Milestones

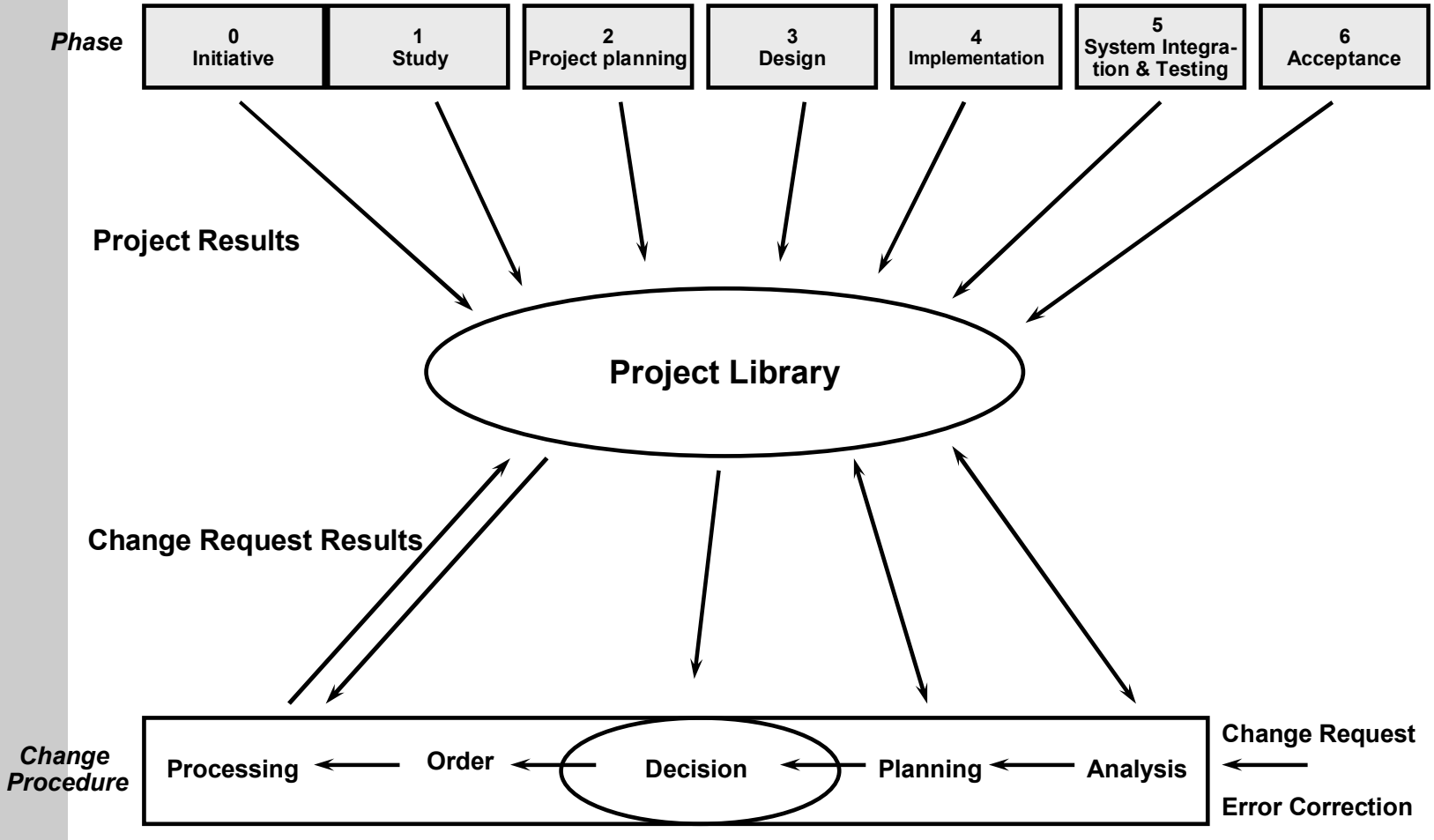


Life-cycle Costs

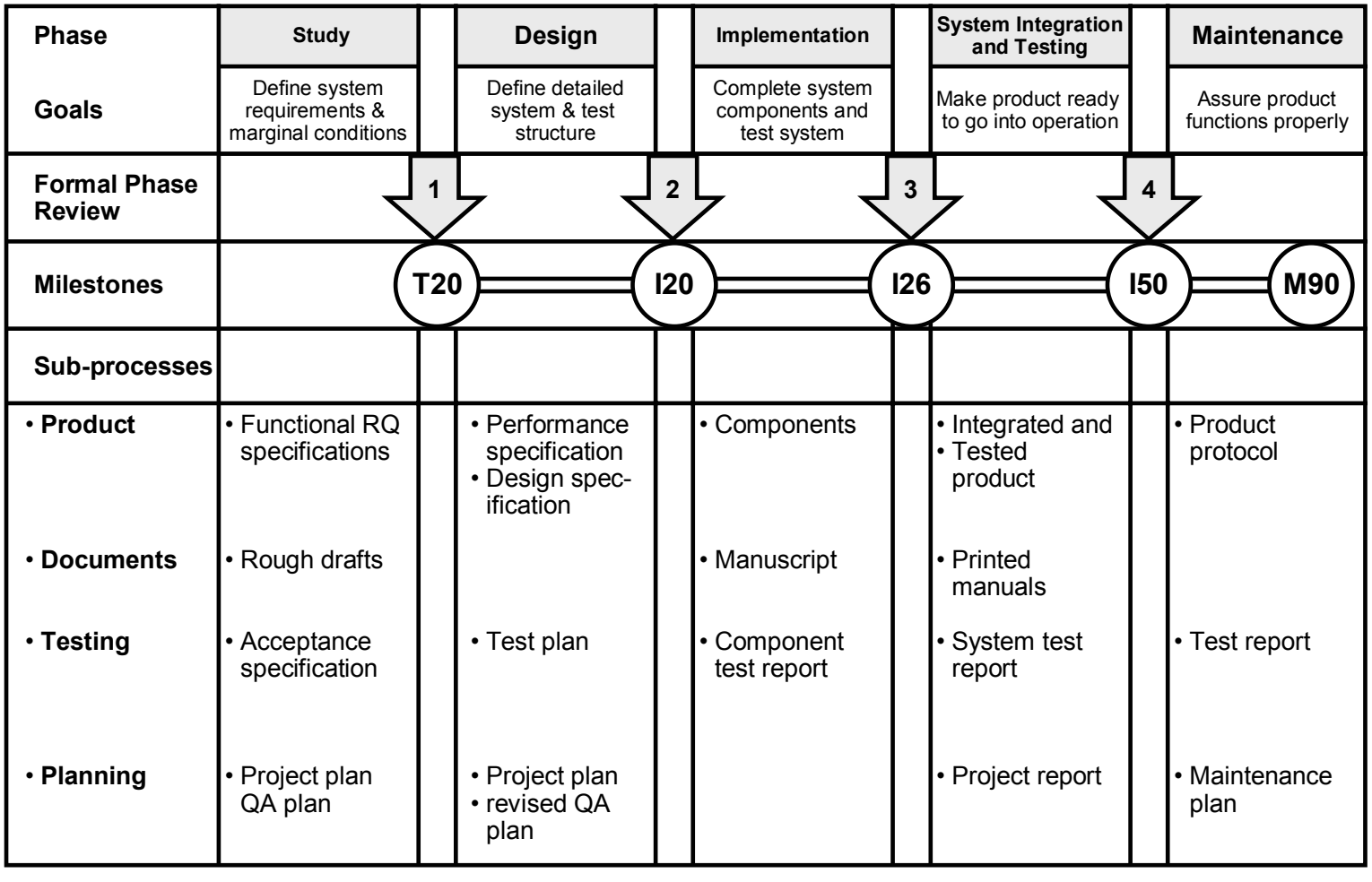


Development Costs per Phase

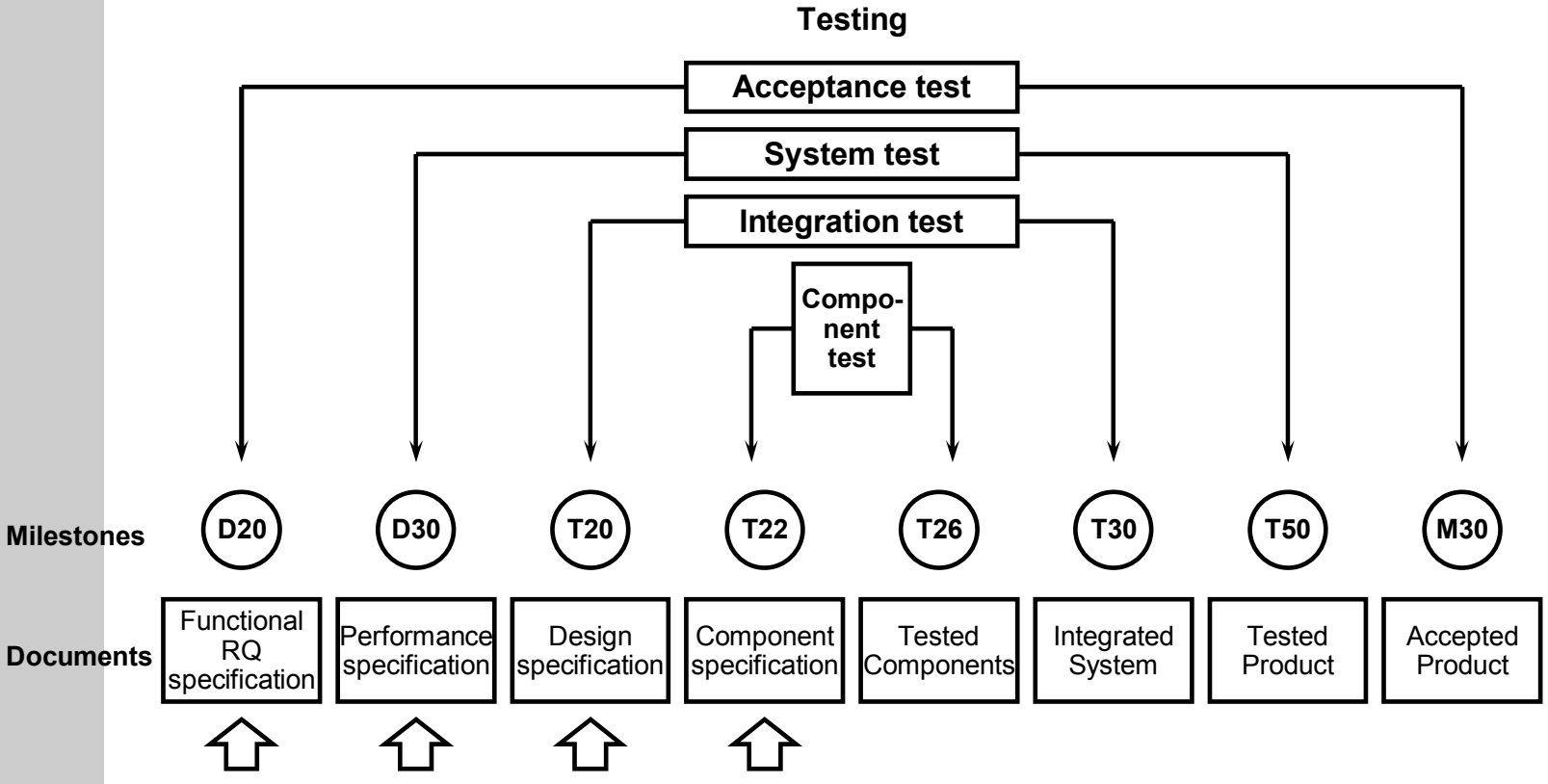
Cost Distribution in Software Projects



Configuration Management and Phase Organization



Phase Organization for Small Projects

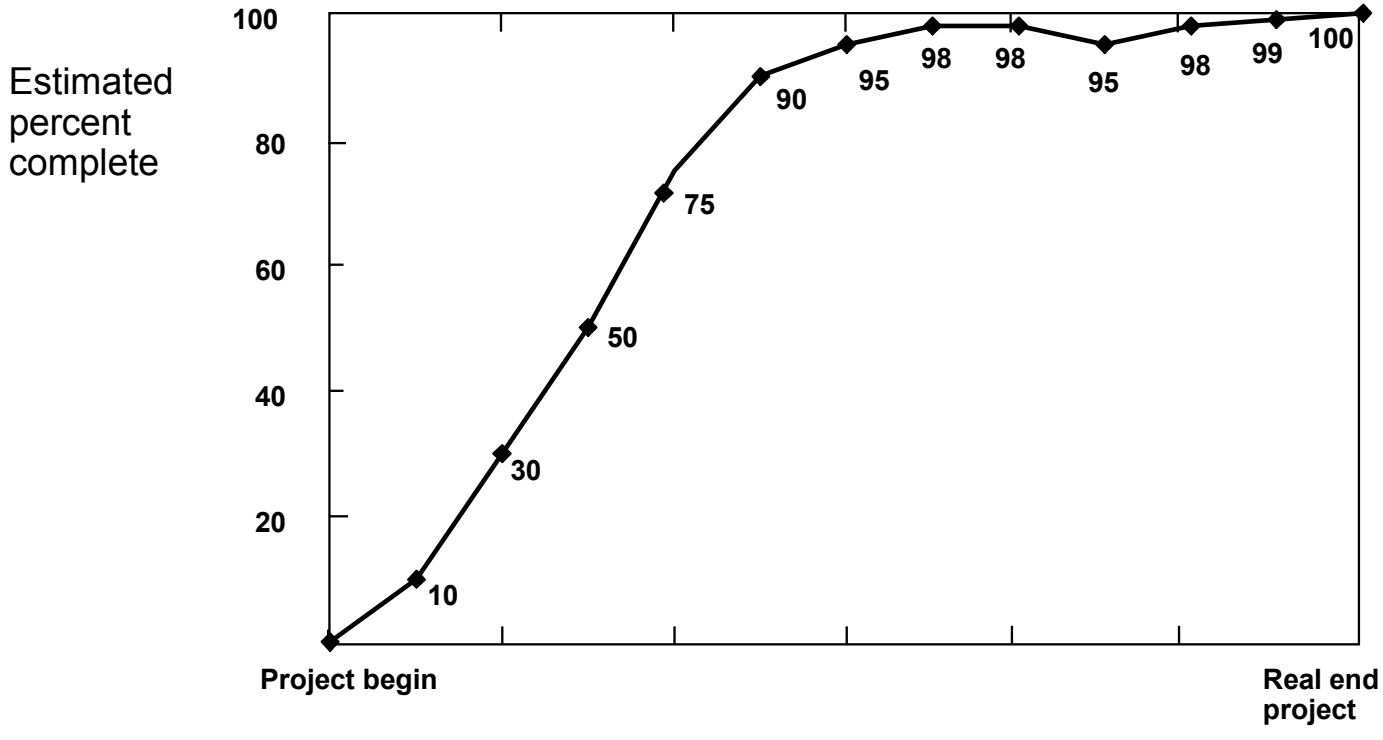


Reviews / Procedures:
- **Walk-Through**
- **Development Document Control (DDC)**

Quality Assurance throughout the Project

Quality Assurance throughout the Life-cycle Phases

Project Planning
Structure Charts



In the middle of the project life-cycle software projects are usually estimated as already being 95% complete!

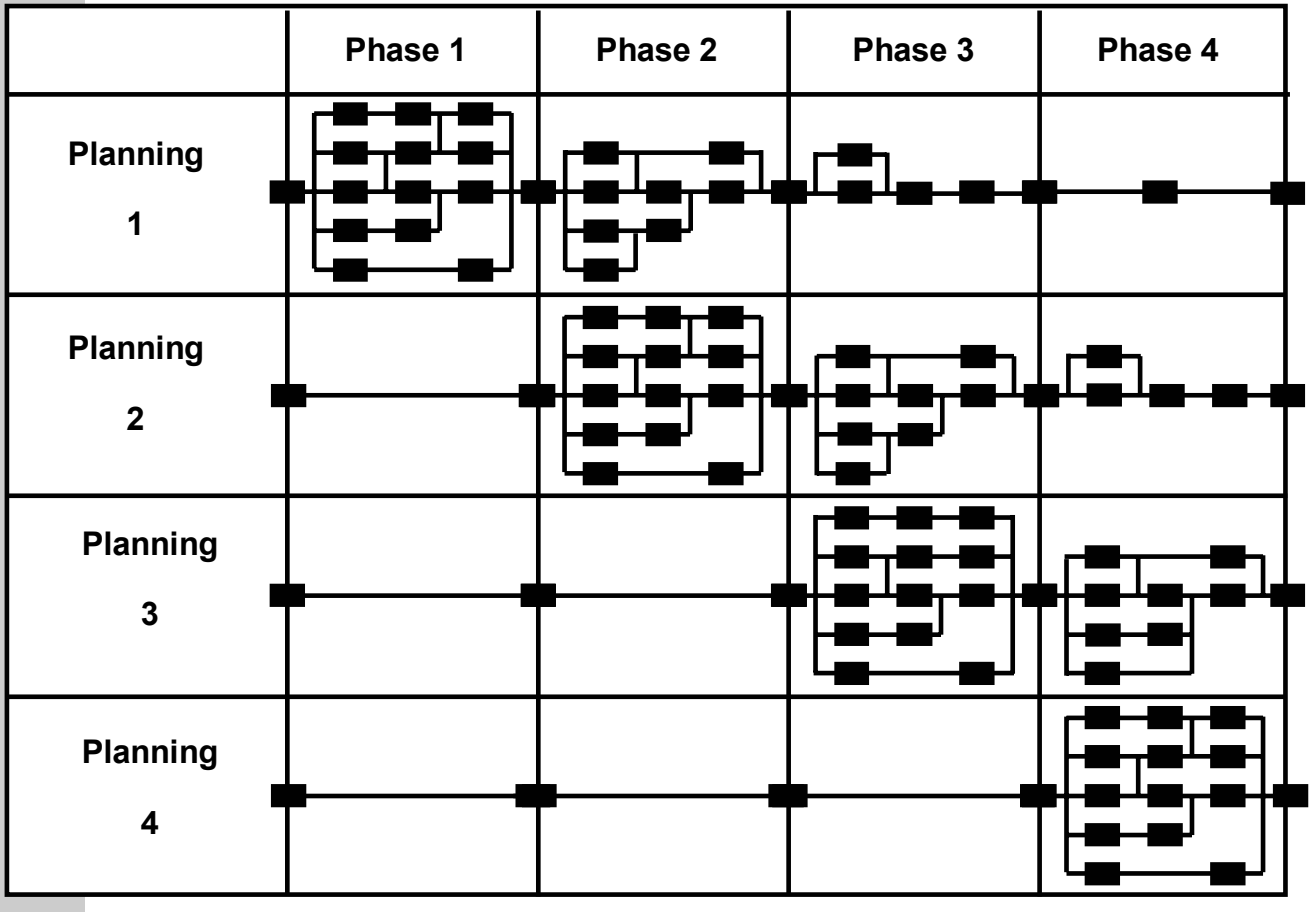
The 90 % Syndrome in Software Projects (from B. W. Böhm)

What are the reasons for making estimation errors?

- **The problem is too complex for the developer to handle He has no / little understanding of inter-dependencies**
- **Inaccurate estimates of time and manpower required for completing the "additional" work**
- **Poorly defined or overly optimistic planning**

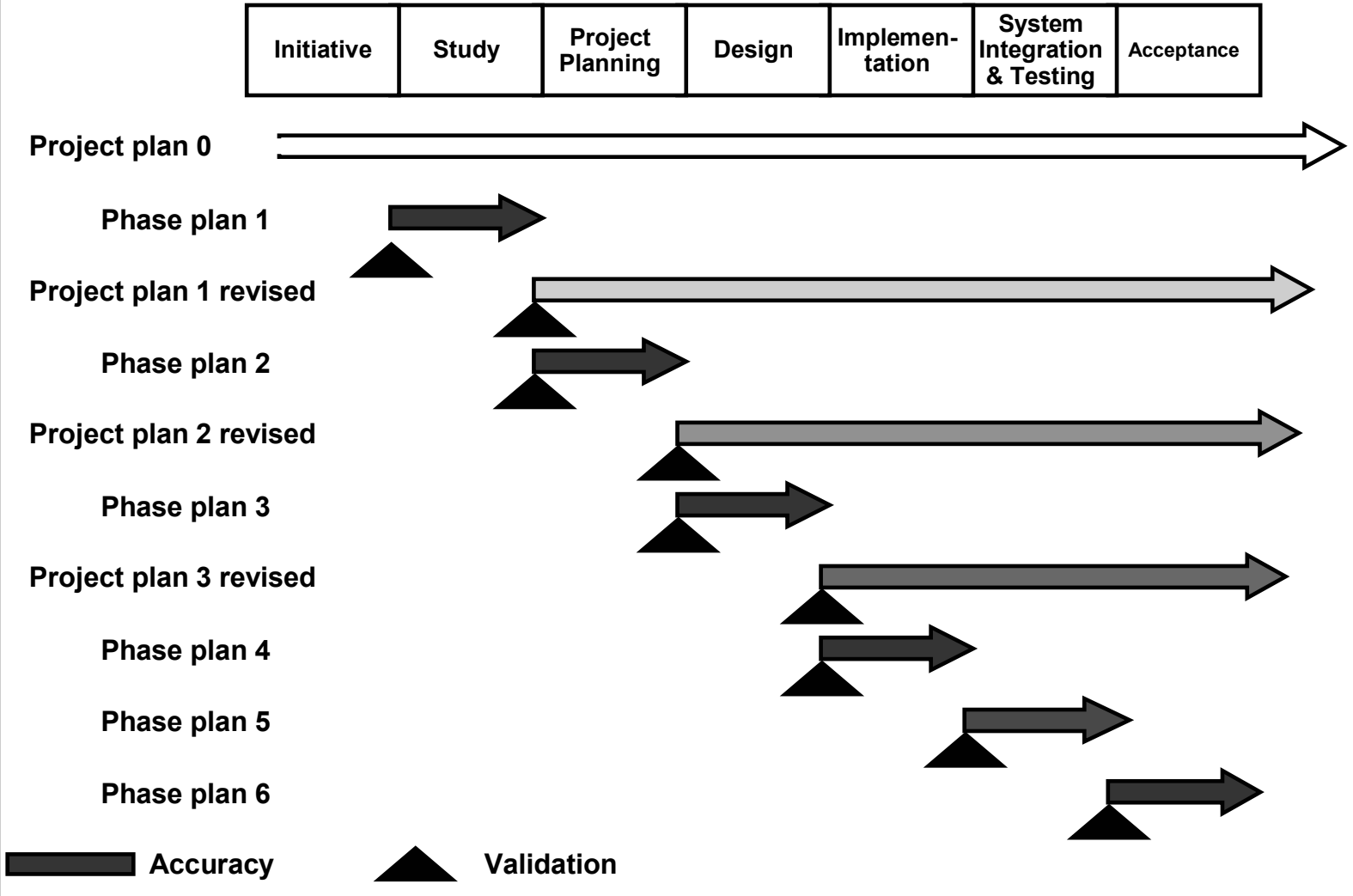
Project planning can be described as:

- **Defining a predetermined course of action (activities)**
- **to achieve the fixed goals of the project**
- **taking into account certain basic constraints (time, costs, resources, etc.)**

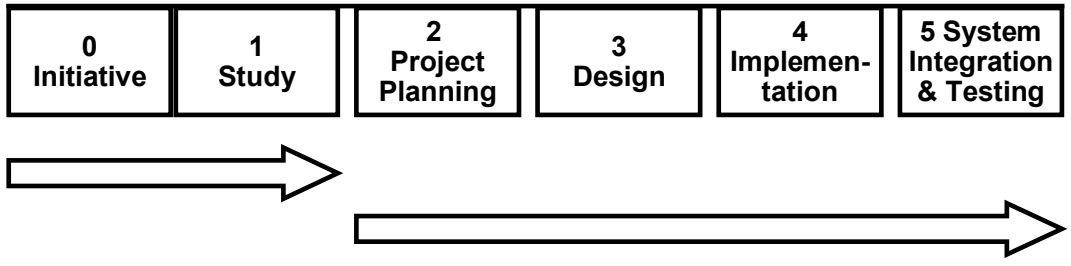


- Projects are planned over time periods of manageable size (phases)
- Tasks occurring in later phases are specified in detail when verified data is available from previous phases
- Detailed plans for new phases are developed based on actual values

Detailed Planning

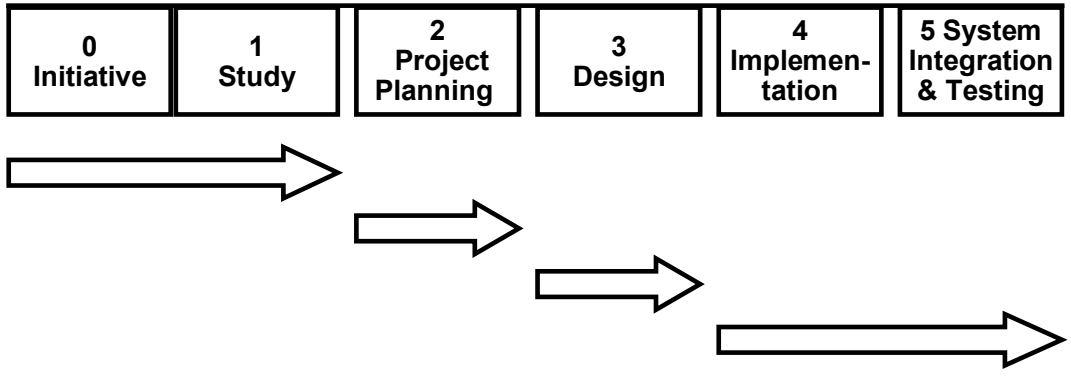


Planning Perspective



Low-risk projects with little innovation

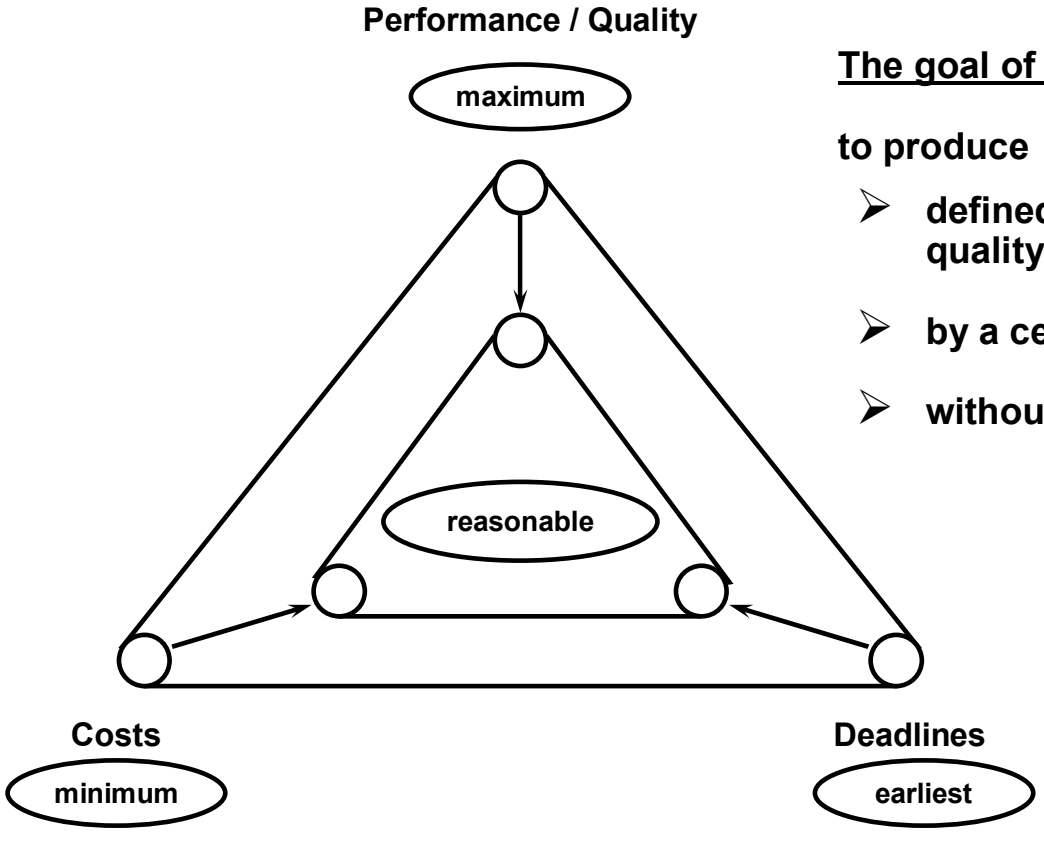
- **After the functional RQ specifications have been defined (10 % of total effort)**
- **the total project can be assessed rather precisely**



High-risk projects with high innovation level

- **Accurate assessments are limited to a range of 10%-20% of the total effort**

Prediction Range

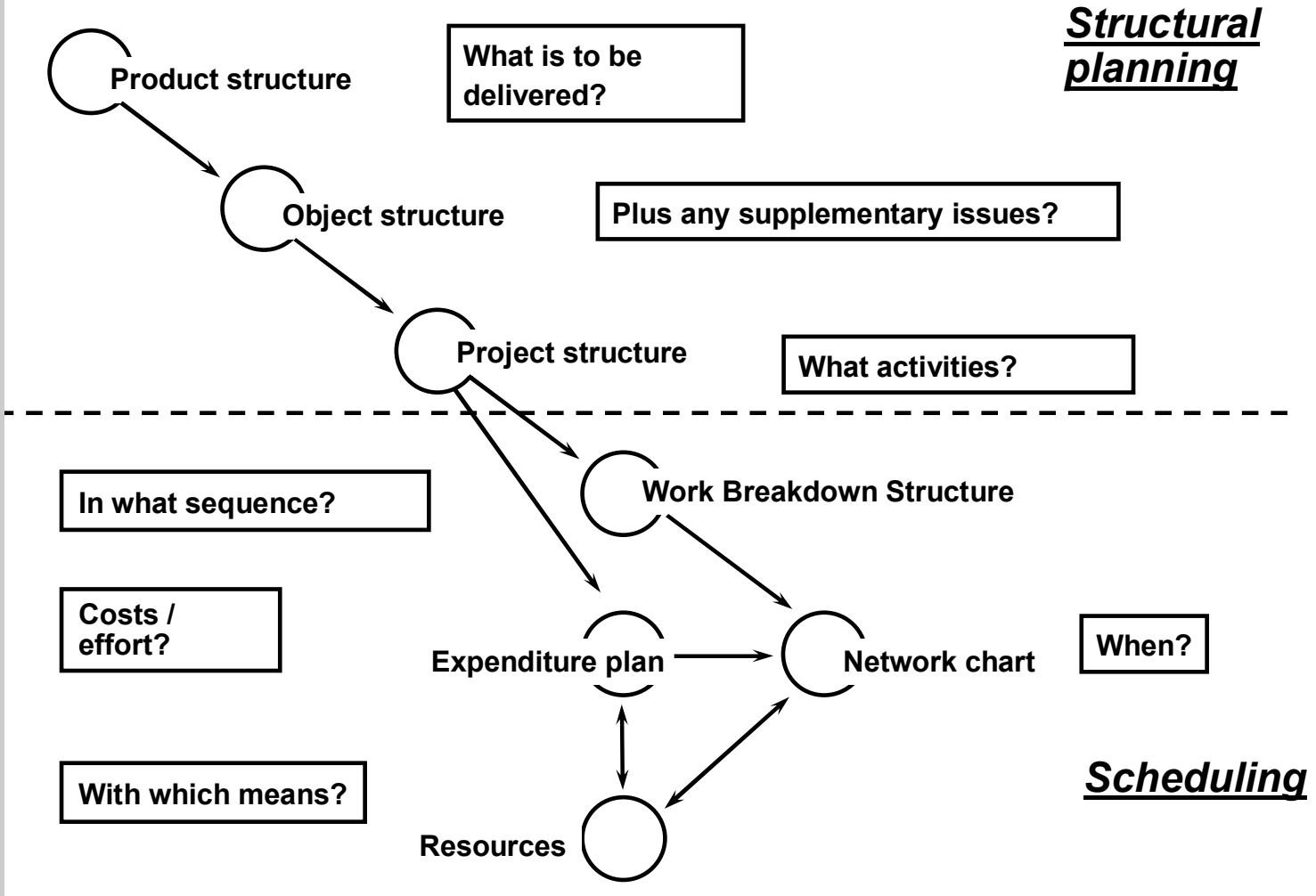


The goal of operative planning is:

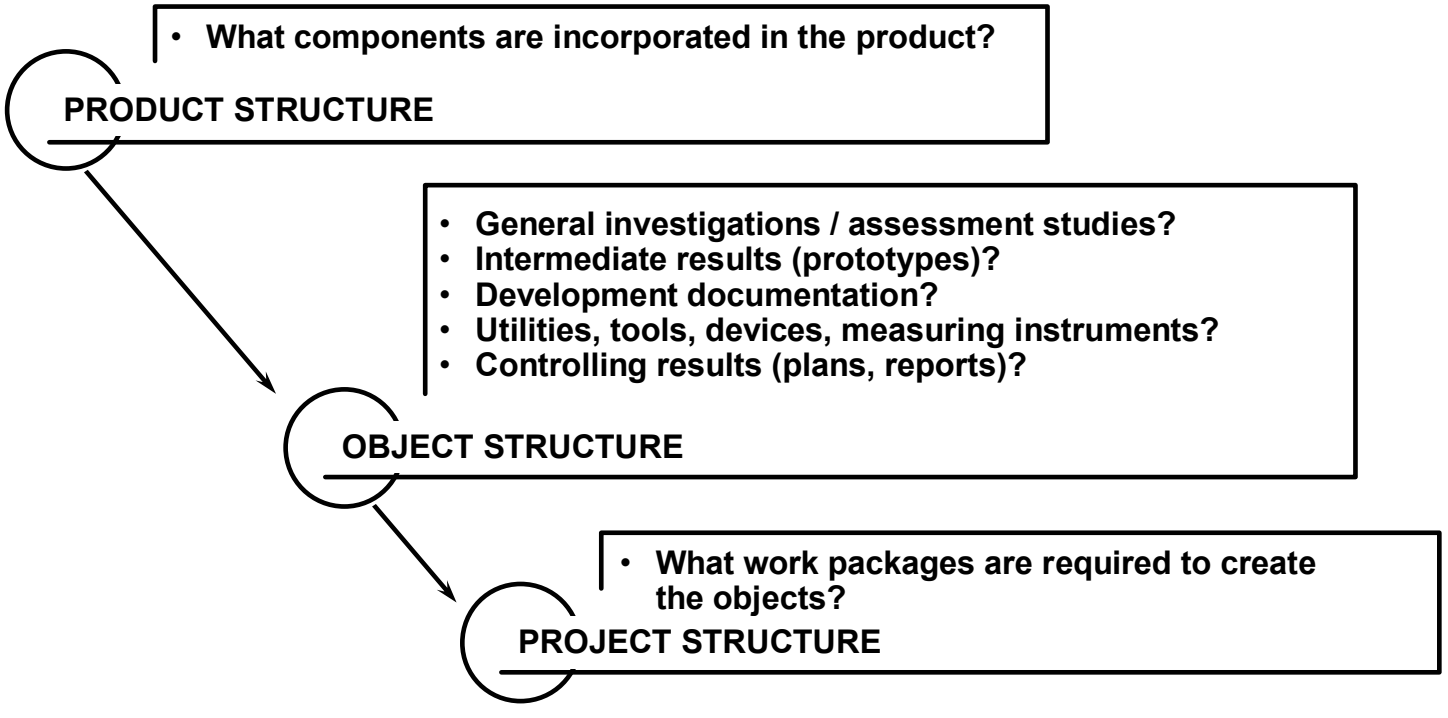
to produce

- **defined technical performance / quality (based on requirements)**
- **by a certain deadline**
- **without exceeding the budget**

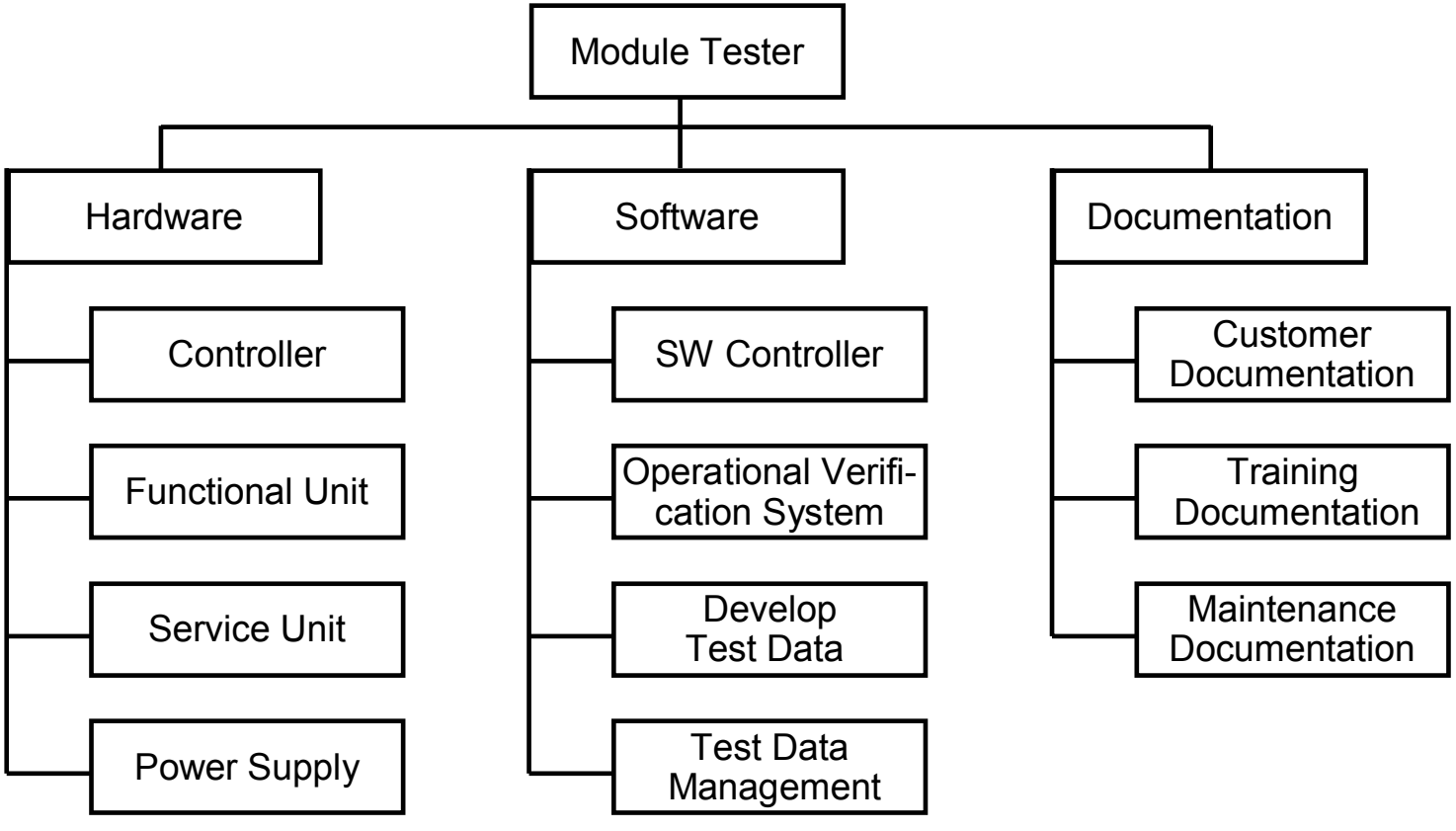
Project Planning Goals



Sequence of Planning Operations

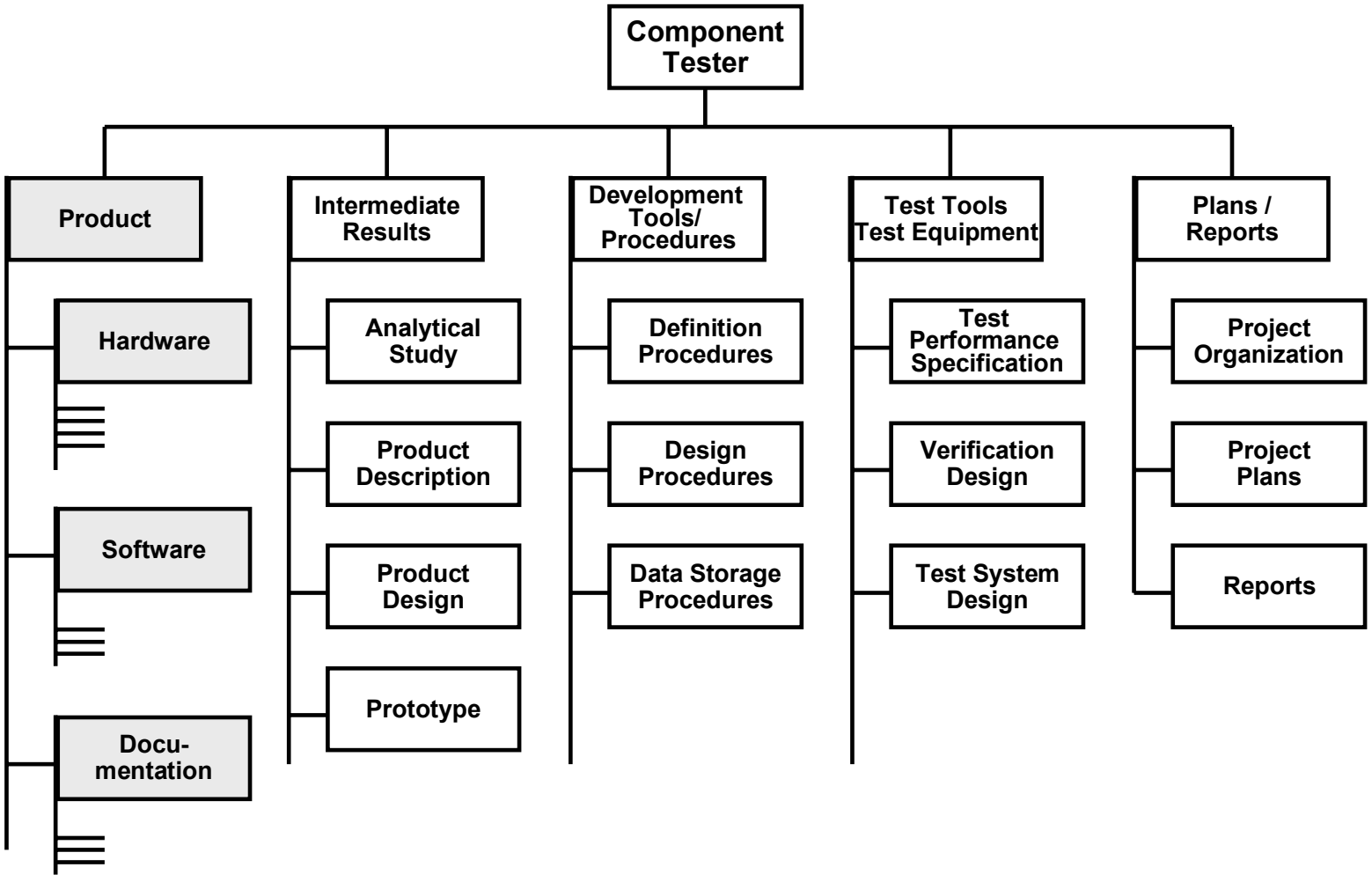


Steps in Structural Planning



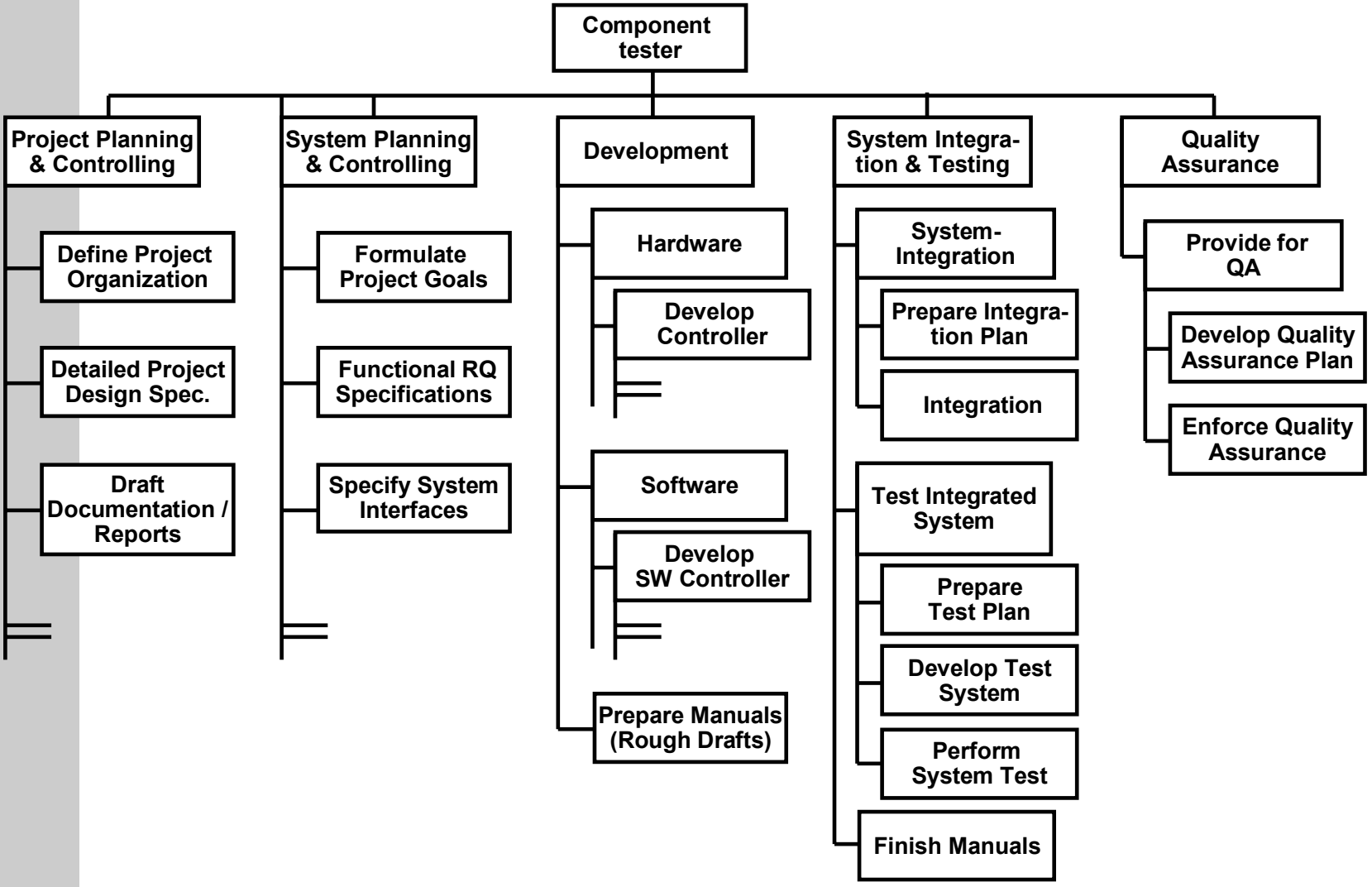
Product Structure Chart

- **The product structure contains the elements of the product to be developed.**
  Each element is then subdivided into components.
- **The product structure is arranged hierarchically according to product components.**
- **The product structure is usually presented in diagram form.**
- **The product structure provides a basis for**
  - **Defining goals with the customer**
  - **Formulating the detailed project design specification**



Object Structure Chart

- The object structure chart specifies all of the results and intermediate results to be developed in the course of the project. It incorporates the final result (product structure), design documents, plans, reports, etc.
- The object structure chart is arranged hierarchically.
- The object structure chart is usually presented in diagram form.



Work Breakdown Structure (WBS)

- The Work Breakdown Structure (WBS) contains all the work packages which are to be developed in the course of the project.
- The WBS provides a basis for
  - estimating costs
  - developing a network chart
  - issuing internal orders
- The WBS is arranged hierarchically according to
  - Objects
  - Project functions
  - Phases
- The WBS is usually presented in diagram form.

Result

Activity

Responsibility

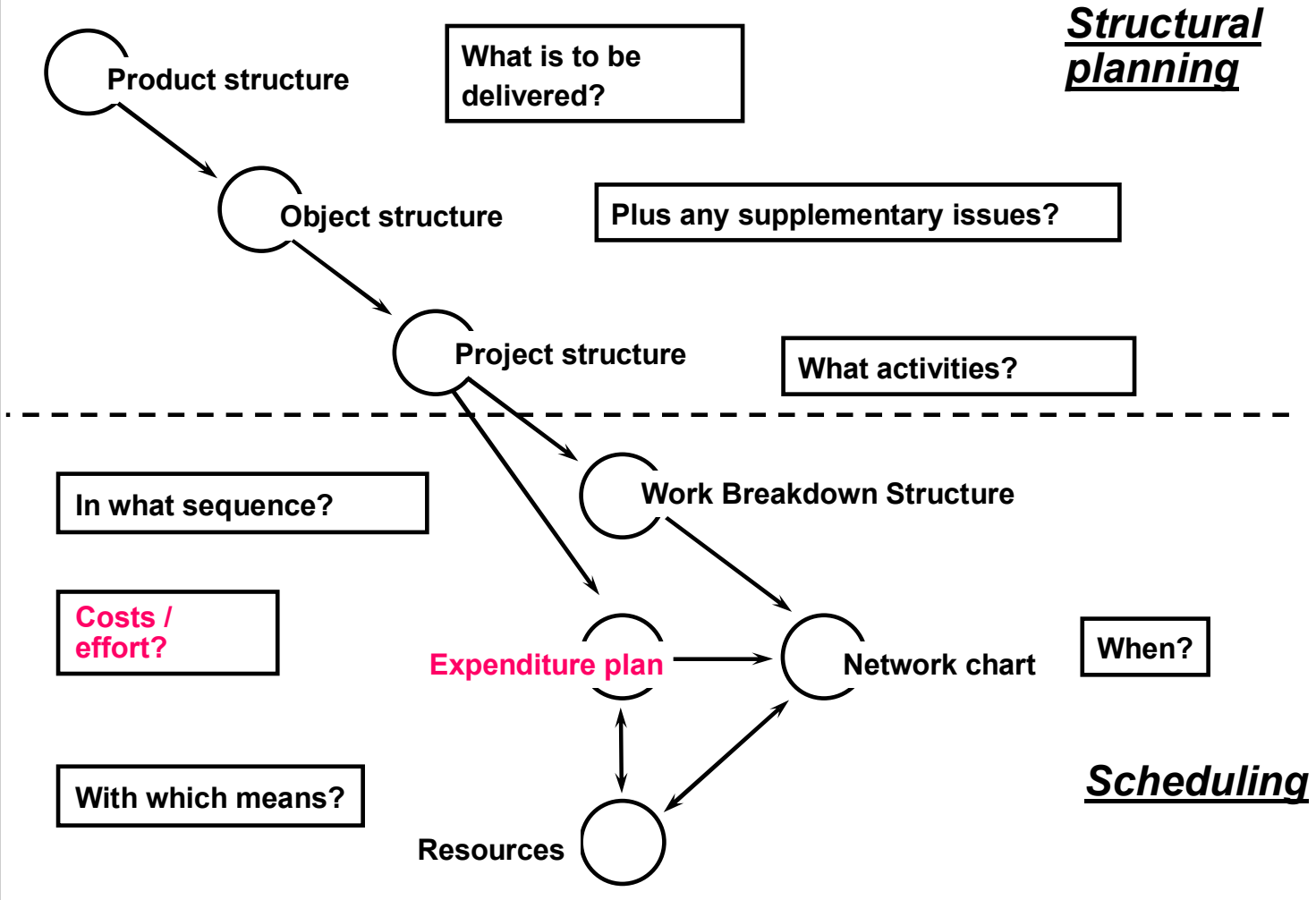
Input

- The work package describes discrete tasks with definable end results
- The objective of defining work packages is to
  - obtain a survey of the effort (volume of work) to be accomplished
  - support individual responsibility in completing assignments
  - monitor and control progress of work.
- The work package is performed by one and only one specific organizational unit (or person).

Work Package

Project Planning

Effort Estimation



Sequence of Planning Operations

Analogy Method
reasoning by analogy using one or more completed objects (projects) similar to the new project to relate actual costs to estimated costs

Approximation Method
formalized analogy method using approximation criteria prorated from previous projects similar in scope and capacity

Percentage Method
Based on: "Standard" cost distribution in the various phases of a project, derived from past projects
One phase analyzed in detail for base estimations,
Other costs projected for remaining phases based on distribution factors

Multiplicative Method
uses a set of product cost coefficients applied to cost variables

→ **Total Costs**

Weighted Sum Method
uses weighted cost-effect variables for estimating

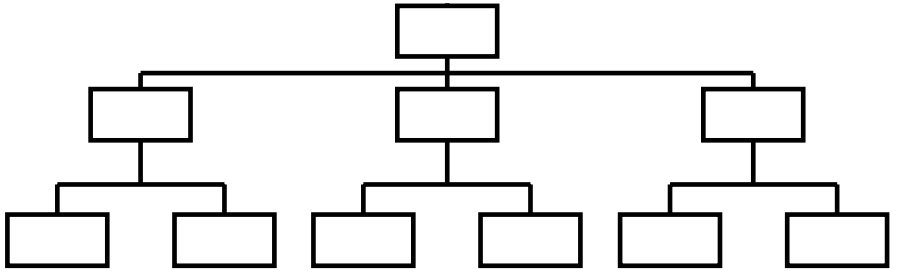
Parametric method
based on statistical data which considers the strength of various cost-effect factors (using regression analysis data derived from previous projects)

Effort Estimation Methods

Basic estimating factors

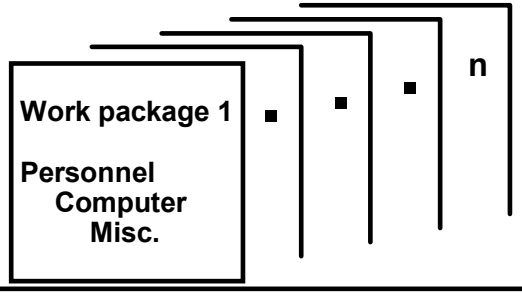
Know How
Technology
Customer
.
.
.
Working hours

Work Breakdown Structure



Work packages

Estimations per work package



Personnel
+
DPE contingency

+
Risk contingency

Σ Computer Σ Misc.

(+) (+)

Σ Σ

Effort (Cost) estimate

Basic Estimating Factors

Direct Product Expenditures (DPE)

Example: Determine DPE contingency based on 1 MW = 40 MH (5 x 8 hrs.)

Activities	Estimate of MH pro week
1 x team meeting	~ 1.5 MH
1 x weekly planning activities (personal)	~ 0.5 MH
technical literature (state-of-the-art)	~ 2.0 MH
	~ 4 MH / week
DPE Factor x =	~ 10 %

Indirect Project Expenditures (IPE)

	Standard ZT calculation					
	work-day ~ 8 MH	MH	%	work-day ~ Std.	Std.	%
Contractual hours of work p.A.	250	2000	100			
Non-productive man-hours:						
-Vacation	30		12 %			
-Sickness	8		» 3 %			
-Misc. activities	5		2 %			
-Act.+pass. further education	7		» 3 %			
IPE Sum	50	400	20			
Productive Project MH	200	1600	80			

"IPE factor" = total work time reduced by 20 %

Estimated 25 % additional time required for project MH

DPE IPE

Customary activities associated with a standard work package:

A work package includes
- **Taking on new task**
- **Familiarization time**
- **Implementation**
- **Validation / Quality Assurance**
- **Maintenance / Refinement**
- **Acceptance**
- **Documentation**
- **Working agreements (interfaces)**

Working hours:

1 MD = 8 MH
1 MW = 40 MH
1 MM = 149 MH
119 net-project MH
1 MY = 1800 MH
1440 net-project MH
1 MY = 10 MM

Cost drivers

Participants

Moderator

Estimators = Experts from the project team or external assessors

Recording secretary (minutes of meeting)

---

max. 8 participants

max. 2 days

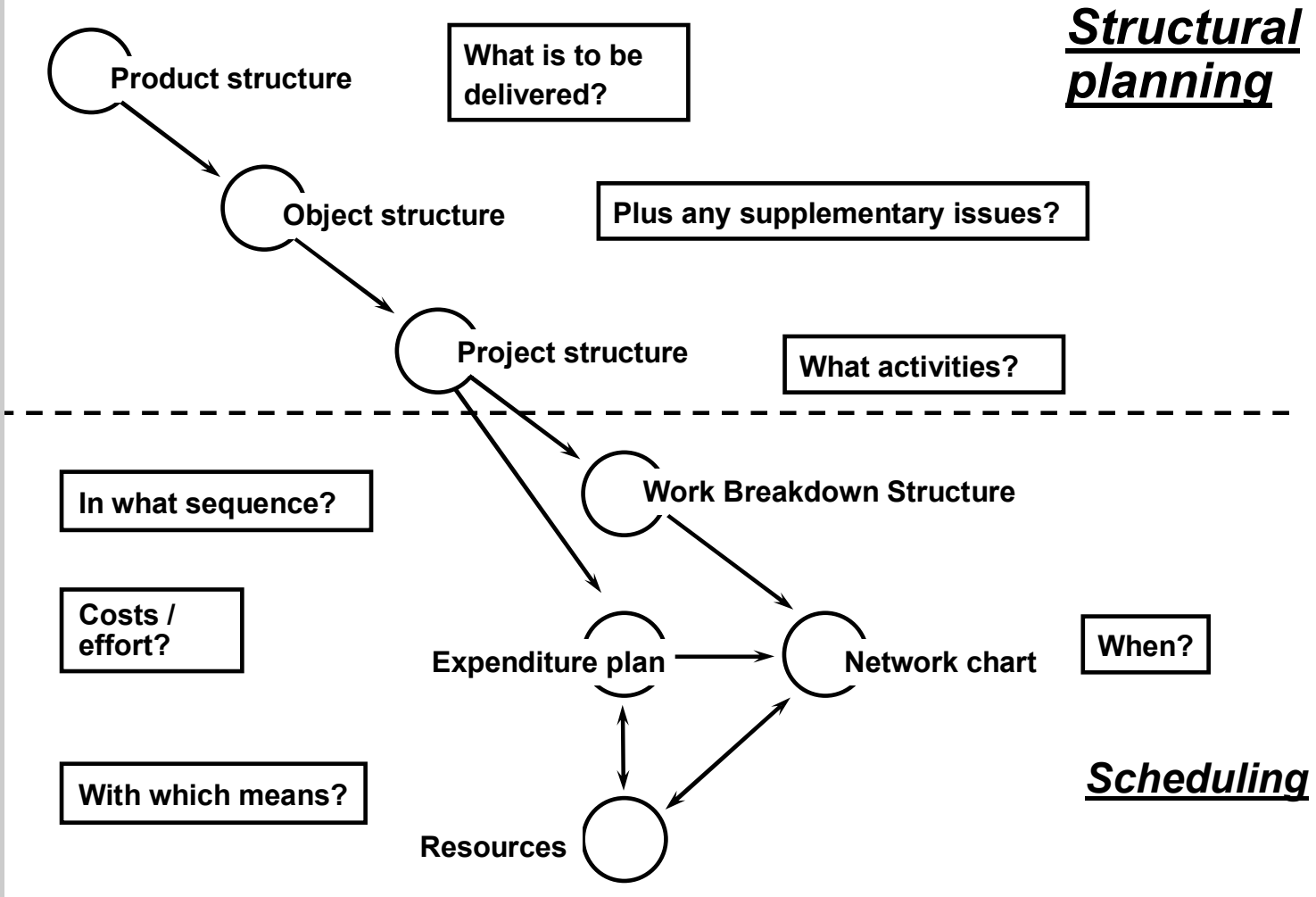
Work methods

- **individual estimates kept hidden**
- **Group estimation (Decision procedures!)**
- **Open minutes of meeting**
- **Documentation / reports explaining the estimation results**

Prepare	• Select estimators and issue invitations • Provide technical reference documents
Implement	• Explain estimation audit procedures • Supply basic information • Discuss project structure • Develop estimation units • Record assumptions
Individual estimations	• Explain work package • Estimate work involved and costs • Discuss estimations • Record results • Estimate risk
	• Determine estimation accuracy
Follow-up	• Document results • Calculate contingencies • Net / Gross conversion • Plausibility check • Send results to and thank appraisers

Activities Associated with Estimation Confinement

Scheduling



Sequence of Planning Operations

Scheduling Objectives

WHAT is to be done
WHEN
in WHAT sequence
for HOW LONG
by WHOM
using WHAT resources

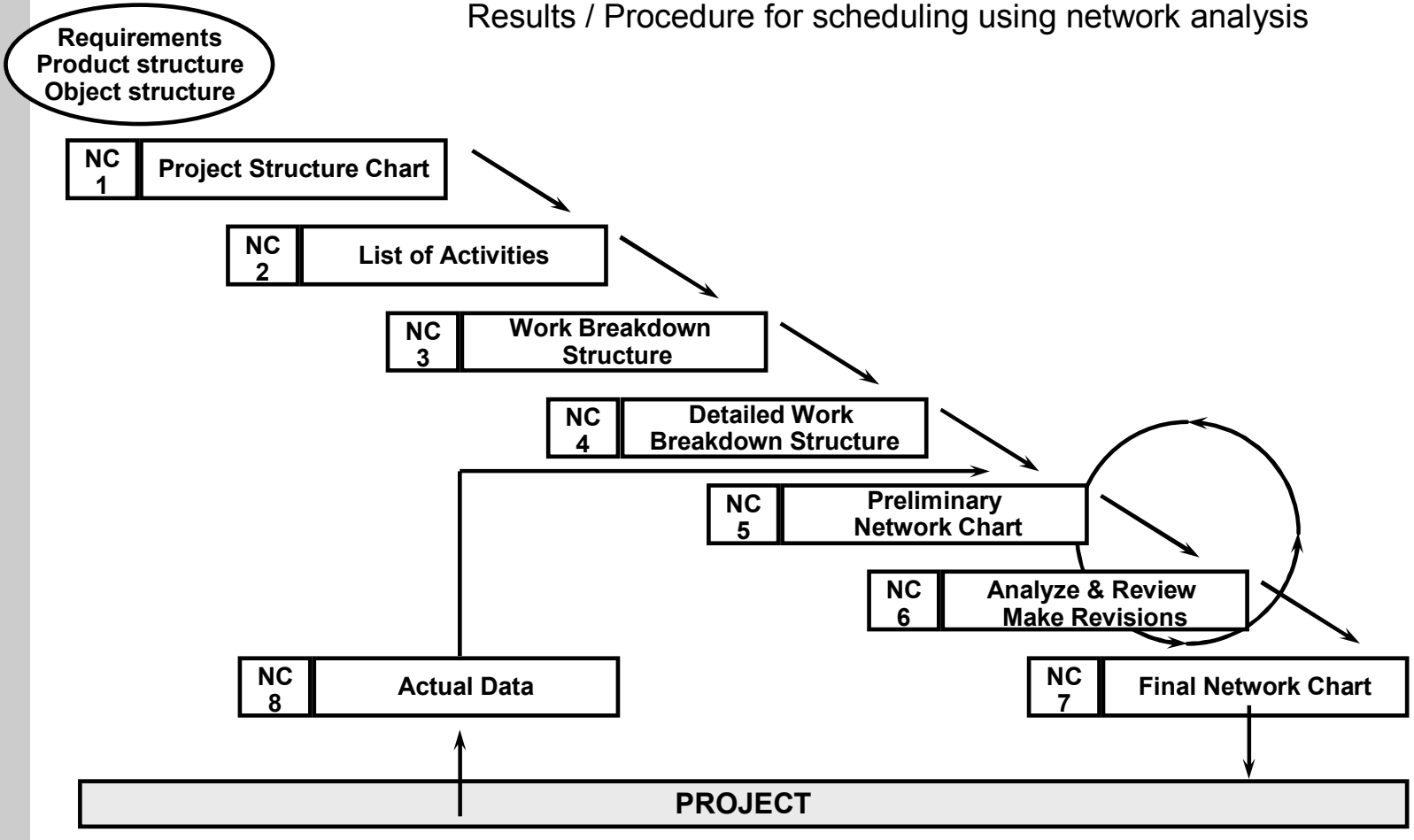
Describe a realistic

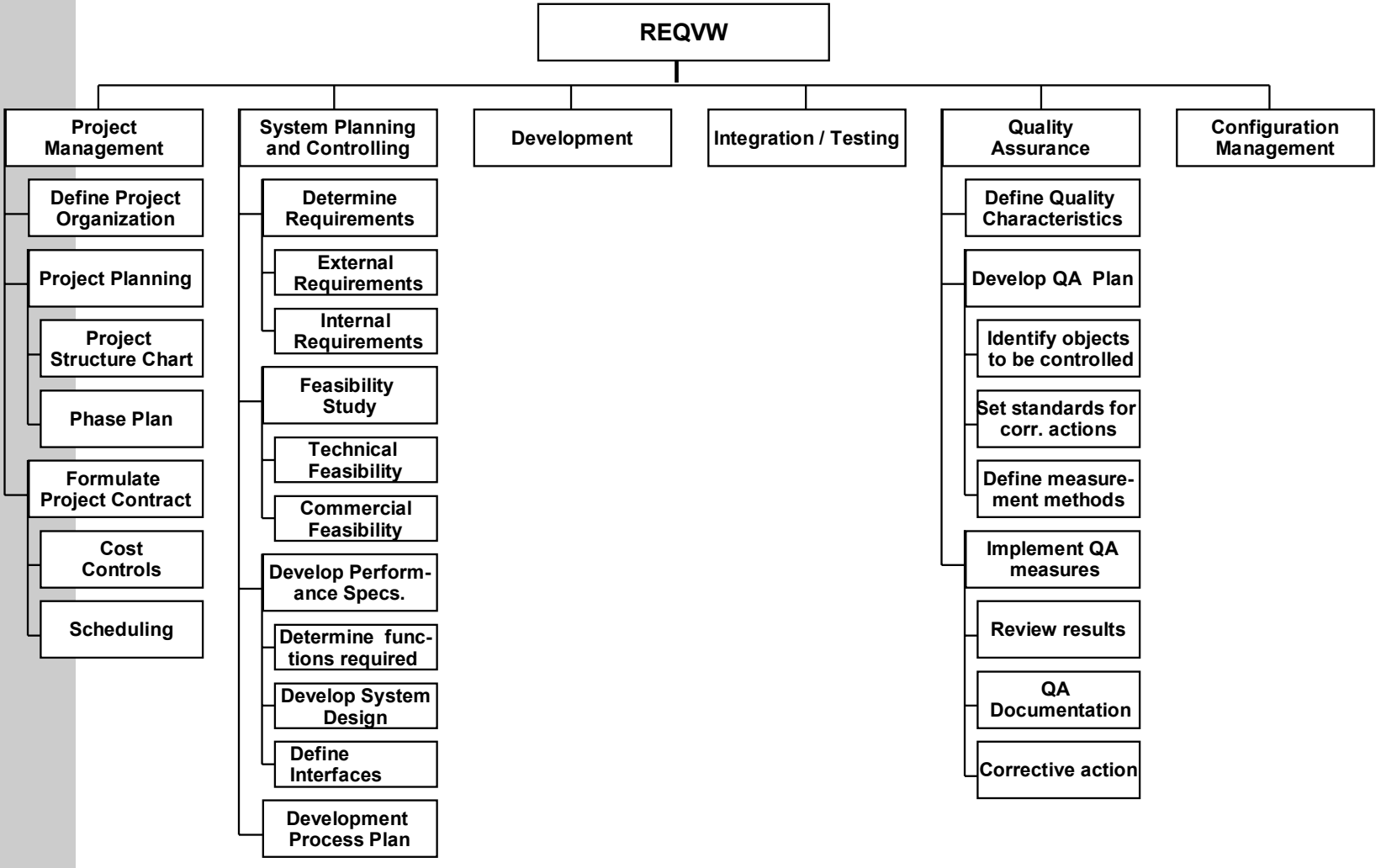
project life-cycle

to ensure

project success

Results / Procedure for scheduling using network analysis

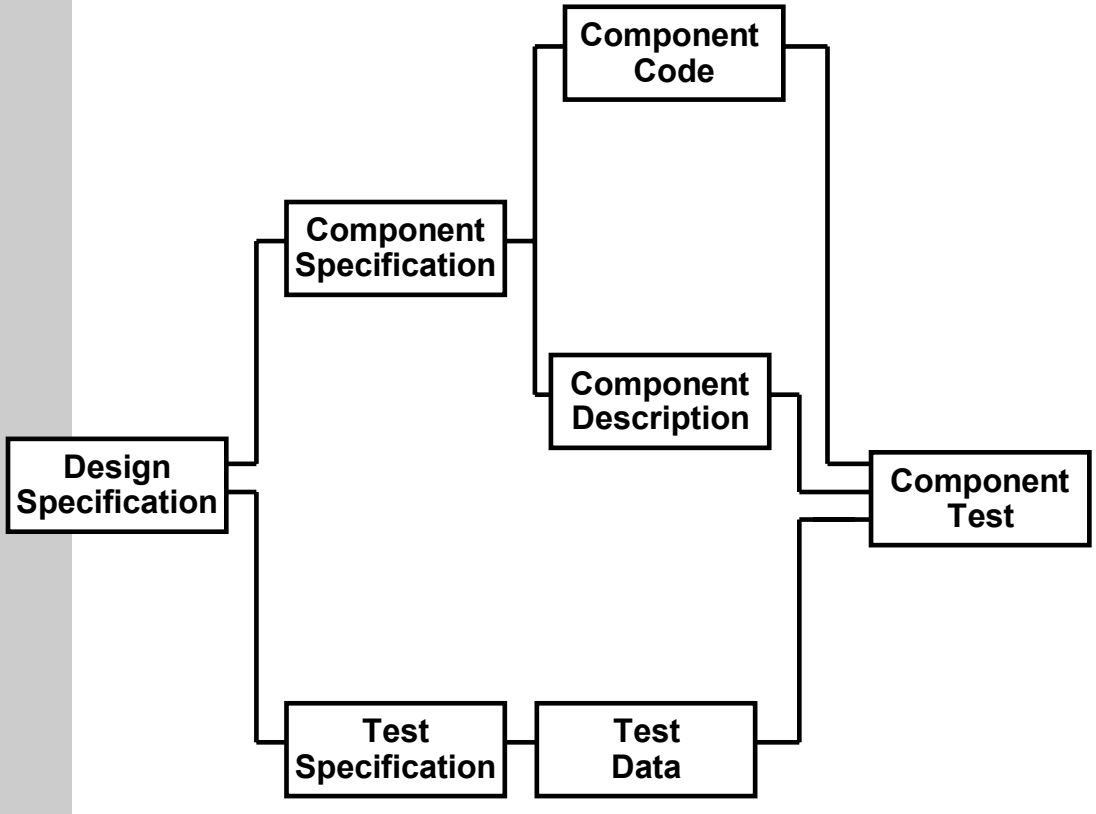




Example of a Project Structure Chart ("REQVW")

	Activity	Responsible	Dependency	Effort	Time
1100	Define project organization				
1210	Project planning				
1220	Phase plan				
1310	Cost controls				
1320	Scheduling				
1410	End of "Study"				
1420	End "Project planning"				
2100	Determine requirements				
2200	Feasibility study				
2310	Performance spec.: Functions				
2320	Performance spec.: System design				
2330	Performance spec: Interfaces				
2400	Development process plan				
3000	Development				
4000	Integration and Testing				
5100	Define Quality characteristics				
5200	Develop QA plan				
5311	Review Perf. spec.: Functions				
5312	Review Perf. spec.: System design				
5313	Review Perf. spec.: Interfaces				
5320	QA reports / documentation				
5330	Corrective actions				
6000	Configuration Management				

Example of an Activity list ("REQVW")



- The Work Breakdown Structure (WBS) provides a comprehensive listing of the work packages and dependencies (I/O interfaces) for a particular project.
- The WBS serves as a basis for the network chart.
- The WBS provides a logical summary of all of the work packages within the project structure chart.
- The WBS is a graphic representation (tree diagram).

Work Breakdown Structure

Detailed Work Breakdown Structure

- Estimation of time per activity
  (Effort required in MD, MW, MM)
- Resource allocation
  (Distributing available resources amongst the activities)
- Determine the duration of each activity
- Consider fixed deadlines

Calculating Time Required

Detailed WBS with time required and deadlines

Practical Recommendation:
No person should be responsible for
more than 2 activities at the same time
Don't forget to add increments for deviation time

Network Chart (NC)

- A NC depicts completion time estimates and interdependent relationships between project work packages
- It displays the planned project activities in a clear-cut manner facilitating project control
- It includes time estimates with:
  - Beginning and end dates for each work package and estimated duration
  - "critical path" and “slack time“

Network Analysis coordinates and expedites project planning and helps projects stay on schedule by monitoring deadlines

Network Verification

- Formal inspection
  - Layout (understandable, clear-cut and well-arranged)
  - Interpretation errors
- Examine scheduling plan
  - Lag time
  - Lead time
  - Deadline discrepancies
  - Interdependencies (absolute, significant, realistic)
- Examine resources
  - Total capacity
  - Individual capacity

Network Replanning

- Include actual data (expenditures, time, personnel)
- Add more details (increases accuracy)
- Update network data

Practical recommendation:

Make detailed notes about decisions or situations causing changes or errors

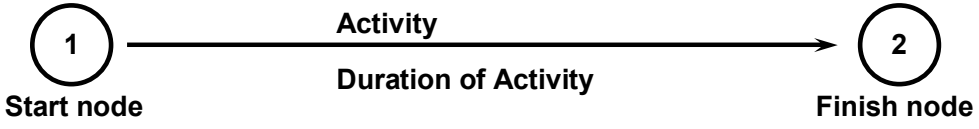
= Experience gained in current projects can provide useful information for future projects

Network Replanning takes place repeatedly throughout a project:

- **To make adjustments due to**
  - **changes to the objectives (requirements)**
  - **modifications to the marginal conditions**
  - **changes to the procedures**
- **To help handle uncertainties (decrease risk)**
- **To add more details to the successive process levels**
- **To provide a basis for monitoring the progress of the project**
  - **by regularly comparing planned estimates with actual values**

- **CPM = Critical Path Method**
  Activity-oriented network

➢ **Activity lies on arrow indicator path**

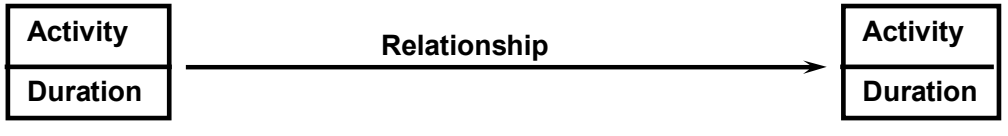


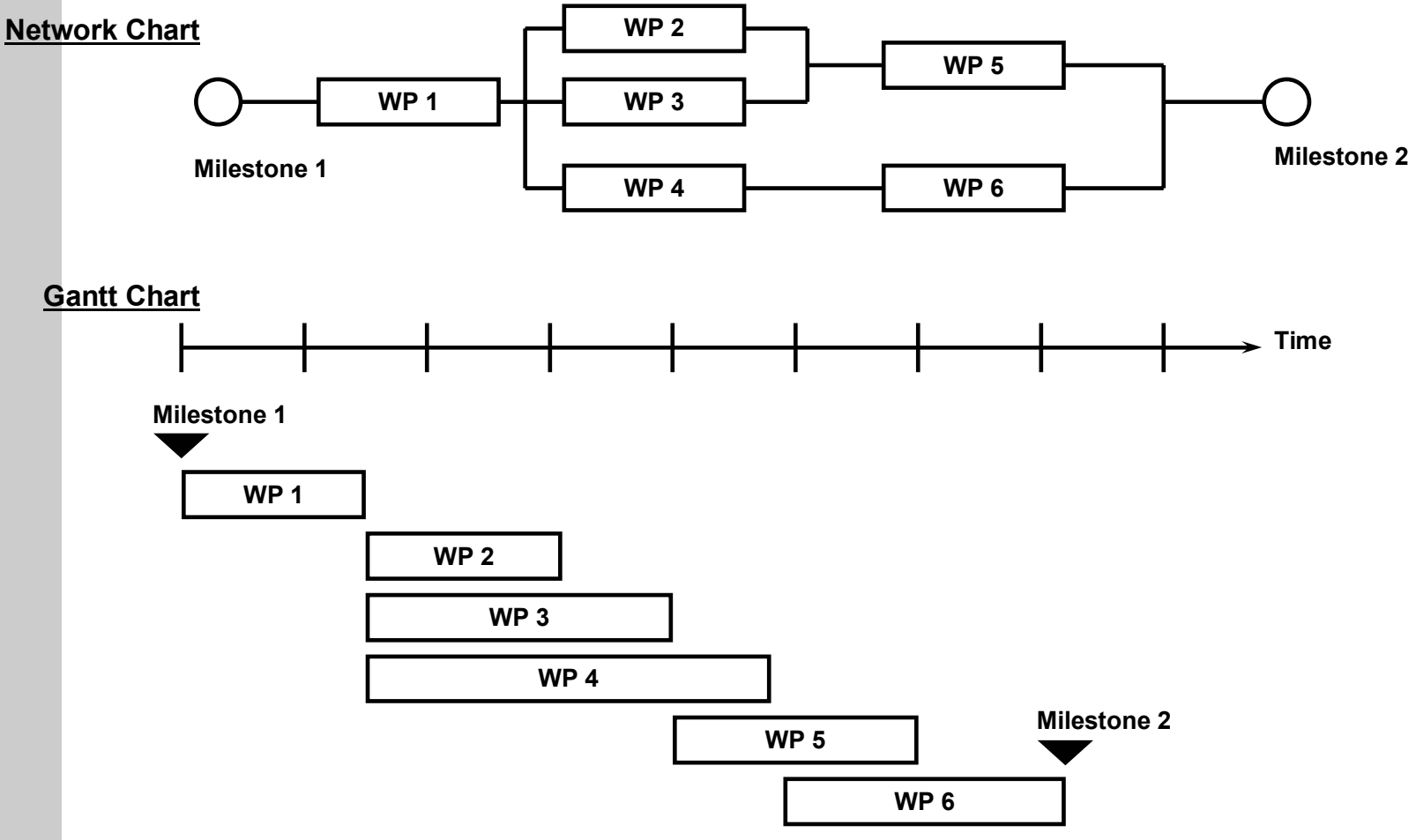
- **PERT = Program Evaluation and Review Technique**
  IBM Program name

- Very similar to CPM (but event-oriented)
- 3 time estimates:
- **optimistic**
- **most likely**
- **pessimistic**

- **MPM = Metra Potential Method**
  Activity node method

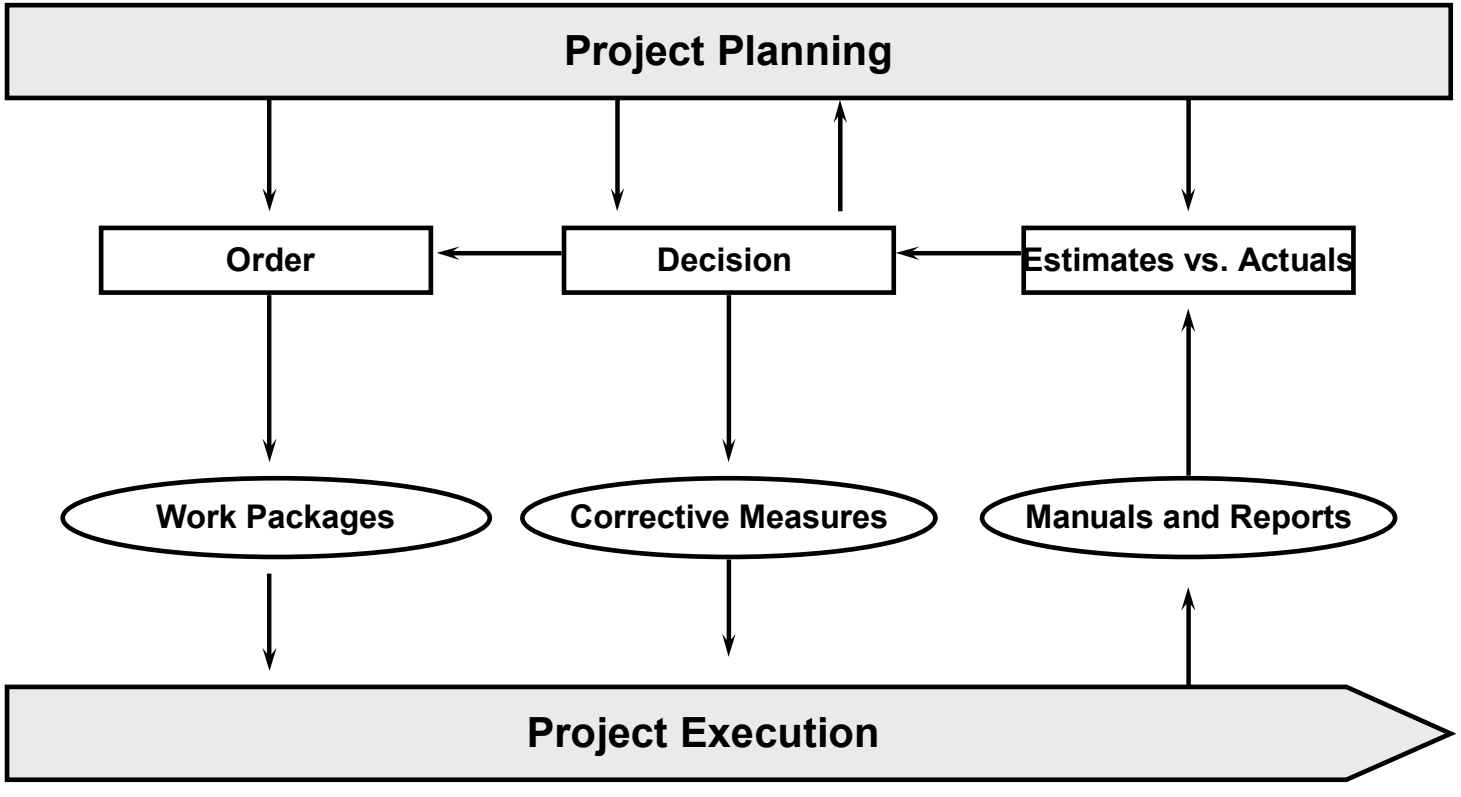
➢ **Activity as node**





Conventional Presentation Techniques for Scheduling

Monitoring and Controlling



Project Controlling

Objective: ***Stay attuned to current situation!***

What should be reported?

- Time, deadlines
- Cost
- Performance, Quality
- Resources

➢ Hard Data

- Problems
- Motivation
- Expected Risks
- Customer characteristics

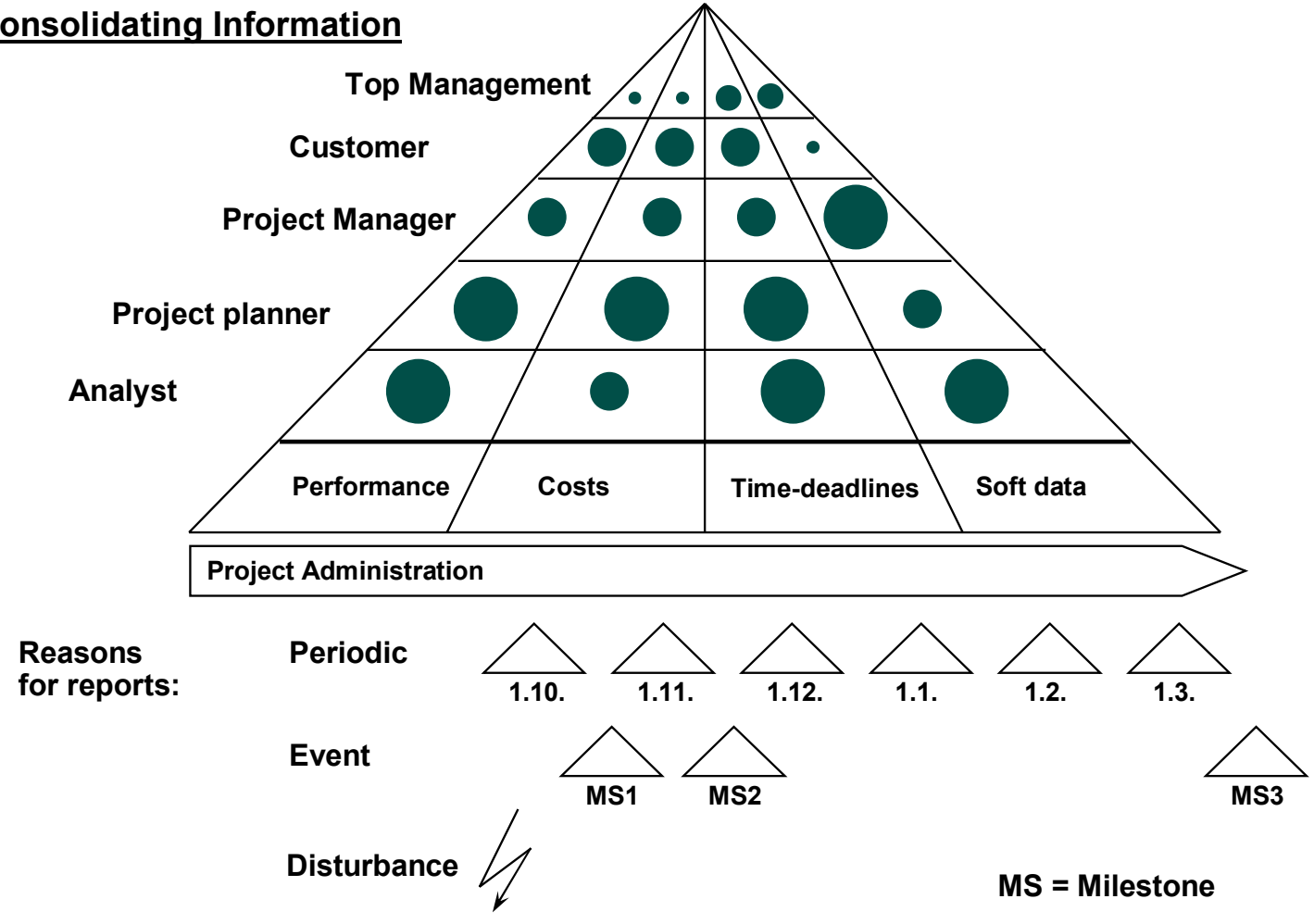
➢ Soft Data

Types of Reports

- Milestone Trend Analysis
- Project reports / review meetings
- Work package acceptance
- Formal phase review
- Team reports
- Quality Assurance reports
- CM controlling report

- Oral Communication (continuous)

Consolidating Information



Documentation and Reports

Objective: *Detect irregularities as early as possible*

Typical problem areas	How can they be identified?
• Results incomplete • Quality • Deadlines • Costs • Productivity • Resources • Management goals	• Official Reports – Milestone Trend Analysis (MTA) – Monthly Reports – Quality Assurance Reports – Formal Phase Review • Observations – Atmosphere in the Project – Personal or Group Discussions – Work attitude – Rumors • Reviews

* The MTA is set up with milestone dates on the vertical axis and report dates on the horizontal axis, each having months of the year as the measurement unit.

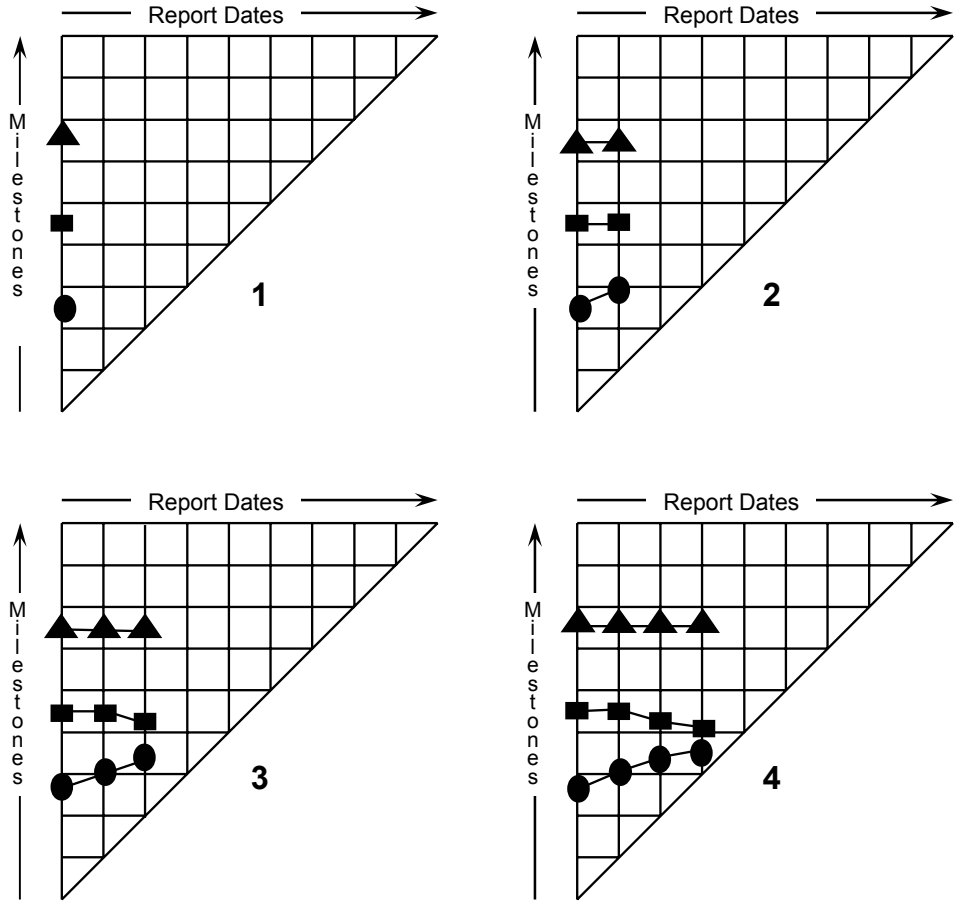
* The milestones are taken from the project structure chart and represented by symbols in the MTA (refer to previous foil).

  The deadlines for each milestone are taken from the scheduling chart. The appropriate milestone symbol is entered at the particular deadline date on the vertical axis. The first report date on the horizontal axis represents the date the scheduling chart was created.

* At regular intervals (i.e., every 4 weeks) the actual project situation is analyzed by the project team and the expected (possibly revised) milestone deadlines are determined. These estimated deadlines are entered at the appropriate report date.

* If there are any significant differences between the estimates and the actuals, the reasons are explained in a supplementary report.
* The trend line provides a clear and understandable measure of the changes in the deadlines.

Milestone Trend Analysis



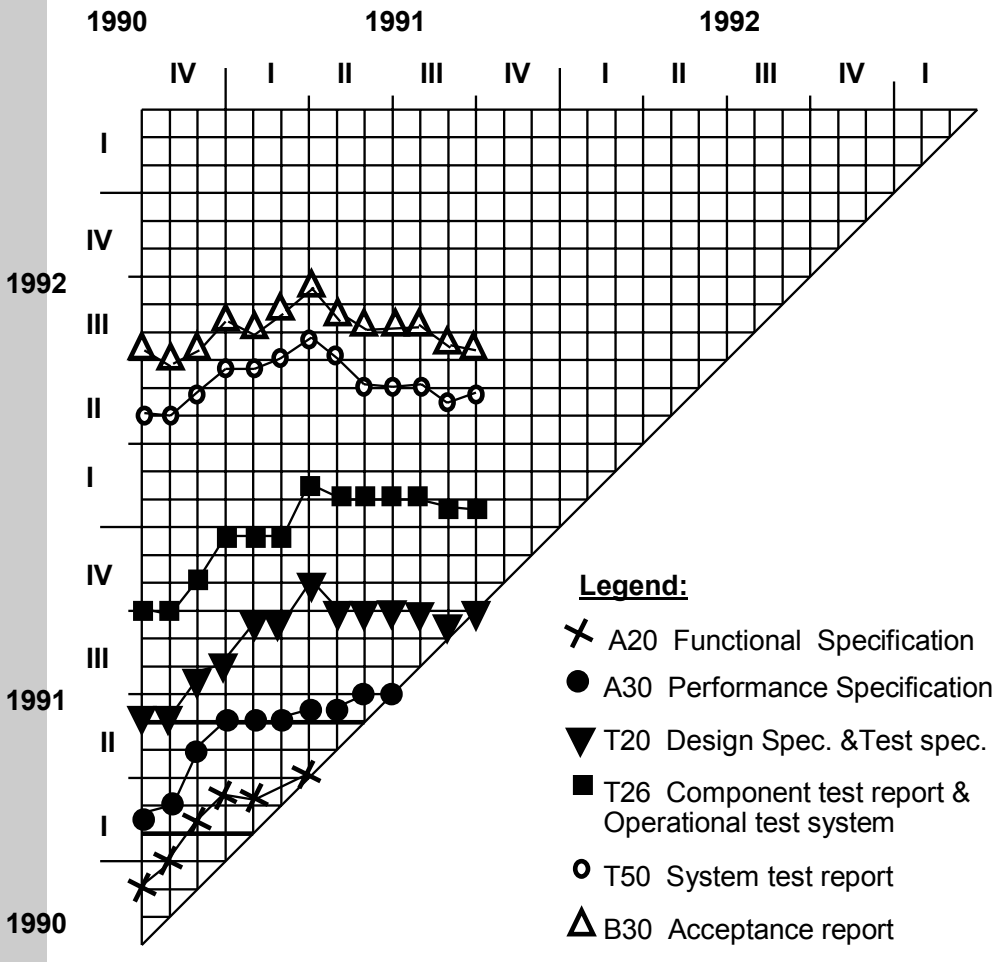
1 Initial state based on planning information

2 First project meeting with deadline control after one month

3 Second project meeting with deadline control after two months

4 Third project meeting with deadline control after three months

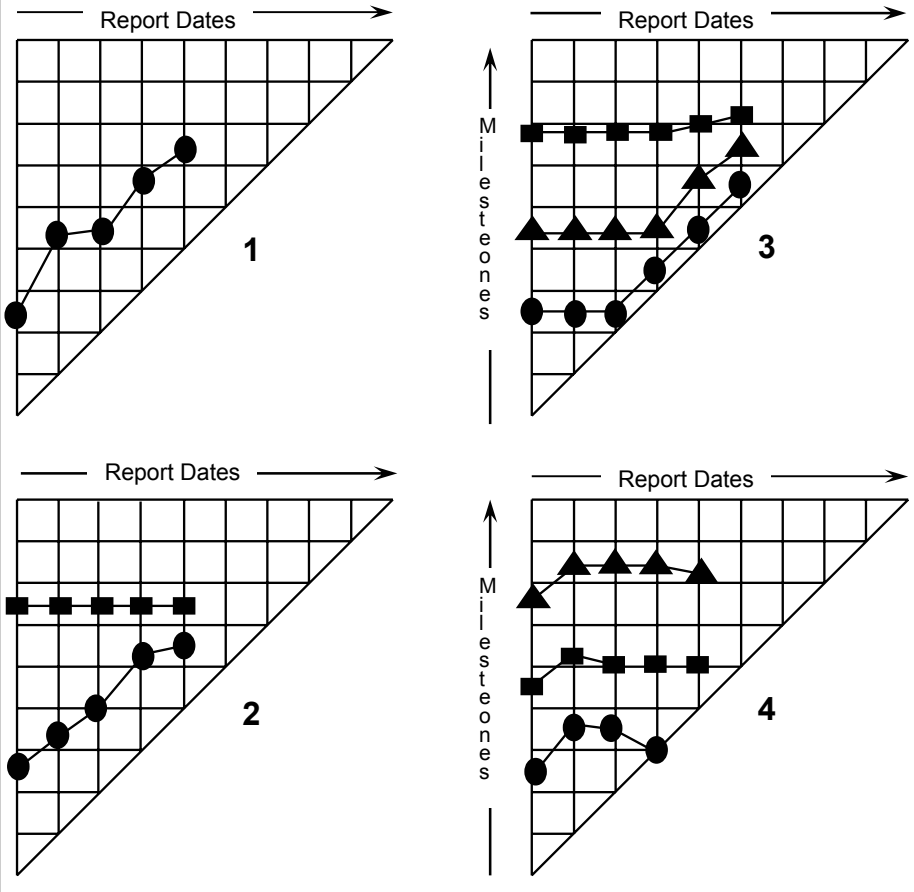
Developing a MTA



Each MS is examined every 4 weeks

Milestone Trend Analysis

- **Milestone Trend Analysis has proved to be most reliable for monitoring project deadlines. It is quite easy to use and involves minimum effort.**
- **For the Milestone Trend Analysis the expected deadline dates for planned milestones are entered at the report date. This data produces a trend line in the MTA chart, which shows the expected deadline dates. If the line goes up a milestone will most likely be finished later than planned; if the line goes down the milestone will most likely be finished early.**
- **Milestone Trend Analysis can be used in all situations where a project plan has been defined containing milestones for activities or components with their deadlines.**



Milestone trends can be quickly recognized by simply inspecting the trend line produced by the MTA. Four typical situations are shown here:

1 **In this example the milestone deadlines are delayed at every report date. This indicates inadequate scheduling. Scheduling must be improved.**

2 **In this example, despite delays in the first milestone, the subsequent milestone was not delayed. Milestones are usually logically dependant upon one another. This situation indicates that the effects of the delay were not sufficiently considered.**

3 **This example displays a relatively stable evolution of deadlines in which the milestones were only delayed direct before the finish date. Evidently scheduling was not accurate for the beginning report dates. The entire control system should be reevaluated.**

4 **This example displays a typical situation in which there was a delay in the first milestone. But subsequent control measures rectified the situation so that later deadlines proceeded with little or no delay.**

Milestone Trend Analysis: Typical Milestone Evolution

Objective: Meet deadlines!

- **Performance**
  - ➢ Scale down
  - ➢ Create versions
  - ➢ Purchase product parts (make or buy)
- **Cost**
  - ➢ Technical alternatives
  - ➢ Development process
  - ➢ Re-use techniques
- **Resources**
  - ➢ Expand
  - ➢ Distribute
  - ➢ External contracts for work packages
- **Productivity**
  - ➢ Training
  - ➢ Information, Communication
  - ➢ Motivation
  - ➢ Guard against interruptions

Learn from experience

- **If we could organize this project again**
  - what would we do exactly the same way?
  - what would we change?
  - what should we change immediately?
- **Purpose**
  - learn from successes and failures in the project
  - warn others about possible sources of error
- **Contents**
  - Life-cycle phase plan, WBS
  - Detailed information (size, deadlines, costs)
  - Comparison of estimates with actuals
  - Cost / effort estimation analysis
  - Deadline analysis
  - Report about experience gained (know-how, problems, etc.)
  - Recommendations (future R&D, management)