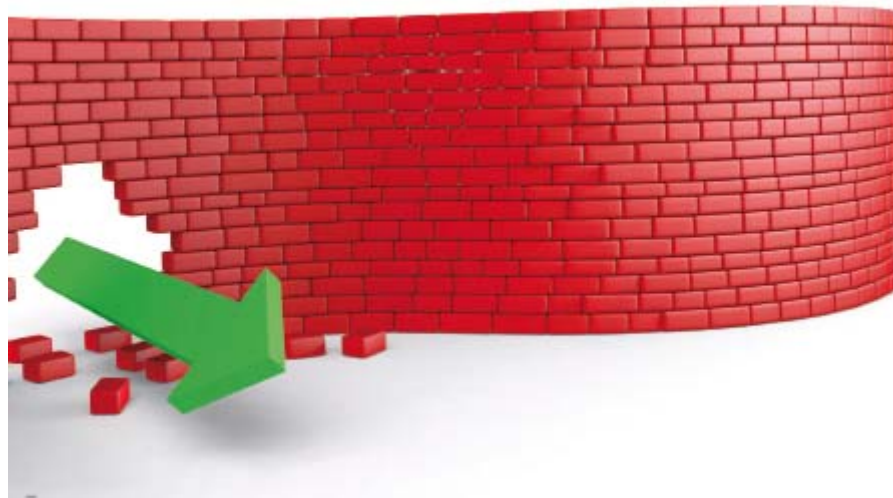


Participatory safety barrier analysis

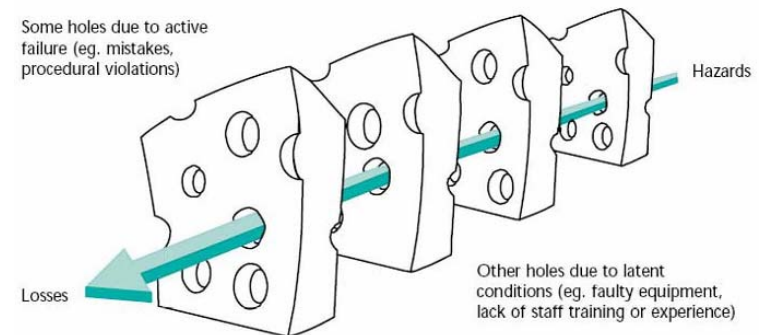


Trond Kongsvik
NTNU, Department of Industrial Economics and Technology Management

HFC Forum meeting, April 28th 2016

Safety barrier analysis is usually made by experts for experts

- Fault tree analysis and quantification of risk-influencing factors
- Examples of methods (Rausand & Utne, 2009):
 - Barrier and operational risk analysis – BORA (Aven, Sklet, Vinnem 2006)
 - Management oversight and risk tree - MORT (Johnson 1980)



Reason, 1997

Barrier:
Technical, operational and organisational elements which are intended individually or collectively to reduce possibility/ for a specific error, hazard or accident to occur, or which limit its harm/disadvantages.
PSA, 2013

Main argument

- A participatory approach, directly involving employees in safety barrier analysis can provide 'added value' to traditional barrier analysis.



The case: Safety barriers in offshore logistics

- 34 collisions between vessels and offshore installations in Norway 2001-2014.
- At least 6 of these had major accident potential
- What barrier exist, how are they functioning and how could they be strengthened?



Statoil's logistics chain: Many actors influence the risk for collisions



Procurement, ship/crew requirements, planning, loading/unloading etc.

Employee participation

- Participation: a process in which influence is shared among individuals who are otherwise hierarchically unequal (Wagner 1994)
- Historically, EP is seen as a means to strengthen democratic values in general
- Later arguments: EP increase work quality, productivity, job satisfaction – good for business!

Self-mobilization

Interactive participation

Functional participation

Consultation

Information

**Increasing
influence**

The participatory activities

**Phase 1:
Barrier
identification**



**Phase 2:
Barrier evaluation**

**Phase 3:
Barrier improvement measures**

32 safety barriers identified and evaluated

Examples:

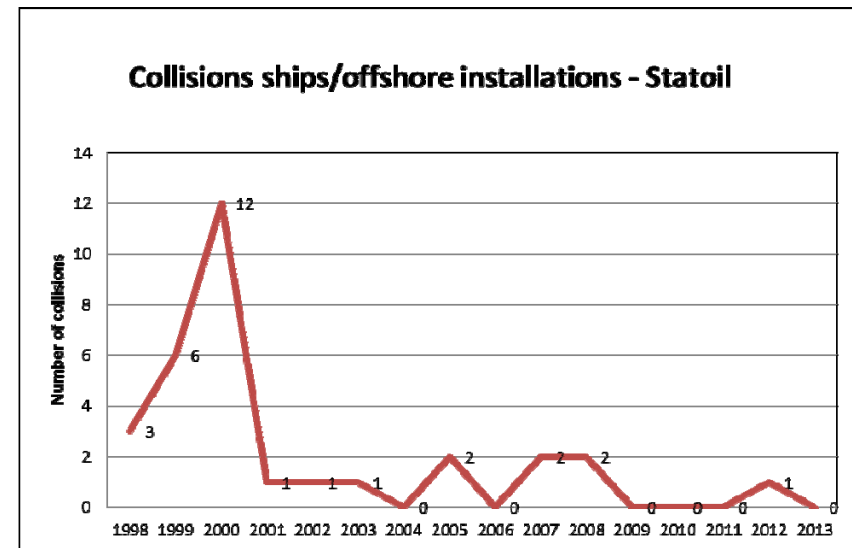
Activity	Collision preventive barriers	Type of barrier
Loading/unloading at installation	The Dynamic Positioning (DP) system	Specialized
	Manning with two navigators on bridge	Specialized
	Considerations of weather criteria (maximum wind, waves) during operations	Specialized
Entering the installations' safety zone	Reviewing checklists on bridge and in engine room	Specialized
	Risk assessment when operations are planned on windward side of installation	Specialized
Sailing to installation	Surveillance from the operators' MTC	Specialized
	Waypoint setting outside the installations' safety zone	Specialized
Supply base activities	Planning of sailing route and placement of cargo on vessel (reduce time spent alongside installation)	Generalized
Procurement and follow-up of supply vessels	Considerations of the vessel's technical conditions according to requirements (redundancy, design, etc.)	Generalized
	Considerations of the crews' qualifications relevant to requirements (certificates, etc.)	Generalized

Areas for improvement

- Training in manual maneuvering if dynamic positioning system (DPS) is lost («deskilling»)
- Redundancy in references for the DPS
- Involvement of installations in planning (loading sequence and sailing plans)

The potential of employee participation in barrier analysis

- Barriers are dependent on human action in design, enforcement and maintenance
- Employee participation (EP) activates relevant, first-hand knowledge on hazards and barrier functioning
- EP focuses attention on safety issues
- EP gives a foundation for «commitment» to possible barrier-strengthening measures



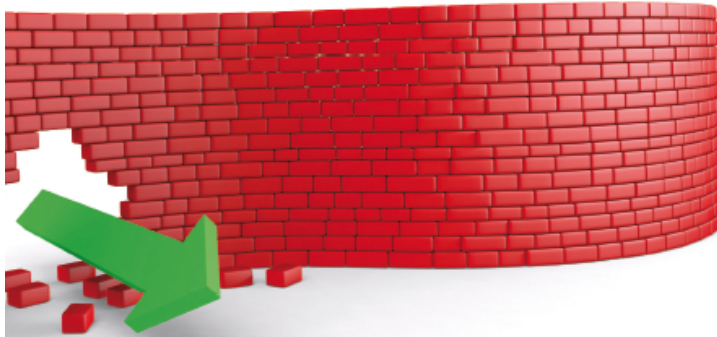
Further reading

 **NTNU**
Samfunnsforskning AS

Trond Kongsvik, Rolf Bye, Jørn Fenstad, Gudveig Gjørund,
Torgeir Haavik, Marit Schei Olsen, Kristine Vedal Størkersen

Barrierer mot kollisjoner mellom fartøy og innretninger

Identifisering, vurderinger og mulige forbedringstiltak



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Rapport 2012
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Participatory safety barrier analysis: a case from
the offshore maritime industry

Trond Kongsvik, Torgeir Haavik & Gudveig Gjørund

<http://www.tandfonline.com/doi/pdf/10.1080/13669877.2012.761275>

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