

2013 STAMP Conference
MIT Partnership for a Systems Approach to Safety

**“Evaluating Project Safety
(System Engineering and Safety Management)
in an Organization”**

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Evaluating Project Safety (System Engineering and Safety Management) in an Organization

Table of Contents



- Background
- Project Outline
- Initial Status Review
- Evaluation
- Lessons
- Outlook
- More Information



Evaluating Project Safety (System Engineering and Safety Management) in an Organization Background



- **Engineering and Consulting Group in Oil & Gas, Water & Environment, Energy & Climate Protection, and Transport & Structures**
- **ILF Munich leads Oil & Gas Business segment (highest turnover in ILF Group)**
- **Process facilities (Upstream, Midstream, Downstream, Onshore, Offshore). Core field cross-country Pipeline Systems**
- **Project and client driven. Different approaches. Not consolidated**
- **Major incidents continue to happen in the O&G industry, a fundamental change is needed. Oil & Gas industry resistant to change ?**



Evaluating Project Safety (System Engineering and Safety Management) in an Organization

Project Outline



- **Master Thesis supervised by Prof. Leveson**
- **Perform Initial Status Review**
 - Learn about current practice
- **Perform analysis of STAMP steps in terms of**
 - Current practice
 - Feasibility of step implementation
 - Development of STAMP step for a project example
 - Definition of high-level guidelines for implementation of step
- **Define a strategy for implementation of STAMP into the system engineering process**

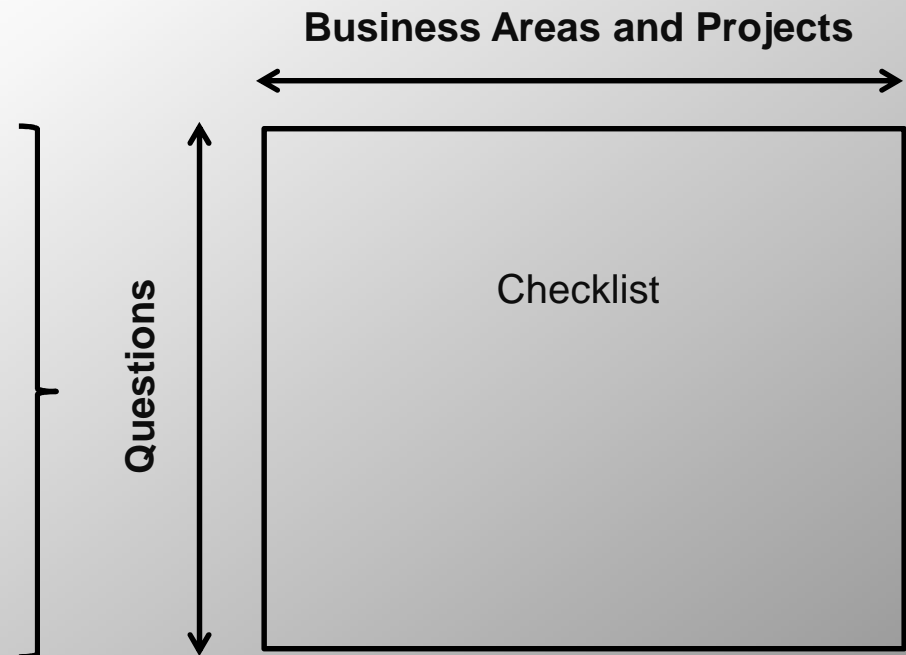


Evaluating Project Safety (System Engineering and Safety Management) in an Organization

Initial Status Review (1/7)

■ Scope

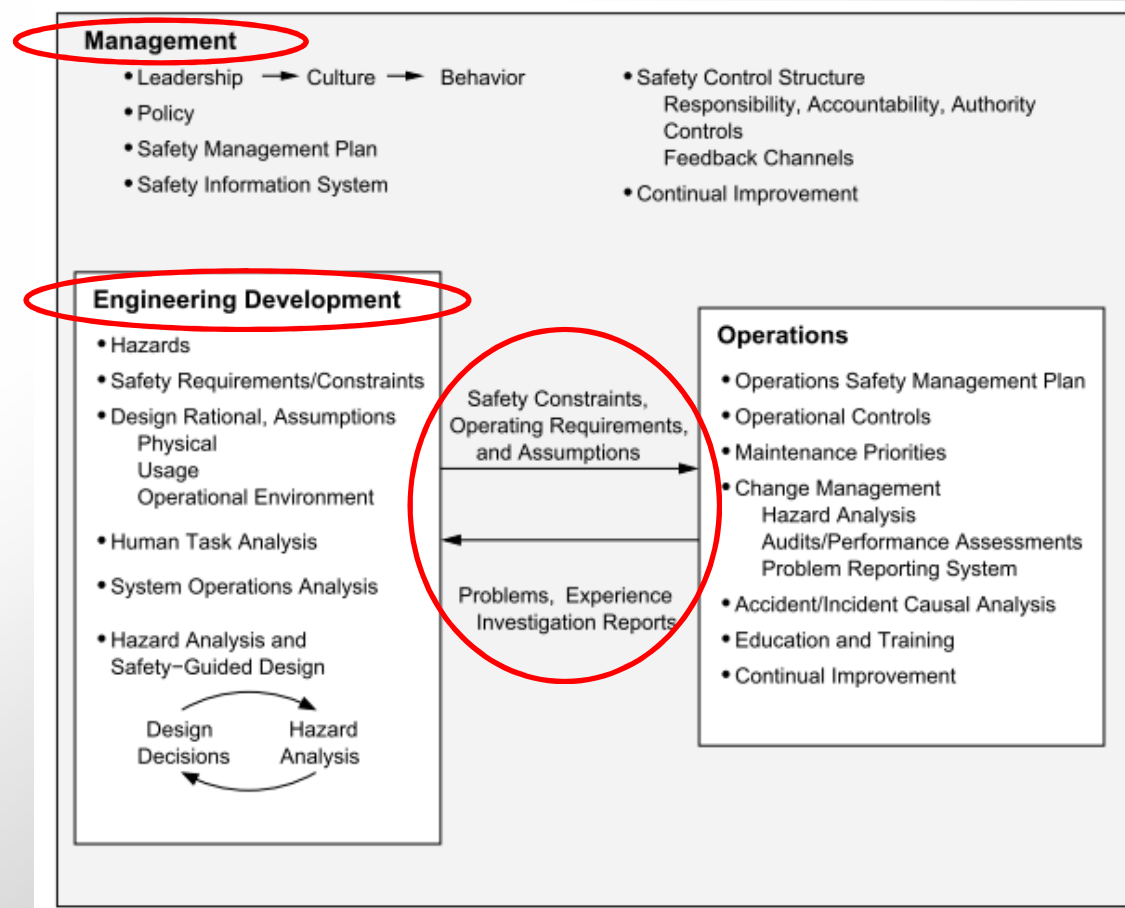
- Elements of System Safety Engineering
- Project Phases as in O&G Industry
- Levels of Intent Specification
- Elements of Using STAMP
- Related Chapters of „Engineering a Safer World“



Evaluating Project Safety (System Engineering and Safety Management) in an Organization

Initial Status Review (2/7)

■ Scope: Elements of System Safety Engineering

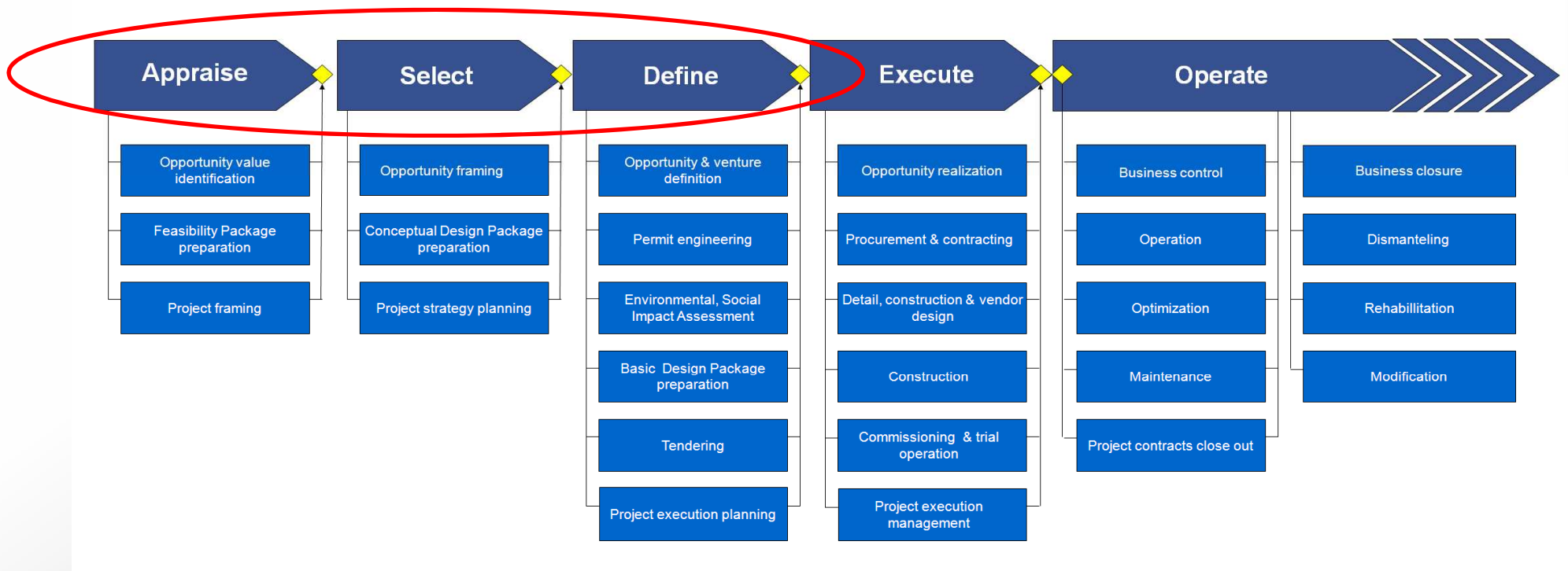


Evaluating Project Safety (System Engineering and Safety Management) in an Organization

Initial Status Review (3/7)

■ Scope: Project Phases

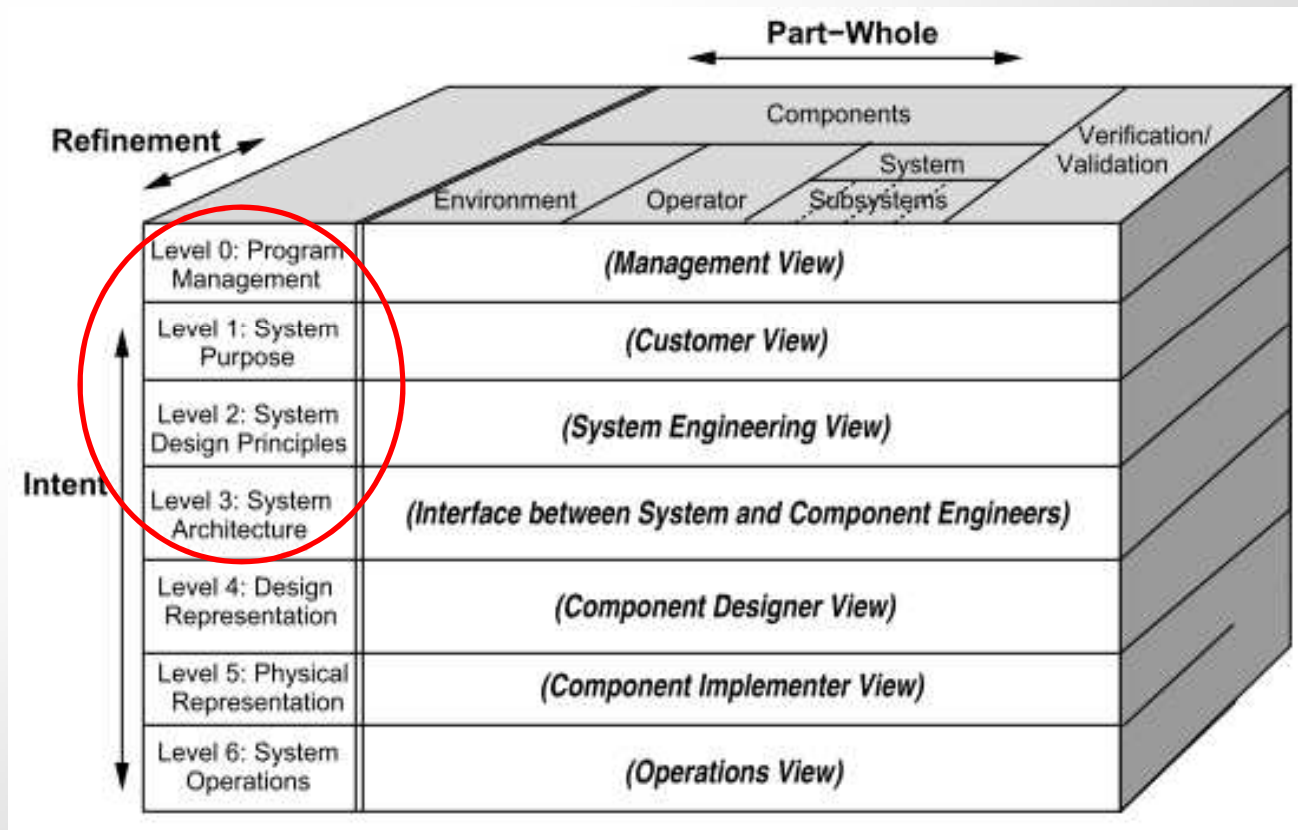
Operating Asset Life Cycle



Evaluating Project Safety (System Engineering and Safety Management) in an Organization

Initial Status Review (4/7)

■ Scope: Levels of an Intent Specification



Leveson (2012)



Evaluating Project Safety (System Engineering and Safety Management) in an Organization

Initial Status Review (5/7)

■ Scope: Elements of Using STAMP

- Establishing the Goals of the System
- Defining Accidents
- Identifying System Hazards
- Integrating Safety into Architecture Selection and System Trade Studies
- Documenting Environmental Assumptions
- Generating System-Level Requirements
- Identifying High-Level Design and Safety Constraints
- Performing System Design and Analysis
- Documenting System Limitations
- Considering relevant Operations Experience in the Development
- Delivering Safety Requirements and Constraints to Operations
- Providing Leadership for Safety Matters
- Implementing a Safety Policy
- Implementing a Safety Management Plan
- Implementing a Safety Control Structure
- Implementing a Safety Information System



Evaluating Project Safety (System Engineering and Safety Management) in an Organization

Initial Status Review (6/7)



■ Example

Element of Engineering Systems	Project Phase (Oil & Gas Terminology)	Intent Spec Level	Element of Using STAMP	Chapter of Engineering a Safer World	Question
Management	All	Level 0	Implementing a safety control structure	13.2.6	Is there a group responsible for safety in the projects?
Development	Functional Design, Basic Design "Define"	Level 1	Generating system-level requirements	10.3.6	Are system-level requirements traceable back to the system goals and/or hazard analysis from where they have been generated?



Evaluating Project Safety (System Engineering and Safety Management) in an Organization Initial Status Review (7/7)



- Review questions adapted to the terminology of O&G industry
- Approx. 100 questions categorized
- No especial preparation required by participants (Project Managers and Business Unit Directors)
- Interviews format
- No audit atmosphere, open discussions



Evaluating Project Safety (System Engineering and Safety Management) in an Organization Evaluation



- **Safety Policy seems an Occupational H&S Policy, rather than a policy for designing for safety**
- **Gap between high-level Safety Policy and Safety Engineering Practice**
- **Safety Engineering practice driven by client requirements**
- **HAZID and HAZOP most useful traditional techniques, QRA and SIL quantitative frame aids in decision making**
- **Managers wish a more proactive approach to Safety Engineering, changing designs after hazards analysis is inconvenient**



Evaluating Project Safety (System Engineering and Safety Management) in an Organization Lessons (1/2)



- **STAMP framework provides a comprehensive, detailed and useful frame for evaluating how an organization designs for safety**
- **Most of standards available for Safety Management Systems are (i) too general and (ii) not specific to designing for safety, but to Occupational H&S**
- **STAMP framework (and the checklist developed in this Project) cannot be used without training**
- **STAMP framework and specially Intent Specification Approach useful for improvement and standardization of design philosophies (requirements)**



Evaluating Project Safety (System Engineering and Safety Management) in an Organization Lessons (2/2)



- **Implementation of complete STAMP framework resource demanding, but less resource demanding measures based on STAMP principles can be implemented little by little and still drive improvement**
- **STPA powerful tool for generating comprehensive and precise requirements**
- **Inclusion of STPA elements into traditional techniques such as HAZOP (STPA control flaws as part of CHAZOP?)**
- **STAMP framework aids in solving „old“ engineering management problems (traceability, interface management, documentation of assumptions and limitations, etc.)**



Evaluating Project Safety (System Engineering and Safety Management) in an Organization Outlook (1/2)



- **Implementation of Thesis Recommendations**
- **„ILF Guideline for Safety in Design in O&G Developments“**
- **Hazards Analyses Recommended Practices considering STPA elements**
- **„ILF Guideline for Project Risk Management“ based on STAMP framework**



Evaluating Project Safety (System Engineering and Safety Management) in an Organization Outlook (2/2)



■ TANAP Trans Anatolia Natural Gas Pipeline



Evaluating Project Safety (System Engineering and Safety Management) in an Organization

More Information



■ MIT Partnership for a Systems Approach to Safety

- Papers, Masters Theses and Ph.D. Dissertations

<http://psas.scripts.mit.edu/home/theses-and-dissertations/>

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