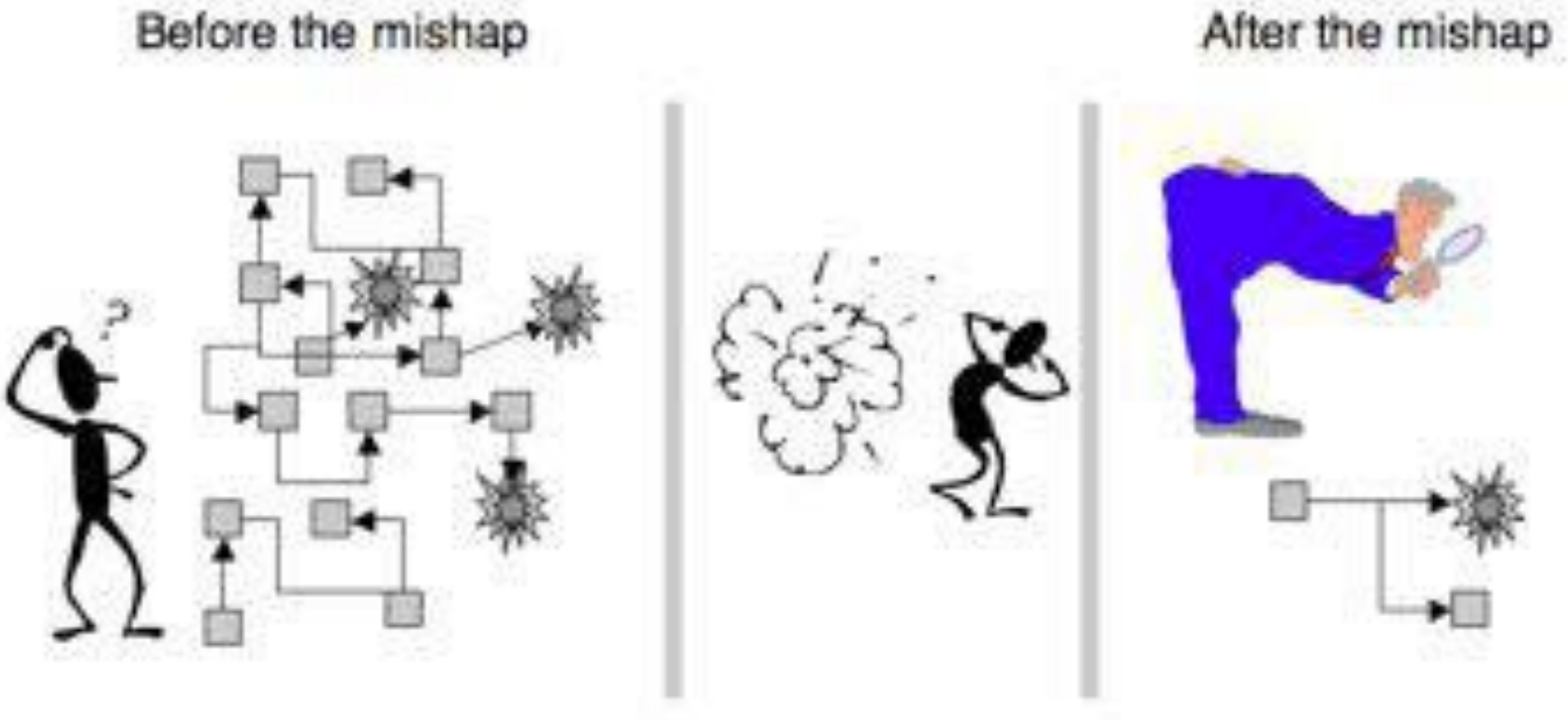
Hindsight Bias



Sidney Dekker, 2009

Overcoming Hindsight Bias

- Assume nobody comes to work to do a bad job.
- Investigation reports should explain
  - Why it made sense for people to do what they did
  - What changes will reduce likelihood of happening again

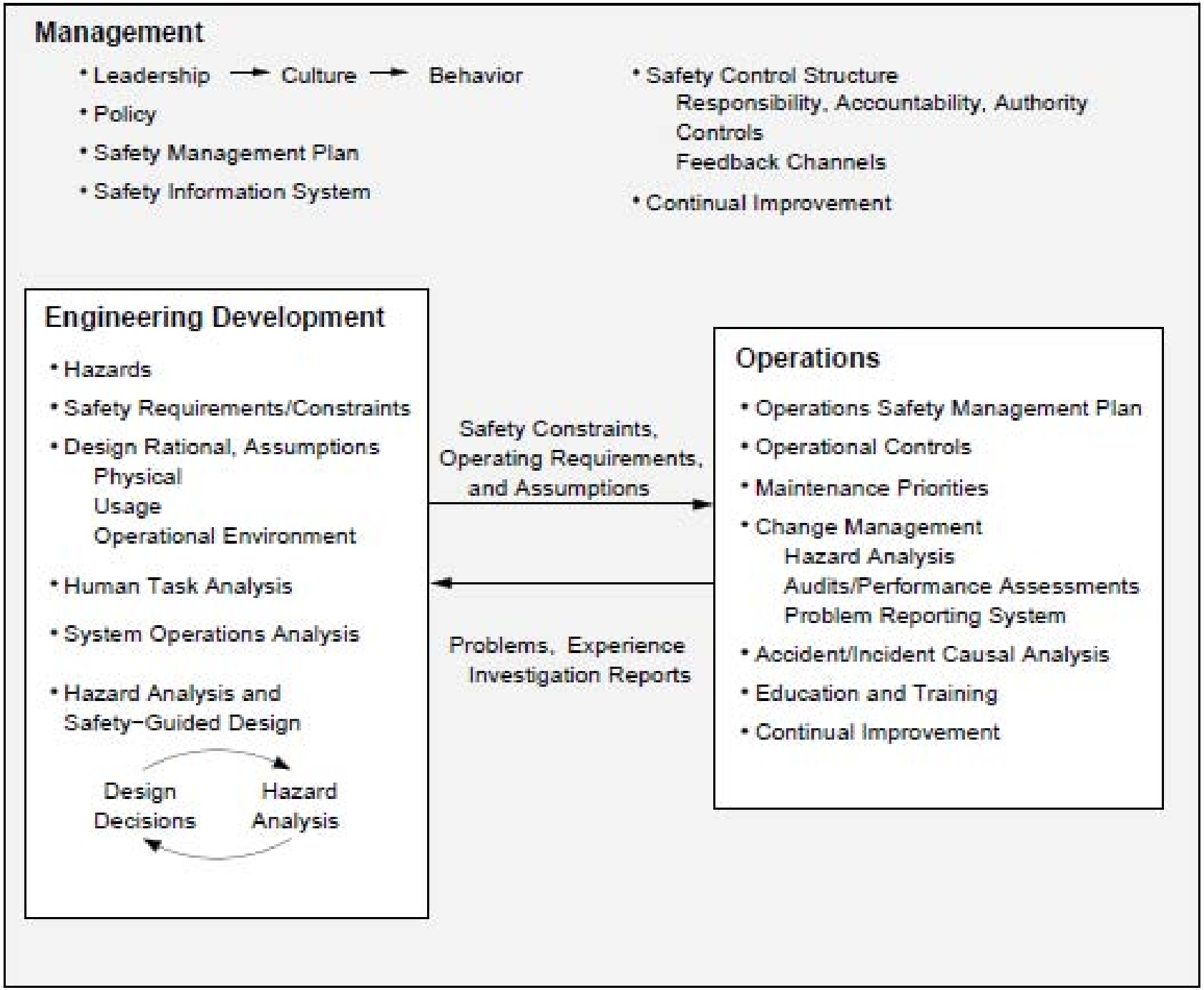
Widespread Myths about Safety

- Safety requires unacceptable financial and other costs
  - Requires tradeoffs with other organizational goals and unacceptable compromises
  - Can add safety to an unsafe design
  - Safe systems cost more

All myths have some elements of truth

Why are our Efforts Often Not Cost-Effective?

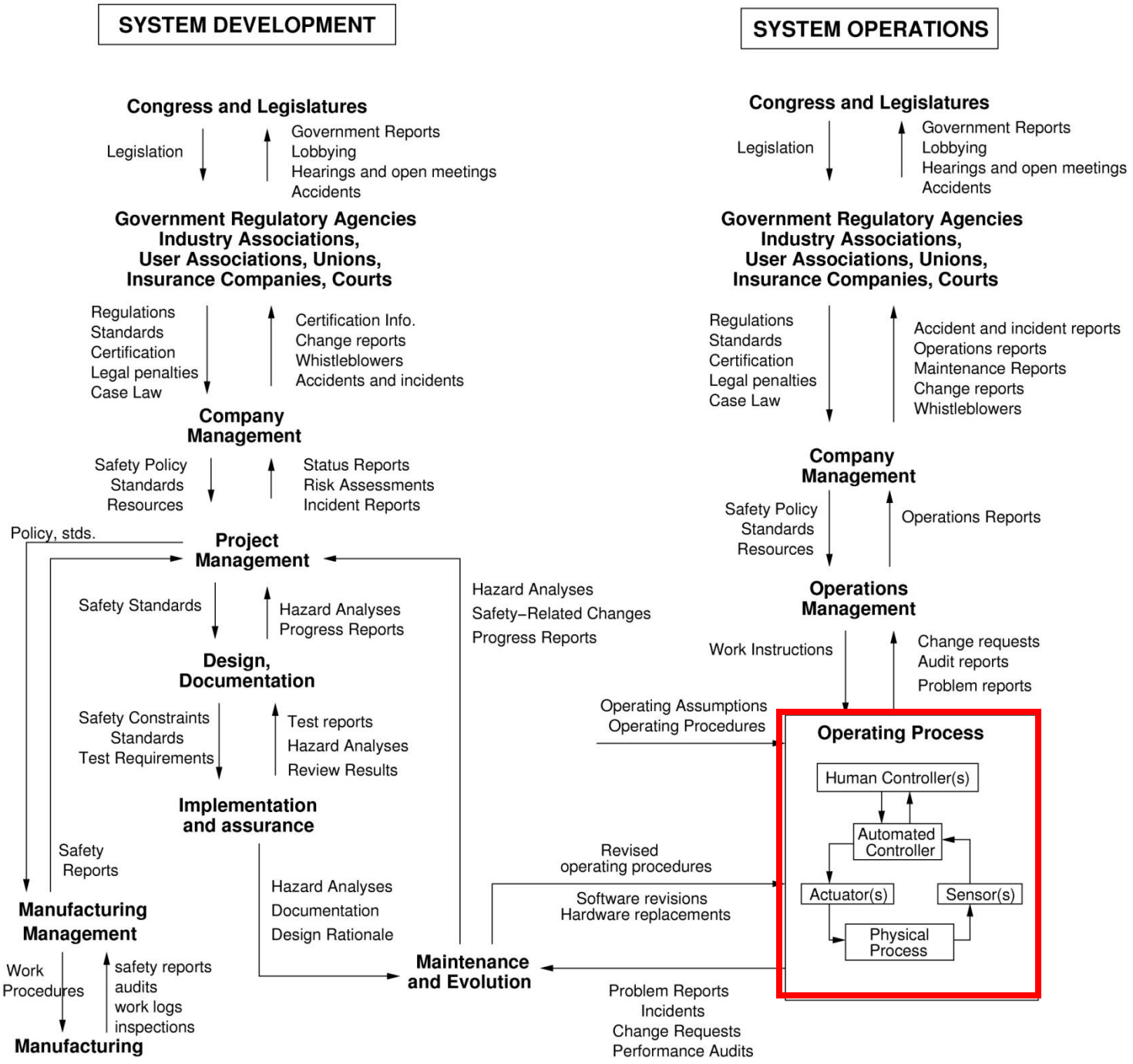
- Efforts superficial, isolated, or misdirected
- Safety efforts start too late
- Inappropriate techniques for systems built today
- Focus efforts only on technical components of system
- Systems assumed to be static through lifetime
- Success can lead to failure (risk perception)
- Limited learning from events


Management
• Leadership → Culture → Behavior
• Policy
• Safety Management Plan
• Safety Information System
• Safety Control Structure
Responsibility, Accountability, Authority
Controls
Feedback Channels
• Continual Improvement
Engineering Development
• Hazards
• Safety Requirements/Constraints
• Design Rational, Assumptions
Physical
Usage
Operational Environment
• Human Task Analysis
• System Operations Analysis
• Hazard Analysis and
Safety-Guided Design
Design
Decisions
Hazard
Analysis
Safety Constraints,
Operating Requirements,
and Assumptions
Problems, Experience
Investigation Reports
Operations
• Operations Safety Management Plan
• Operational Controls
• Maintenance Priorities
• Change Management
Hazard Analysis
Audits/Performance Assessments
Problem Reporting System
• Accident/Incident Causal Analysis
• Education and Training
• Continual Improvement

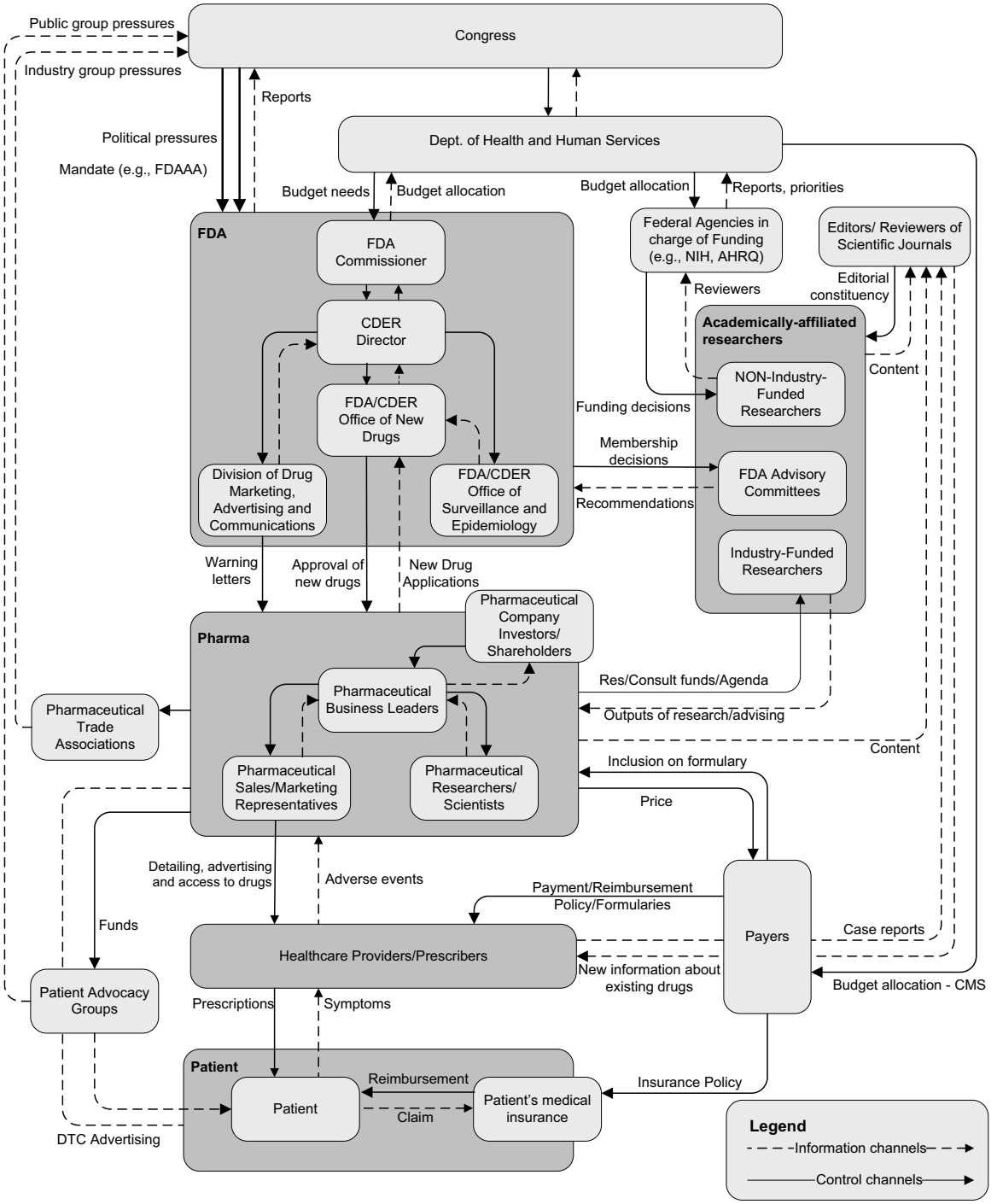
Where We Are

- New accident causality model based on systems theory
- On this we can create new analysis, design and decision tools
  - Hazard analysis techniques (STPA)
  - Design approaches
  - Accident causality (CAST)
  - Operations
  - Management

Example Safety Control Structure



U.S. Pharmaceutical Safety Control Structure

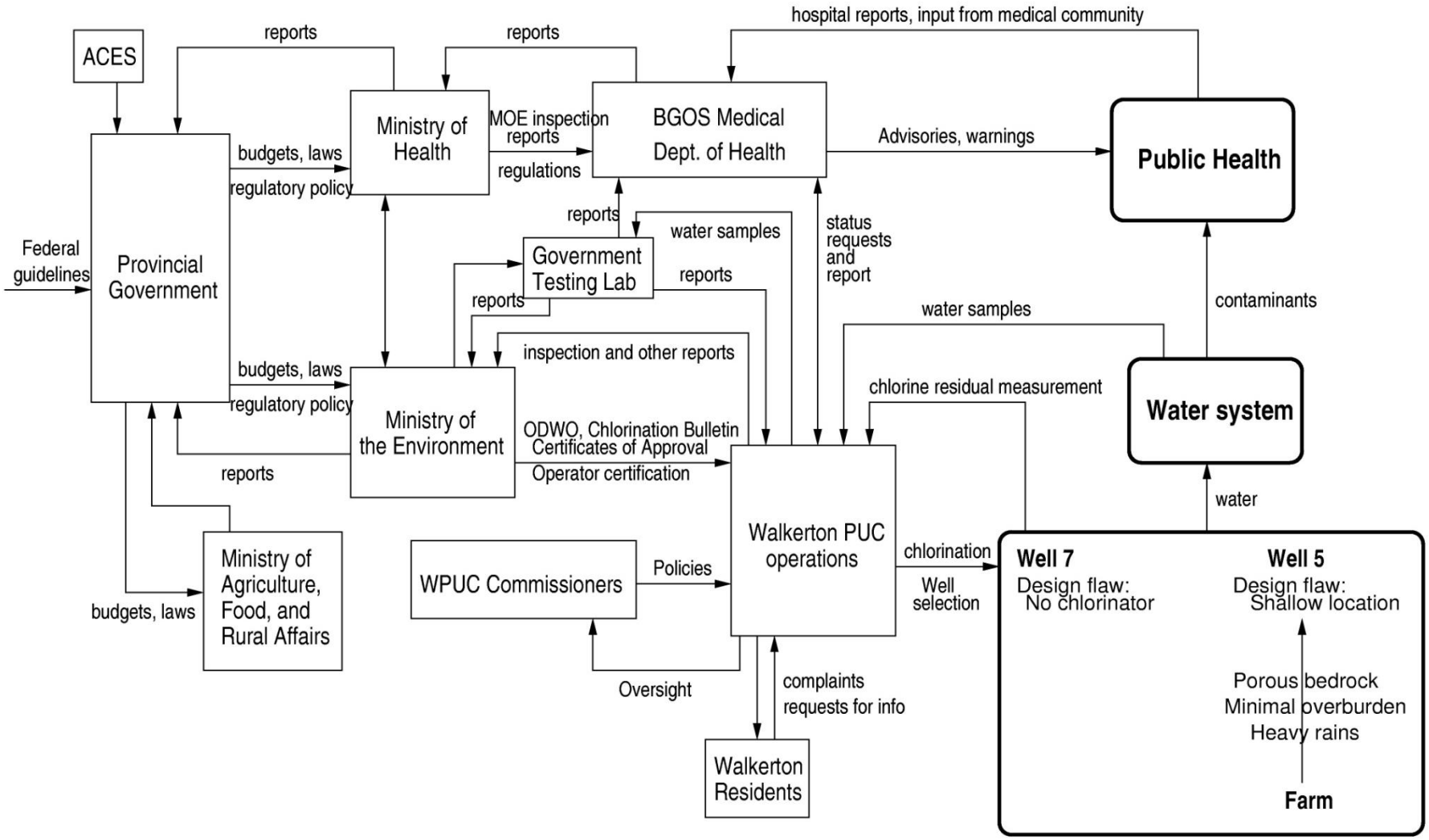


System Hazard: Public is exposed to E. coli or other health–related contaminants through drinking water.

System Safety Constraints: The safety control structure must prevent exposure of the public to contaminated water.

(1) Water quality must not be compromised.

(2) Public health measures must reduce risk of exposure if water quality is compromised (e.g., notification and procedures to follow)



Walkerton PUC Operations Management

Safety Requirements and Constraints:

- Monitor operations to ensure that sample taking and reporting is accurate and adequate chlorination is being performed.
- Keep accurate records.
- Update knowledge as required.

Context in Which Decisions Made:

- Complaints by citizens about chlorine taste in drinking water.
- Improper activities were established practice for 20 years.
- Lacked adequate training and expertise.

Inadequate Control Actions:

- Inadequate monitoring and supervision of operations
- Adverse test results not reported when asked.
- Problems discovered during inspections not rectified.
- Inadequate response after first symptoms in community
- Did not maintain proper training or operations records.

Mental Model Flaws:

- Believed sources for water system were generally safe. .
- Thought untreated water safe to drink.
- Did not understand health risks posed by underchlorinated water.
- Did not understand risks of bacterial contaminants like E. coli.
- Did not believe guidelines were a high priority.

CAST

- Accident analysis method
- Steps to take
  - Defining hazards and safety control structure
  - Start with physical structure
  - Work upward in structure (may involve adding new parts of safety control structure)
  - Define:
    - Responsibilities
    - Inadequate control actions
    - Context
    - Process model flaws

- Coordination and Communication
- Dynamics and migration to higher risk
- Generating Recommendations

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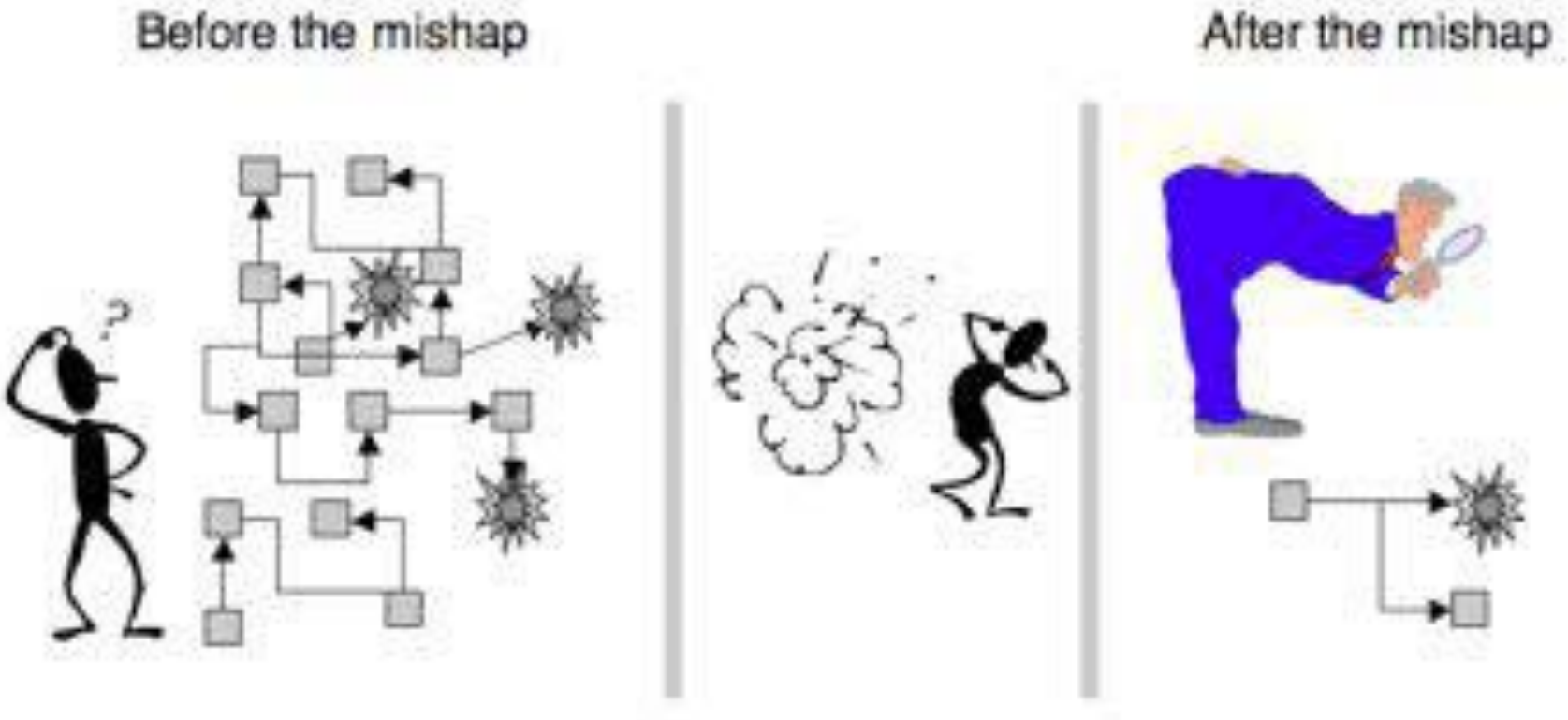

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