Effects of human errors on decisions concerning robustness measures

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Introduction
Risk assessment – office building
Concluding remarks

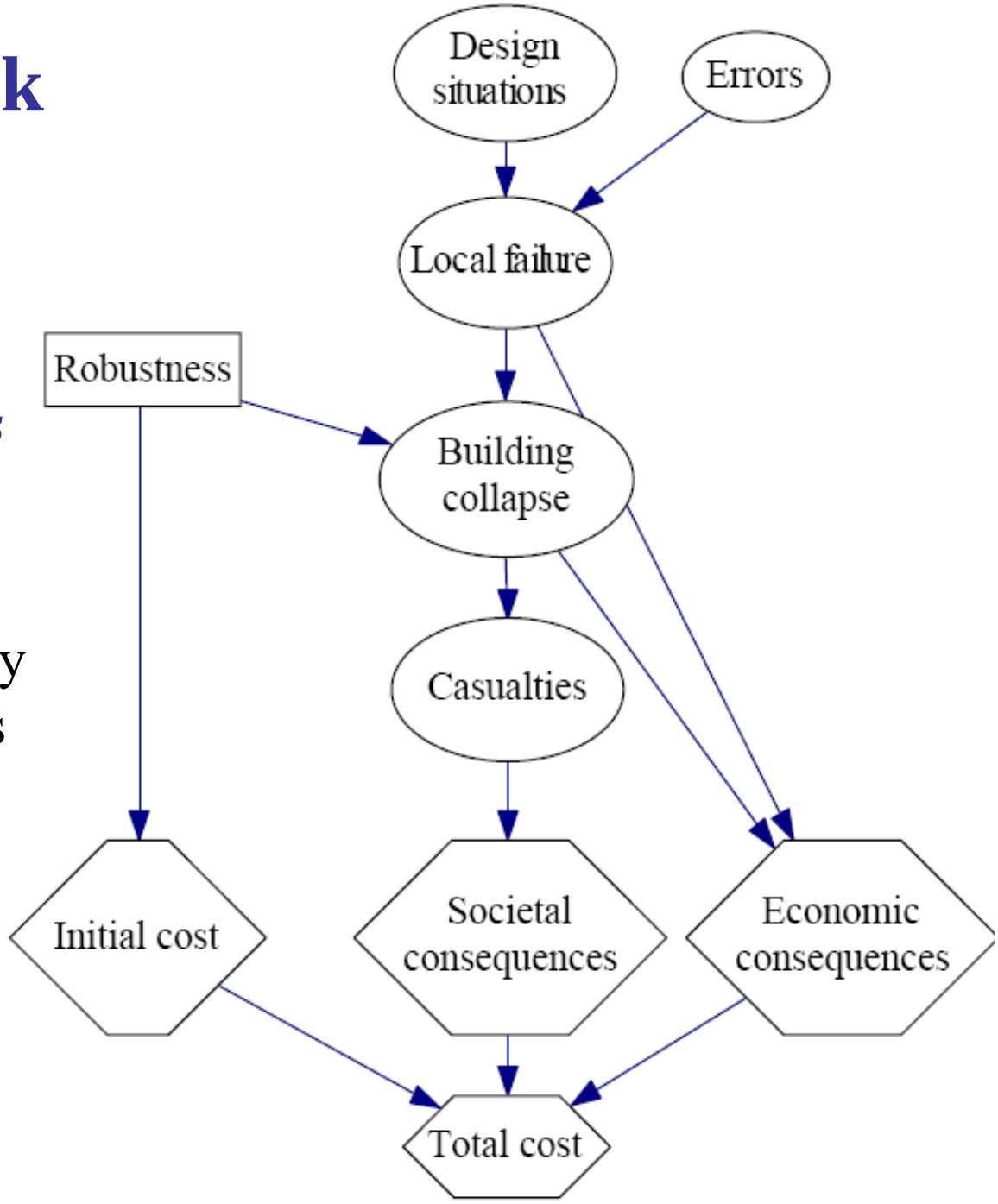
Introduction

- ***Decisions*** concerning robustness can be based on ***optimisation*** of cost and consequences over the working life, considering:
  - societal and economic ***consequences*** of structural failure
  - permanent and accidental ***design situations***
- ***Tools***: risk analysis and assessment
- Up to now effects of human ***errors*** seem to be ***neglected***.
- Human errors in design, during execution and use significantly contribute to about ***75-90 % of failures***.
- The submitted study attempts to:
  - show how the human errors can be considered in the decision making
  - identify needs for development of error models

  → As an example ***robustness measures*** for an office building are ***analysed***

Bayesian network

- ***Risk analysis*** - 50-year working life, fire may occur
- Low/medium/high ***levels of robustness***
- Increasing level reduces ***probability of collapse*** by the factor 5 but increases the ***initial cost*** by 2.5 %
- ***Societal consequences*** assessed by the Societal value of statistical life



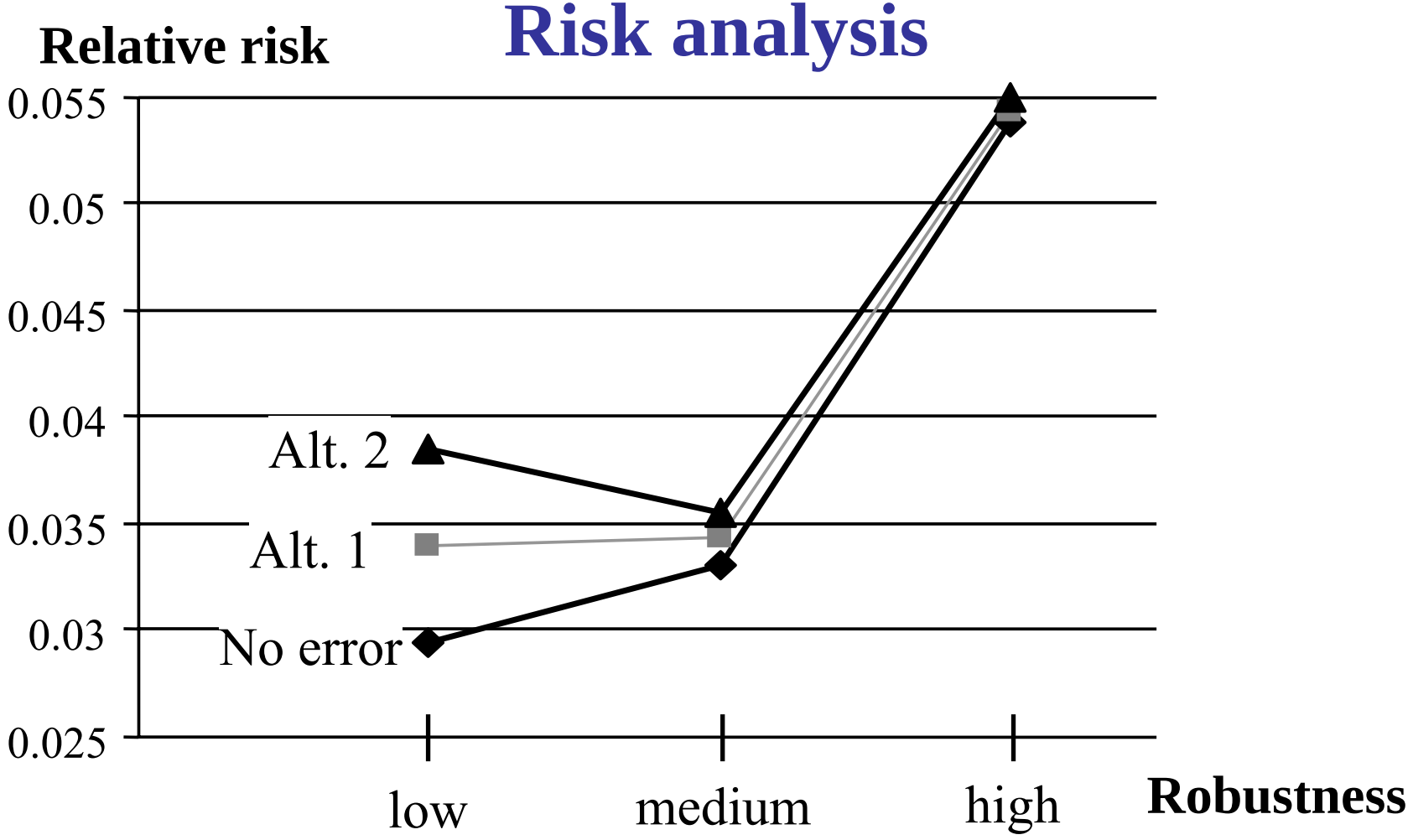
Model for human errors

- Three ***levels*** distinguished:
  - ***no error*** - target failure probability
  - ***medium*** error - failure probability increased by the factor 10
  - ***gross*** error - failure probability increased by the factor 100

- Two ***alternatives*** are considered for occurrence of the error levels:

Alternative	No error	Medium	Gross	Failure probability increased
1	0.86	0.1	0.04	5-times
2	0.72	0.2	0.08	10-times

Risk analysis



- Human ***errors increase risk*** and may ***affect decisions*** concerning robustness measures.
- ***Effect*** of the errors ***decreases*** with increasing ***robustness***.

Concluding remarks

- ***Decisions*** concerning structural ***robustness*** can be based on ***risk optimisation*** using the Bayesian causal networks, considering permanent and accidental design situations.
- Human ***errors*** in design, execution and use should be ***considered***.
- Human ***errors increase risk*** and may ***affect decisions*** concerning robustness measures.
- ***Effect*** of the human ***errors decreases*** with increasing ***robustness***.
- Models for ***societal*** and ***economic consequences*** of adverse events significantly affect resulting risk.
- ***Further research*** should be focused on
  - consequences (WG3 – Activity 7)
  - distribution of the errors (WG2 – Activity 4, influence of quality assurance WG3)
  - effect of the errors on probability of local failure and collapse (WG2 – Activities 4 and 5).

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Thank you for your attention.