



# Risk and uncertainty

: the generation and  
use of confidence  
limits

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# Some matters for debate

- MoD requirements
- Purposes of an estimate
- Forecasting of risk
- Quantification of risk and uncertainty
- Granting of approvals

# MoD requirements (1)

The central figure of three-point estimates has been defined variously by MoD as

- The ‘average position where some risks do materialise and some do not’
- That which ‘has a 50% probability of being exceeded’
- The ‘most likely’ value

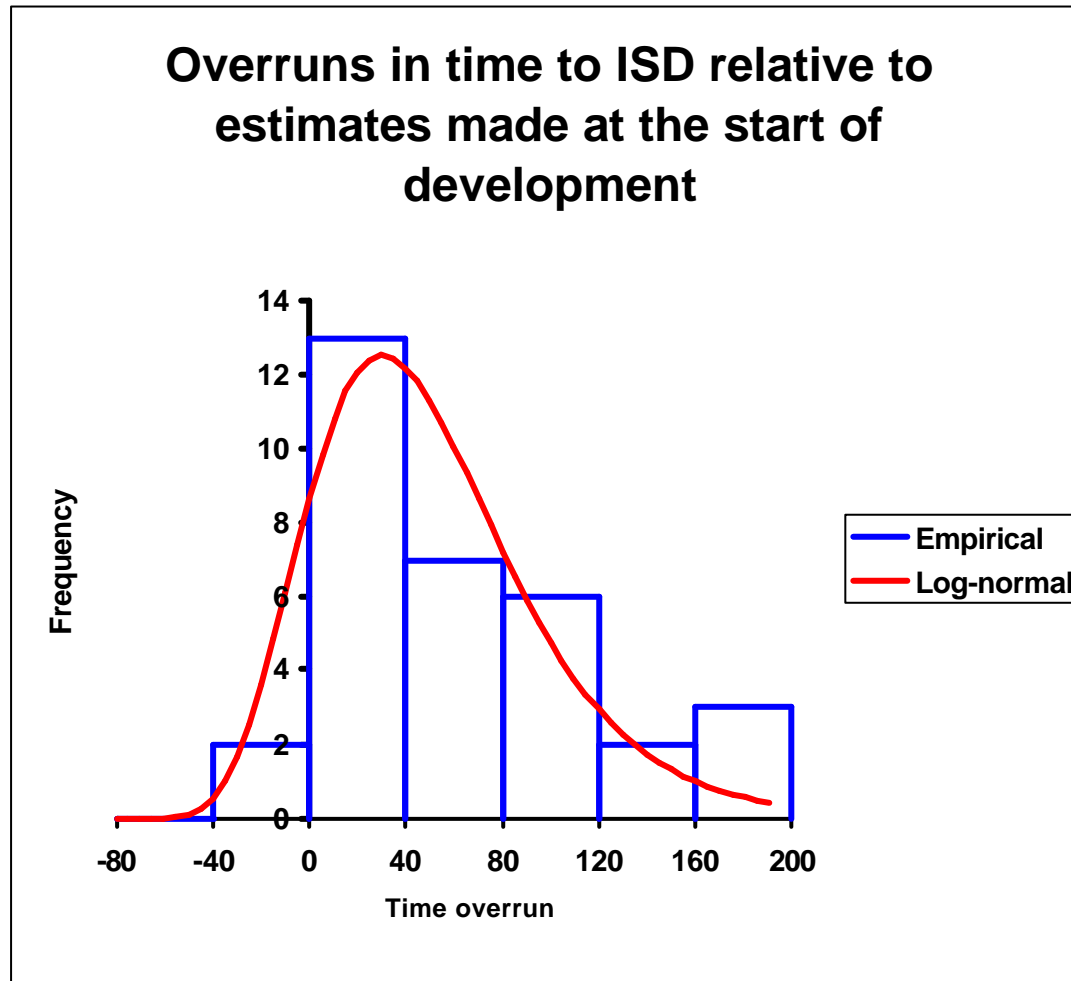
**Mean**

**Median**

**Mode**

# MoD requirements (2)

Actual distributions of outturn/estimate are highly skewed



Mean

~

Median

~

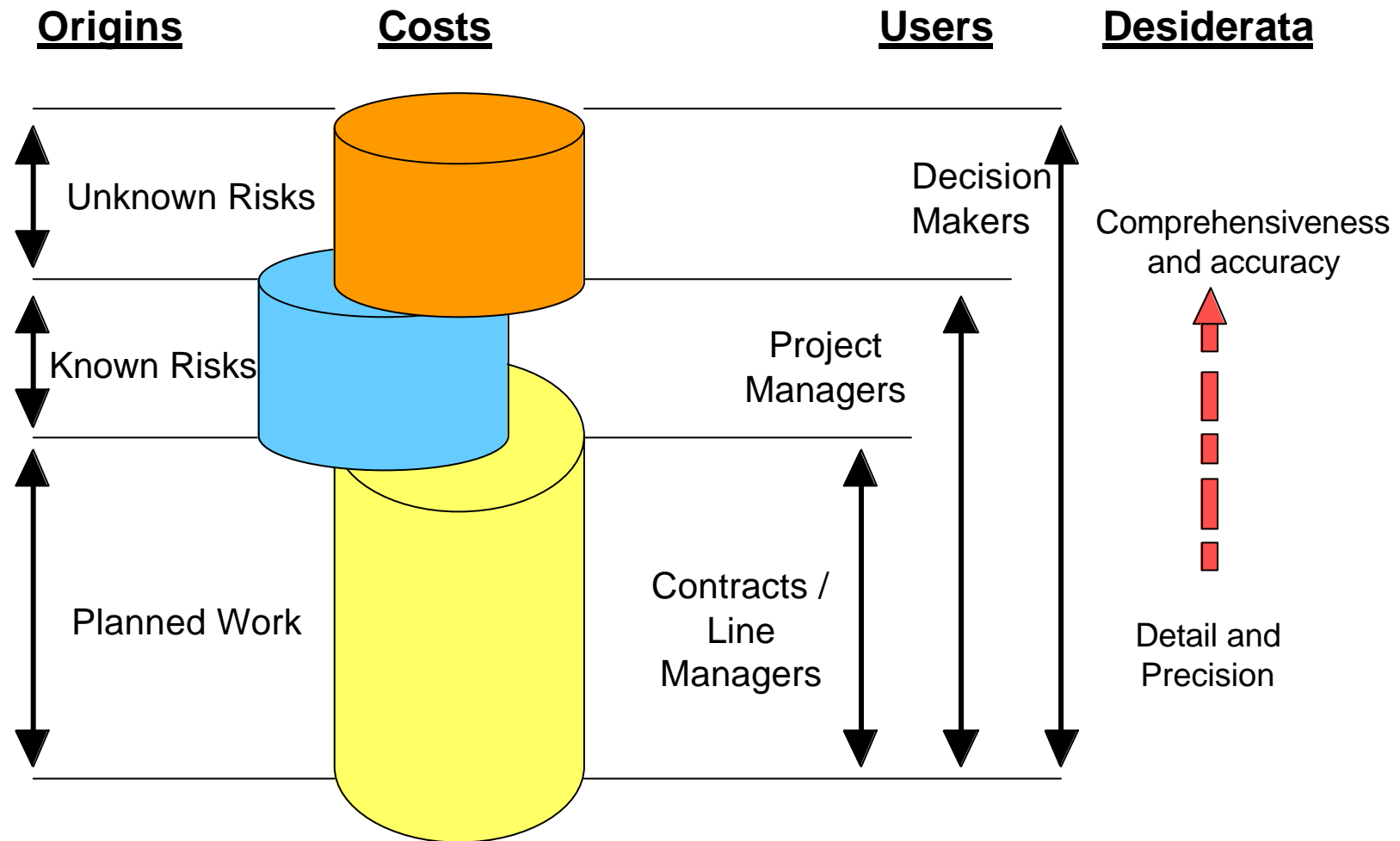
Mode

**Which is it that MoD wants?**

# Purposes of an estimate

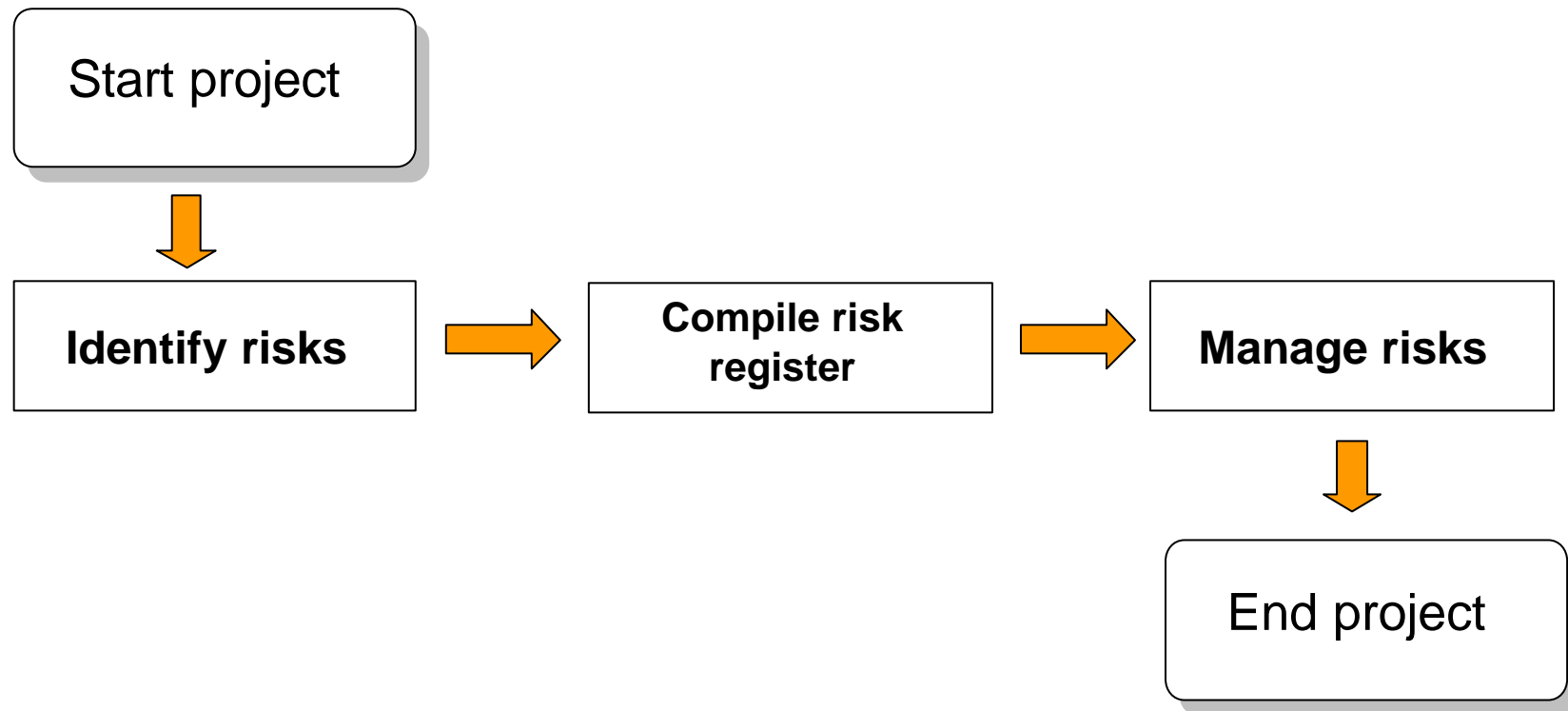
- The preparation of estimates should not be an end in itself but should be
  - An aid to decision making
  - A support to the management of projects
- Different applications call, therefore for different types of estimate

# To Each Their Own Estimate



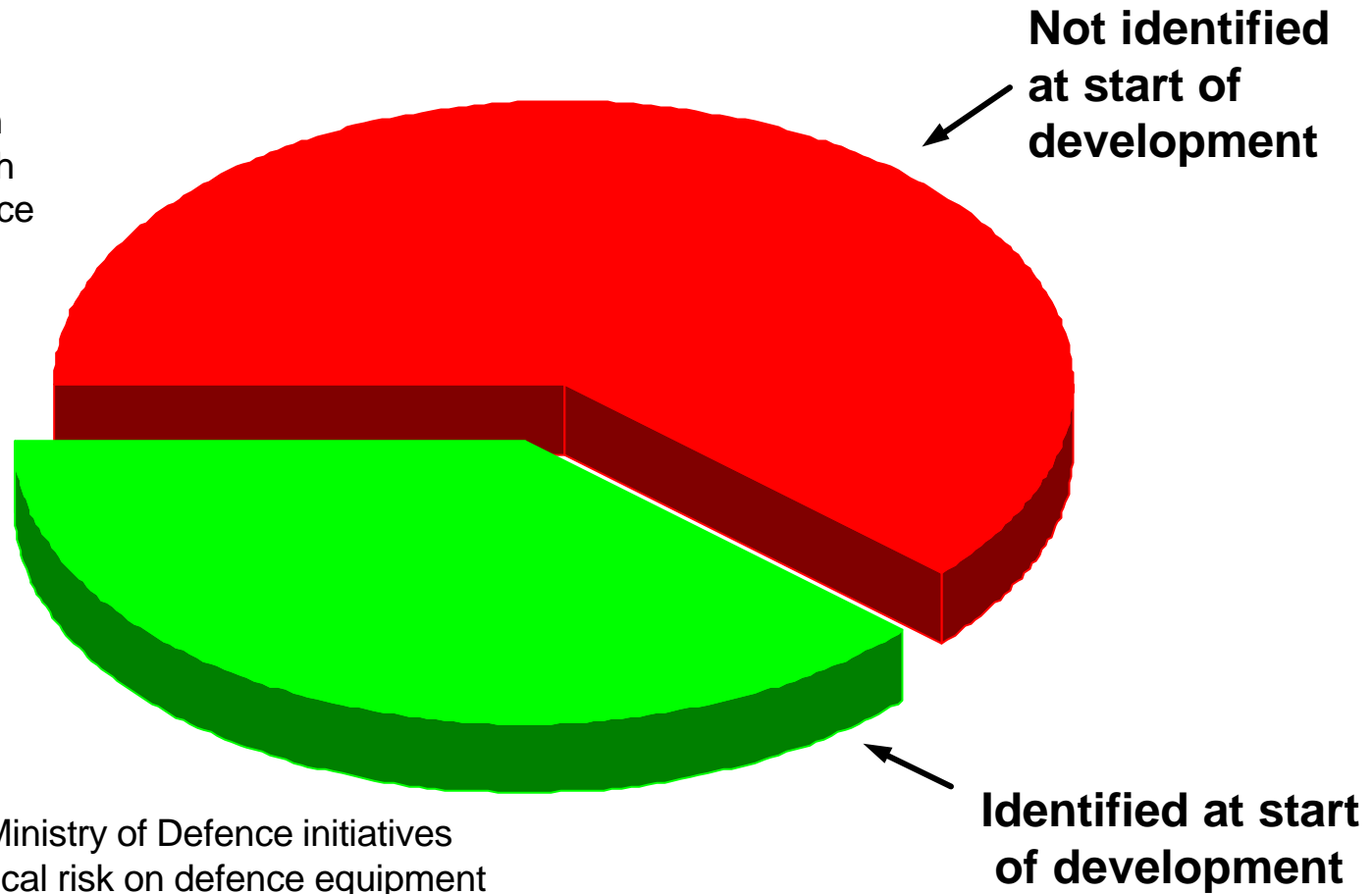
**Treatment of risk must depend upon the purpose of the estimate.**

# Forecasting of risk: theory



# Forecasting of risk: reality

Technical risks only  
(28 projects begun in  
1985 or later of which  
11 had entered service  
at time of survey)



Source: NAO report, "Ministry of Defence initiatives to manage technical risk on defence equipment programme"; HC361, Session 1995-96; HMSO 1996

## Risks eventuating during the average project

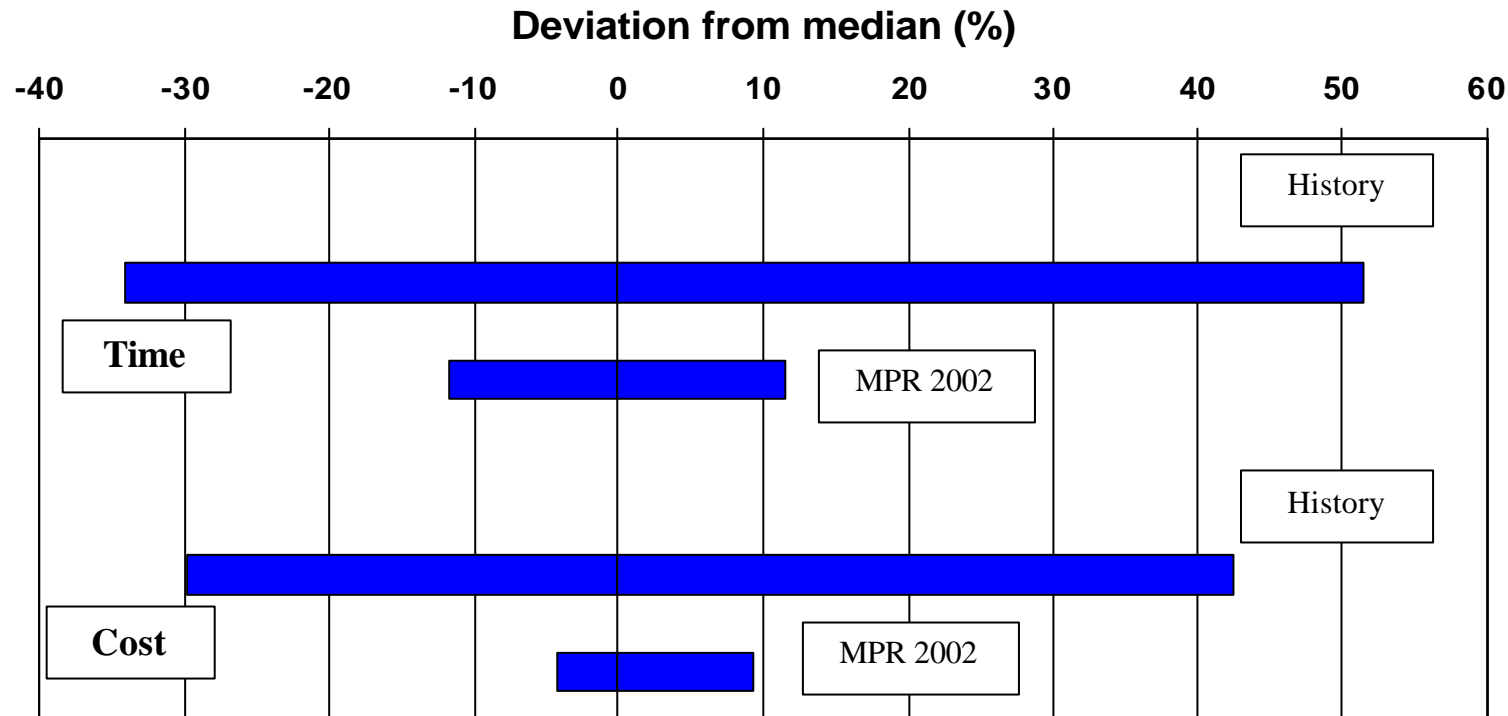
Detailed risk analysis can be self-delusive

# Quantification of risk (1)

- Is 'risk and uncertainty' to be all-embracing?
- Who accounts for risk and uncertainty outwith the control of the contractor and/or the IPT?
  - 'Knock-on' effects of delays in other projects and/or research programmes
  - Specification changes due to re-evaluation of threat
  - Delays imposed for overall equipment programme budgetary reasons
  - Risks of low probability but high impact
  - Et cetera, et cetera .....

# Quantification of risk (2)

## Uncertainty of estimates: NAO MoD MPR 2002



How is the balance of risk accounted for?

# Granting of approvals (1)

- Project approvals are against the upper (90% confidence) limits on cost and time.
- Equipment Plan is compiled on the basis of the middle figure of three-point estimates (treated as if they are means).
- It is possible, therefore, that the Equipment Plan becomes unaffordable even though not one project is overspent.

How is the mid-point estimate to be given the significance required?

# Summary

## Questions requiring to be addressed include

- What should the middle figure of a three-point estimate represent?
- How is the treatment of risk to be matched to the purpose of the estimate?
- How can detailed risk analyses be prevented from becoming self-delusive?
- How comprehensive a set of risks are to be accounted for within three-point estimates?
- How is the middle figure of a three-point estimate to be given a significance for individual IPT commensurate to that which it has for the Equipment Plan as a whole?