Human and Organisational Factors in Major Risks Prevention : INERIS positioning and guidelines

Presentation Outline

HOF in INERIS's work

Justification and theoretical context of our work:

- to better integrate HOF in the policies and practices of risk prevention
- our reference frame: INERIS's Systemic and Dynamic Model of Safety Construction

Guide accounting for organisational changes in risk prevention

HOF Engineering Guide

Feedback Process Evaluation Guide

Discussion on possible applications

What are HOF?

NB: HOF are not a discipline, it is a term used in industry that does not have a common meaning…

HF: Human Factors

- considers work situations, individual or collective, and interaction with their various material and interfaces.
- refers to disciplines such as ergonomics, psychology (cognitive, social)
- traditionally front line workers were the primary subject of study of these disciplines, even if other actors were also concerned.

OF: Organisational Factors

- considers real operational questions of an organization, its history, the roles of its different members, power, influence, and process performance
- includes disciplines such as sociology, management and political science
- the organisation is the subject of study, thus all participants will be taken into account (engineers, managers, directors, regulators)

HOF and Industrial Safety

Improve accounting for HOF in the identification, evaluation, and treatment of risks (INERIS's mission)

HOF dimension is important for the control of industrial risks

- Complementary to technical and managerial approaches
- Very little taken into account by Seveso plants

Accident feedback identifying HOF as contributors in 62% of accidents (cf. BARPI 2013 accident inventory);

HOF approaches vary greatly in industry:

- Work station safety (including psychological and social risks)
- Societal governance
- Perceptions and values
- The analysis of relations between technology, individuals and organisation

Our Position

- Independence
- Support for the ministry and industry: HOF guides are for industrialists and for inspectors
- Integration of technical aspects: we treat **sociotechnical problematics in major risk prevention**
  - Not exclusively oriented toward social aspects (sociological description of at risk organisations, psycho-social risks).
  - No systematic remedy to the concept of safety culture.
  - Not exclusively oriented to human factors (behavioural approach).
- We develop approaches based on
  - The expertise of team members with more than 15 years of experience in three industrial fields (Seveso plants, nuclear and aeronautics).
  - A strong knowledge of real work situations at industrial sites and regional inspectors.
  - Research: internal work and with a network of external correspondents
  - A multidisciplinary approach: human, social and engineering sciences

Our Definition of HOF

Definition

- Our definition: “Human and Organisational Factors (HOF)” designate the **multidisciplinary** approaches that employ knowledge, models and techniques from the **Human and Social Sciences** in order to understand how **safety** is managed in **socio-technological systems** in their **actual operation.**

- These approaches are used in phases of
  - **Design**: technological, organisational (procedures, process, workflow, structure, etc.)
  - **Operation**: analysis of activities, procedures, processes, organisational analysis, etc.
  - **Investigation**: event analysis, investigations following accidents

HOF at INERIS

Activities:

- Support to public authorities
- Research
- Business services

HUGO (unit responsible for HUmain et de la GOuvernance des risques)

- DRA (Direction des Risques Accidentels) / AGIR (Analyse et Gestion Intégrée des Risques) / HUGO
- 7 people (psychologists, ergonomists, sociologists, SMS specialists)

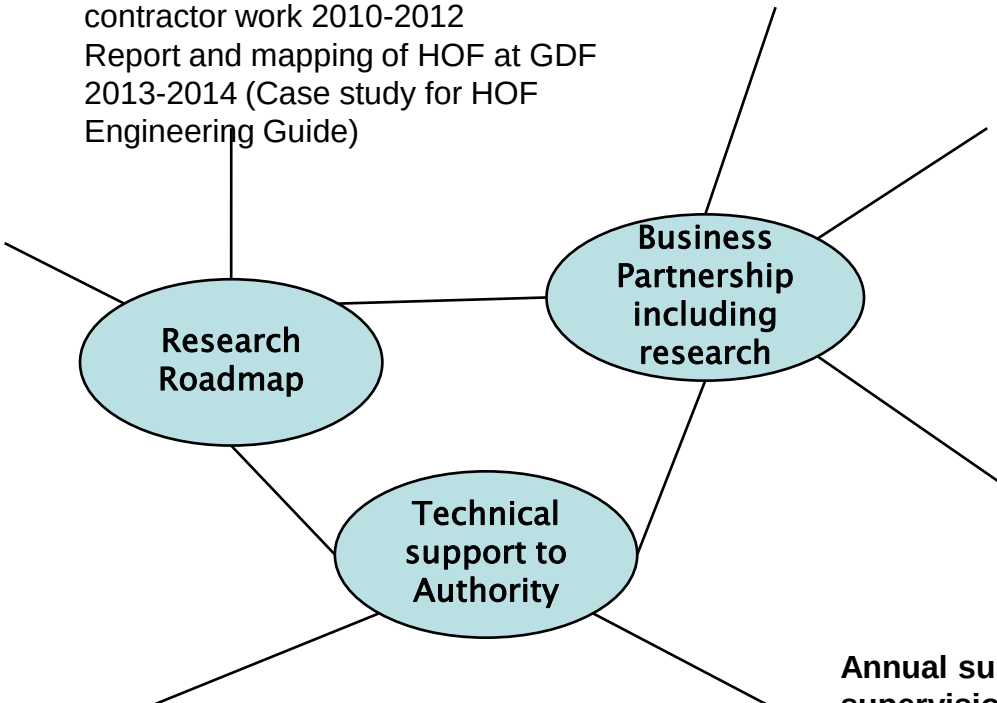
HOF activities at INERIS

Evaluation
- Evaluation Guide
Case study (Sanofi, 110 Bourgogne, SI Group, Lubrizol between 2009-2015)
- STARS : Comparative study of regulatory regimes

Engineering
- HOF Engineering Guide
- Definition of principles of good use of IT for training and daily risk management at an industrial site (TOSCA)

GDF SUEZ (HUGO)
Accounting for human and organisational factors in monitoring activities of contractor work 2010-2012
Report and mapping of HOF at GDF 2013-2014 (Case study for HOF Engineering Guide)

ASN
Mobilisation of the evaluation methodology for assistance in the inspection of transportation of nuclear materials (2012)



Air Liquide: Technical modification (interface) and training using IT (2012-2013)
SHEM
Development of a SMS using IT (2013)
SNOI: SMS and IT dashboard
SNECMA: evaluation of 30 human barriers (2014)
Vermilion: SMS development / evaluation

ANDRA (2010-2014)
Pre-diagnostic HOF of a business entity (case study for HOF Engineering guide).

DRA 71: Study of the use of feedback by industrialists, accident analysis guides
DRA 73: Joint organisation of meetings of the Omega 10 Club (evaluation of technical safety barriers) and Omega 20 Club (evaluation of human safety barriers)
DRA 81: flooding safety barriers, safety procedure implementation
DRA 91: Use of information technology to define and manage SMS in hydro-electric dams
DRA 94: Consultation, risk and territory (societal governance)
DRA 96: Participation in reflection on qualitative analysis of risks in transportation infrastructures

Annual support program (DRA 77 supported by supervision)
Inter-industrial study on the integration of HOF
Guide accounting for organizational changes (case studies with inspectors in 2013).
HOF Engineering Guide
Feedback Process Inspection Guide
SMS Evaluation Guide (in progress)

Inter-industrial study on the integration of HOF: comparison between aviation, nuclear, and Seveso Ind.

Why such a study?

- To study the possibility of reproducing what was done in other industrial sectors
- To better integrate HOF in policies and practices in the prevention of risks in Seveso plants.

How was this study performed?

- Bibliographic study: references tracing the history of certain approaches or regulations in a given industry,
- Meeting with thirty agents in risk prevention having piloted HOF approaches (ten per industrial sector)
- Reconstruction of the history and place of HOF in institutional structures in each industry
- Analysis of differences, common points, and particularities to deduce means of integrating HOF in Seveso plants

Brief summary of results and conclusions of the study

Sectors with very different histories

- Technological history (age, innovation, accidentology)
- Institutional history (national, European, international)
- Regulatory history

Different developments from one sector to another: network of competencies, resources and different means

Common blockages (technical / human opposition, lack of HOF competencies of all the safety actors)

5 enablers to better integrate HOF in policies and practices of Seveso plants

1. Strengthen **S**afety **M**anagement **S**ystems (and their monitoring systems) by HOF support to make them more consistent with **true operational practices** and company needs

2. Develop HOF reference frameworks on key themes to allow
   - Non-specialist safety agents to better understand HOF
   - Industrialists to clearly review their commitment to the field

3. Favour organisational and institutional learning by developing HOF incident / accident feedback:
   - Encourage thorough analysis of incidents and accidents
   - Clearly identify the technical, organisational and human contributing factors

5 enablers to better integrate HOF in policies and practices in Seveso plants

4. Favour the transfer of knowledge of research issues toward institutional and industrial agents

5. Reflect on an adapted government for HOF questions :

- What HOF competencies are necessary for each agent? How can they be valued?
- What regulatory or normative modes are compatible with the resources of institutional and industrial agents?

A framing model for the entirety of INERIS's HOF activities (MSDCS)

Strategic adaptations of directors of the organisation in its environment (market, regulations), the environment of the organisation, etc., leading to…

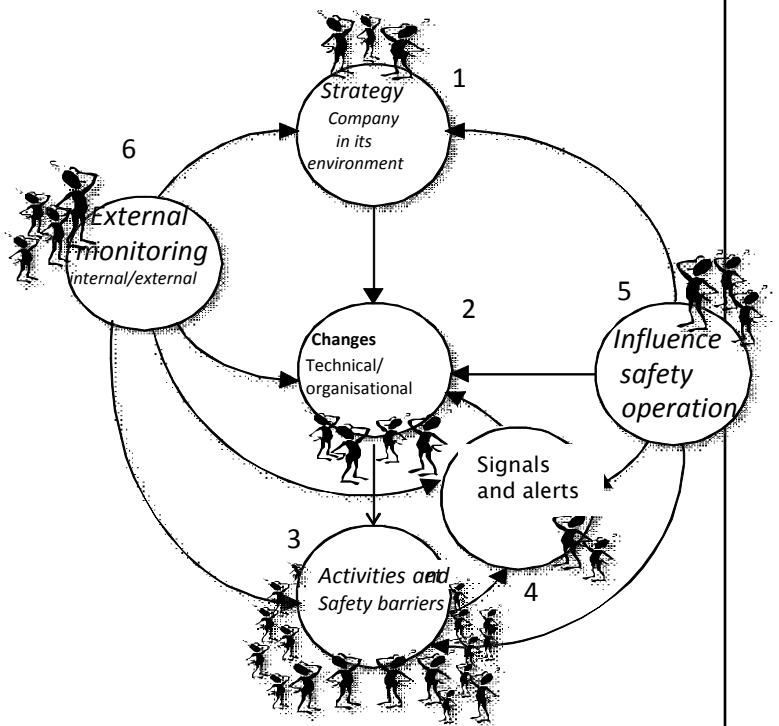
Organisational and technological changes (more or less constraining, more or less hindering, more or less concurrent, more or less cumulative) that can have positive or negative consequences on…

The operation of technical and human safety barriers foreseen at the design level (risk analysis), of which implementation problems must notably correspond with …

An attentive ear to weak signals as well as an **ability to respond to the after effects of incidents/accidents,** which rely notably on

A competent and sufficiently influential safety service, as well as an organisation capable of reacting

External, qualified monitors, to understand and draw information, which correspond concretely to strategic choices and practices.



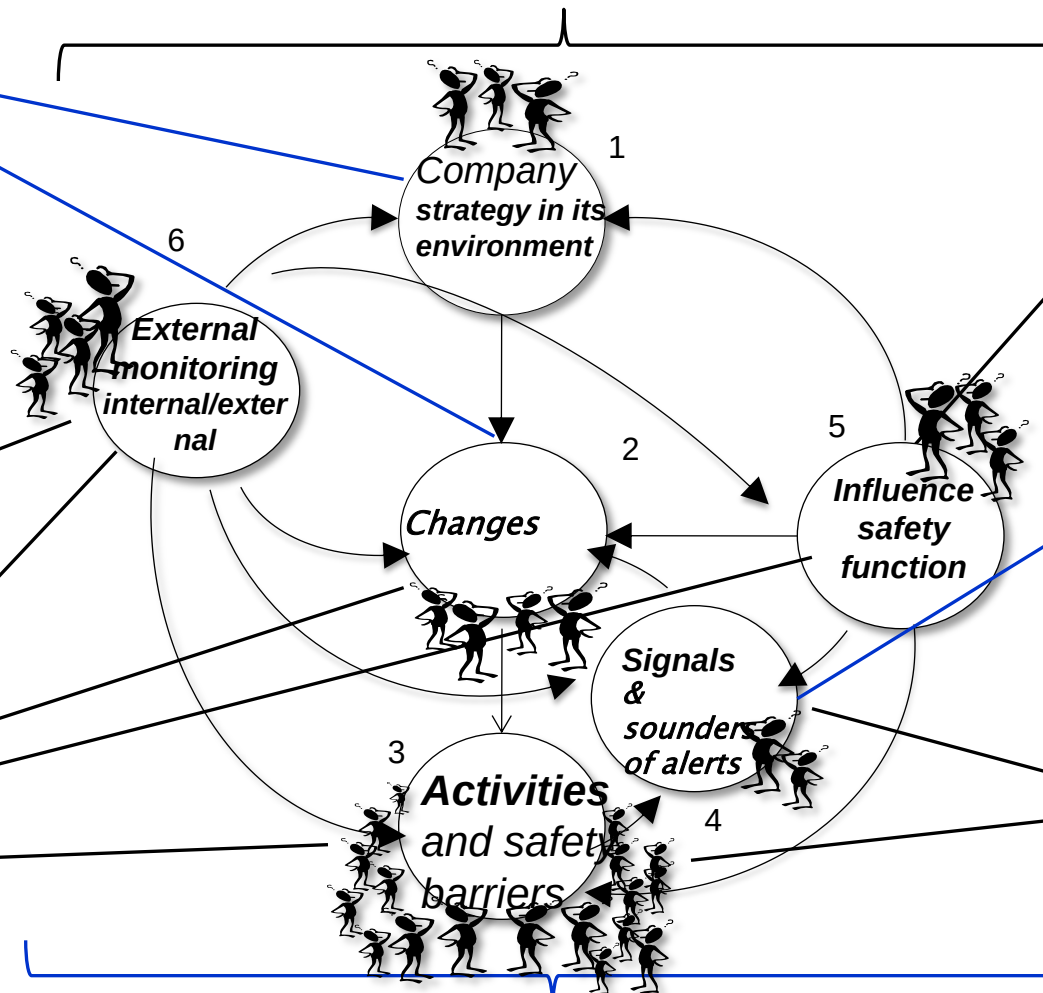
A contextual model for the entirety of HOF activities of INERIS

Safety evaluation in socio-technical systems (enablers 2 and 4)

Guide for the consideration of organisational changes in risk prevention (enablers 1, 2 and 4)

STARS (Saf€ra) Study of the influence of safety regulators (enabler 5)

TOSCA :
- e.g. SMS /
- Simulator training …



Thesis on the influence of safety services (enablers 4 and 5)

Feedback evaluation process guide: weak signals, incident, accident (enabler 1)

Thesis taking into account weak signals in risk analysis

HOF Engineering Guide (mapping, reporting and structuring HOF approaches (enablers 2 and 4)

GUIDE FOR THE CONSIDERATION OF ORGANISATIONAL CHANGES IN RISK PREVENTION

Guide accounting for organisational changes in risk prevention

What is the purpose of this guide?

- Consensus between industrial accident analyses, empirical studies led by INERIS and others, feedback from industrial safety agents (public and private): **organisational change is a risk factor,**

but…

- It is not change that causes problems, but the lack of anticipation, surveillance and monitoring of its impacts
- Three enablers are implicated: 1, 2, and 5

Objective of the guide?

- Provide a practical and pedagogical tool on a difficult subject

Guide accounting for organisational changes in risk prevention

Contents of the guide

Three types of organisational changes are targeted:

- Change of operators
- Centralisation / decentralisation of the safety operation
- Changes of personnel in key positions

For each type of change:

- Illustrations through three case studies
  - BP Texas City
  - Nitrochemicals – Billy Berclau
  - History of two SEVESO plants having undergone changes of two successive operators
- Lessons learned from these case studies
- Preconceived ideas on the theme
- An interrogative attitude: questioning and leads to interpret responses in terms of impacts on safety

The impact of a fusion is not necessarily identical for the two companies that merge.

For example, in the case of a fusion-absorption or an unbalanced fusion in which one of the two companies takes strong control of the other, imposing its principle directors, organizational choices and managerial choices, etc. The establishments that were managed up until then by the company now in control will probably be less impacted by the merger than those than those that were up until then operated by the weaker company.

Case 1: (BP Texas City) is exemplary of this point, for in merging with BP-Amoco, BP took control of Amoco (by imposing its PDG, its decentralized safety organisation, its cost reduction policy), and the ex-refineries of Amoco (including those of Texas City) were particularly perturbed by the changes.

Guide for accounting for organisational changes in risk prevention

Approaches for developing the guide

Theoretical bases

- Sociology

Empirical bases

- Accident analysis
- Data from organisational diagnostics
- Theses with monograph (ground data) in nominal situations

Working groups

Accompaniment for implementation

- Inspection side: done
- Industrial side: initialisation today ;)

Deployment

EVALUATION OF FEEDBACK PROCESSES GUIDE

Evaluation of Feedback Processes Guide

Why this guide ?

Feedback process poses real implementation difficulties

- Demanding resources
- Difficulties of accession of the agents
- Difficulties in drawing lessons…

Objectives of the guide

Provide a benchmark to

- encourage **good organisational practices** that optimise the implementation of a feedback process
- prepare for inspection (SMS system) by demonstrating the implemented good practices

Evaluation of Feedback Processes Guide

Guide contents

Three sections:

- Feedback process in the organisation
- Proactive feedback
- Reactive feedback

Process divided into eight phases, with for each them:

- A reference “ideal” to which the company situation should be compared
- Practices to surpass
- A questioning for each phase of the process
- Sources (traces) to find answers

Evaluation of Feedback Process Guide

Guide development procedure

- Base developed with the Authorité de sécurité nucléaire (ASN) (working group inspection)
- Adaptation to Seveso plants by INERIS
- Tested by inspectors (organisation of feedback and reactive feedback)
- To be tested by industry…

Questionings	Observables	Ideal
3. What are the sources of information allowing the collection of data during an event?	Interview those having contributed to the collection of data (including CHSCT): the safety director and/or the person responsible for the feedback process	All the information concerning the event are to be considered. It Is important that the collection of data be performed with an adequate methodology, notably with the help of the safety director. It is equally indispensable to gain information from issues on the ground and site agents, and this should be done several times and with different people. To do so, "hot" and "cold' interviews with the agents concerned (more or less directly) by the event should be performed in order to gather the most pertinent information. It is equally desirable to collect data relative to: the duration/ work time of the implicated operators (period of the year, time of day), pressure at play at the time of the events (time, production, etc.), the congestion of the workstation, interactions with other actors (colleagues, collective environment, supervisors), etc.
4. What are the questions that guide the collection of data?	Content of the incident / accident report (analytical part) Internal report of the event Internal analysis guide	Human and organizational aspects (beyond human error) are part of the questioning.

What do we expect now ?

Guide applications, with or without accompaniment

Application feedback

- Output
- Need for contextual adaptations
- Difficulties
- ...

A room for discussion / questions ?

HOF ENGINEERING GUIDE

HOF Engineering Guide

Why this guide?

Need identified by safety agents to clarify the notion and to describe the range of possible approaches in the field called HOF.

Objective of the guide:

Provide a tool to establish a structured approach in this field for at risk companies, in particular:

- **map** existing HOF procedures in the industry over the last 30 years
- propose a tool **to review** HOF actions implemented on a site or in a group
- propose a tool to **structure** HOF policies

HOF Engineering Guide

Contents of the guide

It specifies what we mean by HOF Procedure,

It proposes a list of existing HOF procedures,

It proposes principles for describing these procedures,

It maps in a simple manner HOF procedures,

It provides descriptive sheets of some of these procedures (appendix A).

It presents an analytical matrix of the HOF engineering abilities of a company for:

- Establishing a **review**,
- **Structuring an HOF engineering action plan**

This first version of the HOF engineering guide will develop and evolve from feedback

Organisation of the HOF Guide

Part 1:Definition and framing of HOF safety procedures

- Framing of what is considered an HOF procedure in the guide
- List of existing HOF procedures
- Description principles / differentiation of these procedures
- Descriptive sheets of some of these procedures (appendix A)
- Simple mapping of HOF approaches

:

Part 2: review HOF activities / procedures, experience on a site

- Definition of differentiating criteria of HOF procedures
- Analytical matrix of HOF engineering abilities of a company
- Lines of questioning to fill out the matrix (more or less in detail depending on the case)
- Illustration of an actual case

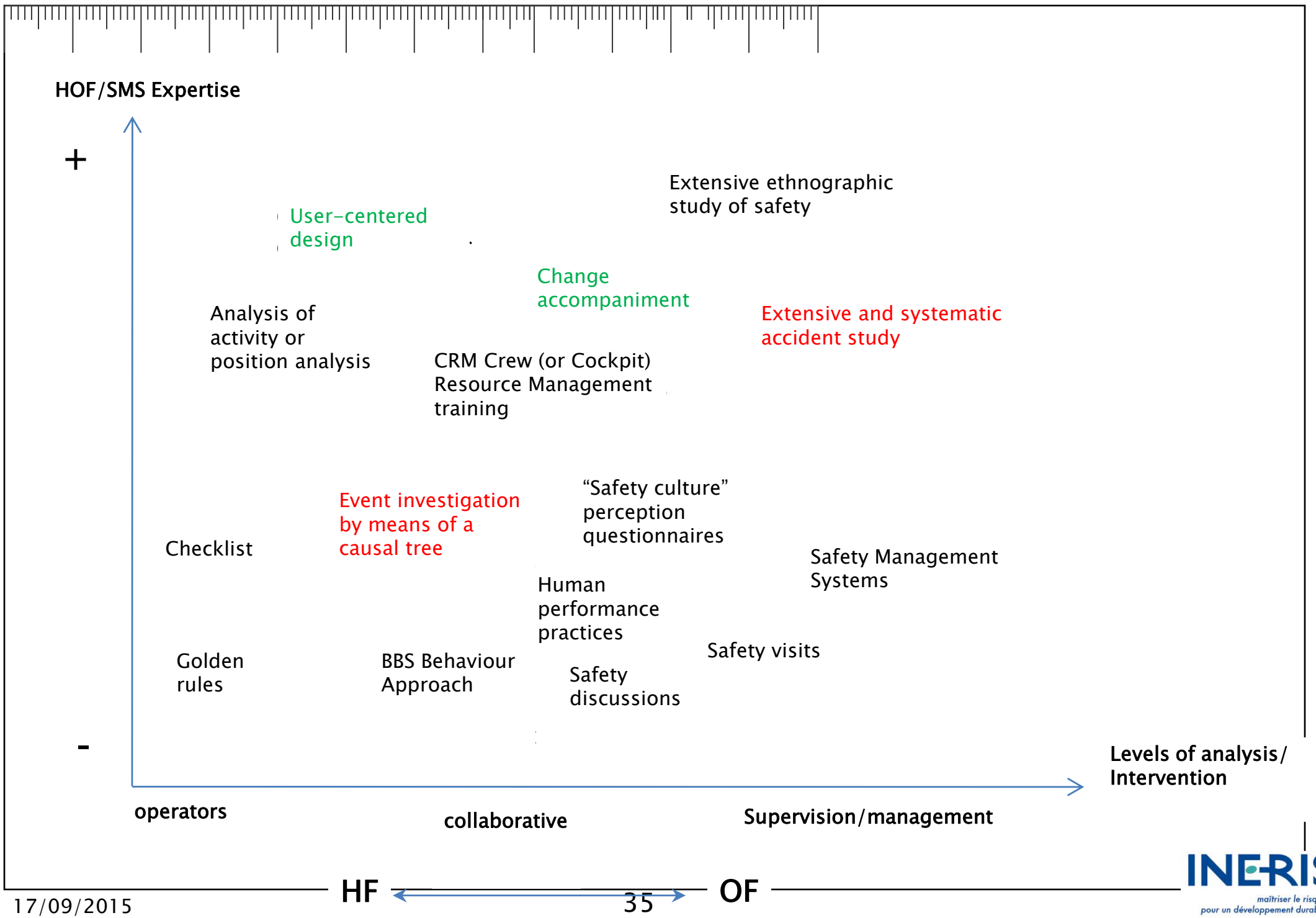
Part 3:Structurisation of an HOF policy (rapprochement of the HOF review and mapping of procedures)

- Questions to construct an HOF engineering procedure (1/2) :
  -Context
  - Structure of the procedure
- Illustration of an actual case

Guide of HOF Engineering

Procedure for developing the guide

- Application of the guide in the context of research partnerships (GDF Suez, ANDRA)
- Working group with experts (INERIS's HOF team)
- To come
  - Other applications
  - Peer validation


HOF/SMS Expertise
+
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User-centered design
Extensive ethnographic study of safety
Change accompaniment
Analysis of activity or position analysis
Extensive and systematic accident study
CRM Crew (or Cockpit) Resource Management training
Event investigation by means of a causal tree
"Safety culture" perception questionnaires
Checklist
Safety Management Systems
Human performance practices
Safety visits
Golden rules
BBS Behaviour Approach
Safety discussions
Levels of analysis/ Intervention
operators
collaborative
Supervision/management

Table 3: Illustration of engineering from a case study

	Before	During	After	
HF	1 /	1 Project in progress to deploy "safety visits" for the operators by the HOF consultant and following the awareness of all of the personnel	1 In progress project for the safety facilitator for deployment, by operators in different departments, of accident analysis.	*Professional expertise*
	2 /	2 The HOF-trained facilitator implements two HOF projects including safety visit. HOF facilitator writes awareness expectations of the provider	2 The HOF-trained facilitator implements two HOF projects including accident analysis. Participation in certain foreseen analyses.	*HOF/network awareness*
	3 / 4 Ergonomic consultant for installation modifications.	3 / 4 External consultant for FOH awareness session for all personnel	3 / 4 /	*HOF expertise internalised (3) or externalised (4)*
OF	1 /	1 Integration of HOF activities in the company's management system.	1 /	*Professional expertise*
	2 /	2 /	2 /	*HOF/network awareness*
	3 / 4 /	3 / 4 /	3 / 4 /	*HOF expertise internalised (3) or externalised (4)*