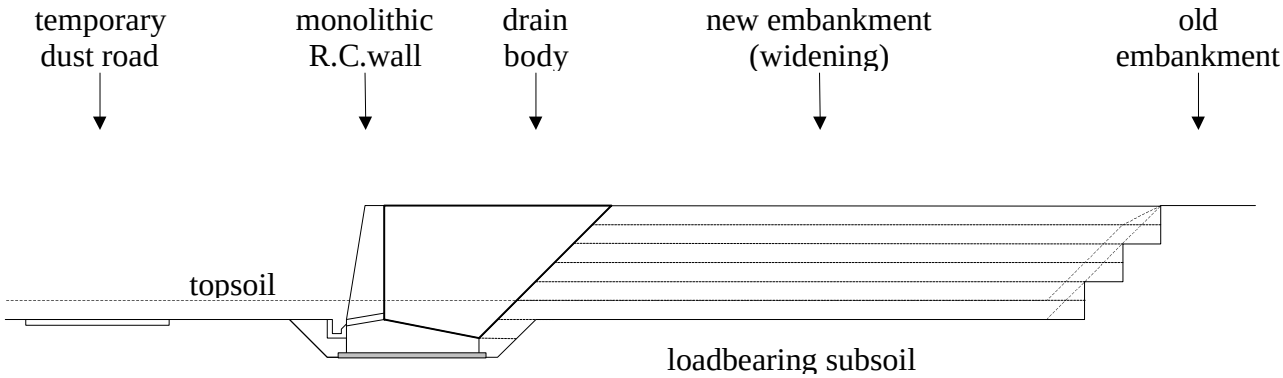
CONTRACTING

(planning – accomplishment – management)



ID	Activity Name	Time	Resource	Work day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	Topsoil removal	2 d	1 bulldr																						
2	Step embankment	4 d	10 labr																						
3	Levelling	1 d	1 grader																						
4	Ditch excavation	2 d	1 excr																						
5	Blinding	3 d	5 labr																						
6	Formwork	3 d	2 carpr																						
7	Reinforcement	5 d	4 rodm																						

$$T = f(\S,\ \$,\ l, m, p, \ldots)$$

$\S$: law & regulation
$\$$: financing
l : location
m : technology
p : time period

Time estimate - Schedule

CONTRACTING

Who …

Where …

What …

What time (deadline) …

What price …

:

W h a t t i m e ? !

Time-Plan

(*Schedule*)

- **As Estimate:** reference for to support decisions concerning future contracts aiming accomplishment of the project
- **As Baseline:** basis for to evaluate variances and responses on variances occuring during accomplishment of the project
- **As Model:** a feasible solution (model) for to facilitate eligible and accepted way of coordinating efforts aiming accomplsihment of the project

It has no meaning to speak of Schedules witout referring or assigning Resources

PRE-TENDER REPORT

(Site Survey)

Systematic view of all facts and factors at the site that may have great influence on accomplishment

Nature: Geology and Topography
Flora and Fauna (Environm.Prot.)
Watershed (Permanent, Seasonal)
Weather Conditions (Extremities)
:

Human: Nearby Municipalities, Agriculture
Local Laws and Regulations
Local Authorities (Permits, …)
Local Customs (Holidays, …)
Education (Communication, …)
Location, Accessing the Site
:

Resource: Local Manufacturers and Suppliers
Local Labour Capacities
Local Mines, Pits, Deposits
Concurrents Local Projects
Transport Capacities
Accomodation Capacities
:

RESOURCES

anything and everything
that is needed … and … bounded

M a t e r i a l

- Construction material (earth, wood, metal, concrete, …)
- Auxiliary structures (formwork, timber, scaffold, …)
- Fuel (gas, petrol, electricity, …)

H u m a n

- Management (leadership, know-how, authority, …)
- Skilled workers (mason, steel-fitter, carpenter, plumber, …)
- Labourers (unskilled, universal, trained workers, …)

E q u i p m e n t

- Heavy equipment (excavator, bulldozer, crane, truck, …)
- Auxiliary machinery (mixer, floater, finisher, pump, …)
- Power tools (cutter, drill, welding set, pin vibrator, …)

T i m e

A r e a

M o n e y

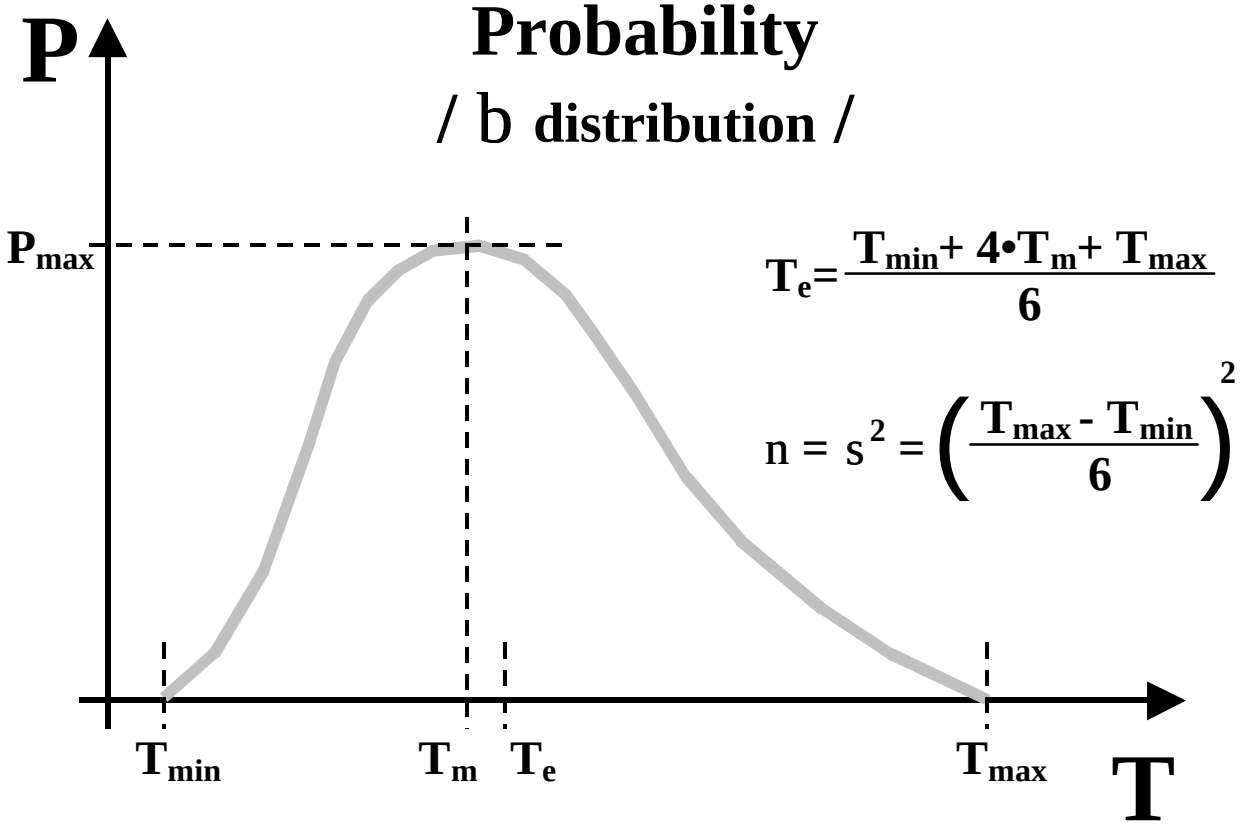
WORK BREAK-DOWN STRUCTURE (WBS)

- Decision Actuality / Circumstances
- Decision Level / Responsibility
- Time-span / Term
- Function / Delivery
- Structure / Unit
- Technology / Contracting
- Measurability / Controlling
- Division / Management
- :
- Experience / Database

typical/frequent, quantified, qualified, …, accurately identified items with reference codes, structured

Probability

/ b distribution /

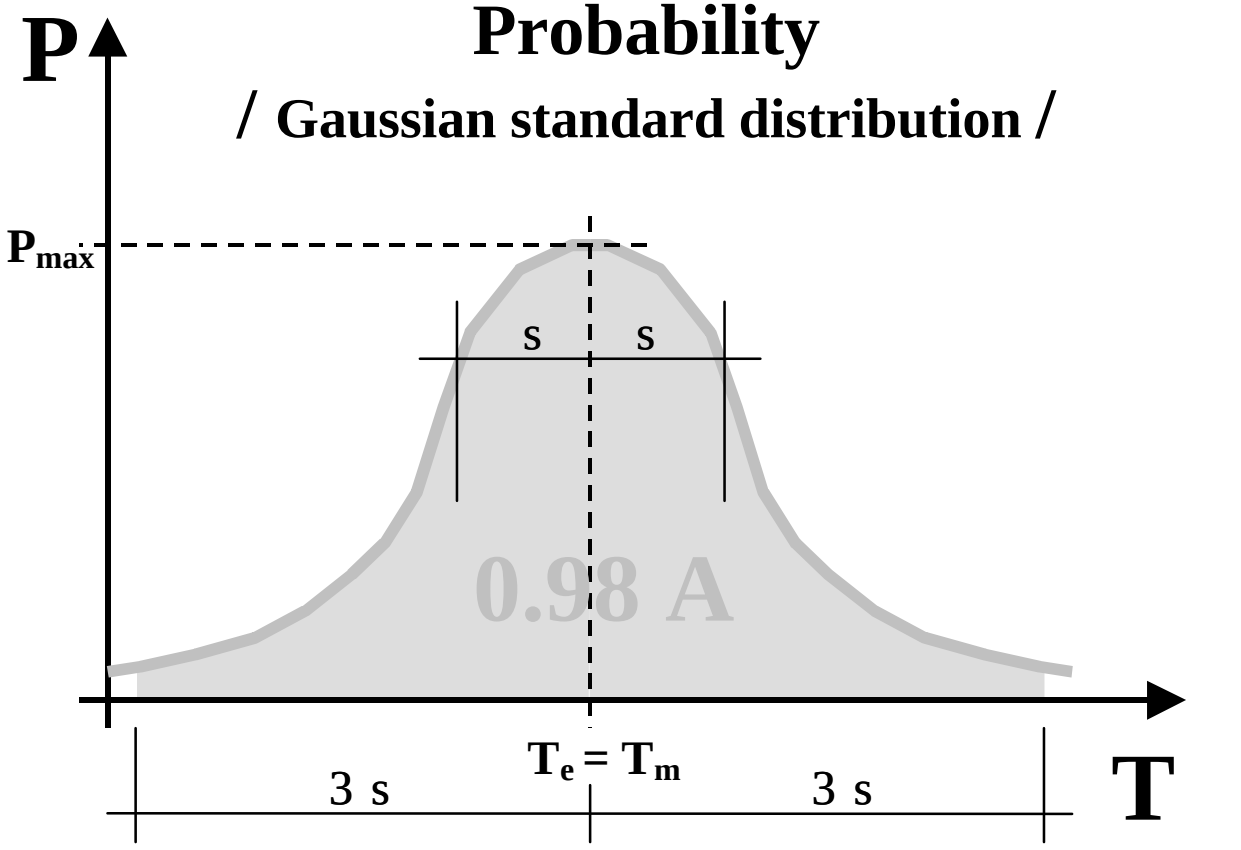


$$T_e = \frac{T_{min} + 4 \cdot T_m + T_{max}}{6}$$

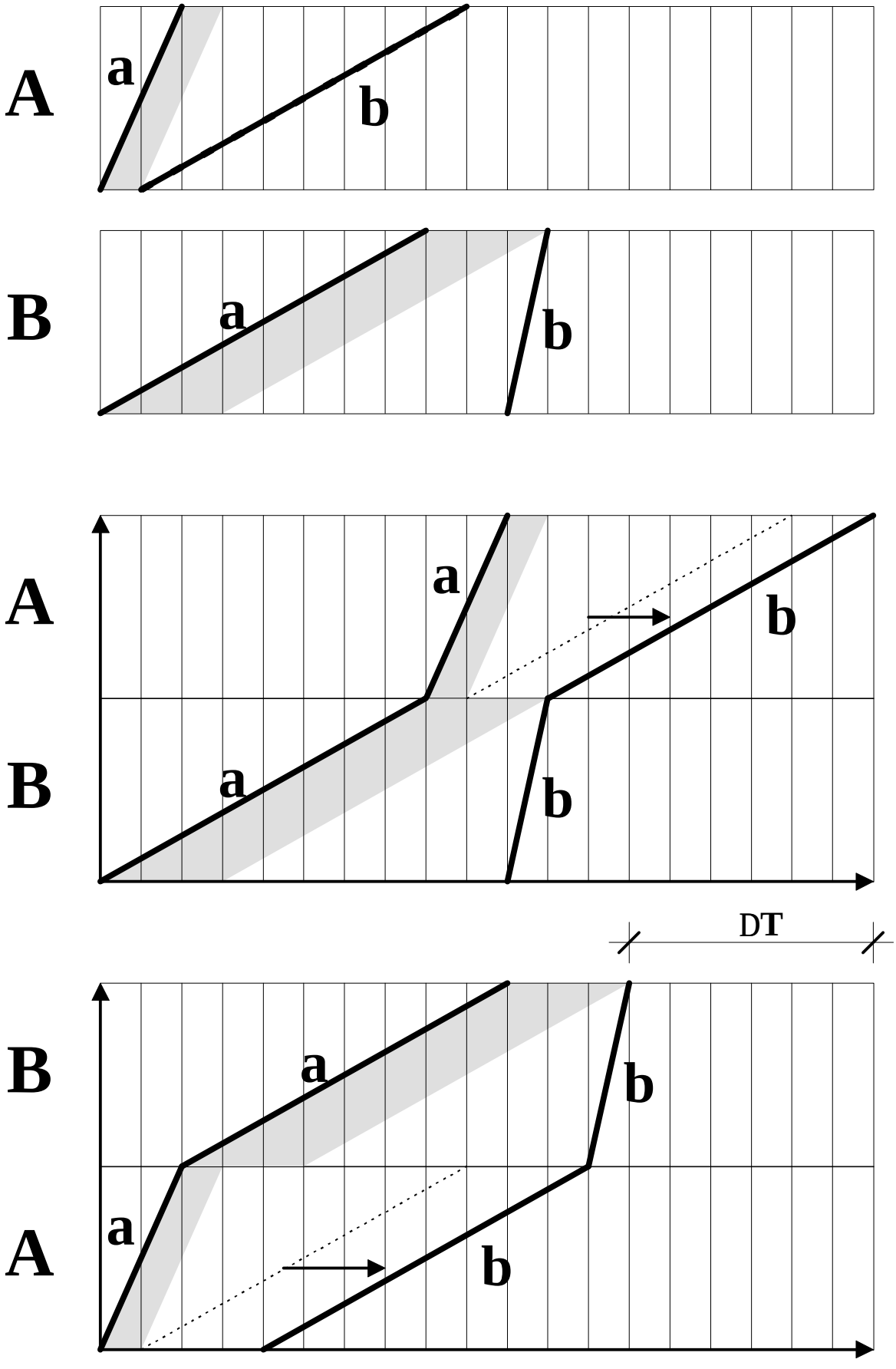
$$n = s^2 = \left(\frac{T_{max} - T_{min}}{6} \right)^2$$

Probability

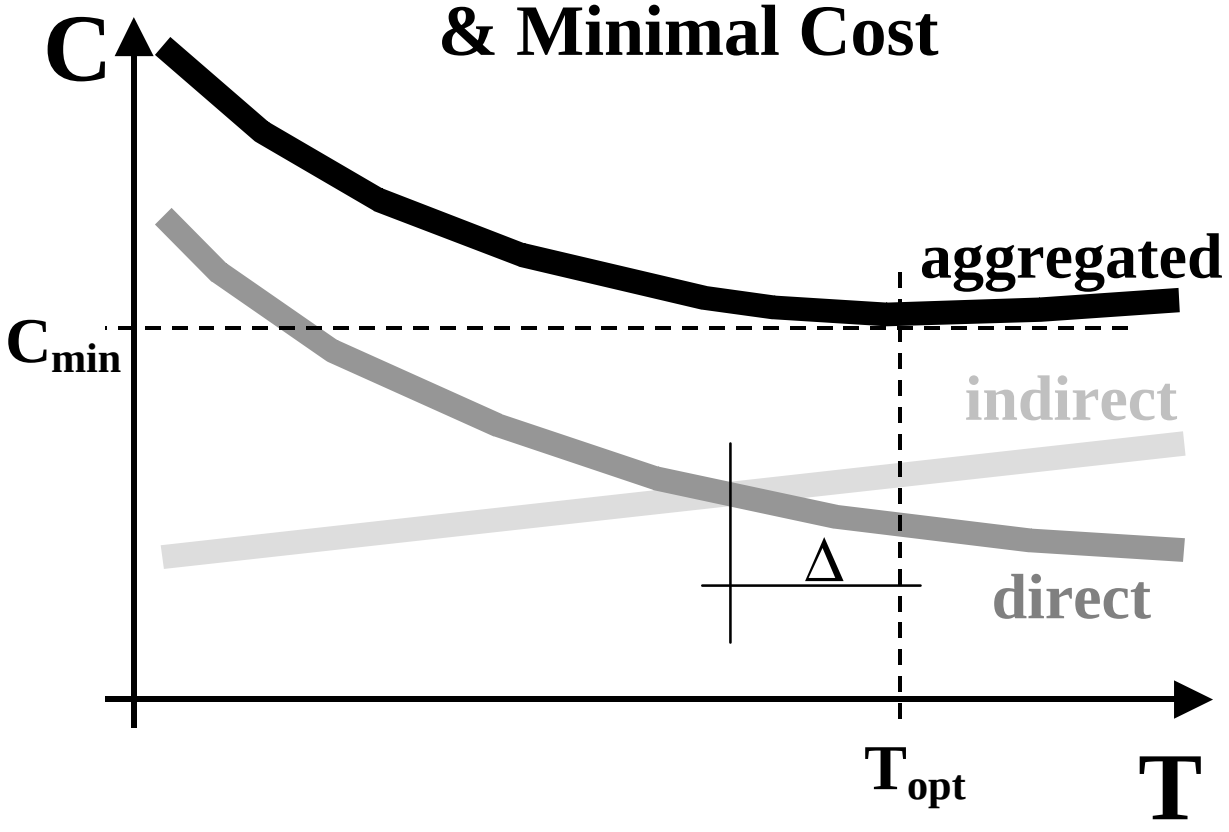
/ Gaussian standard distribution /



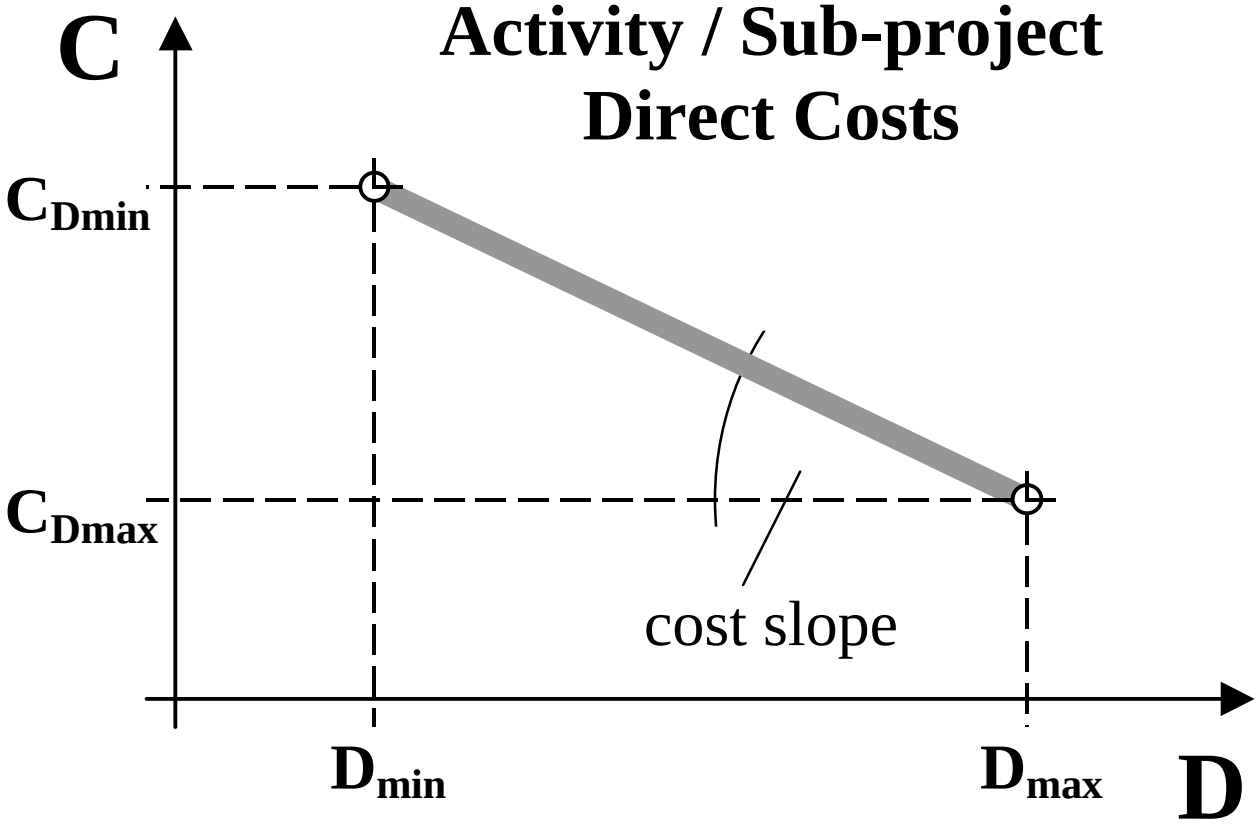
SEQUENCING (SUB-)TASKS



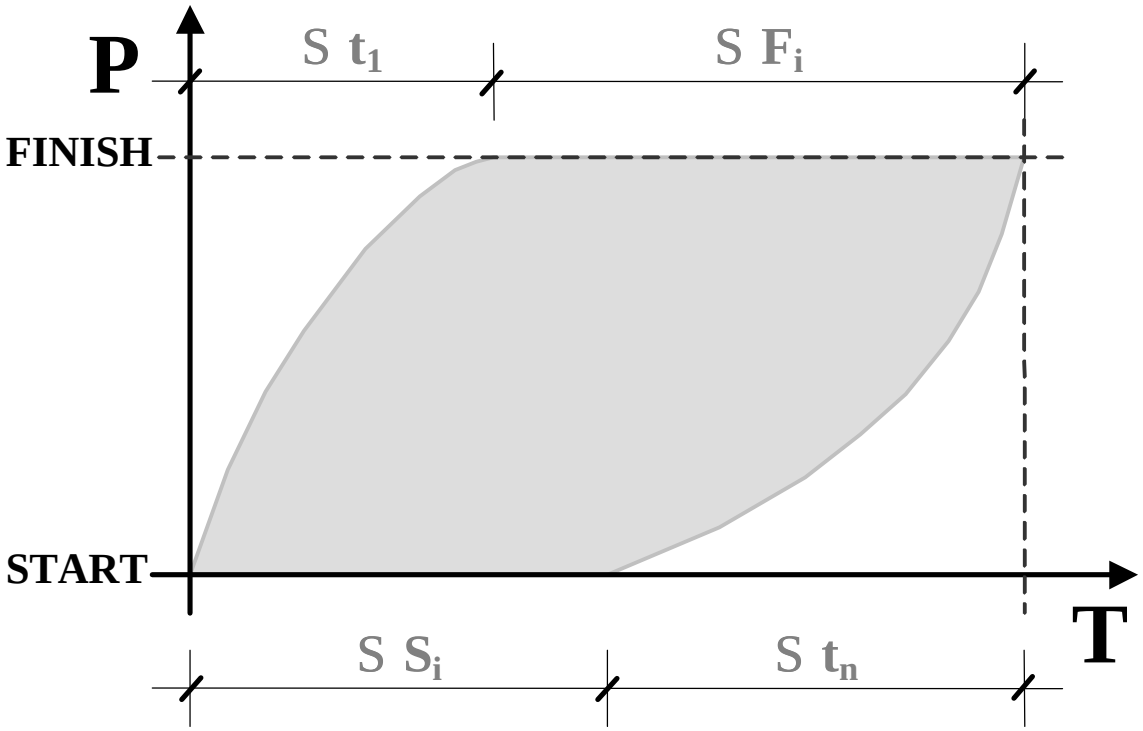
Optimal Time-Span of Project & Minimal Cost



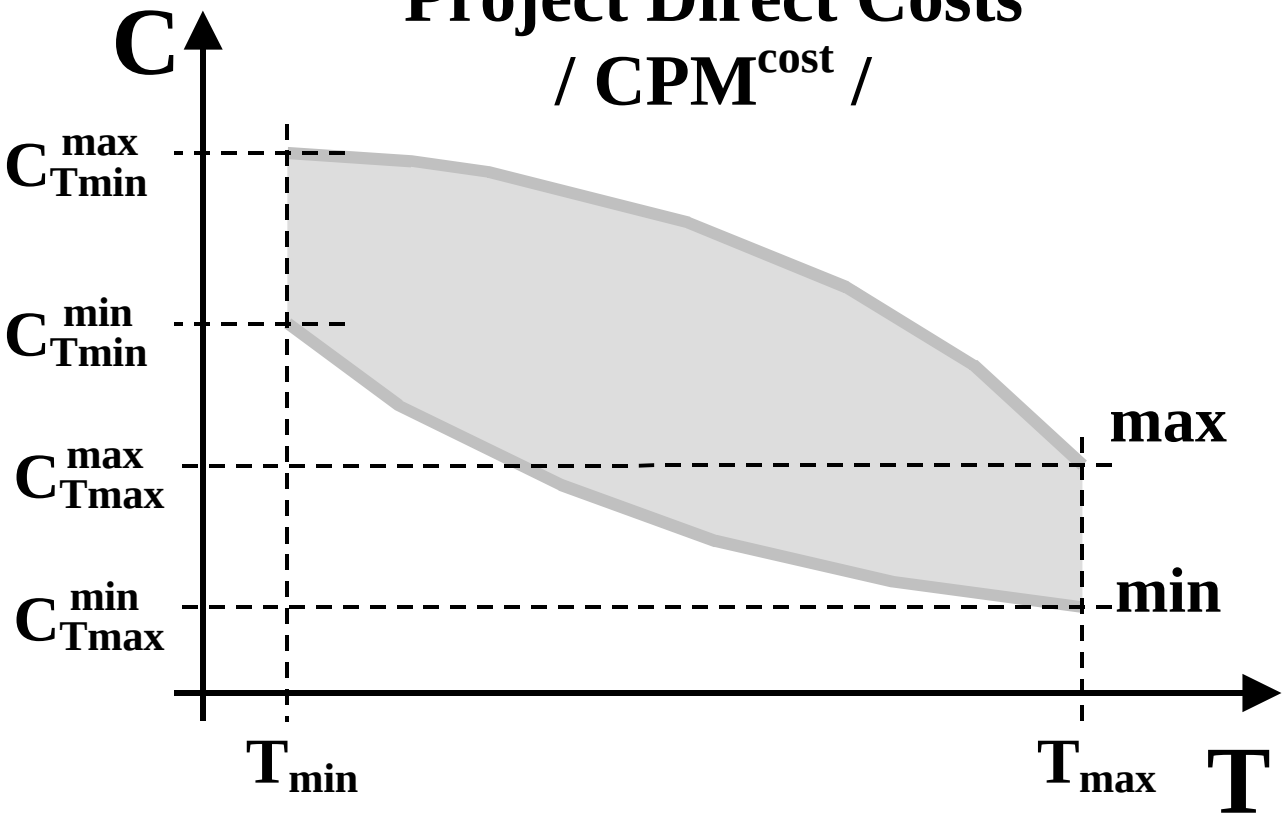
Activity / Sub-project Direct Costs



Project Schedule



Project Direct Costs / CPM^{cost} /



Network Techniques

(Scheduling)

Analogies in Graph-techniques:

- The Longest Path's Problem
- The Minimal Potentials' Problem

(All components are necessiated, but we are interested in finding dominant ones and in predicting roll on effects of likely changes)

Developed Network Techniques

(auxiliary algorithms, variant correspondence)

- $PERT^{time}$
- CPM^{time}
- CPM^{cost}
- $CPM^{létra}$
- MPM^{time}/PDM^{time}
- MPM^{cost}
- GTM *(General Time Model)*

Risk Management

RISK:

Risk represents the chance and impact of adverse consequences or loss may occure.

„Risk is an inherent – and inevitable – characteristic of any project”

Risk Management:

– **Risk assessment** (idenfification, probability estimate and impact analysis) make clear definition of risks, including chance of their occurance together with assessing their impact on the project’s outputs.

– **Risk management** deals with identifying counteractions necessary to avoid or lessen chance of occurance or to decrease impact of adverse consequences identified during risk assessment.

Based on: The Open University, Project Management 1995

Risk Management

Risk Assessment:

- Exploring and **identifying** risks
- Analysing risk factors in terms of their **impact** on performance (cost, schedule and quality)
- Estimating **probability** and **likelihood** of the risk occuring during execution of the project (*exposure*)
- Assigning **priorities** to risks according to thier probability, effects and range of damages associated, together with analysing chance of their simultaneous occurance

The scope of risk identified in an assessment will be in keeping with with the scope and level of project definition used to identify risks

Based on: The Open University, Project Management 1995

Risk Management

Ways of exploring and identifying risk:

- Expert evidence, expertice, consultancy, analysing experiences of past projects
- Methods of process- and/or system analysis (e.g.: based on list- or interrelations of activities, or on organizational structure)
- Statistical methods, multivariate analysis, computer aided simulations

Improving efficiency of risk analysis and risk identification:

- Risk assessment checklists, questionaries
- Teamwork (Brainstorming) – „*Two minds are better than one*”
- Draw stakeholders into conversations, group works with stakeholders and third parties.
- Negative brainstorming – „*How could we sabotage the given aspect of the project?*”

Based on: The Open University, Project Management 1995

Risk Management

Risk Management Priorities:

- High-impact, high-probability risks
- High-impact, lower-probability risks
- Lower-impact, high-probability risks

Complexity of Countermeasures:

- **Avoiding** the risk (eliminating)
- **Reducing** the risk (likelihood or impact)
- **Transferring** the risk to others (insurance)
- **Contingency plans** (to be implemented should the risk occur)
- **Accepting** the risk (just monitoring)

Cost-effective countermeasures – compared with the likely damage if the risk occured

Based on: The Open University, Project Management 1995

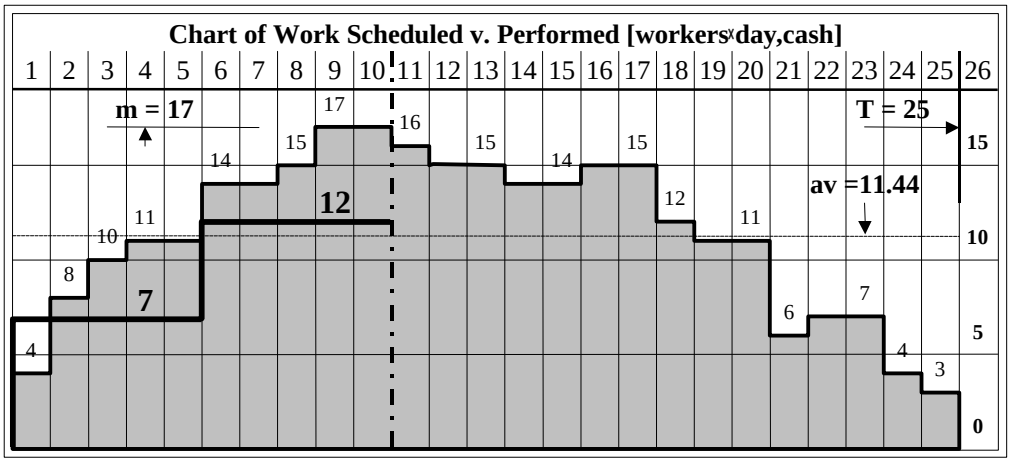
Reducing The Risk

Risk factor Identified	Reducing Probability	Reducing Impact
…	…	…
Lack of experienced staff	Employ skilled professionals, and/or consultant-experts	Experinced staff informally supervise the work of less experienced collegues
Lack of technical infrastructure in the form of tools or access to tools	Hire or purchase necessary tools and resources	Increase time-span of project planned
Lack of necessary knowledge or of technical experience	Invite professional sub-contractors with high reputation	Organize trainings and study courses for the staff
…	…	…
Multiple vendors or contractors included	Nominate "Main Contractor"	Increase project contingency times
…	…	…
Latesome deliveries, and tardy performance of sub-contractors	Stipulate penalties in the contract	Schedule increased durations for activities
Defficient deliveries, and imperfect performance of sub-contractors	Screen sub-contractors, specify technical priorities and expectations	Stipulate waranty conditions in the contract
…	…	…
Unforseen weather extremities	Use less weather-sensitive technologies	Contract Insurance Co., financial reserves, special contract closures

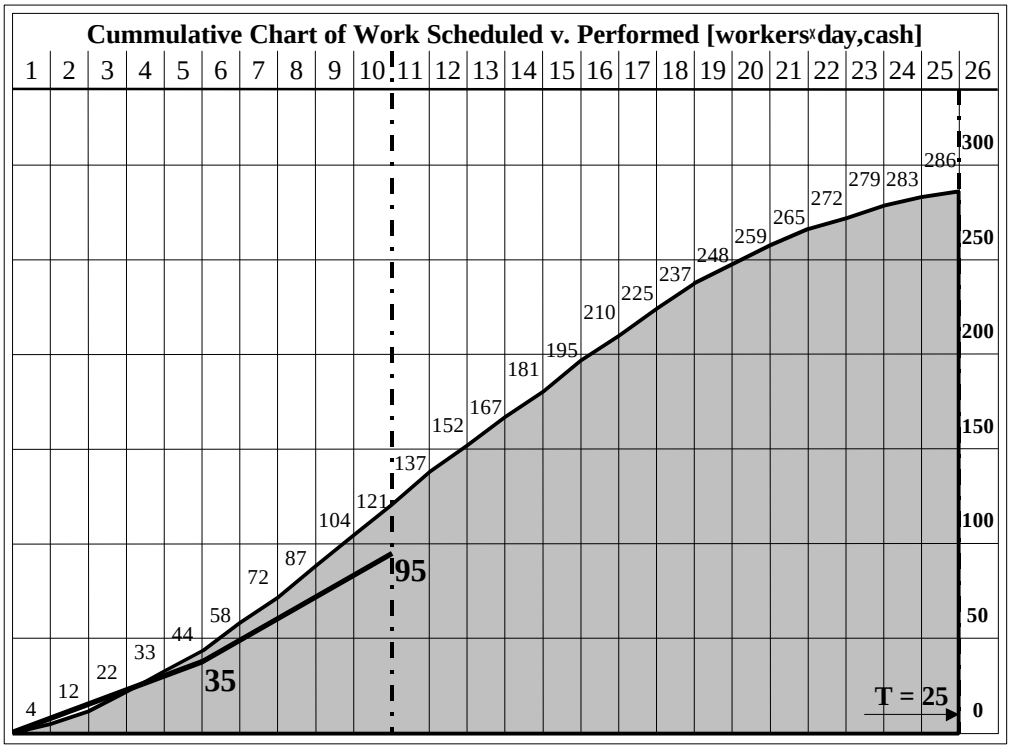
Based on: The Open University, Project Management 1995

MONITORING PROGRESSION
(Graphics)

Differential Curves (e.g.: work)



Integral Curves (typical: costs)



MONITORING PROGRESSION
(Indices)

ACWP: Actual Cost of Work Performed

BAC: Budgeted At Completion

BCWP: Budgeted Cost of Work Performed

BCWS: Budgeted Cost of Work Scheduled

CV: Cost Variance

CVI: Cost Variance Indicatrix (CVI=BCWP/ACWP)

EAC: Estimate At Compltion (Cost)

ETC: Estimate To Complete (Cost)

EVCV: Earned Value Cost Variance *

EVSV: Earned Value Schedule Variance *

FAC: Forecast At Completion (Cost)

SPI: Schedule Performance Indicatrix (SPI=BCWP/BCWS)

SV: Schedule Variance

Source: A Guide To The Project Management Body Of Knowledge 1996