Evaluation of Experience –
the development of a generic procedure for the assessment of failures and malfunctions

Jochen Köhler

Andreas Müller

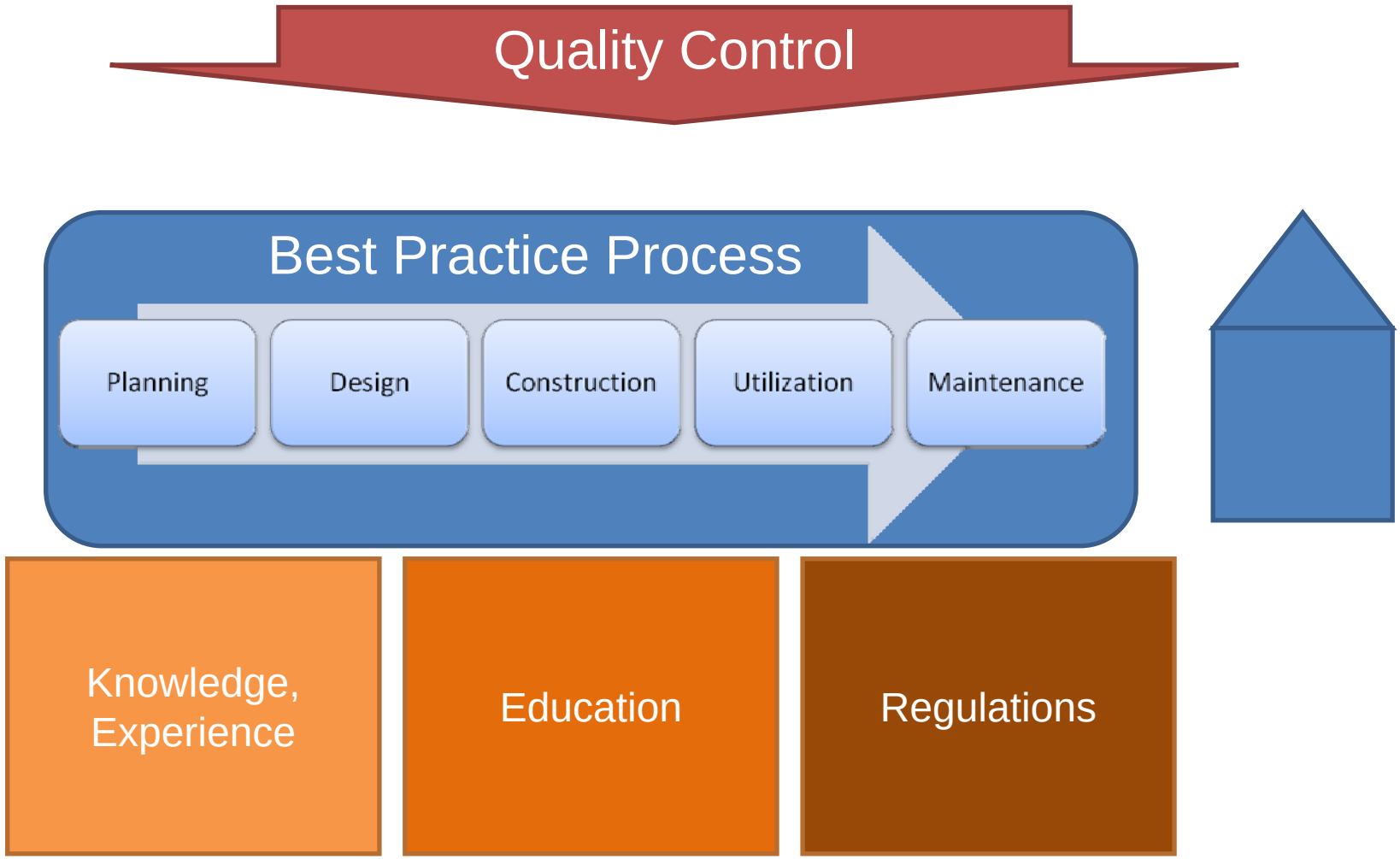
Outline

- Background
- Past Experience
- Future Experience Evaluation
- Scheme and Database
- Swiss Project

Background

- Load bearing structures are designed and constructed to **fulfil certain requirements**
- Requirements related to **reliability**, **serviceability** and **cost efficiency**
- It is assumed that the performance can be **predicted and controlled**
- This requires that **best practice is efficient**
- And that best practice is **not violated**

Background


Quality Control
Best Practice Process
Planning
Design
Construction
Utilization
Maintenance
Knowledge, Experience
Education
Regulations

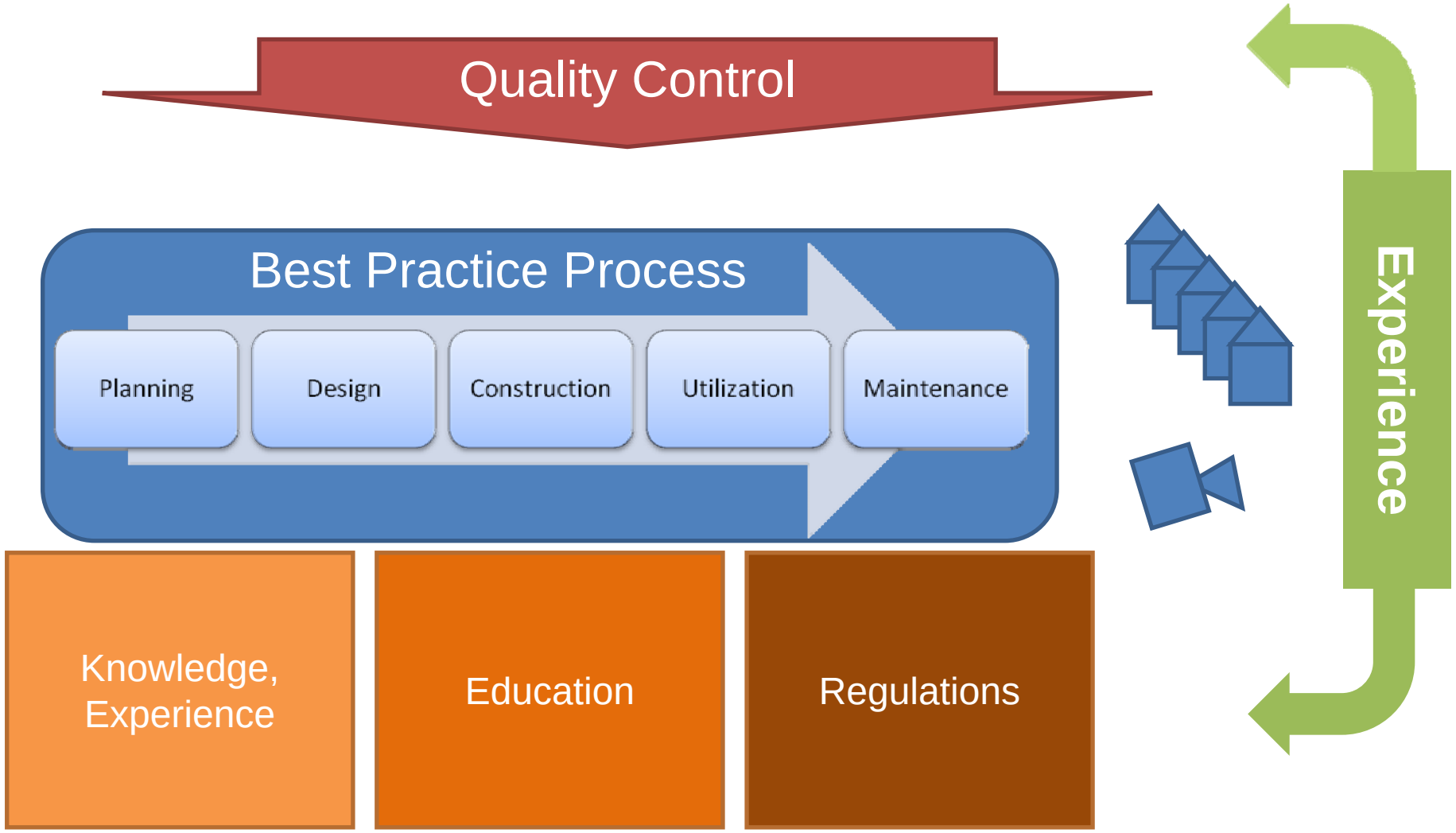
Past Experience

- Several studies assessed the performance of structures – it is **focus on bad performance** (failures and malfunctions)
- The analysis of failures and malfunctions delivers an important **insight to the efficiency of current best practice** and how often a **violation of best practice** is leading to failure.

Past Experience

- These evaluations are **hard to compare** – different classification schemes are used
- The findings are rather consistent:
  The vast majority of failures had been caused by **violations of best practice**.
- This was found for **different types** of structures build with **different building materials**.

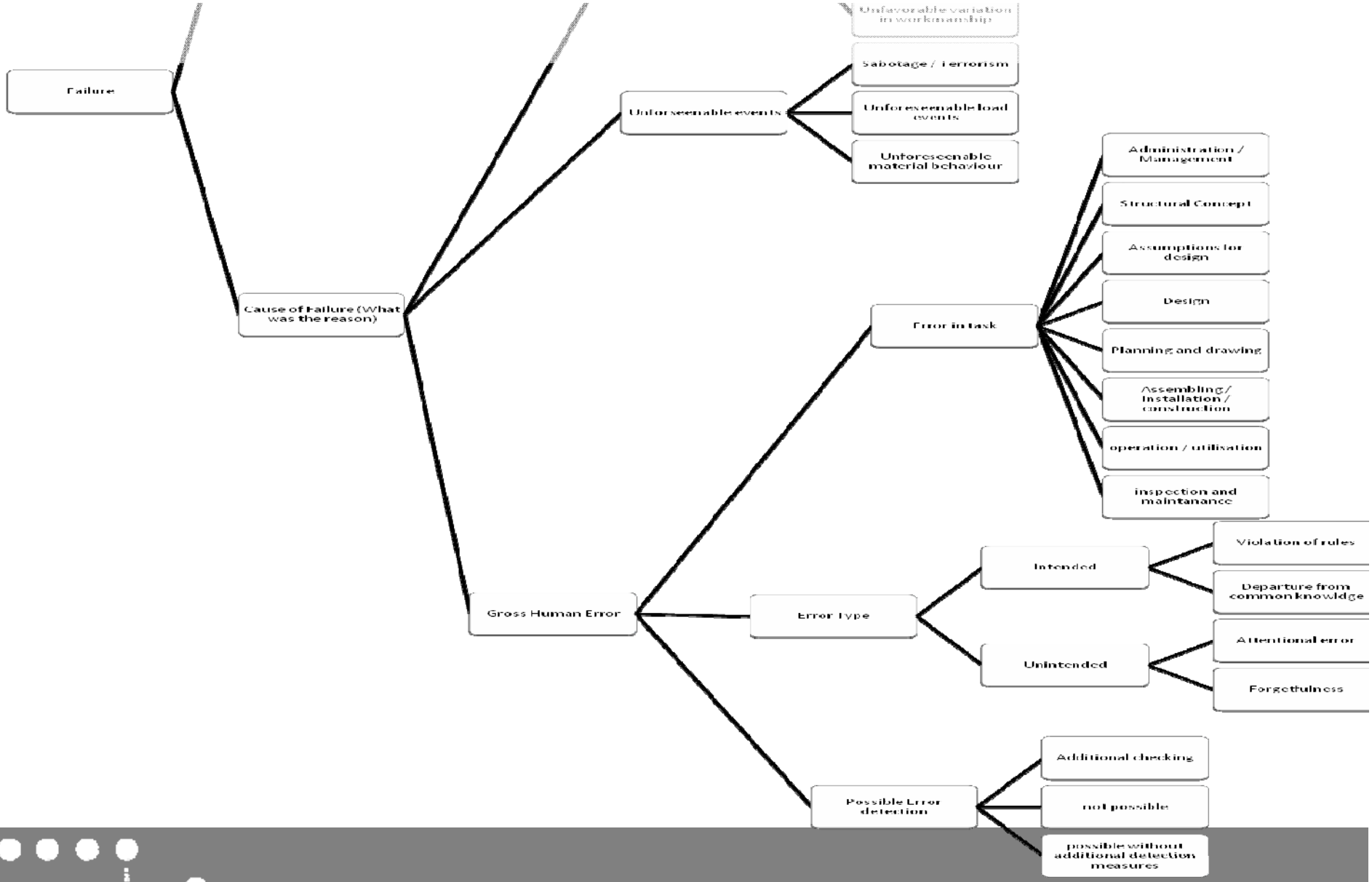
Past Experience



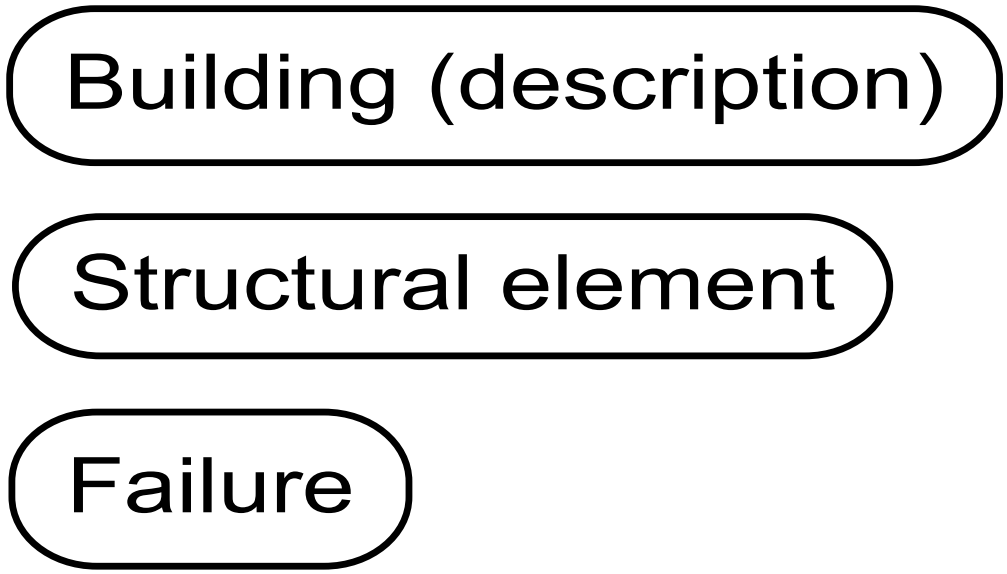
Future Experience Evaluation

- What can we learn (not from failures, but) from past evaluations? The following should be considered:
  - Appropriate and **common procedures** for analysing structural failures are necessary so that **soundly based conclusions** can be derived.
  - The **structural system** should be described in detail.
  - The influence of **national legal systems** should be identified and described.
  - Procedures should **isolate organisatorial differences** (e.g. of applied quality control policies) in projects involving structural failures.
  - Procedures should allow for the assessment of the **effectiveness** of **quality control**.
  - Development of **feedback systems** and trend warning mechanisms for the engineering profession.

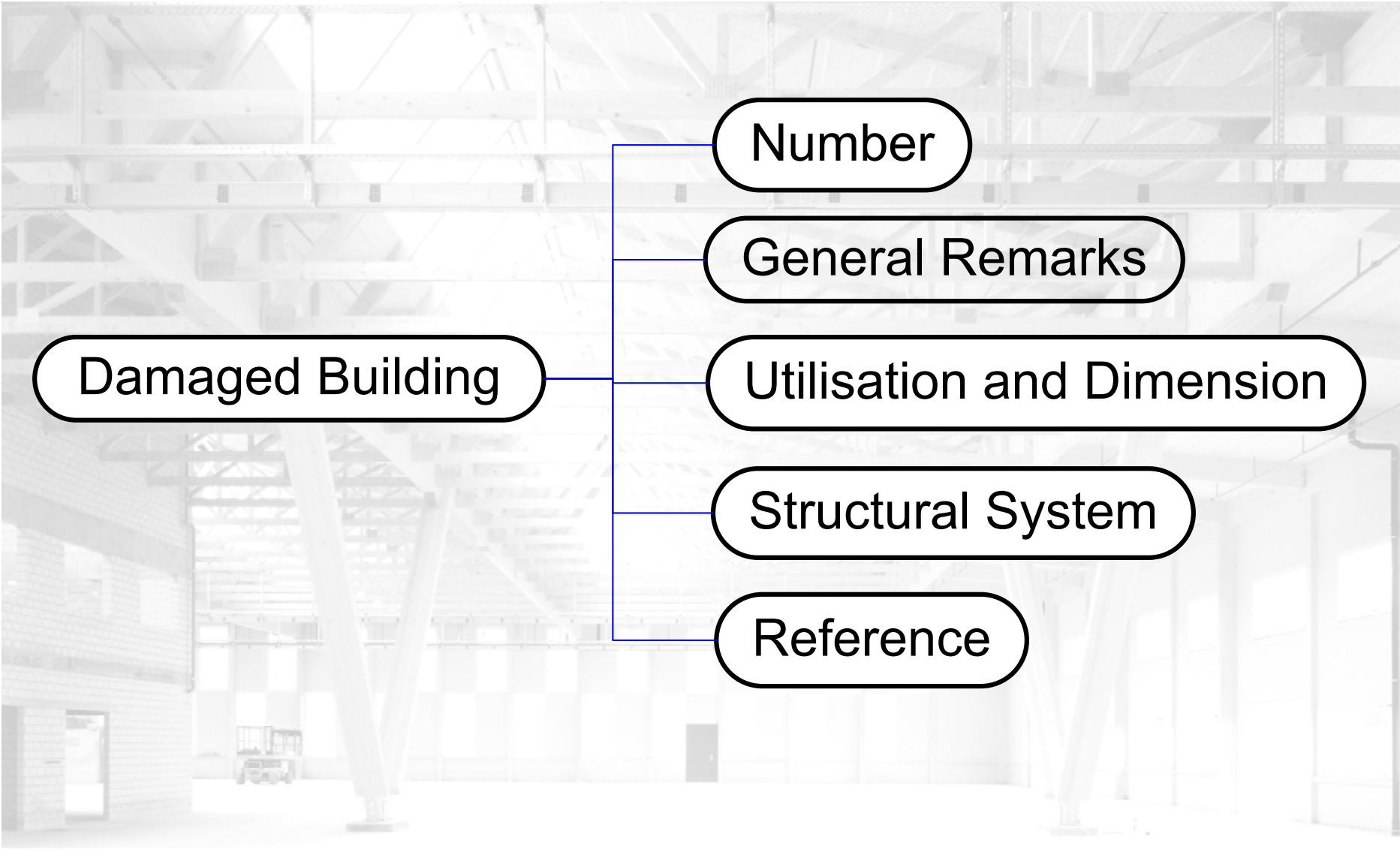
Evaluation scheme for failures and malfunctions



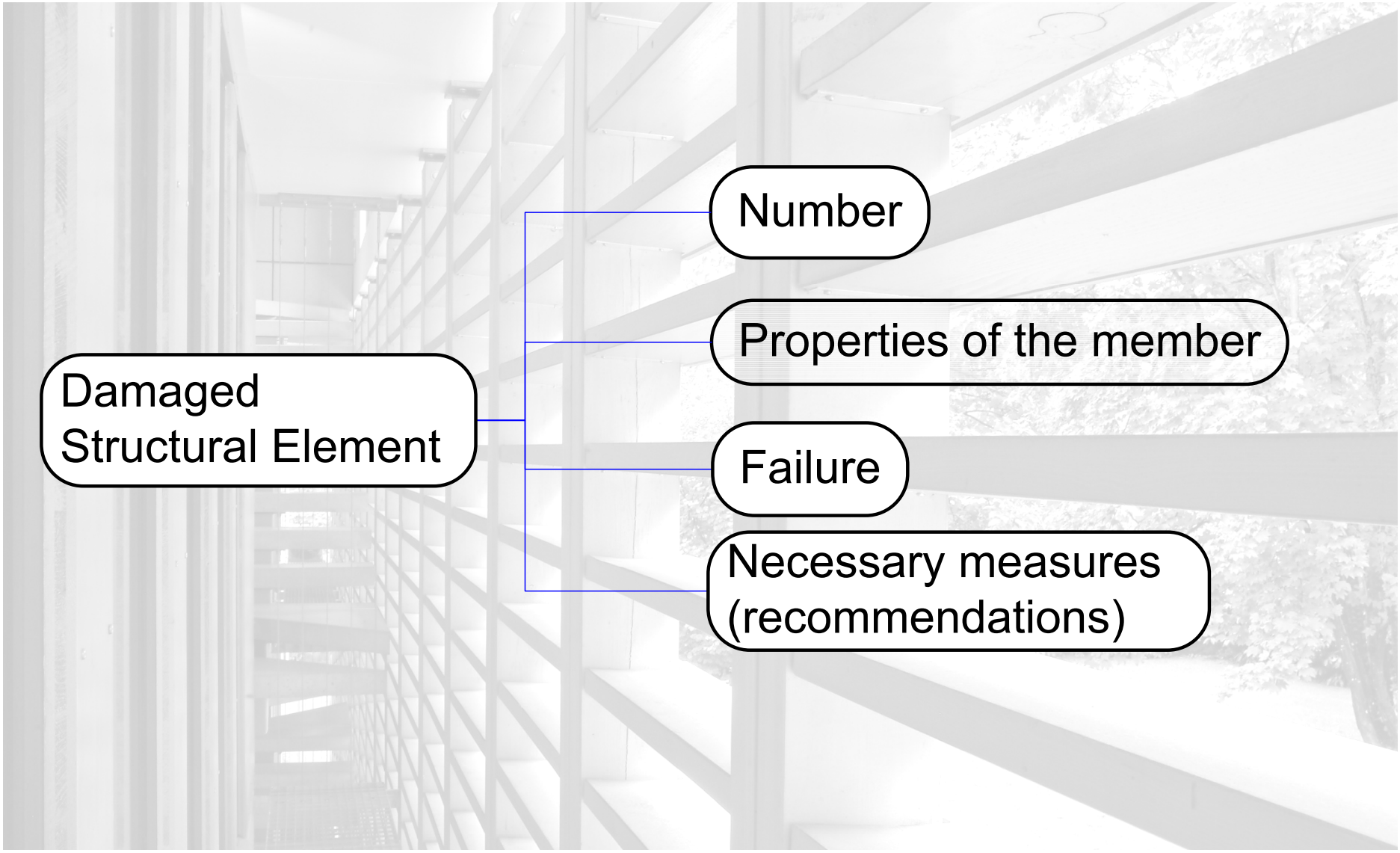
Evaluation scheme for failures and malfunctions



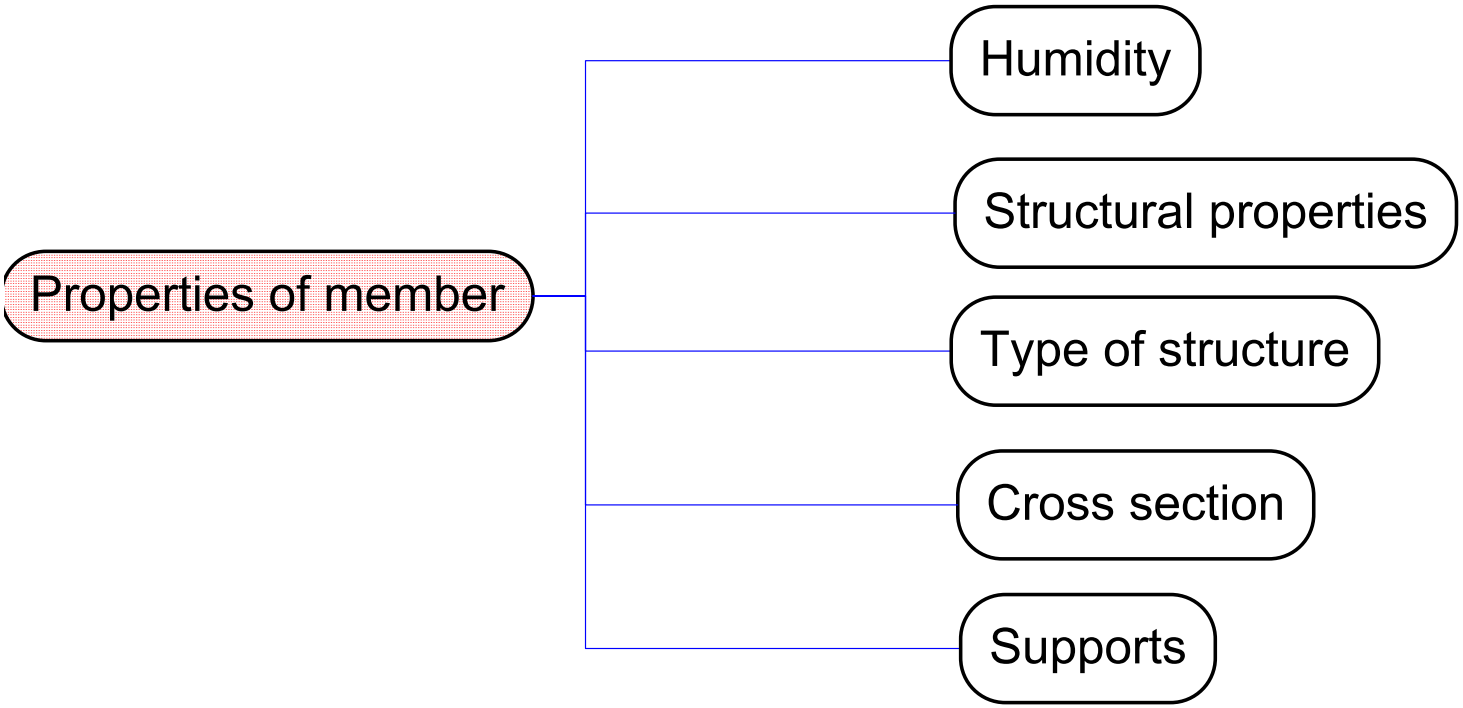
Description of the damaged building



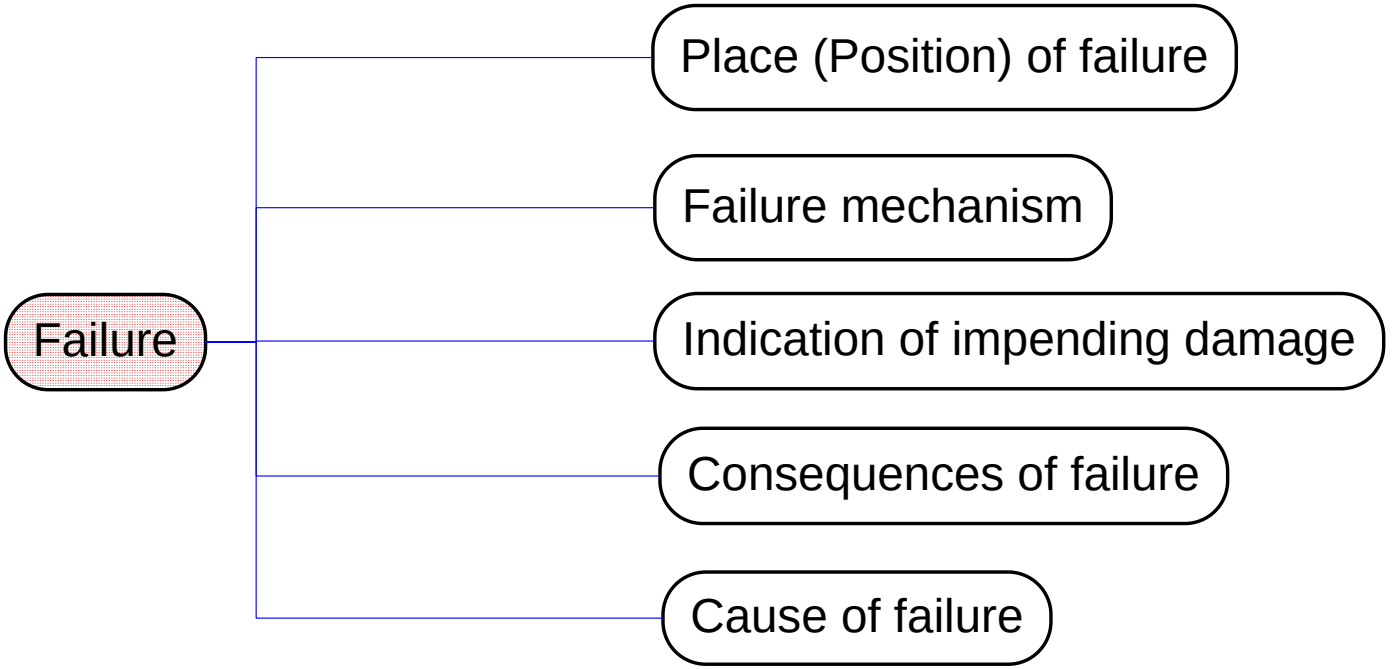
Damaged structural element



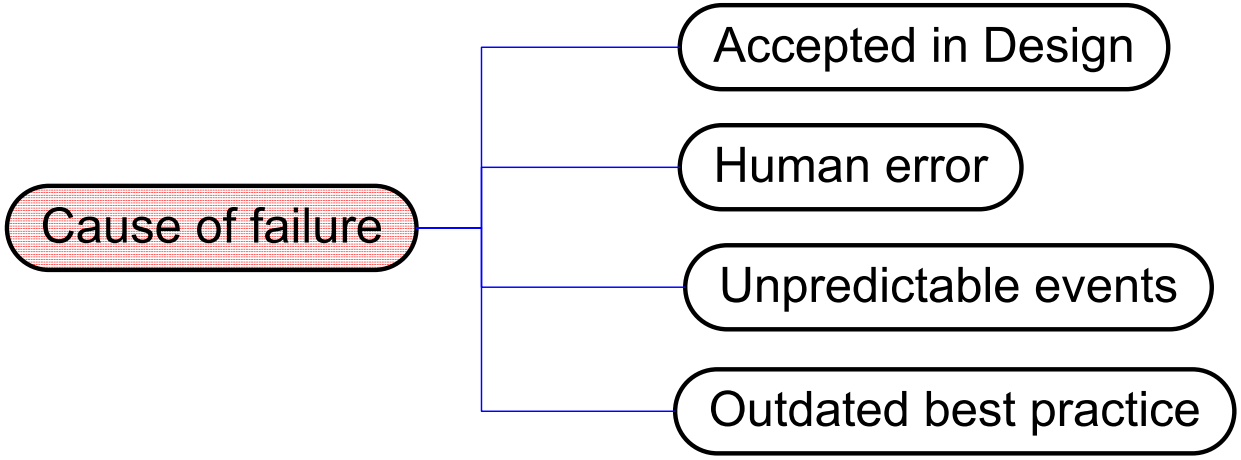
Properties of member



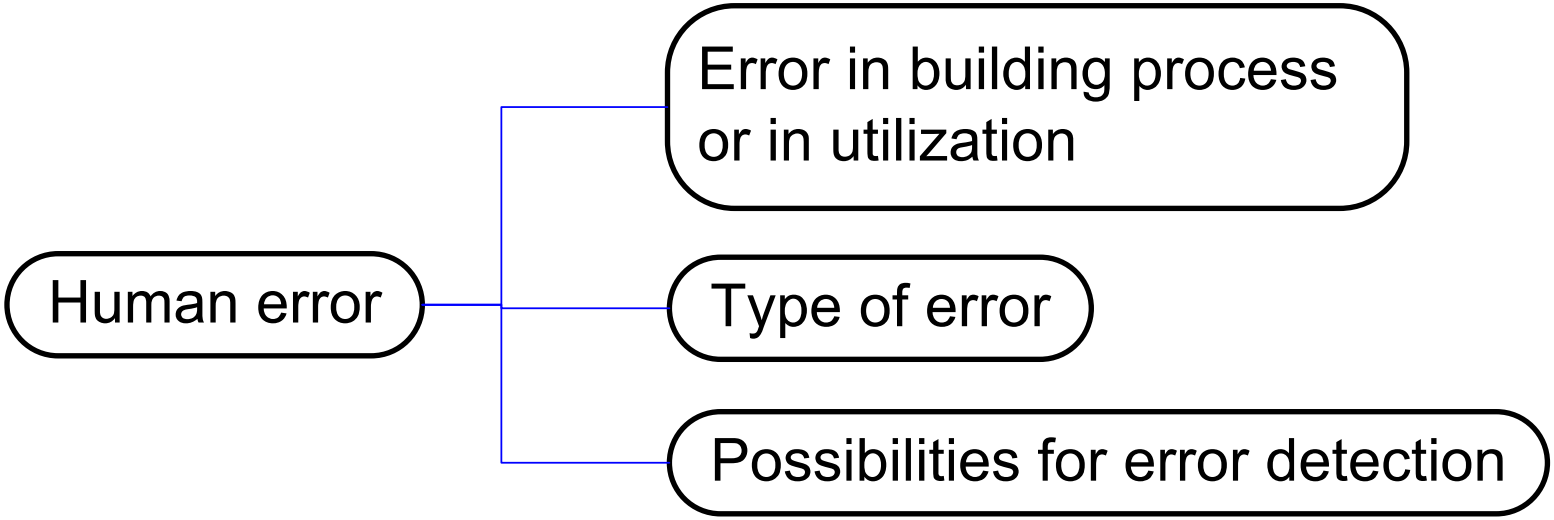
Description of Failure



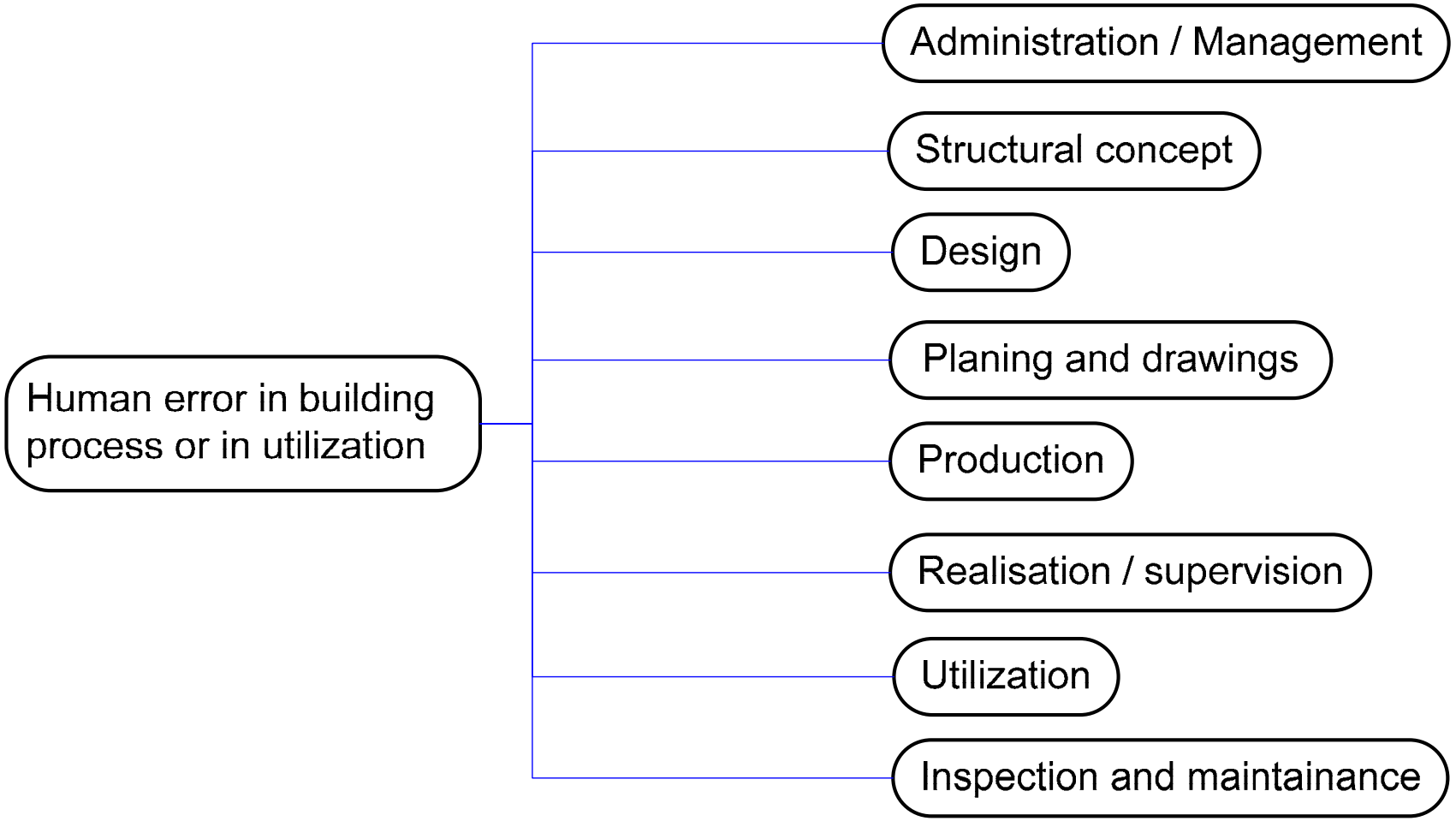
Cause of failure



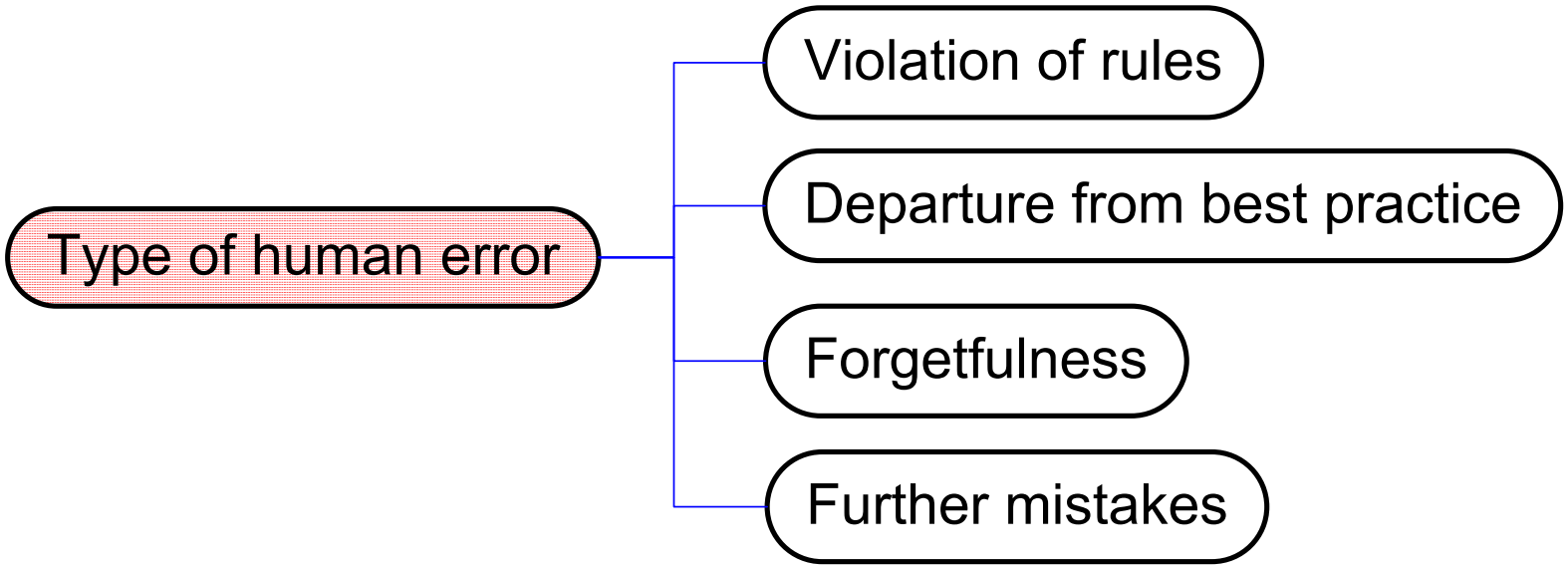
Human error


Human error
Error in building process or in utilization
Type of error
Possibilities for error detection

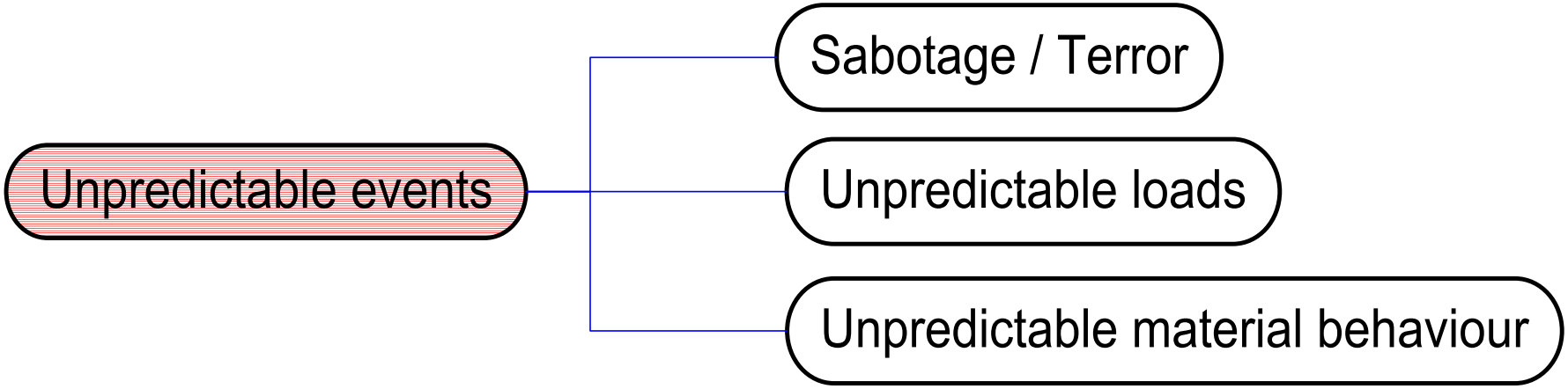
Human error in building process or in utilization



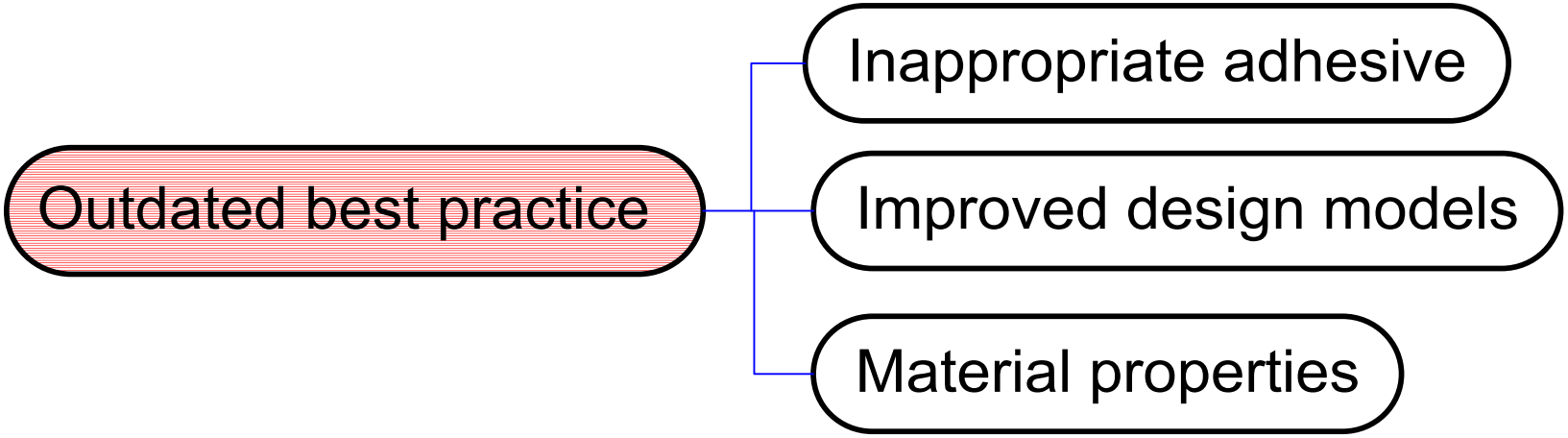
Type of human error



Unpredictable events



Outdated best practice



Swiss COST- Project
„Prediction and Assessment of the Life-Cycle Performance of Timber Structures“

Partners: **Swiss Federal Institute of Technology - ETH, Zürich**

Material Sciences - EMPA, Dübendorf

Berne University of Applied Sciences - BFH, Biel

Swiss COST- Project
„Prediction and Assessment of the Life-Cycle Performance of Timber Structures“

Phase 1: **(June 07 – Jan. 08)**	Evaluation of failure and malfunction in timber structures
Phase 2: **(Jan. 08 – Juli 09)**	Load bearing behaviour of structural components
Phase 3: **(Sept. 08 – Dec. 09)**	Behaviour of structural systems
Phase 4: **(Jan. 08 – Dec. 09)**	Evaluation of existing structures