EUROPEAN LEADERSHIP FOR SAFETY EDUCATION

ELSE Workshop Scientific Report

January 22 - 24, 2020

MSHS - Nice

enstti
J Repussard Conseil
UNIVERSITÉ CÔTE D'AZUR
ACADEMY OF EXCELLENCE
SPACE, ENVIRONMENT, RISK AND RESILIENCE
cnrs
Gredeg

Summary

1. European Leadership for Safety Education (ELSE) Project presentation

a. Project Context

Major accidents in the 20th century (for example, the Challenger spaceship explosion or the nuclear accident at Chernobyl in 1986) and the early 21ˢᵗ century (for example, the Texas City refinery explosion in 2005, Air France flight 447 accident in 2009 or the nuclear power plant accident in Fukushima-Daiichi in 2011), question the reliability and performance of industrial safety, evidencing the foremost role played by human and organizational issues.

Many institutions have made research and development on safety and security practices their priority. For example, the Institute for an Industrial Safety Culture (ICSI) was created two years after the explosion of the AZF factory in Toulouse in 2001 and, in 2005 the Foundation for a Culture of Industrial Safety (FONCSI) was created to support the institute's activities. This recently created Foundation focuses on research in the area of "the shared and governed awareness of industrial risks in a broad sense and their associated values." (Report "La Foncsi depuis 2005", 2017: 3).

The International Atomic Energy Agency (IAEA) and its member states have recognized the importance of safety leadership and included it in the frame of its fundamental safety principles. IAEA has recently published a document on security requirements (GSR Part 2) that sets a requirement for managers at all levels to demonstrate safety leadership. The document emphasizes three complementary concepts upon which the demonstration of safety leadership is based: the ability to define and attain safety objectives, the values and attitudes underlying leader-manager actions and leader-manager commitment to safety issues.

In 2016, the IAEA General Conference adopted a resolution calling for the development of specific training on the topic of safety leadership. Such training corresponded to a pressing need of many countries: those in the process of developing a nuclear industry and those wishing to reinforce safety in other applications of ionizing radiation, particularly in the medical sector. The first training, mainly aimed at executives in organizations with nuclear or radiological activities and control bodies in IAEA member countries, was held experimentally at the University Côte d'Azur (UCA) in Nice in November 2017. It was sponsored by the IAEA and the European Nuclear Safety Training and Training Institute (ENSTTI).

The UCA was chosen by the team of experts advising the IAEA on this project because of the specific interest developed so far by its management school component, in cooperation with the French institute for nuclear safety and radiation protection (IRSN), in issues related to management in the nuclear sector, particularly in the field of knowledge management in nuclear safety.

On this basis, and considering the high interest demonstrated in many countries for such training, the European Union, acting in the framework of its Instrument for Nuclear Safety Cooperation (INSC), has decided to further develop actions in this field, for example, by financing the ELSE project. The latter aims to develop a more academic approach to education of safety leadership skills. In order to be able to respond in a sustainable manner to the challenge of setting up an innovative professional training and a Master degree module, considering the current situation where no such diploma, focused specifically on leadership skills in managing heavily regulated industry activities such as those in the nuclear sector exists so far in Europe or elsewhere, the ELSE project will bring together management schools and technical universities specialized in education for the nuclear sector.

b. Project Objectives

The ELSE project has started on September 1, 2019 and will last three years. It has three main objectives:

- To develop a certified university diploma in the field of safety leadership based on up-to-date scientific knowledge and best practices;

- To experiment the training curriculum of this diploma with two successive groups of young professionals from INSC and European countries;

- To establish the basis for a sustainable development of leadership for safety education:

  - by making leadership for safety education available to students through a network of "implementing European Universities", as a component of a Master's degree;

  - by designing a MOOC for worldwide reach;

  - by creating an international and multidisciplinary network of academics and experts on leadership for safety.

c. Project Consortium

The three above mentioned tasks are performed by two partners of the ELSE project consortium: Université Côte d'Azur (UCA), and the European Nuclear Safety Training and Tutoring Institute (ENSTTI), with the support of a key Contractor, JC Repussard Conseil.

Lead Applicant - The Côte d'Azur University (UCA) is an Association of Universities and Higher Education Institution (ComUE) in Provence-Alpes-Côte d'Azur region, France. It was created in 2013 as a result of France's Law on Higher Education and Research, which instructed the formation of ComUEs. University Côte d'Azur includes 13-member institutions with a wide range of functions and specialties. Among the 13-member institutions, two will be directly involved in the project: Nice Sophia Antipolis University, and SKEMA Business School that offers undergraduate and graduate programs in management in France, China, Brazil and the US. More specifically, Nice Sophia Antipolis University will be represented by the School of Economics and Business (Institut Supérieur d'Economie et de Management - ISEM). On January, 1st 2020 the 13 members of the ComUE agreed will form a new experimental university called Université Côte d'Azur.

Both ISEM and SKEMA have experience in the development of the different undergraduate and postgraduate diploma. ISEM and SKEMA researchers belong to the same research center, GREDEG (Groupe de Recherche en Droit, Economie et Gestion, UMR 7321, CNRS). The latter is affiliated with the CNRS (French National Centre for Scientific Research), a governmental research organization with its headquarters in Paris.

Co-Applicant - ENSTTI is an initiative of the European Technical Safety Organizations (TSOs) Network-ETSON. It was created in 2010 with the objectives: 1) to develop a high-quality training to tackle training needs of experts at Nuclear Regulatory Authorities (NRAs) and TSOs; 2) to ensure the continuous development of qualified experts in this area and 3) to foster harmonization of technical practices in nuclear safety, nuclear security and radiation protection. This is achieved through the regular provision of

vocational training and tutoring, exclusively delivered by senior professionals of European TSOs, which integrate the latest technical developments, and which are continuously up-dated and improved by applying a systematic approach to training.

It is ENSTTI's ultimate goal to provide initial training and continuous qualification programs that will ensure that personnel at Nuclear Regulatory Authority and Technical Safety Organization are able to maintain competencies in their current positions and that they have the opportunity to get prepared in time to take on emerging tasks or advancements.

Each year ENSTTI welcomes over a thousand of trainees and uses a pool of lecturers counting more than 250 international experts. Training and Tutoring are delivered in English, French, Spanish and Russian.

J Repussard Conseil will be a key contractor. J Repussard Conseil it is a small size and dynamic consulting company operating worldwide. Its founder, Jacques Repussard, is a former French top civil servant who ran French public bodies and spent some of his career in Brussels, developing the European standardization system in close cooperation with European Commission, in response to the challenge of setting up the European internal market.

After having led the French Institute for Radiation Protection and Nuclear Safety (IRSN) between 2003 and 2016 (a public body set up in 2002, with a budget of circa 300 M€ and 1700 staff), and having during his mandate developed a solid international experience in nuclear safety issues and scientific cooperation in this field, Jacques Repussard set up his own consulting company, J Repussard Conseil, dedicated to the provision of services to public stakeholders of nuclear safety and radiation protection.

Project partners possess complementary competencies, necessary to guarantee the success of this ambitious training project. The UCA brings in competencies in the development of Master-level diplomas. In addition, its researchers possess solid competencies in the domains of management, organizational dynamics, high-reliability organizations and organizational learning, which are key elements in the development of innovative research and training in the domain of safety leadership. For the last six years ENSTTI has continuously led consortia for implementing INSC training and tutoring projects. ENSTTI has also been instrumental in the development of the pilot school for safety leadership, which was held in October 2017.

J Repussard Conseil has played a key role in the development of the IAEA leadership for safety pilot school, by chairing the international expert group in charge of its conception, mobilizing his network of contacts in order to support the initiative, and contributing to the training program development and experimentation. Some of the international projects in which J Repussard Conseil is currently engaged, such as, for example, the development of the IAEA TSO initiative, also have a direct bearing on the issues associated to leadership for safety.

d. ELSE project governance

The ELSE Project is managed by the University Nice Côte d'Azur (UCA) in partnership with the European Nuclear safety training and Tutoring Institute (ENSTTI), and with the support of J Repussard Conseil.

The daily management of the project, including its project team, is placed under the responsibility of UCA.

ELSE Project team:

- Catherine Thomas, UCA, ELSE Coordinator
- Renata Kaminska, SKEMA/UCA, ELSE Key Expert
- Natalia Jubault Krasnopevtseva, SKEMA/UCA, ELSE Research and Training Assistant
- Didier Louvat, ENSTTI, ELSE Consortium Member
- Anna Benattar, ENSTTI, ELSE Consortium Member
- Jacques Repussard, ELSE Contractor, Chair ELSE Steering Committee

A Project Steering Committee has been set up in order to oversee the pedagogical and scientific approach, with a view to ensure that the needs of key stakeholders such as national safety authorities and their TSO's, or nuclear operators are well apprehended, and to prepare for future European academic partnerships in the field of leadership for safety.

Chaired by J Repussard, this Committee also serves as Scientific Advisory Board for the diploma management in the first three years, including consideration of how the most recent research results in the field of safety leadership can be translated in formalized and stabilized knowledge to be implemented for the training of managers and students.

2. ELSE Workshop

a. Objectives

The ELSE project aims to develop a new science-based approach for education in the domain of safety leadership. This requires combining scientific knowledge from the different academic disciplines with empirical knowledge from the nuclear sector. By favoring multiple interactions, the workshop served a double objective:

- To help identify the existing knowledge on the topic of safety leadership/leadership for safety, which in turn will help design a training program for managers and students.

- To foster research collaborations among scientists from the different disciplines and between scientists and the actors of the nuclear sector. These collaborations guarantee a continual development of knowledge on safety leadership/leadership for safety.

b. Methodology

The above objectives were achieved in a co-creation mode. Co-creation was based on the collaborative development of new concepts and values with the different stakeholders. The main concepts identified in the literature were confronted with stakeholders' expectations with respect to training and education. They were discussed and enriched jointly.

The co-creation in the ELSE project was organized simultaneously at three levels:

- ➢ **Level 1: co-creation among the academic stakeholders.** The co-creation resulted from the discussions among researchers from a diversity of disciplines, mainly represented by sociology, psychology and management, but all working on the themes related to leadership for safety/safety leadership.

- ➢ **Level 2: co-creation between academics and the nuclear sector actors.** The nuclear sector actors included operators, regulators and Technical and Scientific Support Organizations (TSOs). They represented the stakeholders interested in training for early career managers of the nuclear sector.

- ➢ **Level 3: co-creation between academics, nuclear sector actors and scientific directors of university programs on safety and risk management.** This third type of stakeholder were more particularly interested by the creation of a leadership for safety/safety leadership module as a component of a Master's degree.

➡ *Process*

The workshop was organized around two types of session: group work on predefined themes and collective debriefing. Three groups worked in parallel on the same theme. These working sessions were followed by a session of collective debriefing with all workshop participants. Each group was composed by members of each types of stakeholder (academic, nuclear sector actors, scientific directors of university programs).

By providing a space for interaction, each group session was designed to favor co-creation. The co-creation was a structured conversational process in which groups of people discussed a specific theme. For each theme the conversation was structured in three 40-minute time periods focused on the three topics:

1) state of the art of the literature,
2) the tensions in the literature and practices, and
3) the implications for leadership and training.

The forty minutes were divided into a thirty-minute discussion and a ten-minute synthesis. To make the discussion on the state of the art of the literature more efficient, one or two researchers briefly presented his or her research on one of the above themes.
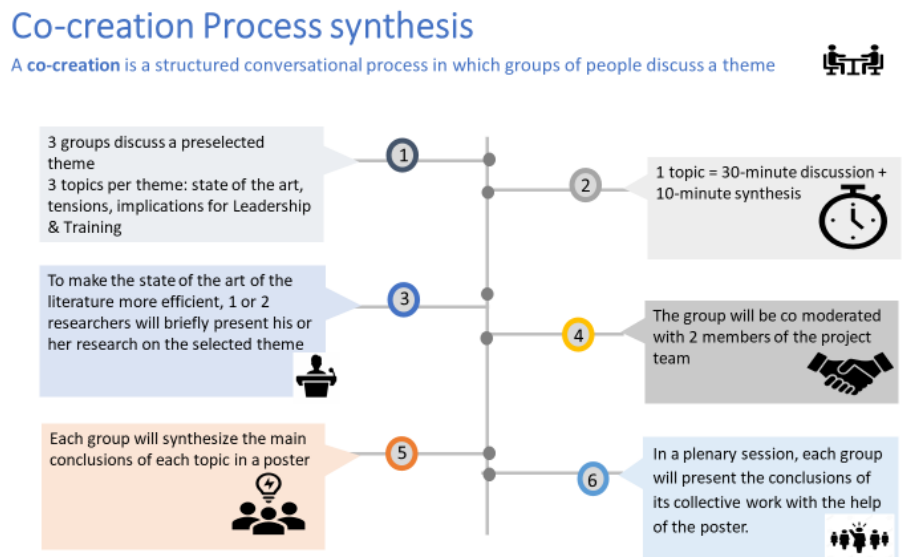
The synthesis of each session was formalized in a poster represented in the following figure.
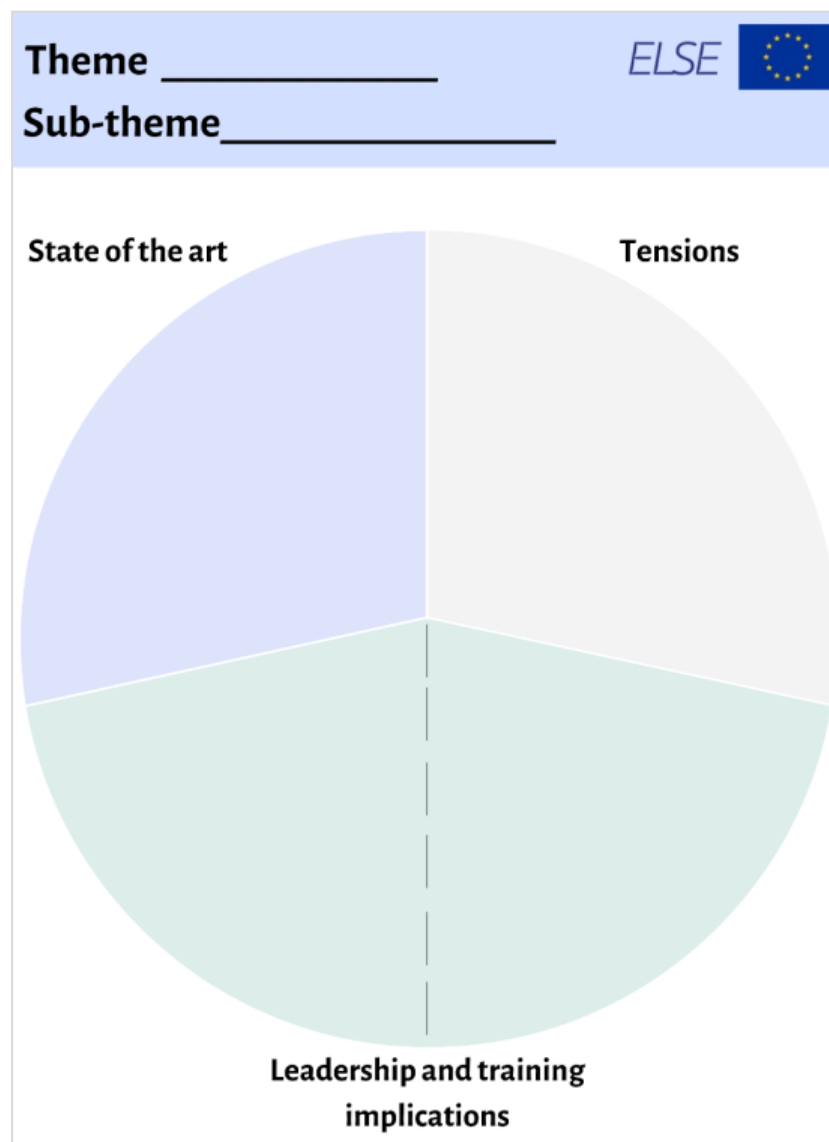
In a plenary session, each group presented the conclusions of its collective work with the help of the above poster.

The co-creation process is represented in the figure below.

Co-creation Process synthesis

A **co-creation** is a structured conversational process in which groups of people discuss a theme

1. 3 groups discuss a preselected theme
3 topics per theme: state of the art, tensions, implications for Leadership & Training

2. 1 topic = 30-minute discussion + 10-minute synthesis

3. To make the state of the art of the literature more efficient, 1 or 2 researchers will briefly present his or her research on the selected theme

4. The group will be co moderated with 2 members of the project team

5. Each group will synthesize the main conclusions of each topic in a poster

6. In a plenary session, each group will present the conclusions of its collective work with the help of the poster.

➥ ***Themes***

Based on the participants' scientific expertise and the answers to our preliminary questionnaire, we identified three themes related to leadership for safety/safety leadership. These themes go from general to more specific:

1) safety culture/safety climate

2) risk assessment and resilience

3) dealing with uncertainty and mindfulness.

After having discussed these three themes, the last group work session focused on the specific theme of leadership for safety/safety leadership.

The figure below summarizes the different themes and their articulation.

c. ELSE Workshop program

Wednesday 22 January 2019		
13h30-14h00	Participant registration/Welcome	MSHS hall
14h00-14h30	Welcome speech by ELSE Project team and welcome speech by Université Côte d'Azur	MSHS, plenary meeting room
14h30-14h45	Presentation by Xavier Pinsolle (EC/DEVCO)	MSHS, plenary meeting room
14h45-15h00	Experience feedback in leadership for safety/safety leadership training: IAEA (Maria Moracho Ramirez)	MSHS, plenary meeting room
15h00-15h30	Presentation of ELSE Project (ELSE Project Team – Jacques Repussard)	MSHS, plenary meeting room
15h30-16h00	Workshop Presentation (ELSE Project Team – Renata Kaminska): Objectives, Methodology, Themes	MSHS, plenary meeting room
16h00-16h30	Coffee break	MSHS hall
16h30-18h30	Group work session (theme 1 "Safety culture and climate")	MSHS, working rooms
	Group A. Importance of safety culture and safety climate Key-speakers: Katharina Jeschke and Dov Zohar	Plenary Room
	Group B. Safety culture in the context of the nuclear sector Key-note speakers: François Jeffroy and Dounia Tazi	Room 418
	Group C. Safety as a social construction Key-note speakers: Silvia Gherardi	Room 131
18h30–19h30	Debriefing session (theme 1 "Safety culture and climate")	MSHS, plenary meeting room
19h30-21h30	Diner (Buffet)	MSHS hall
Thursday 23 January 2019		
9h00-10h00	Stakeholders expectations (Valérie Lagrange, Vincent Nys, Cyril Pinel, Didier Louvat)	MSHS, plenary meeting room
10h00-10h30	Coffee break	MSHS hall
10h30-12h30	Group work session (theme 2 "Risk assessment and resilience")	MSHS, working rooms
	Group A. Resilience: Management of contradictions and Ethics Key-note speaker: Benoit Journé and Yoann Guntzburger	Room 131
	Group B. Resilience and organizational limits Key-note speakers: Nick Oliver	Plenary Room
	Group C. Resilience, reporting and knowledge management Key-note speakers: Jean-Louis Ermine	Room 418

12h30-14h00	Lunch	MSHS hall
14h00-16h00	Group work session (theme 3 "Dealing with uncertainty and mindfulness")	MSHS, working rooms
	Group A. Dealing with uncertainty and rules Key-note speaker: Gudela Grote	Room 418
	Group B. Dealing with uncertainty: a psychological approach Key-note speakers: Rhona Flin and David A. Hofmann	Room 131
	Group C. Safety mindfulness and meta-cognition Key-note speaker: Ravi S. Kudesia	Plenary room
16h00-16h30	Coffee break	MSHS hall
16h30-18h30	Debriefing session (themes 2 "Risk assessment and resilience" and 3 "Dealing with uncertainty and mindfulness")	MSHS, plenary meeting room
18h30-21h00	Dinner	Restaurant
Friday 24 January 2019		
9h00-11h00	Group work session (theme 4 "Leadership for safety")	MSHS, working rooms
	Group A. Leadership and mechanisms for achieving safety Key-note speaker: David Denyer & Renata Kaminska	Plenary Room
	Group B. Perception of safety effectiveness and leadership Key-note speaker: Nick Turner	Room 418
	Group C. Leadership for safety in research and practice Key-note speakers: Colin Pilbeam and Eivor Oborn	Room 131
11h00-11h30	Coffee break	MSHS hall
11h30-12h30	Debriefing session (theme 4 ""Leadership for safety")	MSHS, plenary meeting room
12h30-13h00	ELSE workshop key takeaways, next steps and concluding remarks	MSHS, plenary meeting room
13h00-14h30	Lunch	MSHS hall
End of the workshop		

Plenary meeting room: "Salle Plate"; floor 0

Working rooms: "Salle Plate", "Salle 131" (floor 1) and "Salle 418" (floor 4)

Working group A

DEN AUWER Christophe - Professor Université Côte d'Azur Chemistry Institut Nice (France, Nice)

DENYER David - Professor of Leadership and Organizational Change at Cranfield School of Management (UK)

GROTE Gudela - Professor of Work and Organizational Psychology at ETH Zürich (Swizerland)

GUNTZBURGER Yoann - Assistant profession in Science, Technology and society at SKEMA Business School (France, Nice)

JESCHKE Katharina Christiane - Researcher (PhD Fellow) at the National Research Centre for the Working Environment (Denmark)

JOURNE Benoit - Professor of Management in Université de Nantes, IAE Nantes - Institut d' Économie et de Management (France), Member of ELSE Steering Committee

MORACHO Ramirez Maria - Senior Nuclear Safety Officer, IAEA

PINEL Cyril - Director for the International Affairs at IRSN

ZOHAR Dov- Professor at the Faculty of IE & Management at the Technion - Israel Institute of Technology (Israel)

Moderators: BENATTAR Anna and KAMINSKA Renata

Working group B

DRUENNE Hubert - Chief Engineer, Nuclear Processes department, ENGIE/Tractebel (Belgium), Member of ELSE Steering Committee

FLIN Rhona - Professor of Industrial Psychology at Aberdeen Business School, Robert Gordon University and Emeritus Professor of Applied Psychology, University of Aberdeen (UK)

FOX Dennis - Professor in the Geography Department of Université Côte d'Azur (France, Nice)

HOFMANN David A. - Hugh L. Mccoll Distinguished Professor And Senior Associate Dean For Academic Affairs at the University of North Carolina Kenan-Flangler Business School (USA)

JANATKOVA Karolína - Consultant for the Instrument for the Nuclear Safety Cooperation of the European Commission

JEFFROY François - head of the IRSN Social Sciences and Humanities Laboratory, IRSN (France)

OLIVER Nick - Professor of Management at the University of Edinburgh Business School (UK)

PAVEL Gabriel - Executive Director of the ENEN, Member of ELSE Steering Committee

TAZI Dounia - Operations director, ICSI Institute for an Industrial Safety Culture (France)

TURNER Nick - Distinguished Research Chair in Advanced Leadership in the Haskayne School of Business, University of Calgary (Canada)

Moderators : JUBAULT KRASNOPEVTSEVA Natalia and REPUSSARD Jacques

Working group C
ABDULKADER Usama - Nuclear safety engineer on the JHR material testing reactor, CEA (France)
ERMINE Jean Louis - Knowledge management expert, Professor emeritus at Institut Mines-Telecom International consultant Jean-Louis Ermine Consulting (France)
GHERARDI Silvia - Senior professor of sociology of organization at the Department of Sociology and Social Research, at University of Trento (Italy)
JEANSON Aurélie - Research Engineer of radiochemistry CNRS Université Côte d'Azur (France, Nice)
KUDESIA Ravi S. - Assistant Professor at the Fox School of Business at Temple University (USA)
LAGRANGE Valérie - Safety management & Human Factor Expert at the Corporate level of the French nuclear fleet, EDF, Operation Division, EDF (France)
NYS Vincent - Senior Expert WENRA, Member of ELSE Steering Committee
OBORN Eivor - Professor of Healthcare Management in the area of Innovation and Organizational Change at Warwick Business School (UK)
PILBEAM Colin - Reader in Safety Leadership in the Safety and Accident Investigation Centre, Cranfield University (UK)
Moderators : LOUVAT Didier and THOMAS Catherine

➡ *Greening*

To demonstrate its commitment to sustainability, the ELSE team will organize this workshop keeping in mind environmental best practices.

There will be a focus on the areas of paper smart documentation, recycled materials (paper, bags, ink) and waste reduction and recycling.
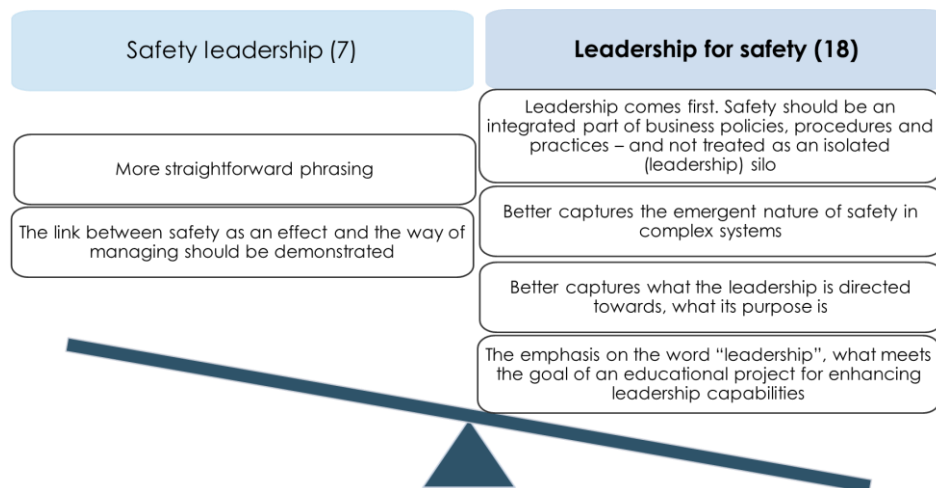
3. ELSE Workshop Results

a. Workshop Questionnaire Response Analysis

A questionnaire about safety and leadership has been sent to the participants before the workshop. The detailed answers are presented in the Participants presentation section. The synthesis of these answers is presented below.
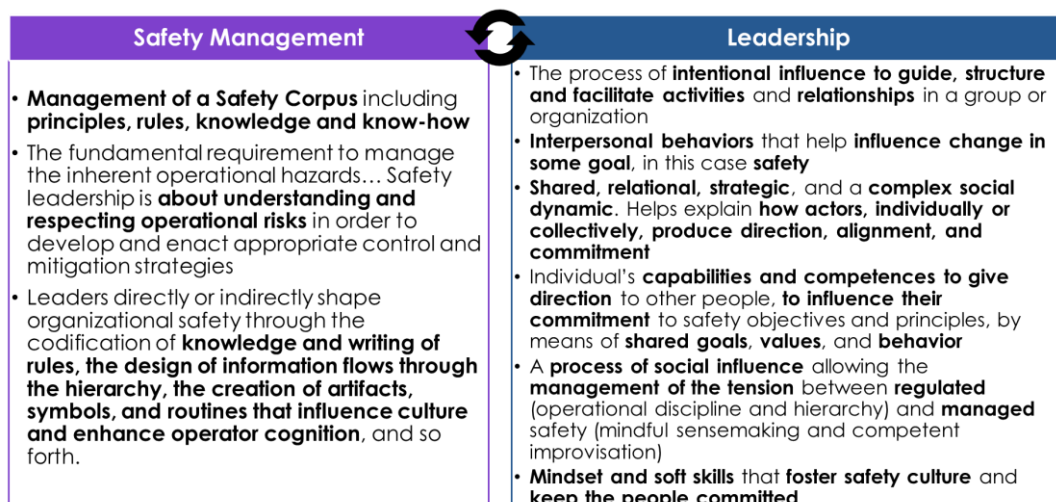
➡ *"Safety Leadership" or "Leadership for Safety"?*

When asked which expression most accurately describes the theme of the ELSE project *Safety Leadership* or *Leadership for Safety*, the majority of the respondents made the choice of **Leadership for Safety**. The main arguments explaining participants' choice are listed below.

Safety leadership (7)	Leadership for safety (18)
More straightforward phrasing	Leadership comes first. Safety should be an integrated part of business policies, procedures and practices – and not treated as an isolated (leadership) silo
The link between safety as an effect and the way of managing should be demonstrated	Better captures the emergent nature of safety in complex systems
	Better captures what the leadership is directed towards, what its purpose is
	The emphasis on the word "leadership", what meets the goal of an educational project for enhancing leadership capabilities

➡ *Leadership for Safety Definition*

When asked to define Leadership for Safety, participants' answers underlined a combination of two different but interconnected key concepts: safety management and leadership.

Safety Management	Leadership
• **Management of a Safety Corpus** including **principles, rules, knowledge and know-how** • The fundamental requirement to manage the inherent operational hazards… Safety leadership is **about understanding and respecting operational risks** in order to develop and enact appropriate control and mitigation strategies • Leaders directly or indirectly shape organizational safety through the codification of **knowledge and writing of rules, the design of information flows through the hierarchy, the creation of artifacts, symbols, and routines that influence culture and enhance operator cognition**, and so forth.	• The process of **intentional influence to guide, structure and facilitate activities** and **relationships** in a group or organization • **Interpersonal behaviors** that help **influence change in some goal**, in this case **safety** • **Shared, relational, strategic**, and a **complex social dynamic**. Helps explain **how actors, individually or collectively, produce direction, alignment, and commitment** • Individual's **capabilities and competences to give direction** to other people, **to influence their commitment** to safety objectives and principles, by means of **shared goals**, **values**, and **behavior** • A **process of social influence** allowing the **management of the tension** between **regulated** (operational discipline and hierarchy) and **managed** safety (mindful sensemaking and competent improvisation) • **Mindset and soft skills** that **foster safety culture** and **keep the people committed**

➡ *Leadership for Safety Key Words*

The same dictonomy between safety management and leadership was observed in the key words participants added to the definiton of leadership for safety:

➡ *Risk Perception Formation - Process and Content*

Risk perception appeared to play an important role in leadership for safety implementation. When asked about how risk perception and the main socio-technical risks form and evolve in high-risk/highly regulated organizations (such as the nuclear sector), the participants made a clear distinction between: 1) risk perception formation process and 2) risk perception content.

How does Risk Perception Form and Evolve?
- Policies, rules and processes; managerial commitment to safety; education, training, mentoring
- Personality traits, emotion
- **Experience** (developed situational awareness)
    o Attention to superstitious learning
    o Increasing role of deliberate learning and knowledge codification
- Changes with time: multi-scale temporalities
- Differences across multiple levels: need interactions for shared perception

What constitutes Risk Perception? Key risks identified by nuclear sectors actors
- Difficulties of interfaces between human, technological and organizational factors
- Over-complexification of socio-technical systems
- Unpredicted events; accumulation of small changes
- Lack or loss of expertise; lack of training; over-confidence; false sense of security
- Production pressures, aging reactors, lack of safety infrastructure in new nuclear countries
- Cyber risk

➡ ***Challenges and Ways of Dealing with Risk***

When asked about challenges of dealing with risk and key practices to promote the highest levels of safety, respondents highlighted the importance of achieving a dynamic mix between managed and regulated safety illustrated below.
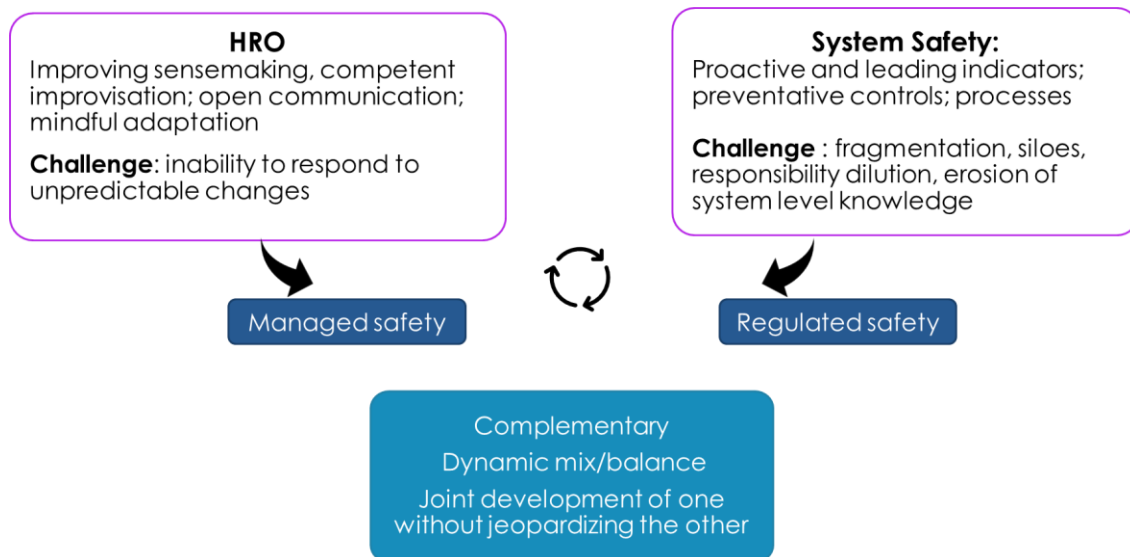
➡ ***Improvement of Leadership for Safety***

When asked about the possible ways of improving leaderhsip for safety, the respondents highlighted following elements:

- Managing tensions
  - o Control ***vs*** autonomy
  - o Static devices ***vs*** dynamic problems
  - o Stability ***vs*** flexibility
  - o Top-down ***vs*** bottom-up approach
  - o Specialization ***vs*** systemic approach
  - o Agency ***vs*** systemic organizational properties
- Making safety a priority
  - o For all types of actors: front-line operators, middle managers and high-level leaders
- Developing individual and collective mindfulness
- Developing organizational learning
- Enabling trust, open relations, dialogues, active listening, group discussion
- Understanding/taking organizational and institutional context into account

➡️ *Future Research Avenues*

Finally, when asked about future research avenues about leadership for safety and related themes, the respondents suggested to focus on the following topics and questions:

- How to achieve loose coupling of standardization and autonomy through rules and organizational design?
- How to design practices that regulate attention and develop individual and collective mindfulness?
- How to manage diverse tensions, e.g. between preventive control and mindful adaptation?
- How to learn from failure and better understand accident causation?
- How to design positive/proactive leading safety indicators that are meaningful?
- Avenues specifically focused on leadership:
    - Conceptual clarity about transformational/transactional leadership
    - Beyond leadership styles, the need to develop a more processual and systemic approach: complexity, network view, shared or distributed (pluralistic) forms, taking into account the context and organizational dynamics
    - Discover specific mechanisms and processes of leadership for safety
    - Developing more qualitative research

b. Group sessions report

1) Safety culture and climate

➡ *Group A: Importance of safety culture and safety climate*

Keynote Speaker 1: Dov Zohar – Professor at the Faculty of IE & Management at the Technion - Institute of Technology, Haifa, Israel

In the picture: Zohar Dov
First day of the Workshop the 22th of January 2020, Group Work
Photographer: Marwa Abdellatif
Place : MSH Nice, France

D. Zohar says that organizational culture and climate are key contextual variables allowing to identify "right versus wrong" behaviours. *Organizational culture* is a strong contextual variable. It may be defined as pattern of shared values beliefs and basic assumptions that unite the members of an organisation/institution by indicating the right ways for thinking and acting (Edgar Schein).

E. Schein identified three building blocks of organizational culture:

- *Artifacts*: observable indicators of the hidden culture elements (dress code, furniture, stories, meeting agendas, etc.);
- *Values*: identifying right vs wrong behaviors; can be strong or weak;
- *Beliefs & Basic assumptions*: Beliefs are statements about the world that are accepted to be valid or true independently of empirical evidence. Beliefs serve as building blocks in our construction of reality (creation of personal theories about the world). Basic assumptions evolve from repeatedly successful solutions to problems, turning it into a (supposedly) verified proposition.

Climate is a cognitive social construct referring to employee shared perception regarding the kinds of role behaviour is likely to be recognized and rewarded. Given the complexity of the organizational environment (e.g. competing demands, inconsistent policies), workers use each other's experiences to identify positive/negative consequences. When

everyone agrees about consequences of specific behaviors, climate emerges (service, innovation, safety).

Keynote Speaker 2: Katharina C. Jeschke – Researcher (PhD Fellow) at the National Research Center for the Working Environment (Denmark)

K. Jeschke shares her experience in the leadership training for managers in the context of Danish construction industry. One of the tools used is Safety Culture Ladder (Swuste, P. *et al.*, 2020). This tool highlights the existence of five types of safety culture/stages in the safety culture development, namely: pathological, reactive, calculative, proactive and generative culture, whereby engagement and accountability increase as one moves up the ladder. By focusing on the difference between what is actually espoused versus spoken, the objective of using the Safety Culture Ladder is to make managers aware of the type of safety culture that exists in their organization with the ultimate goal to make them reflect on how to move up the ladder. K. Jeschke highlights the difficulty to talk about culture with employees with a technical background. It seems that the notion of culture is not concrete enough to them.

K. Jeschke also highlights that work roles and role identity should be part of an education program for managers and future leaders. The difficulty in organizations is that the meaning of safety is often negotiated so it may be unclear who has the ultimate responsibility for safety. Moreover, formal and informal work roles might differ. All in all, safety should become an integral part of managers' professional and role identity and training should include discussions around professional identity, the role, the responsibility, how they are connected. Last but not least, management commitment to communication about safety can have a significant positive impact safety. Managers should be aware of their impact on safety through effective communication.

Discussion:

20 years ago EDF R&D elaborated the notion of safety climate in a nuclear context (with scales, etc.), but then asked the managers to abandon it because it was too difficult to operate on a day-to-day basis (even though theoretically climate is much easier to manage than culture). Maybe because it was too threatening for people to talk about climate?

In some organizations safety is used for other purposes, for example to change/monitor/improve something else in the organization, and the managers have put it in safety terms to get more attention.

Is climate a relevant proxy for culture? Many questions remain: what are the implications of measuring climate instead of culture? What do we miss by doing this? Some researchers study climate; some study culture; some study culture using climate scale... The relation/difference between the two is sometimes unclear.

The literature on culture usually refers back to Edgar Schein but we should explore the concept in the light of today's environment. The group discussed the links between the concepts of culture and organizational theory literature (e.g. organizational logics and

complexity, competition logics in relation to a dynamic view of culture) to conclude that culture is contested all the time. This dates to Weick's view of culture as a way to create stability in an organization while still allowing for flexible action. There are norms and values, and different dynamic ways of living these norms and values. Culture in that sense works as a kind of coordination mechanism, allowing to understand the different tasks, how they are related to one another. Culture is paradoxical – it gives and limits autonomy at the same time. This theoretical richness is certainly lost by measuring culture through climate.

Group discusses the supposed "homogeneity" of cultures and climates. The existence of subcultures within the organization highlights the necessity to adopt a systemic approach: organizational activities rely on multiple internal and external actors, which questions the alignment of cultures in multiple organizations.

Questions around the notion of professional identity emerge: e.g. is it possible to address this notion through a 100h training program? Is identity something that could be desirable to change? Even if the answer may be "no", it is important to make explicit some basic underlying assumptions. Nuclear safety is specific because nuclear or radiological threat is something that you can't see. And you won't know until you look for it. This is why it is necessary to develop some kind of reflex or awareness of that specificity, a specific way of thinking. It is important to understand the dynamics of risk perception. Thinking about risk all the time may generate a kind of anxiety but also carelessness. Organizations need to strike the right balance.

Culture/professional identity is perhaps different in regulators and operators; there are also subcultures between engineers, managers and operators, who all have different goals and objectives.

➡ *Group B: Safety culture in the context of the nuclear sector*

The *state of the art* shows the existence of different definitions of safety culture and also different models to analyse or describe safety culture. Several limits of the safety culture concept have been identified but it is a fundamental concept and as such it needs to be even better understood.

In the picture (from left to right): Pavel Gabriel, Repussard Jacques, Jubault Krasnopevtseva Natalia, Tazi Dounia, Jeffroy François
First day of the Workshop the 22th of January 2020
Group Work
Photographer: Marwa Abdellatif
Place: MSH Nice, France

Keynote Speaker 1: JEFFROY François - head of the IRSN Social Sciences and Humanities Laboratory, IRSN (France)

F. Jeffroy presents the definition of the safety culture concept from the IAEA INSAG-4 "*The set of characteristics and attitudes which, both in organizations and in individuals, cause nuclear power plant safety related issues to be given the priority attention warranted by their significance*".

Safety culture contributes to a better understanding of the risk management (it is a framework for interpreting reality; it integrates informal aspects; it promotes a systemic approach).

However, it also presents some limits: it can be vague, it is considered to be simplistic and isolated from other issues, the links between safety culture and other aspects (skill management, career management, social climate, budget management, …) of organizational dynamics are not clear, some question its usefulness.

F. Jeffroy proposes to come back to Science and Theory and switch from Safety Culture to Cultural dimensions of risk management. He questions the impact of culture on group performance: safety culture as a framework for interpreting reality that contributes to shared interpretations within a group. This is also a motivation and a tool for social control.

Keynote Speaker 2: TAZI Dounia - Operations director, ICSI Institute for an Industrial Safety Culture (France)

D. Tazi presents the definition and the explanation of safety culture (shared behaviors and attitudes): a set of ways of doing and thinking that is widely shared by the employees of an organization/community when it comes to controlling the most significant risks associated with organizational activities.

She also outlines the multiple attributes of safety culture on the strategic levels actors and processes. She introduces seven complementary expectations for safety leadership:

create the safety vision; share the safety vision; be credible; give safety its rightful place in decision making & tradeoffs; be present in the field; foster team spirit and the team's transdisciplinary nature; recognize good practices and apply fair sanctions.

Discussion:

Some group members criticize the concept of safety culture, in particular they outline the absence of a clear definition. They also question its usefulness. To respond to its critics, M Druenne proposes a practical definition of safety culture: "it defines what you do when your manager is not here". Everybody agrees that is a concept difficult to understand, a very contradictory notion, but essential. The concept of the culture focuses attention on the organizational approach. However, the question remains open: what are the ways to influence the culture? The group agrees that culture cannot be prescribed. The discussion moves on to the idea that it is important to understand the mechanisms of influence; for example, how safety standards are produced and enacted in practice at the different organizational levels?
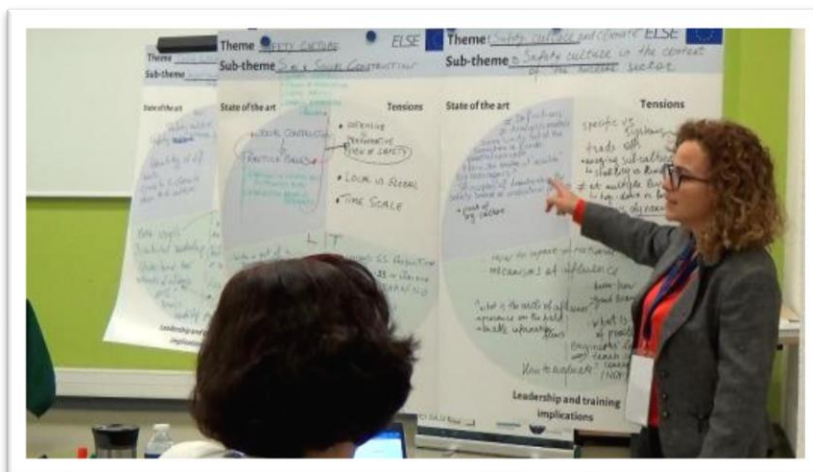
In the picture (from left to right): Kaminska Renata, Tazi Dounia
First day of the Workshop the 22th of January 2020
Photographer : Marwa Abdellatif
Place : MSH Nice, France

In addition, safety culture does not exist by itself. It is part of the organizational culture. The group has a lively discussion about the trade-offs among different sub-cultures (production, safety, budgeting, innovation). The nuclear operators have to deal with these competing forces.

The group then discusses safety leadership and training implications. First, the necessity to find a balance between enlightening managers about these new concepts and giving them keys to act. Second, the definition of the perimeter of influence: managers in a plant cannot influence the whole safety culture, they can maybe have an influence on his/her team or other managers. Third, the impact of the different national cultures: how to take into account these differences as well as the different ways leadership manifests itself in these cultures. Fourth, the definition of leadership for safety KPIs; for example, if the importance of the leader presence in the field is acknowledged, the number of on-site visits may not be the best KPI. Maybe more qualitative KPIs are needed, for example, what kind of information you give when you are on site.

➡ Group C Safety as a social construction

Keynote Speaker: Silvia Gherardi Research Unit on Communication, Organizational Learning and Aesthetics (RUCOLA)University of Trento (Italy)

In the picture (from left to right): Gherardi Silvia, Lagrange Valérie, Abdulkader Usama, Kudesia Ravi S., Thomas Catherine, Nys Vincent, Ermine Jean-Louis, Louvat Didier,
First day of the Workshop the 22th of January 2020
Group Work
Photographer : Marwa Abdellatif
Place : MSH Nice, France

The presentation outlines the evolution of the study of risk and safety.

1) From the study of risk –as an 'objective' factor inherent in risk conditions –to the social production of safety conditions sustained by a culture of safety. In an organization, different discourses on safety with their own logic of action can coexist (contextual, technological, normative, pedagogical and economic);
2) Moving on: practice theory that assumes the entanglement of the social and the material (sociomateriality). A practice is defined as a collective knowledgeable doing in which humans, non-humans and discourses are entangled. Safety is thus seen as a material-discursive 'doing' in situation.

In the latter view, safety is an emerging property of cultural systems – professional, organizational, industrial, social – which produce social conceptions of what is dangerous or safe, and of what attitudes and behaviours towards risk, danger and safety are appropriate. Safety is a social competence realized in practice, which is socially and materially constructed, innovated and transmitted. Safety is emergent in a distributed and situated way.

Discussion:

The discussion proposes to integrate social construction approach and the practice-based approach by focusing on different phenomena such as the Safety Standards.

The group agrees that Safety Standards and culture result from social construction. These constructions or artifacts are both science-informed and the result of a negotiation process. In other terms, there are always political processes that come in, but then there are also many that are based on the advances in technology. It is thus important to understand the process of production of safety standards.

When you are practicing in a context, the understanding is not something that is all in your head. It is also in the technologies, the tools and the artifacts you use. And it is embedded

In the picture (from left to right): Denyer David, Louvat Didier, Benattar Anna, Kudesia Ravi S, Kaminska Renata
First day of the Workshop the 22th of January 2020
Photographer : Marwa Abdellatif
Place : MSH Nice, France

in the interactions, the way that we repeatedly interact with each other. As a result, it is not something you can just easily extract or communicate. It is embedded within this whole realm of practice. And again, the role of the material (physical things, tools, artifacts, technologies) was important for practice theory. These constructions constitute artifacts that are enacted in practices.

This process of enacting allows to identify and specify tensions. The first tension relates to the control/autonomy dilemma. Indeed, how do you take a standard and apply it in real life? It takes some judgment; it needs to mobilize tacit knowledge.

Keep performing the same standard, teams adjust and adapt it. The second tension echoes the ostensive versus performative view of routines. Safety achievement can be viewed as the result of an articulation of an ostensive and a performative side of the concept of safety. Understanding the interactions between ostensive and performative safety requires to consider the different levels of organization (global versus local) and the different time scales. At a more fundamental level it also requires to understand the structure/agency duality.

2) Risk assessment and resilience

➡ *Group A: Management of contradictions and ethics*

Keynote Speaker 1: Benoit Journé - Professor of Management in Université de Nantes, IAE Nantes – Institut d'Économie et de Management (France), Member of the ELSE Steering Committee

In the picture (from left to right): Grote Gudela, Journé Benoit
Second day of the Workshop the 23th of January 2020
Group Work
Photographer: Marwa Abdellatif
Place: MSH Nice, France

B. Journé highlights that safety is not isolated from the other dimensions of organizational performances. It involves building acceptable compromises.

Pragmatism (Dewey): Situation and Inquiry. Assumptions: Safety is built (or destroyed) through day-to-day situated activities of different internal actors (professional groups – hierarchical levels) and external actors (contractors, etc.).

Ethics is action oriented; values are created/emerge through valuation processes, in situated environment, during the inquiry process. Ethical issue: how to build a compromise between legitimate but competing values?

Keynote Speaker 2: Yoann Guntzburger – Assistant Professor of Management, SKEMA Business School, Université Côte d'Azur (France)

Y. Guntzburger underlines the necessary distinction between ethics, law and code of ethics. *Ethics* is defined as a process of critical reflections aimed at establishing what is desired, with and for the others, in 'just' institutions.

Ethics and risks management: industrial activities imply taking risks and competition among the different values (health, vs safety, etc.). Put simply, the purpose of risk management is to identify, assess and manage these risks. Science informs us about risks, but some uncertainty remains. There is always is an evaluative aspect of risk

management. Therefore, ethics plays an important role in risk management: decisions are made based on the determination of the prevailing value among the competing values in a context of uncertainty. Ethical leadership is part of leadership for safety.

Five main issues have been addressed in the current literature: 1) uncertainty, value judgement and knowledge creation in risks management, 2) the concept of acceptable risks, 3) distribution of burdens and benefits in space and time, 4) stakeholder influence and communication and 5) education about the previously mentioned issues.

Discussion:

The group discusses the different issues related to time:

➡ stability versus change dynamics, which is at the core of the resilience concept. The most important issue is how to learn from crises so that next time around a crisis can be avoided. Some aspects are discussed in the ambidexterity literature.

➡ action versus non-action; sometimes the best action is the non-action. In relation of the construction of time also: non-action could be also to delay action.

Group discusses competing legitimate perspectives on risks: e.g. the role of experts versus non-experts or deliberative approach to risk management.

Discussion underlines the influence of risk communication on risk acceptance: values behind risk communication. It questions the place of emotions in risk perceptions and risk acceptability.

Ethics is on the qualitative side: how can we have stakeholder dialogue around ethics when you have very quantitative minds in the room?

➡ *Group B: Resilience and organizational limits*

Keynote Speaker: OLIVER Nick - Professor of Management at the University of Edinburgh Business School (UK)

In the picture (from left to right): Fox Dennis, Tazi Dounia, Turner Nick, Jeffroy François, Jubault Krasnopevtseva Natalia, Oliver Nick , Janatkova Karolína, Repussard Jacques, Flin Rhona,
Second day of the Workshop the 23th of January 2020
Group Work
Photographer: Marwa Abdellatif
Place: MSH Nice, France

N. Oliver presents the contexts of his article on the Air France 447 accident. He cites Weick's et al. (1999) research on High-Reliability Organizations and the literature on sensemaking (as the ability to construct meaning in complex, ambiguous and dynamic situations and respond appropriately) (Amalberti, 1998, 2001; Farjoun & Starrbuck, 2005,2007; Rochlin, 1993, 1997). N. Oliver presents the theory of organizational limits: it is important to know the limits to not cross and establish a margin around these limits. He explains that operating close to the limit has some benefits: discovery of new knowledge, learning, capability development. Indeed, the exogenous limits reduce opportunity for 'edge' experience and for a fine-grained constant engagement between system controllers and the systems themselves, crucial for situational awareness and the capability to respond to unusual events.

The more you try to design safety and reliability into the system, the more likely it will limit the capability of operators to deal with unexpected events. This is sometimes expressed by idea of R. Amalberti - the paradox of almost totally safe systems. It is the idea that the more you design safety into a system, the more vulnerable you make it to unexpected such as rare events. This is because the actors involved do not recognize them and therefore do not respond inappropriately. If actors rely only on technology, it may result in a loss of basic cognitive skills and automation surprise (Rochlin, 1993, 1997). The more equipped for safety the system within limits, the more vulnerable it becomes when for some reason it moves outside the limits. This is because the actors involved will not be aware of the danger quickly enough.

Discussion:

Group discusses the challenges involved in the creation of rules and procedures. First, the necessity to envisage human reactions in real situation. The main problem is that those

who are designing, assessing, validating, certifying systems and procedures are likely to be in some distance away from how these procedures are actually applied and enacted. And they may find it difficult to envisage the full spectrum of human reactions. A very recent example that of Boeing 737 illustrates a tension between design, rules and procedures, and human reactions. Therefore, it is important to understand interactions between technology and humans and how technology works, especially the invisible mechanisms, beyond the interfaces.

Second, the cases where it is necessary to deviate from rules: sometimes in unusual situations, it is actually necessary to deviate from the formal rules and procedures. Unusual, extreme situations where is impossible to have procedural solutions highlight the importance of highly developed sense making and response capabilities. To what extend the formal instructions fit with the intent of an activity? The group discussed about uncertain situations and how the persons in charge of the system need to spend time explaining the intent to those who have to enact the rules.

Third, the necessity to accurately evaluate the situation. How to categorize the situation is going, to determine how we see it, what to pay attention to, the meaning we will impute when the information arrives. If situation is changing and you know the broader picture, you are more likely to step away from the rules and act appropriately. An example from the army was given: the idea of "ground truth" a US military expression, that describes that when you try to manage the context – you really need to know what is going on the ground. This notion of ground truth is knowledge that there is a fine-grain reality that may be different from situation expected in procedures. The discussion then moved to the way we constantly categorize situations and the necessity to be able to re-categorize then, where there has been a change (organizational attention framework).

This accurate evaluation is possible if leadership allows autonomy and realistic learning and creates trustful and humble environment. Do you try to control a system, or do you trust the operators and give front line operators autonomy to come up with solutions to their specific situations? The ability or inability of the front-line people to evaluate situations correctly is linked to their ability to associate an appropriate procedure with it. However, a pervasive use of exogenous limits to <u>control</u> variety leads to an erosion of the capabilities to <u>deal</u> with this variety

The group concludes the discussion by underlining the importance for leadership to translate the individual feelings and ideas into a collective meaning.

➥ *Group C: Resilience, Reporting and Knowledge Management*

Keynote Speaker: Jean-Louis Ermine Knowledge management expert, Professor emeritus at Institut Mines-Telecom International consultant Jean-Louis Ermine Consulting (France)

In the picture (from left to right): Nys Vincent, Ermine Jean-Louis, Thomas Catherine, Jeanson Aurélie, Oborn Eivor, Gherardi Silvia, Pilbeam Colin, Lagrange Valérie
Second day of the Workshop the 23th of January 2020
Group Work
Photographer: Marwa Abdellatif
Place: MSH Nice, France

Jean-Louis Ermine presents two examples highlighting the role of knowledge management to enhance safety in the nuclear sector. The first shows how providing safety knowledge to NPP operators enhances their decision-making capability. The second demonstrates that building a Safety Knowledge Repository enhances the vision of the Safety Managers.

Based on these two examples, the presentation shows how Safety Knowledge Management provides a sound foundation for building Organizational Resilience. Knowledge Management allows to share and capitalize scientific and organizational knowledge. Knowledge is codified by combining different disciplinary knowledge to address a specific issue or describe a specific context. Knowledge we have allows to go back to a normal situation after an incident, and thus improve resilience.

Knowledge Management System includes: 1) who knows what and 2) the why and the how of procedures, processes, methods… Providing the "why" of procedure (or process) increases the understanding of the managers and operators and allows them to adapt it in situation.

Discussion:

The Knowledge Management System needs to distinguish different kinds of knowledge: knowledge for crisis and knowledge for normal situations. The knowledge codified in the Knowledge Management System constitutes an artefact that is mobilized in practices. We have a tension between the prescribed or codified knowledge (e.g. knowledge encoded in a procedure) and the knowledge used in action (e.g. knowing how to apply the procedure,

knowing what to do in an unexpected situation). This echoes the tension between ostensive versus performative safety.

Another tension was identified between prescribed knowledge that some follow and knowing in action, which has to be adapted to the situation. This is related to the control/autonomy tension.

3) Dealing with uncertainty and mindfulness

➡ *Group A: Dealing with uncertainty and rules*

Keynote Speaker: Gudela Grote – Professor of Work and Organizational Psychology at ETH Zürich (Swizerland)

G. Grote talks about managing uncertainty: balance between minimizing uncertainty (stability) and coping with uncertainty (flexibility). She also highlights the existence of situations in which uncertainty is augmented: e.g. through the culture of speaking up (allowing a questioning attitude increases uncertainty).

G. Grote highlights that in the context characterized by highly qualified personnel, stable teams, routine activities, high formalization, strong hierarchy, etc., it is difficult to keep intrinsically motivated people. She also highlights the role of rules in managing uncertainty: from supporting stability to fostering flexibility. Rules can be viewed as replacement of leadership. Rules diminish ad hoc adaptation and improvisation. G. Grote notes that rules do not usually justify themselves: they lead to the atomization of actions; most of the time there are no underlying narratives, no sensemaking.

Rule is an artefact containing a written-down formal description of certain behavioral patterns. Rules are in interaction with routines in principle (ostensive routine) and routine in practice (performative practice). There are three type of rules: goal, process and action oriented. Other characteristics of rules include advise vs command, with or without latitude, with or without exceptions, with or without reasons.

What is a good rule? G. Grote gives an example of the rule book of a European railway company. Action rules (set the basics, sets the stability) → Process rules (support flexibility) → Goal rules (support flexibility). Rules require backing by values and norms that support signalers in fulfilling the partly conflicting demands.

Discussion

Higher order autonomy is linked to having the actors participate in writing their rules. These rules will give and limit their autonomy.

Concerning the stability/flexibility tension, organizations have to clear about the level at which they want to be flexible or stable. Other relevant questions include: how can we keep people intrinsically motivated? How to resolve the under/over-stimulation tension? What is the relation between autonomy and motivation? Can simple rules describe complex phenomenon: e.g. birds flying? (in Eisenhardt).

➡ *Group B: Dealing with uncertainty - a psychological approach*

Keynote Speaker 1 (presents at the end of previous session) **HOFMANN David** - Hugh L. McColl Distinguished Professor and Senior Associate Dean for Academic Affairs at the University of North Carolina Kenan-Flangler Business School (USA)

D. Hofmann starts by highlighting the danger of superstitious learning. If you cut corners and over time this deviation normalizes, and nothing happens, you are not really learning; this deviation is what is called 'a superstitious learning'. It is a situation in which one incorrectly connects a stimulus to a response. You are not really reducing uncertainty and so you need to differentiate superstitious learning from actual learning.

D. Hofmann also presents a theory of construal – psychological distance. Construal level theory comes from social psychology and deals with the abstractedness with which you construe goals. Regarding decisions, middle managers have competing priorities: some are very salient, concrete and measured, and others are still abstract, long term, describing dynamic non-events. Second type of priorities involve long term abstract decisions. Abstract construals make it very difficult to perceive the potential harm. Therefore, high level constructs are associated with reduced perceptions of safety as ethical/moral responsibility due to lower perceived perception of harm (low probability).

Key-note speaker 2 FLIN Rhona - Professor of Industrial Psychology at Aberdeen Business School, Robert Gordon University and Emeritus Professor of Applied Psychology, University of Aberdeen (UK)

R. Flin presents a psychological perspective focused on individual managers and aiming to understand not only skills, but the more individual characteristics that are underneath the skills.

The first characteristic is the concept of safety intelligence. This concept comes from the air traffic control: some senior managers seem to show attitudes, behaviors, values, skills and problem solving by gathering relevant information, especially in the case of ambiguous information.

The second characteristic is the notion of chronic unease from the HRO literature. The idea is that very safe organizations have employees and managers who are uneasy/uncomfortable about the risks. Even with time, they do not become complacent. Linked to chronic unease we identify some personality attributes such as vigilance, propensity to worry, requisite imagination, flexibility of thought and pessimism. In other words, it is a state of psychological strain in which an individual experiences discomfort and concern about the control of risks. Chronic unease also implies some skills around information gathering, problem solving and looking for ambiguities.

Discussion:

These two presentations give an overview of the research in psychology about leadership for safety. This session outlines the importance to take into account individual traits. First, the group discussion highlights the need to take into account the emotional component (comfort versus unease), in particular how emotional state effecting your decision making. Consequently, we have a set of tensions between rational and emotional aspects of decision making.

Second, different tensions are discussed. Tensions caused by the interplay between immediate and longer-term priorities. This tension implies the difficulties of timescale: we need time for gathering and analyzing situations (to draw a big picture), but we also need to be ready for immediate decision-making (situational awareness). In addition, managing decisional tradeoffs based on the understanding short and long-term objectives has different results (short term focus may get you the rewards and the promotion, whereas the maintenance investment, for example, has not so obvious result).

Third, another group of tensions involves how people conceptualize and think about problems: the abstract versus concrete ways of thinking. The image is used in the discussion of "having a high-beam or a low-beam perspective", like the lights of the car. It is about whether you are looking at a detail or in the longer term, bigger picture and the necessity to switch between these perspectives. The group discusses the importance to keep more tangible targets from overwhelming ambiguous "dynamic non-events" and to build a culture of true learning (non-superstitious). It implies proactive behaviors and tolerance of uncertainty (rechecking, confirming, testing assumptions, watching / questioning team members, slowing down, open questions, risk re-calibration) and gathering/making sense of the information to reduce uncertainty. This leads managers to think flexibly, not jump to conclusions, to encourage employees to speak up, to discuss emotions and create conditions for open discussions and show safety commitment.

Finally, the discussion underlines the necessity to take into account managers' individual differences in terms of training. These will come not just from their experience, but also from their personalities, their style of working out their cultures. Discussion is centered on using tools such as self-assessment tests, because they build self-awareness in managers. It would be interesting to know how self-awareness affects managers' safety management and activities.

☛ *Group C: Safety mindfulness and meta-cognition*

Keynote Speaker: Ravi Kudesia Assistant Professor at the Fox School of Business at Temple University (USA)

R. Kudesia highlights that according to High Reliability Organization (HRO) theory, mindfulness is the ability to induce active differentiation and refinement of existing categories, the creation of new categories out of streams of events, and the development of more nuanced appreciations of the context and potential solutions. It helps the operators direct their attention toward current activities and the potential failures (weak

signals) - lurking in them, rather than allowing past successes or previously determined strategies to lull attention away from current activities. These patterns, in turn, rely on operators having the expertise and autonomy to interpret the causes of any lurking failures they notice and ways to address them accordingly.

The mark of mindfulness, therefore, is not what information processing style people use but how they adjust their information processing to the situation at hand. These processes are metacognitive in nature. Mindfulness is about the ability to notice how we are processing information in a situation. As such, mindfulness is a metacognitive practice.

In the metacognition framework, people respond to situations based on the interplay of a lower-order information processing level and a higher-order metacognitive level. At the information processing level, people perceive, conceptualize, and respond to situations. The higher metacognitive level entails three processes. First, people can monitor the state of their information processing in real time, as they perceive, conceptualize, and respond to current situations. Second, based on monitoring, metacognition can adjust information processing. Third, people monitor and adjust the state of their information processing in the light of their metacognitive beliefs.

As a metacognitive practice, mindfulness is something we do as individuals. But, through our social interactions we can collectively become mindful at the system level. It has to be part of our interactions and of how we design these interactions in organization structure: information flows in the hierarchy, from top to bottom, the artifacts and the routines. So, organizations design practices that can help this meta-cognition function. This is not going to emerge very easily. It's going to take effort all throughout.

Discussion

Different tensions are discussed. The first relates to the trust you have in the collective models of a situation, of a problem. Should you trust beliefs, should you believe in beliefs? Silvia Gherardi outlines that it is difficult to identify the broader differences between cognitive and social dimension of mindfulness. Is mindfulness a metacognitive practice or a social discursive practice?

The second tension is between the global (prediction) and the local (execution): at the global level, risk management means that CEO, the top management team, does all the planning, they do all the predictions and then they give the plan to someone else. Planning is in one place and the execution in another. So, how can people improvise? How can people adjust? How can people adapt? If it is too separate, there is a problem. The robustness of the system can be improved if you allow closer iterations between planning and execution. How does that work? You cultivate the expertise of operators. You allow them to improvise. You direct the improvisations based on simple rules and then you use middle managers to notice when this is going wrong, to find good improvisations and then to standardize and retain them in the system. These two tensions echo the control/autonomy dilemma.

Finally, we discuss the temporal and spatial dimensions of mindfulness. When you notice, you pay attention, your mind drifts and you come back; this is one dimension. Then, over the course of a day, of the career, you diminish attention. By the time you're an expert, you barely pay attention to anything because you believe you know it all. So, attention and mindfulness are fluctuating in these different temporal dimensions. We need to regulate it by modifying practices at work in each of these dimensions. These kinds of dimension also fluctuate in relation to the hierarchy. The mindfulness time frame goes up the hierarchy; the cycles get longer; people at high hierarchical level are more involved at the long-term project level. So, we need to think not only about time, but also about time-functions across the hierarchy.

4) Leadership for safety

➡ *Group A: Leadership and mechanisms for achieving safety*

Keynote Speaker 1: Renata Kaminska – Professor of Innovation and Strategy at SKEMA Business School, UCA (France)

R. Kaminska talks about leadership for safety as process in a critical realist perspective. Traditional leader-centric research fails to explain the link between leaders' characteristics and organizational outcomes (Dinh and Lord, 2012) and calls for more processual and contextual approaches to leadership. Leadership as process requires to focus on leadership activities allowing the influence and the interaction with followers in order to increase organizational outcomes; the recognition of the complexity of the environment and the need to uncover the 'mechanisms that explain the causal relationship between inputs (e.g., leader behaviors and practices) and outputs (e.g., organizational performance)' (Fischer et al., 2017, p. 1727). This calls for the development of new methodologies, better equipped to capture not-easily observable complex dynamics of social interactions and influences. Indeed, the leadership influence processes are embedded in organizational dynamics and cannot materialize independently from these dynamics. In addition, studying leadership influence process requires a deep understanding of its underlying mechanisms. It is Critical Realism which offers a relevant framework for studying both the organizational dynamics and leadership influence underlying mechanisms. In the context of leadership for safety, two different types of mechanisms need to be studied: the mechanisms that enhance safety management and the mechanisms of the influence processes. It is necessary to understand how to activate these mechanisms and how they interact.

Keynote Speaker 2: David Denyer – Professor of Leadership and Organizational Change at Cranfield School of Management (UK)

Everyone believes to know what leadership is because everyone has his/her own individual take on leadership. And we often assume that we all have the same take on leadership. But what is leadership? There are 4 paradigms, which are very different

ontologically. What are the clients for the ELSE program, and what is their view about leadership?

1st: Leader as attribute, trait: it is something that people have (or not) (mainly 19th century);

2nd: Leader as a style: leadership tripod: leader ↔ followers ↔ common goals (1970s). Ontology: it is a relationship: LMX, ethical leadership, transformative leadership, charismatic leadership, etc. All is from this tripod. It is now the dominant paradigm;

3rd: The romance of leadership: romantic view of what people can do;

These three paradigms are based on a "Leader" based view and account for 95% of the writing/thinking on leadership.

4th: Leadership work (practice, process): distributed/shared phenomena, networks of influence, social network analysis, network diagram. We need to think about the middle outcomes of leadership. Direction, alignment, commitment: how do we create the context for that (1990s) which is very different from the individual development.

4th': Adaptative leadership (2000s): how do we create this adaptive/enabling leadership? Complexity leadership highlights the complex nature of organizational problems. How do we create adaptability and flexibility relationship between administrative and adaptative leadership? Enabling leadership focuses on creating conditions for enabling that balance.

What kind of problem we think leadership is the solution to? Here, it is safety. What is the nature of safety problems? Is it technical or adaptative? It is both; safety is not just a technical problem. The single biggest leadership problem in organizations is when an adaptative problem is treated as a technical problem.

A real issue/paradox with leadership development programs: clients say they want leadership development, while they actually mean leader development.

Discussion:

The group mentions that there is increasing evidence showing that there is no direct relationship between certain styles of leadership and certain outcomes in term of human behaviors. The group highlights that it is extremely difficult to capture complex process and systems of influence in a diagram. Sociologists have worked on uncovering underlying mechanisms of action. There is one model that can simplify this by highlighting the different mechanisms: Situational mechanisms (elements of the context that affect the individual), action mechanisms (influence of the action of the individual on the collective action of the group), transformational mechanisms (effect on the collective action back on the system). Mechanisms should be in the arrows not in the boxes in the bottom when drawing diagrams.

This model focuses on social mechanisms, but in safety, there are also technical mechanisms. Hence, it is important to explore the interplay between social and technical mechanisms.

A soon as there is uncertainty, people come back to the leader centric model. Also, from a psychological point of view, organizations want to "fix" people because they don't want to deal with the structure. You first fix the leader so that he/she can fix the people. "Take relevant people – transform them - plug them back" model.

In reality, for safety you got to bring the problem in the room, and work on the problem. This has implications for ELSE: stakeholder map of the people you need to influence to change a rule or a practice. Start with the problem, what is the problem you want to solve and how leadership can help solving this problem. Start with the problem, end with the individual (and not the other way around).

Leadership for safety involves:
➡ identifying contradictions and to build the conditions to reach an acceptable compromise that does not compromise safety

- creating a "safe space" for discussing competing but legitimate values, stakeholder dialogue
- understand the values behind risk communication, and how risk communication might influence risk acceptance.
- acknowledging the limits of knowledge about risks, and how to deal with uncertainties.
- creating the conditions, driving the process of ethical inquiry on risk and risk management, empowering individuals to be part of this process.

➡ *Group B: Perception of safety effectiveness and leadership*

Keynote Speaker: TURNER Nick - Distinguished Research Chair in Advanced Leadership in the Haskayne School of Business, University of Calgary (Canada)

N. Tuner presents his work of meta-analytic investigation of leadership and workplace safety, looking at the distinctions between generalized leadership behaviors and safety specific leadership based on the meta-analysis of 118 papers. Based on this work, N. Turner presents the following leadership behavior categorization: Negative (e.g. passive); Positive transaction-based (e.g. active transactional); and Relationship-based (e.g. transformational or LMX)

The relationship between general leadership and safety specific leadership is virtually the same. Practically speaking, in terms of behaviors, you're likely to want to develop behaviors that enable people to lead towards multiple goals. Then you have to identify leadership behaviors that are specific to the goal of safety. The role of the leadership as a social influence process is to impact safety perception, attitudes, cognition, compliance, participation, all of which will result in safety outcomes.

To conclude, N Turner analyses the effects of the three different leadership behaviors on safety (perceptions, attitudes, cognitions, compliance, and participation) and safety outcomes (for example, number of injuries per year at the workplace):

- Relationship-based leadership: safety-specific leadership has higher impact on safety outcomes than general leadership
- Transaction-based leadership: safety-specific leadership has a higher impact on attitude and compliance than general leadership
- Negative leadership: safety specific leadership has a higher impact on attitude, compliance, participation and outcomes than general leadership

Discussion:

The participants of the group discuss the idea of leadership as a process of mutual social influences. The discussion allows to identify key elements of this process:

- Developing commitment (even of the non-operational public)
- Allowing delegation and autonomy
- Setting example
- Being present on 3 levels:
    - Very abstract level, across-boundaries
    - Compliance level
    - Very concrete daily level (low construal) – detect small cues, be humble with people.

Then, the discussion focuses on psychological dimensions of the leadership process. First, it is outlined that process of mutual influence exists regardless of position: everyone can enable and assist change in the organization, with safety as a central goal.

Second, the group outlines the role of the mundane mechanisms of leadership to influence people: knowing people, relating to them, being concerned about them and trusting them, creating a sense of psychological safety. Thus, the training program should focus on behaviors.

Third, the group discusses three main tensions: 1) distinction between the concrete 'here and now' and more abstract priorities; 2) compliance with rules versus the sort of more expansive participation and improving safety in the future; 3) safety is one among a number of competing goals, so that the merit of being able to talk about safety or any other outcome in its isolation probably doesn't reflect the ecological reality of the complexity of the interactions between these different goals.

➡ *Group C: Leadership for safety in research and practice*

Keynote Speaker 1: Eivor Oborn Professor of Healthcare Management in the area of Innovation and Organizational Change at Warwick Business School (UK)

The presentation outlines the dynamics of risk and how that plays out in the context of the mental health sector in the UK. The study shows that the nature of this risk is emerging and relational. It can thus be apprehended, but not codified, in relation to a dynamic understanding of risk - organizing processes can render objects, products, technologies etc. safe or risky. Thus, it is important for leaders to be aware of and pay attention to the context in which risk evolves in order to better understand its dynamics.

Keynote Speaker 2: Colin Pilbeam, Reader in Safety Leadership in the Safety and Accident Investigation Centre, Cranfield University (UK)

The presentation defines safety and leadership as two umbrella concepts. The labeling "safety leadership" appeared at the mid-2000s and increased in use over time. If you go back and look at the regulation and the HSA Health and Safety Executive documentation in the U.K. in the 1990s and through the early 2000s, law about "safety management", that's how it was labeled. From about the mid-2000s, it has changed to "safety leadership", but the content was exactly the same. So, there is a labeling issue here: what are we trying to develop? Executive safety leaders or safety managers? What is it? There is an interesting exploration around that.

Then, thinking a little bit more about practices, what is safety leadership and where does it occur in the system? Is it about the individuals influencing other individuals or is it individuals influencing collectives or organizations and vice versa? So, is it a collective influencing of the organization or of individuals? How does that multi-level system's approach begin to influence the way we think about safety leadership? We need further research around that.

The presentation also shows that the performance of safety and the safety working changed with what people did at different levels. So, if you were a supervisor, how is that different from if you were a manager, if you were a director? So, what are these different practices that we get to react to those different levels? How does that play out in the context that you are wishing to explore within your industry?

Discussion

Thinking about the tensions raised several questions around structure and agency. Is it the agent that makes the difference or at what level is the difference being made? Is it at the individual versus the collective level? Who is making those influencing processes, thinking about possibly relating it to the notion of safety behavior, safety climate, safety culture, a different sort of individual group and organizational levels? And then the prospect of this short term, long term perspective that the leader has on the decisions, and of the impact of those decisions if adopted (short and long-term consequences?).

One challenge that came back from the other participants was that the group didn't really talk much about decision making, and hadn't talked about that in the context of leadership. This opens up into a whole set of other discussions about the sorts of things that leaders are actually doing and how decision making occurs. And what are the consequences of those decisions that leaders need to pay attention to. And how did they use the information available to them? Is there an overload of information? And if so how do leaders sift and select the salient pieces of information from a variety of sources that are available to them?

5) Training

The ultimate objective of all group sessions was to reflect on the implications of the discussed themes on the leadership for safety training. The conclusions reached by each group session can be synthesized in the following points: objectives, content, methodology and evaluation.

➡ *Objectives*

1. Leadership development
   We start from leadership styles (leader development) and focus on the development of a better understanding of the influence process within an organization (leadership process). This is based on an understanding of safety requirements and leadership practices, allowing to implement the influence process.
2. Educating reflexive practitioners: questioning assumptions, develop humbleness, critical approach.
   These points were highlighted by a large number of academics.
3. Teaching the participants to interpret qualitative data, taking uncertainty into account
4. Developing tools and skills (leadership practices)

➡ *Content*

1. Organizational dynamics

Leadership is a process of influence, which is embedded in an organizational context. Implementing this process requires the understanding of organizational dynamics. It is particularly important because this training is aimed at engineers who mainly deal with technical systems. They therefore must learn about social and organizational aspects of systems, and about their implications for safety problematics and practices Example: "*We know a bit more about rules. A leadership development program would say prior to the program; we want you to identify where you've got some real difficulties around rules not being followed.*" (Debriefing Theme 4, Group A)

- Definition of organizational components and its dynamics (key general elements that define the organization):
  o Key concepts: structure, practice, culture, rules, routines, knowledge flows and decision making.
  o Model(s) of interaction
- Tensions within organizations
  ▪ Structure versus agency
  ▪ Control versus autonomy
- Emotional and political aspects or organizations
- Interaction between technology and human.

"Understand and train how technology works, especially the invisible mechanisms (beyond interface). People operating complex systems often do not really quite understand how these systems are working (automation surprise, when the technology behaves unexpectedly).

Training, at least preparing people, educating them to invisible mechanisms underlying the technology that they are using is quite important.

Acknowledge the importance of the interactions between the technology and the human." (Debriefing Theme 2, Group B).

2. **Safety culture and climate**
   - Definition of safety culture (values) and safety climate (enactment of culture in practice)
   - Safety culture, one type among many (organizational culture, industrial culture, national culture)
   - The role of culture (how to change organizational culture?)

A concept difficult to understand, but essential. *How to male it "usable" by managers? ."* (Debriefing Theme 2, Group B).

3. **Safety management**
   - Evolution from risk management to safety management (regulated versus managed safety, paradoxes, resilience, organizational limits)
   - Understand safety standards (elaboration and enactment in practice)

"You can't just teach all the standards. You have to teach them about the process by which standards are produced. So, the first part is about how to see it is actually produced. Teach the people a little bit about the political process. A little bit of understanding about how things can be contingent, how things can be updated, how truth is provisional.

And then understand also this aspect of how things are actually done in practice, enacted in practice, because one of the things that we really brush up against is the idea that you really can't teach something conceptually and then expect someone to go into an organization and implement it" (Debriefing Theme 1, Group C)

   - Dealing with uncertainty (now –immediate decision- vs after - analysis)
     - Understanding dynamic trajectory of risk
     - Flexible rules (different types of rules / follow versus adapt)

"We want you to identify where you've got some real difficulties around rules not being followed. Bring those rules in. We're going to help you work on those rules in the weeks between the program. A rule that they could deconstruct so they could critique the rule; using all the different types of rules. They could then rewrite that rule. Create quite experiential exercise when they are doing an activity. And you might give them a set of forms that are action-based rules to do the activity that some might be a process so they can feel the difference between them. And if you did that with activities that were kind of a simple task or complex task, you could really get them to experience that as well as just understanding and which will actually be really fun". (Debriefing Theme 4, Group A)

- o Mindfulness (collective versus individual levels, situational awareness vs big picture, metacognitive practice)
- o Individual approaches to deal with risk (chronic unease, abstract-concrete, risk tolerance, train behaviors and understand traits)
- o Ethics of Complexity

- Organizational learning and knowledge management
    - o The role of experience
    - o Superstitious learning
    - o Knowledge management (different types of knowledge in crisis and routine situation)

"How does knowledge flow within the organizations, getting people to appreciate that? So, where are they resourcing their information to influence the decisions they're talking about? And then obviously, at least in this sense, decision making. Within the context that is dynamic, changing, evolving and understanding those sorts of changes and the challenges, I think that was what we talk about. (Debriefing Theme 4, Group C)

4. **Leadership concepts & leadership for safety**
- Definition and historical evolution of key concepts
    - o Different theoretical models (leader styles, complexity leadership, leadership in practice, adaptive leadership, agency LMX vs system view, …)
    - o Historical evolution
    - o Leader traits versus leadership development (the focus of this training)
- Mechanisms and practices of leadership in general
- The specificity of safety leadership

"We have to reflect on how special or different leadership is in high risk environment compared to leadership in any other context. The discussion about leadership training in general and the leadership for safety, I think is an important one to balance, because if it's … If they're quite synonymous, if you get similar outcomes, then how would this program look? I guess the question I have is, how is this program different from other leadership training programs? We do leadership training in a hospital. There are a lot of programs. But what is different about this program? How might that be different? There are there a lot of leadership trainings. Some of them are very good. So, why reproduce what is different with a specific focus on safety? That is something that is not clear to me. I think it is kind of interesting that they took us off into a whole set of other discussions about these sorts of things that leaders are actually doing and how that decision making occurs. And what are the consequences of those decisions that they need to pay attention to." (Debriefing Theme 4, Group B)

- Techniques for stakeholder dialogue (internal/external; operational/strategic)
    - o Teach techniques of how to get people around the table and discuss in a way that is "safe" for them; have a discussion around that with both good and equitable outcomes of that discussion?

- o This should also infuse internally within the organization, but also externally bringing in regulators, but also bringing in the broader public kind of stakeholder dialogue.
- o Interdisciplinary labors issues experts.

➡ *Methodology*

1. Face-to-face training techniques
- Diary (what participants learnt, points to be clarified, every day - self-reflection)
- Reflexive mode: working on assumptions, train to be more knowledgeable, train trainers.
- Active and situated learning (role play, teach in context, meaning of practice, start with the problem, failure/learn/do method)
- Case studies – from different industries to develop interpretative flexibility.

"Variety of case studies across sectors, across industries to try and learn to identify what the commonalities were and what the general principles were from the specific, detailed cases that were in front of them." (Debriefing Theme 4, Group C)

- Students create and manage scenarios by groups (realistic)

"Practicalities of using things like different kinds of scenarios for training and people coming up with examples or teams making scenarios for other teams to solve the problems or having whole day event of having different groups work together, having role play, or having very minimalistic scenarios about how we could, you could bring in more maybe of some of these less familiar conceptual dimensions into the cycle of psychological dimension, into that different kinds of training that could be for those where it was different groups." (Debriefing Theme 3, Group B)

2. Individual project
- Mentoring: debriefing with participants to make them reflect on their own work experience
- Creating "safe space" by involving executive sponsors
- Social support platform + weekly calls/coaches and peers

"The second implication is the vital need for social support to enhance the leadership training. So we talked about models of coaches having I don't know what you want to call them, mentors or people to enable these students to go back into their organization to make things happen. I think there is an analogy about running into your organization with your proverbial water pistol only to face the sort of like dam resistance. So, there needs to be people inside this organization that enable these students to transfer the training back into their organization. That may seem at times like excess because we want to imagine what happens in the classroom where the training happens. That's not the case. We imagine them wanting to take this back and having people inside the organization who's going to be vital" (Debriefing Theme 4, Group B)

- Collective debriefing with a regulator.360° assessment before and after the individual project)

➡️ *Evaluation*

1. From the beginning think about evaluation criteria
2. Self-assessment before and after the training
3. Short term vs long term

➡️ *Key references*

Addressing Cultural Aspects of Organisations in High Risk Industries, Gisquet Elsa, Levy Emmanuelle, Jeffroy François, Report IRSN-PSN-SRDS/SFOHREX 2017-0005

Agnieszka Latuszynska (2020) Dissertation. Warwick Business School, University of Warwick.

Amalberti, R. (1998) Automation in Aviation: A Human Factors Perspective. *In:* Wise, J. A., Hopkin, V. D. & Garland, D. J. (Eds.) *Handbook Of Aviation Human Factors.* Boca Raton Florida: Crc Press.

Amalberti, R. (2001) The Paradoxes of Almost Totally Safe Transportation Systems. *Safety Science,*37**,** 109-126.

Andersen LP, Nørdam L, JoenssonT, Kines P, Nielsen KJ. (2018): Social identity, safety climate and self-reported accidents among construction workers. *Construction Management and Economics*, 36(1):22-31.

Asveld, L. & Roeser, S. (2009). *The Ethics of Technological Risk*. Earthscan, London;

Avolio, B.J., Walumbwa, F.O. & Weber, T.J., (2009) Leadership: Current Theories, Research, and Future Directions. *Annual Review of Psychology*, 60(1), pp.421–449. Available at: 10.1146/annurev.psych.60.110707.163621.

Bamel, Pandey, & Gupta (2020) Safety climate: Systematic literature network analysis of 38 years (1980-2018) of research. *Accident Analysis and Prevention*, 135, 105387.

Boholm, Å., & Corvellec, H. (2011). A relational theory of risk. *Journal of Risk Research,*14(2), 175-190.

Bruns, H.C. (2009), "Leveraging functionality in safety routines: Examining the divergence of rules and performance", *Human Relations*, 62(9): 1399-1426.

Deborah H. Oughton& B. J. Howard (2012) The Social and Ethical Challenges of Radiation Risk Management, *Ethics, Policy and Environment*, 15:1, pp. 71-76;

DeJoy, D. M. (2005). Behavior change versus culture change: Divergent approaches to managing workplace safety. *Safety Science*, 43, 105–129.

Dekker (2011). *Drifting into failure*. Ashgate

Dekker, S. (2003). Failure to adapt or adaptations that fail: Contrasting models on procedures and safety. *Applied Ergonomics*, 34, 233-238.

Denis, J-L., Langley, A., and Sergei, V. (2012). Leadership in the plural*. Academy of Management Annal*s 6(1): 211-283.

Denyer, D. & James, K.T., (2016). Doing leadership-as-practice development. *Leadership-as-Practice: Theory and Application*, 9, pp.262–283.

Drath, W.H. et al., (2008). Direction, alignment, commitment: Toward a more integrative ontology of leadership. *The Leadership Quarterly*, 19(6), pp.635–653.

Drath, W.H., McCauley, C.D., Palus, C.J., van Velsor, E., O'Connor, P.M.G and McGuire, J.B. (2008). Direction, alignment, commitment: Toward a more integrative ontology of leadership. *The Leadership Quarterly* 19: 635-653.

Eisenhardt, K. M. & Sull, D. (2001). Strategy as simple rules. *Harvard Business Review*, 79(January–February), 107–116.

Ermine, J.-L., (2018). *Knowledge Management: The Creative Loop*; Volume 5, Wiley

Eurocontrol (2016) *White Paper on Senior Managers' Safety Intelligence.*

Farjoun, M. & Starbuck, W. H. 2007. Organizing at And Beyond The Limits. *Organization Studies,*28**,** 541-566.

Fischer, M. D. & Ferlie, E. (2013). Resisting hybridization between modes of clinical risk management: contradiction, contest, and the production of intractable conflict. *Accounting, Organizations and Society,*38(1), 30–49.

Fitzsimons, D., James, K.T. & Denyer, D., (2011). Alternative Approaches for Studying Leadership. *International Journals of Management Reviews*, 13, pp.313–328.

Fruhen & Flin (2016) Chronic unease. *Journal of Risk Research, 19,* 645.

Fruhen *et al* (2014) Safety intelligence. *Applied Ergonomics, 45,* 967.

Gherardi, S., Nicolini, D. and Odella, F. (1998), "What do you mean by safety? Conflicting perspectives on accident causation and safety management inside a construction firm", *Journal of Contingencies and Crisis Management*, Vol. 6(4): 202-213.

Grint, K., (2005). Problems, problems, problems: The social construction of "leadership." *Human Relations*, 58(11), pp.1467–1494.

Grote, G. (2009). *Management of uncertainty - Theory and application in the design of systems and organizations.* London, Springer.

Grote, G. 2015. Promoting safety by increasing uncertainty–implications for risk management. *Safety Science*, 71, 71-79.

Grote, G., Kolbe, M., & Waller, M. J. (2018). The dual nature of adaptive coordination in teams: Balancing demands for flexibility and stability. *Organizational Psychology Review*, 8, 125-148.

Grote, G., Kolbe, M., Zala-Mezö, E., Bienefeld-Seall, N., & Künzle, B. (2010). Adaptive coordination and heedfulness make better cockpit crews. *Ergonomics*, 52, 211-228.

Grote, G., Weichbrodt, J. C., Günter, H., Zala-Mezö, E. & Künzle, B. (2009). Coordination in high-risk organizations: The need for flexible routines. *Cognition, Technology & Work*, 11, 17-27.

Guntzburger, Y. & Pauchant, T. C. (2014). Complexity and ethical crisis management: A systemic analysis of the Fukushima Daiichi nuclear disaster. *Journal of Organizational Effectiveness: People and Performance*, 1:4, pp. 378 –401;

Guntzburger, Y. *et al.* (2019). Empowering Engineering Students in Ethical Risk Management: An Experimental Study, *Science and Engineering Ethics,* 25:3, pp. 911–37;

Hale, A. R. & Borys, D. (2013a). Working to rule or working safety? Part 1: A state of the art review. *Safety Science*, 55, 207-221.

Hale, A. R. & Borys, D. (2013b). Working to rule or working safety? Part 2: The management of safety rules and procedures. *Safety Science*, 55, 222-231.

Hale, A. R., & Swuste, P. (1998). Safety rules: Procedural freedom or action constraint? *Safety Science*, 29, 163–177.

Hardy, C., & Maguire, S. (2016). Organizing risk: Discourse, power, and "riskification". *Academy of Management Review*,*41*(1), 80-108.

Heifetz, R.A. and Laurie, D.L. (1997). The work of leadership. *Harvard Business Review* 75(1): 124-134.

Hiller et al (2017) Tolerance of uncertainty. *Social Science and Medicine,* 80,62.

Horlick-Jones, T. (2005). On 'risk work': Professional discourse, accountability, and everyday action. *Health, Risk & Society*, *7*(3), 293-307.

Hutter, B. & Power, M. (2005) (Eds) *Organizational encounters with risk* (pp. 1-32). Cambridge: Cambridge University Press.

Jeschke KC, Kines PA, Rasmussen L, Andersen LPS, Christensen JD, Ajslev J, Kabel A, Jensen E, Andersen LL. (2017). Process evaluation of a Toolbox-training program for construction foremen in Denmark. *Safety Science*, 94:152-160.

Kastenberg, W.(2015).Ethics, risk, and safety culture: reflections on Fukushima and beyond, *Journal of Risk Research*,18:3,304-316;

Kines P, Andersen DR, Andersen LP, Nielsen KJ & Pedersen LM (2013). Improving safety in small enterprises through an integrated safety management intervention. *J Safety Research*, 44, 87-95.

Kines PA, Andersen L, Spangenberg S, Mikkelsen S, Dyreborg J, ZoharD. (2010). Improving construction site safety through leader-based verbal safety communication. *Journal of Safety Research*, 41(5):399-406.

Kines PA, Lappalainen J, Mikkelsen KL, Olsen E, Pousette A, Tharaldsen J, Tomasson K, Törner M. (2011): Nordic Safety Climate Questionnaire (NOSACQ-50): A new tool for diagnosing occupational safety climate. *International Journal of Industrial Ergonomics*, 41(6):634-646.

Klein, G. A. (2017). *Sources of Power: How People Make Decisions,* Boston, Mit Press.

Kudesia, R. S. (2019). Mindfulness as Metacognitive Practice. *Academy of Management Review*, *44*(2), 405–423.

Kudesia, R. S., Lang, T., & Reb, J. (2020). How institutions enhance mindfulness: Interactions between external regulators and front-line operators around safety rules. *Safety Science*, *122*, 104511.

Lawton et al (2019) Risk aversion, experience and tolerance for uncertainty. *BMJ Quality & Safety, 28,387.*

Luria, G. (2019). Climate as a group level phenomenon: Theoretical assumptions and methodological considerations. *Journal of Organizational Behavior*, 1-12. DOI 10.1002/job.2417

Luria, G., Zohar, D., & Erev, I. (2008). The effect of workers' visibility on effectiveness of intervention programs: Supervisor-based safety interventions. *Journal of Safety Research*, 39, 273–280.

Maguire, S., & Hardy, C. (2013). Organizing processes and the construction of risk: A discursive approach. *Academy of Management Journal*,*56*(1), 231-255.

Maguire, S., & Hardy, C. (2016) *Three Scenarios from a Study of Industrial Chemicals in Canada*. In M. Power (Eds.) Riskwork: Essays on the organizational life of risk management. Oxford University Press.

Mosier & Fisher (2010) Affect and decision making. *Journal of Cognitive Engineering and Decision Making, 4, 240-255.*

Oliver, N., Calvard, T. & Potočnik, K. (2017). Cognition, Technology, And Organizational Limits: Lessons from The Air France 447 Disaster. *Organization Science,* 28**,**729-743.

Oliver, N., Calvard, T. & Potočnik, K. (2019). Safe Limits, Mindful Organizing and Loss of Control in Commercial Aviation. *Safety Science,* 120**,**772-780.

Orton, J.D., Weick, K.E., (1990). Loosely coupled systems: a reconceptualization. *Academy of Management Review* 15, 203–223.

Pentland, B. T., & Hærem, T. (2015). Organizational routines as patterns of action: Implications for organizational behavior. *Annual Review of Organizational Psychology and Organizational Behavior*, 2, 465–487.

Pilbeam C., Doherty N., Davidson R. & Denyer D. (2016). Safety leadership practices for organizational safety compliance: developing a research agenda from a review of the literature. *Safety Science*, 86: 110-121.

Pilbeam, C., Denyer, D., Doherty, N. and Davidson, R. (2019). Designing safer working interventions through a literature review using a mechanisms-based approach. *Safety Science* 120: 352-361.

Pilbeam, C., Doherty, N. & Denyer, D. (2017). *Safety Leadership: fashion, function, future*. pg. 115-137. In: Health and Safety in a Changing World. EdsR. Dingwalland S. Frost. Routledge, Oxon.

Raelin, J. (2011). From leadership-as-practice to leaderful practice. *Leadership 7*(2): 195-211.

Rall, M., Glavin, R. J., & Flin, R. (2008). The 10-seconds-for-10-minutes-principle: Why things go wrong and stopping them getting worse. *Bulletin of the Royal College of Anaesthetists*, 51, 2614–2616.

Ripamonti, S., Scaratti, G., (2015),"Safety learning, organizational contradictions and the dynamics of safety practice", *Journal of Workplace Learning,* Vol. 27(7): 530 –560

Roe, E. & Schulman, P. R. (2008). *High Reliability Management: Operating On the Edge*, Stanford University Press.

Roeser, S. (2011). Nuclear energy, risk, and emotions. *Philosophy & Technology*, 24, pp. 197–201;

Roeser, S. *et al.* (2012). *The Handbook of Risk Theory: Epistemology, Decision Theory, Ethics and Social Implications of Risk*. Springer, Dordrecht;

Saulais, P. & Ermine, J.-L., (2019). Kn*owledge Management in Innovative Companies: Understanding and Deploying a KM Plan within a Learning Organization*, Volume 23, Wiley

Scott, C.W. and Trethewey, A. (2008), "Organizational discourse and the appraisal of occupational hazards: interpretive repertoires, heedful interrelating, and identity at work", *Journal of Applied Communication Research*, Vol. 36(3): 298-317.

Slovic, P. (2010). *The Feeling of Risk: New Perspectives on Risk Perception*. Earthscan, London;

Special Issue on ambiguity, (2015): *Journal of Contingencies and Crisis Management, 23*.

Starbuck, W. & Farjoun, M. (2005). *Organization at The Limit: Lessons from The Columbia Disaster,* Malden Ma, Blackwell Publishing.

Swuste, P., Coen van Gulijk, Groeneweg, J., Guldenmund, F., Zwaard, W. and Lemkowitz, S. (2020): Occupational safety and safety management between 1988 and 2010. Review of safety literature in English and Dutch language scientific literature. *Safety Science* 121:303-318.

Trevino, L. K. *et al.* (2014). (Un)Ethical Behavior in Organization*. Annu. Rev. Psychol.*, 65, pp. 635–60;

Tucker, S. & Turner, N. (2017). *Young worker responses to workplace hazards and responsibility for safety, and workplace injuries across time.* Winnipeg: Workers Compensation Board of Manitoba.

Tucker, S., & Turner, N. (2011). Young worker safety behaviors: Development and validation of measures. *Accident Analysis & Prevention,43*, 165-175.

Tucker, S., & Turner, N. (2013). Waiting for safety: Responses of young workers in Canada to unsafe work. *Journal of Safety Research*, *45*,103-110.

Tucker, S., & Turner, N. (2015). Sometimes it hurts when supervisors don't listen: Antecedents and consequences of safety voice among young workers. *Journal of Occupational Health Psychology,20*,72-81.

Turner, N., Tucker, S., & Deng, C. (2020). Revisiting vulnerability: Comparing young and adult worker safety voice intentions under different supervisory conditions *Accident Analysis & Prevention*, 135, 105372.

Uhl-Bien, M., Marion, R. & McKelvey, B., (2007). Complexity leadership theory: Shifting leadership from the industrial age to the knowledge era. *The leadership quarterly*, 18(4), pp.298–318.

Vermersch, P., (1985). Donées d'observation sur l'utilisation d'une consigne écrite: L'atomisation de l'action. *Le Travail Humain* 48, 161–172.

Vogus, T. J., & Hilligoss, B. (2016). The underappreciated role of habit in highly reliable healthcare. *BMJ Quality & Safety*, 25, 141–146.

Weick, K. and Sutcliffe, K. (2001), *Managing the Unexpected: Assuring High Performance in an Age of Uncertainty*, Wiley, San Francisco, Vol. 1(3): 5.

Weick, K. E. & Roberts, K. H. (1993). Collective Mind in Organizations -Heedful Interrelating On Flight Decks. *Administrative Science Quarterly,* 38**,**357-381.

Yukl, G., (2012). Effective Leadership Behavior: What We Know and What Questions Need More Attention. *Academy of Management Perspectives*, (November), pp.66–85.

Zohar, D. & Hoffman, D., (2012). Organizational culture and climate. In: S. Kozlowski (Ed.), *Handbook of Industrial and Organizational Psychology*. New York, NY: Oxford University Press, pp. 643-666.

Zohar, D. (2002). Modifying supervisory practices to improve sub-unit safety: A leadership-based intervention model. *Journal of Applied Psychology*, 87, 156–163.

Zohar, D., & Luria, G. (2003). The use of supervisory practices as leverage to improve safety behavior: a cross level intervention model. *Journal of Safety Research*, 34, 567–577.

Zohar, D., Thirty Years of Safety Climate Research: Reflections and Future Directions, *Accident Analysis and Prevention*, 42, 1517-1522, 2010.

4. Participants Presentation

a. Academics working on safety leadership or related themes

David DENYER

Professor of Leadership and Organizational Change at Cranfield School of Management

David has an international reputation for his research on leadership in extreme contexts, organizational resilience and high reliability organizations. He has also been responsible for redefining evidence-based practice and application in business and management studies.

David is Professor of Leadership and Organizational Change at *Cranfield School of Management*, Vice Chair *British Academy of Management*, Fellow of the *Academy of Social Sciences*, Fellow of the CIPD, Fellow of the Higher Education Academy and member of the ESRC Peer Review College. He has a proven track record in accessing research grants. He obtained a prestigious AIM/ESRC Fellowship, secured grant funding from EPSRC and has been part of research teams funded by the National Institute for Health Research Service Delivery and Organization and the Institute for Occupational Safety and Health.

David has made a substantial contribution outside academia through strategic and policy advisory roles. He worked with senior leaders in public, private and voluntary sectors to develop safety leadership and organize for high reliability.

His work was selected by the *Academy of Social Science* as an exemplar of social science research that has made a difference to policy and practice. His work was also selected by the ESRC as an exemplar of excellence in research impact. In 2012 HR Magazine voted David UK's 'Most Influential Thinker'.

Contact: david.denyer@cranfield.ac.uk

David DENYER's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Leadership for safety. The term leadership is often (mis)used to make a theme more attention grabbing. I don't think that there needs to be a safety leadership construct. Instead, we should address leadership in the context of safety.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

I tend to use Yukl's, 2013 definition of leadership – which is "the process of intentional influence, exerted over other people in order to guide, structure and facilitate activities and relationships in a group or organisation". I see leadership as a process/practice not as a characteristic of an individual – as assumed in much of the literature. It is also more than the traditional leadership tripod (as labelled by Bennis) between leaders, followers and shared goals.

Leadership is not "only incremental influence of a boss toward subordinates, but most important it is the collective incremental influence of leaders in and around the system." (Osborn et al. 2002: 798). Leadership is shared, relational, strategic, and a complex social dynamic. Leadership helps explain how "actors, individually or collectively, produce direction, alignment, and commitment" (Drath, 2008: p. 636), which are crucial to the achievement of safety in organizations.

3. *Based on your experience and research:*

   a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

   The established strategies for managing risk in volatile programme environments are formal structures, hierarchical decision making, defences in depth and adherence to plans, procedures and processes and the implementation of standardised risk management methodologies. However, recent high-profile incidents suggest that there was no shortage of formal rules nor prior examples from which to learn. We find that an over-reliance on the structures and processes intended to control risk and ensure stability, can generate outcomes that are unanticipated and suboptimal.

   In contrast a mindfulness-based approach recognizes that people at the 'sharp end' (Flin, O'Connor and Crichton, 2008) create safety. Through situational awareness (Klein, Moon and Hoffman, 2006) and bricolage (Weick, 1993) front-line personnel continuously make sense of situations, improvise and adapt to changes, bridge gaps in system design and flaws in procedures and react to unplanned situations (Hollnagel et al., 2006). This perspective holds that adaptations in the form of workarounds, fine-tuning and innovation are necessary to keep the system safe.

   For Hollnagel et al. (2006), accidents occur when the organization is unable to adapt and respond to the demands of the situation rather than because something or someone fails. HRO studies have shown that HROs avoid system accidents, not by technology or procedures, but by creating the appropriate behaviours, attitudes and safety culture (Weick and Roberts, 1993). This perspective suggests that organizations can also learn to correctly anticipate problems, enabling them to be proactive.
   Effective anticipation requires people to take weak signals of potential problems, however innocuous, seriously and investigate them until they are either demonstrated to have an innocent explanation or, alternatively, are demonstrated to be indicators of danger.

Mindfulness-based approaches encourage people to communicate openly, frequently and precisely and provide each other with appropriate challenge and support. They create an environment where people feel able to openly report problems without fear of reprisal and trust that their concerns will be heard.

   b. *What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?*

   Safety, like health, shows itself only by the events that do not happen! (Hollnagel, 2006). Stability from this standpoint can be regarded as a 'dynamic non-event' (Weick and Sutcliffe, 2001, p. 69), which is not involuntarily obtained, but has to be accomplished every day. Failure from this perspective, does not result from a singular failed component or barrier, but occurs as a result of an inability to respond to unpredictable changes in the context (Woods and Hollnagel, 2006, p. 14). It is the "intrinsic ability of an organisation (system) to maintain or regain a dynamically stable state, which allows it to continue operations after a major mishap and/or in the presence of a continuous stress" (Woods and Hollnagel, 2006, p. 14). Therefore, safety requires both

preventative control and mindful adaptation. Creating the conditions for both to coexist is a significant challenge.

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

    As above

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

    (1) As above, safety requires both preventative control and mindful adaptation. Creating the conditions for both to coexist is a significant challenge. How this can be achieved is a key issue for future research.

    (2) Learning from failure. After incidents, the focus often lies with causality (why did this happen?), attributing blame (whose fault?), and remedy (how do we stop this?). Once the solution (an inquiry's recommendations) has been published, media attention and wider debate fade. With many incidents, closure seems to be achieved with the publication of 'lessons learned', overlooking 'lessons applied'.

    (3) Accident causation and the use of qualitative comparative methods and AI.

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?*

Jean-Louis ERMINE

Knowledge Management expert

Professor emeritus at Institut Mines-Telecom
International consultant

Jean-Louis Ermine holds a PhD in fundamental mathematics (Denis Diderot University of Paris) and the diploma of National Research Director in computer science (University of Bordeaux).

Jean-Louis Ermine began his career as a teacher-researcher at the Universities of Algiers and Bordeaux. He has worked at the French Atomic Energy and Alternative Energies Commission (CEA) as a Knowledge Manager for more than 10 years. From 2003 to 2015, he was a professor at *Institut Mines-Telecom*, successively director of the Information Systems department, associate dean of research and associate dean of innovation. He is currently Professor Emeritus at *Institut Mines-Telecom* and expert consultant in Business Knowledge Management.

Jean-Louis Ermine has written 8 books and more than 100 articles in peer-reviewed journals and conferences. He is creator and Honorary President of the French Knowledge Management Club since 1999, an association bringing together many francophone companies and the French Academic Association for Knowledge Management (AGeCSO) since 2008.

Jean-Louis Ermine has been a project manager or advisor in numerous research or industrial Knowledge Management projects in public or private companies and international organizations in France (Industry, Energy, Transport, Defense, Banking, SMEs ...) and abroad (Sonatrach (Algeria), Hydro-Québec, Public Administration (Canada), IPEN (Brazil), National Nuclear Safety Authorities (Asia), United States, UN ...). He was French delegate for ISO International Standards Commission on Knowledge Management (2018-2019)

He is the creator of the MASK Knowledge Management method, which is now widely used in various companies and organizations around the world.

Contact: jean-louis.ermine@laposte.net

Jean-Louis ERMINE's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

   Safety Leadership

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

   - Safety First in decision making
   - Safety Awareness for leaders and decision makers
   - Management of a Safety Corpus including principles, rules, knowledge and know-how

3. *Based on your experience and research:*

a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

- Risk Assessment processes
- Risk Commission within the organization, including all the interested parties, consulted periodically, discussing without constraints about all the subjects linked to Risks in the organization, with more than a consultative role

b. *What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?*

- Risk management at every level of the organization
- Readiness to unpredictable events

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

- Knowledge codification on passed events (story telling, knowledge eliciation, lessons learned...)
- Knowledge sharing in communities of practice relevant to safety
- Innovation processes of all kinds related to safety topics

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

- Design and disseminate a Knowledge Corpus on Safety topics at different levels : corporate level, national level, international level, going far beyond usual Safety Standards

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?*

- Knowledge Management and Knowledge Sharing framework
- Innovation theories applied to safety enhancement

Rhona FLIN

Professor of Industrial Psychology at Aberdeen Business School, Robert Gordon University and Emeritus Professor of Applied Psychology, University of Aberdeen.

She is an elected Fellow of the British Psychological Society and the Royal Society of Edinburgh and has been awarded Fellowships by the Royal College of Surgeons of Edinburgh and the Royal Aeronautical Society. She has served on Expert Groups on Patient Safety Research and Education for the World Health Organization and was a member of the Safety Advisory Committee for the Military Aviation Authority (UK Ministry of Defence). She is a member of the Board of Directors for the Society of Petroleum Engineers, Human Factors Technical Section and is a Board member of Step Change for Safety (UK offshore safety).

Her research examines human performance in high risk work settings, such as acute healthcare and the energy industries, with studies focusing on leadership, safety culture, team skills and cognitive skills. Current projects include psychological factors in the introduction of new technology on the UKCS, mindfulness training for safety, and non-technical skills in safety-critical tasks. Her books on safety include *Safety at the Sharp End: A Guide to Non-Technical Skills (*2008, with O'Connor & Crichton) and *Enhancing Surgical Performance: A Primer on Non-Technical Skills* (2015, with Yule & Youngson).

Contact: r.flin@rgu.ac.uk

Rhona FLIN's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Probably Safety Leadership. I think a distinction may have to be made between safety leadership when it applies to those with specific safety roles, (e.g. HSE manager) as opposed to being applied to those managers in all the other operational / business roles (e.g. production manager). I understand from the briefing document that the latter is the focus of the ELSE workshop.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Safety leadership could be defined as the fundamental requirement to manage the inherent operational hazards which can threaten the wellbeing of the workforce, the plant and the public. Safety leadership is about understanding and respecting operational risks in order to develop and enact appropriate control and mitigation strategies.

Key words: safety commitment; prioritisation of safety; balancing risks; decision making; fostering supportive conditions; safety ethics.

3. *Based on your experience and research:*
    a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

From education, training, workplace experiences, mentoring, modelling, personality traits (e.g. risk tolerance, pessimism), workplace learning, feedback mechanisms, reward systems, cultural referencing etc.

b. What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?

Challenges to dealing with risk include complexity, inadequate feedback, rate of change (e.g. new technologies), competing objectives, government pressures.
Relevant methods of dealing with risk include regulation, education/ training, competence assurance, risk analysis, risk calibration, organisational design, evidence-based practices, appropriate reward systems, data analysis/ operational intelligence, examination of cultural conditions.

4. According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?

In line with the ELSE objectives, one of the prime factors would be the incorporation of safety leadership training in a broad range of management and technical education. More attention to safety-related components in selection, promotion, competence assurance systems and reward schemes. Better understanding of effective development mechanisms and supportive organisational conditions for the maintenance of safety leadership skills and activities.

5. What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?

Future research avenues at an individual level could include further examination of safety intelligence, safety commitment, 'chronic unease', ethical disposition, mindfulness skills, trade-off decision making, coping with ambiguity, risk tolerance. Capturing of expertise relating to established and proven leaders' ability to deal with complexity, change management, competing goals, fostering supportive organisational conditions.

6. In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?

Theoretical knowledge relating to existing leadership theories applied to safety (transformational, authentic, ethical etc) where there is an evidence-base. Other topic areas could include: Risk perception and risk tolerance and how these are developed. Workforce and managerial wellbeing and the relationship to safety should be a key element. Organisational change mechanisms and processes. Organisational safety culture. Safety management techniques. Human factors science.

More attention could be devoted to understanding the process of integration of safety leadership with managers' other functional responsibilities (e.g. finance, production, design, logistics). Consideration of how leadership theories have been applied to or developed for these domains might be informative.

Other topic areas: decision styles and processes, ethical approaches; mindfulness applications applied to safety outcomes, development of simulations and scenario planning for training managers, training evaluation techniques.

Silvia GHERARDI

Senior professor of sociology of organization at the Department of Sociology and Social Research, (University of Trento, Italy)

She founded the Research Unit on Communication, Organizational Learning, and Aesthetics (www.unitn.it/rucola). She is also professor II at the School of Business, Society and Engineering, Mälardalens University (Sweden).

She received the degree of "Doctor Honoris Causa" from Roskilde University (2005), East Finland University (2010) and St Andrews University (2014).

Her research interests include: feminist studies, entrepreneurship, epistemology of practice, and post-qualitative methodologies in organization studies. She published two books on practice-based studies with Edward Elgar: How to conduct a practice-based studies (2019) and Learning and Knowing in Practice-Based Studies (2012), co-authored with Antonio Strati.

Contact: silvia.gherardi@unitn.it

Silvia GHERARDI's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Frankly let me start writing that I have difficulties with the current abuse of the term 'leadership', that may be taken for granted in Anglo-Saxon language as way of naming a position (as team leader) but that works less well in Latin languages. My position is that we need responsible managers and responsible people in organizing and not leaders. In few words, I would prefer Safety leadership and not leadership for safety (the link between safety as an effect and the way of managing should be demonstrated).

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Safety is the emergent effect of a way of organizing, in which persons, technologies, discourses and environment are entangled to create a safer context. Neither people, nor technologies, nor discourses have primacy, therefore the knowledgeable way of intertwining them produce social effects in the organization and in the society at the same time.

3. *Based on your experience and research:*

   a) *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

I think that this question addresses the difference between 'risk' as an objective dimension and risk perception as the subjective and relational way of becoming aware of a potential risk. My answer is that risk perception is a social and cultural phenomenon. The nuclear sector is a well-established industrial sector with a solid base of dealing with hazard and a strong and well-established culture of risk elaboration. Dealing with potential and actual risks is part of organizational practices.

> **b) What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?**

Many challenges, of course, and of different nature. One challenge is how to make the knowledge, that is grounded and kept in the bottom line, move up and become available for more situations.

> **4. According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?**

Again, a small thing is how to contrast the professional cultures based on certainty (and therefore myope towards weak signal) and educate to indeterminacy and a critical stance towards the limits of measurement, the limits of infrastructures for data sensing etc.

> **5. What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?**

I answered before: to contrast a check-list mentality and slow down the process of 'black-boxing' what we suppose to know.

> **6. In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?**

A critical analysis of epistemic practices. And I have a question: what leadership has to do with a sensitivity for what is emerging from a social context that faces the uncertainties of a not-yet situation to come.

Gudela GROTE

Professor of Work and Organizational Psychology at ETH Zürich

Gudela Grote is Professor of Work and Organizational Psychology at the Department of Management, Technology, and Economics at the ETH Zürich. She received her PhD from the Georgia Institute of Technology, Atlanta, in 1987.

The main objective of her research is to provide psychologically based concepts and methods for integrative job and organizational design, taking into consideration the changing technological. economic and societal demands and opportunities. A special interest are the increasing flexibility and virtuality of work and their consequences for the individual and organizational management of uncertainty. Application fields for Prof. Grote's research are teamwork and standardization in high-risk systems, effects of new technologies on work processes, and the management of the employment relationship.

Prof. Grote is associate editor of the journal Safety Science and member of the editorial board of several other journals. She has published widely on topics in organizational behavior, human factors, human resource management, and safety management. She has worked with companies such as the Swiss Railways and Swiss Re and with public organizations, especially regulatory agencies. Gudela Grote is Past President of the European Association of Work and Organizational Psychology, a Fellow of the Society for Industrial and Organizational Psychology, and member of the Swiss National Research Council.

Contact: ggrote@ethz.ch

Gudela GROTE's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

I don´t think it makes a big difference - see my definition below.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Either term refers to what leaders and possibly other team members do to establish and maintain conditions that allow everyone to work safely. Leadership for safety might be understood as the slightly broader term to include also organizational measures, while safety leadership could be interpreted in a narrower sense as influencing safe working through team leadership mostly. But then safety leadership can also mean being a leader in safety as an organization, which would be even broader than leadership for safety.

3. *Based on your experience and research:*
   a.   How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?

This is a vast question that cannot be answered in this given format.

   b.   What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations? dito

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

managing tensions such as stability/flexibility, innovation/routine, central control/empowerment

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

how to get managers and employees ready to accept these tensions and to manage them well

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?*

team dynamics and team adaptation, resilience/HRO, paradox theory, uncertainty management, organizational adaptability

Yoann GUNTZBURGER
Assistant profession in Science, Technology and society at SKEMA Business School

He holds a Ph.D. degree in management (HEC Montreal), a M.A.Sc. as well as a bachelor degree in process engineering (Polytechnique Montreal). Yoann is specialised in ethics and risk management, as well as organisational crisis management. During his thesis, Yoann gained specific abilities in public risk perceptions and social acceptability of technologies and processes, as well as in responsible technology development. He also developed practical skills in systemic and complex analysis of organizational systems, analysis of organizational safety culture and of the dynamics between ethics and risk management. Yoann does interdisciplinary research combining moral philosophy, organisational theory, system thinking and complexity theory. His current topics of interest focus on science-policy interfaces related to sustainable development, digitalisation and risk management, as well as inclusive business models.

He teaches introductory and advanced courses in digital transformation and sustainability, ethics in digital business and life cycle management.

Contact: yoann.guntzburger@skema.edu

Yoann GUNTZBURGER's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Both expressions can be found in the literature. However, it seems that the former, "Safety Leadership" is much more common. Even in the project presentation, the former expression is the most widely used. That being said, this expression implies somehow that "Safety Leadership" is a specific kind of leadership, as well as transformational leadership or transactional leadership, while it is actually these kinds of leadership that will influence safety climate or safety performance (Clarke, 2013; Mullen *et al.*, 2017).
Therefore, while "Safety Leadership" allows to be consistent with the existing body of literature, the expression "Leadership for Safety" is, in my opinion, more accurate, conceptually speaking.

*2. **How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?***

The concept of leadership alone is difficult to define. Several elements have been used to frame this concept such as personal traits and behaviour, a specific administrative position, the perceived legitimacy of influence, and so on. Those lie mostly within the dominant leader-centric paradigm. In the project presentation, the concept of complexity leadership has been put forward, another paradigm "that focuses on enabling the learning, creative, and adaptive capacity of complex adaptive systems within a context of knowledge-producing organizations" (Uhl-Bien *et al.*, 2007). This concept is based on three intertwined processes: adaptive leadership, administrative leadership, and enabling leadership.

Based on this concept, Leadership for Safety would be defined as a process of social influence that leads to the emergence of contextual ambidexterity allowing the management of the tension between both regulated safety (operational discipline and hierarchy) and managed safety (mindful sensemaking and competent improvisation) (Cowley & Denyer, 2016).

Keywords: Complexity, Contextual ambidexterity, Operational discipline, Competent improvisation

*3. **Based on your experience and research:***
   *a. **How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?***

The question is not clear for me. Are we talking about what influence risk perception? Also, are we talking about the public's or the operators' and managers' perceptions?

Risk perception, especially in the context of highly technical organizations, such as chemical industries or nuclear plant, has usually been associated with public rationality biased by emotions and opposed to (non-biased) experts' judgement (Coeckelbergh, 2009). However, in many fields such has moral philosophy, psychology, ethnology, behavioural studies to name a few, it has been argued that emotions play an essential role in moral decision-making (Decety, 2009; Nussbaum, 2001). Moreover, in the last decades, neuroscience has also shed new light on cognition by showing the deep interconnections between emotional and rational processes in decision-making, that is to say, the actual need of emotions for rational judgments (Damásio, 1994; Okon-Singer *et al.*, 2015). Specifically in the field of risk management, several authors, rejecting this dichotomy between supposedly rational expert opinions and irrational – therefore irrelevant – emotionally biased public perceptions, have argued for the legitimacy of both perspectives, especially for risk acceptability (Herkert, 1994; Renn, 1999; Roeser, 2006; Slovic, 2000). Therefore, what is interesting from a risk management point of view, is actually the perception by plant managers of the public's risk perception. Indeed, the acknowledgement of the existence of this plurality of legitimate perspectives (Funtowicz & Ravetz, 1993) can help to develop more ethical approaches of risk management, through public and other stakeholders involvement (Cotton, 2009).

On the other hand, if we focus on operators and managers within the organization, risk perceptions are directly influenced by safety climate which, in turn, mediate the influence of safety leadership on safety performance (Wu *et al.*, 2011). Said differently, safety leadership positively influence safety climate which leads to better safety performance and reduced risk perceptions. Interestingly, safety leadership (understood here as leader-centric) is also influenced by risk perception. Indeed, when managers perceived that their direct supervisees are exposed to important risks, they tend to be more involved in safety management (Kouabenan *et al.*, 2015). Finally, perceptions of safety climate significantly influence leadership training outcomes (Tafvelin *et al.*, 2019).

   *b. **What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?***

It would be hard to summarize here the considerable body of literature focusing on better risk management in high risk organization. However, there are mainly two (optimistic) schools of thought about risk management in complex socio-technical systems: System Safety (Leveson *et al.*, 2009) and High Reliability Organizations (La Porte, 1996; Weick & Sutcliffe, 2007), the former focusing more on regulated safety, while the later focuses more on managed safety. Both are relevant and valid approaches and are actually complementary. The most efficient way of dealing with risks in highly regulated organizations is then certainly a mix of both approaches. There lies, in my opinion, also the biggest challenges: 1- to first be able to acknowledge that the complexity of risk management requires this mix, 2- to find the right balance between the two, considering that it could be dynamic. More specifically about managed safety, and in line with the complexity leadership theory, it could be challenging in a highly regulated organization to consider that leadership is a socially distributed process aiming, among other things, at improving sensemaking and competent improvisation.

4. According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?

Recent research has shown that contextual factors such as role overload and production pressures negatively influence safety leadership while social support and autonomy enhance it (Conchie *et al.*, 2013). As leadership here is understood as a complex process of social relations, open relations, trust, active listening psychological safety are, among others, important factors to promote and improve safety leadership (Carrillo, 2019).

5. What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?

Pilbeam *et al.* (2016) have recently proposed a research agenda to refine our understanding of the concept of safety leadership and its implications for safety performance. The authors identify three main research avenues, which are still worth exploring.

First, there is still a lack of conceptual and methodological clarity about transformational and transactional leadership, which, in turn limits the practical implications of most of the current studies. It would therefore be necessary to refine these concepts and the methods used to investigate them in a context of safety. Moreover, these concepts still fit in the dominant leader-centric paradigm. A more distributed approach of leadership, consistent with the complexity leadership theory, and its influence on safety performance should be explored. More specifically, the specific mechanisms and practices that lead to the conditions of emergence of such distributed leadership could be the object of further studies.

Second, although high-risk industries have traditionally been the subject of safety research, the sample as well as the access is limited. It could be interesting to explore the concept of safety leadership in lower risk organizations to assure its robustness.

Finally, and in line with the first research stream identified, the authors suggest investigating qualitatively how safety leaders – or to be consistent with a complex approach: safety social systems – make sense of their context and how it influences their behaviour and practices.

6. In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?

All the elements presented in the previous answers are relevant to support higher education and training for safety leadership. Maybe more specifically: complexity and system thinking, enactment and sensemaking, complex leadership theory, factors that influence safety leadership, safety climate perception.

David A. Hofmann, Ph.D. (Dave)

Hugh L. Mccoll Distinguished Professor And Senior Associate Dean For Academic Affairs

Dave is the Hugh L. McColl Distinguished Professor and Senior Associate Dean for Academic Affairs at the UNC Kenan-Flagler Business School. His research and consulting activities focus on organizational climate, leadership, organizational change, organizational design, and decision making. He was formerly the Associate Dean for the full-time MBA program and Area Chair for the Organizational Behavior group.

One specific focus of his research is on how leadership and organizational culture impact safety and errors within organizations operating in high-risk environments. In 2006, he was awarded the American Psychological Association's Decade of Behavior Research Award recognizing the applied implications of his work. He also has been the recipient of a Fulbright Senior Scholar Award (University of Giessen, Germany). He has edited two scholarly books on these topics, the most recent of which, *Errors in Organizations*, was published in 2011 (with Michael Frese).

Since 2010, he has served on two National Research Council / National Academy of Engineering committees. The first committee investigated the causes of the BP Deepwater Horizon accident. The second committee focused on how to improve safety culture in the offshore industry. He has taught, presented research, or conducted executive development sessions internationally in Australia, Canada, Finland, France, Germany, Hong Kong, India, Italy, Netherlands, Singapore, Spain, Switzerland, Taiwan, UAE, and United Kingdom.

Dave earned his Ph.D. in industrial and organizational psychology from Pennsylvania State University, a master's degree in industrial and organizational psychology from the University of Central Florida and a bachelor's degree in business administration from Furman University.

Contact: David_Hofmann@kenan-flagler.unc.edu

David A. Hofmann's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

DH: I would prefer Safety leadership as that signals to me that the person is leading the safety mission of the organization. I think that it also is a more straightforward phrasing.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

DH: Well, I think that you have first define effective leadership in general. If the person is not an overall effective leader, then they will be incapable of safety leadership (and some of my research speaks to this). So, I would define effective leadership as involving these keywords: setting a direction, influencing/motivating/engaging others, establishing management systems, creating and modeling an effective culture/climate, establishing accountabilities and achieving results. Then I would put safety as one of several strategic objectives that must be pursued simultaneously and where safety must not be sacrificed for short-term gain. So, effective safety leadership is

pursuing the mission of the organization in a way that ensures the safe achievement of this mission.

3. **Based on your experience and research:**
   a. **How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?**

N/A

   b. **What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?**

DH:

A – How does risk perception form? This is not one I have done much research on so I will defer to the wisdom of others. But, one aspect of risk perception that I do know a little about is how our experience informs risk perception. So, one-way risk perception develops is through experience. For example, if I cut corners on the safety front and nothing happens, then I have "learned" that these actions do not lead to an increase in risk. Learning here is in quotes, because often this is false or superstitious learning – something I can discuss more at the conference. So, our own experience and our perception of what we learn from that experience would seem to be one way that risk perceptions form.

B – Challenges and ways of dealing: Somehow, organizations have to keep the perception of risk front and center – particularly for the more abstract, long-term situations where it is really easy to gradually allow the perceived risk to drift into a false sense of security. You have to make the leading indicators of risk/accidents tangible and concrete so individuals continue to keep top of mind the potential risk.

4. **According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?**

DH: As noted above, you need really effective frontline and middle management leadership – general leadership capabilities. Then you need to make leadership a strategy priority/goal/value. Oftentimes, I think organizations try to train safety leadership while ignoring the general leadership capability of their employees. I think this might be backward. We need to develop the general leadership capabilities of our employees and then throughout the organization create a culture and accountability systems that signal safety is a core value, etc.

5. **What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?**

DH: I think innovation in using new technology for training – microlearning, virtual reality. Virtual reality might be a useful tool to ensure that upstream employees (e.g., design engineers) to not lose sight of how their design will be used by real people trying to accomplish real goals in a resource-constrained environment.

6. **In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?**

DH: General leadership frameworks (transformational leadership, relationship base leadership (LMX), etc.), frameworks of culture/climate, and then behavioral/experiential learning.

Katharina Christiane JESCHKE

Researcher (PhD Fellow) at the National Research Centre for the Working Environment, Denmark

She has her MSc in Sociology from the University of Hamburg. For the past 5 years, she has been primarily carrying out accident and safety research – with focus on identifying and developing effective and occupational safety education strategies. This involves working simultaneously with integrated leader-based and worker-based approaches that are an integrated part of business. In particular, she has developed a training program for construction industry foremen. Her research interest is at the intersection of micro-level, practice-based processes and cultural influences (such as institutional arrangements) on organizational leadership and safety. Currently, she is working on themes such as leaders' professional role identities, safety practice and organizing within complex environments under her PhD study.

Contact: kcj@nfa.dk

Pete KINES

Senior Researcher at the National Research Centre for the Working Environment, Denmark

He has his MSc in Psychology and PhD in Civil Engineering. For the past 20 years, he has been primarily carrying out accident and safety research – with focus on identifying and developing effective and occupational safety education strategies. This involves working simultaneously with integrated leader-based and worker-based approaches that are an integrated part of business. In particular, he has developed a training program for construction industry foremen, and is currently adapting it to e-learning and an avatar system. In evaluating the education programs Pete has worked at developing various safety surveys, including the Nordic Occupational Safety Climate Questionnaire (NOSACQ-50), and an app for measuring and documenting safety – 'Safety Observer'. In addition, Pete also works with research regarding 'Vision Zero strategy for safety, health and wellbeing', small and medium enterprises and young workers.

Contact: pki@nrcwe.dk

Katharina JESCHKE's and Pete KINES' answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Leadership comes first. Safety should be an integrated part of business policies, procedures and practice – and not treated as an isolated (leadership) silo, separate from other business processes. The integration of safety and health in business is also what is reflected in the new ISO45001 for Occupational Safety and Health.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Leadership for safety deals with both hard and soft issues, from governance, regulations and systems, to people, empowerment and culture. All three issues of safety, health and wellbeing are interrelated, and include process safety, physical safety, psychological safety, brand safety (CSR), etc.

3. **Based on your experience and research:**
   a. **How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?**

Risk perceptions form by what people see, hear, feel and do every day. It is how policies and procedures are interpreted, implemented and enacted. Policies, education and training can be foundations for risk perceptions, but the everyday culture and context are crucial for shaping risk perceptions.

   b. *What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?*

- Identifying and implementing proactive/leading indicators for safety (health and wellbeing) that can be used as meaningful, relevant and effective benchmarks for companies and departments, and as KPIs for top and middle managers and workers.
- The hierarchy of controls need to be applied in the concept, design, budgeting, and planning stages in dealing with process and occupational safety.
- Ensuring an open communication culture for reporting, following up and learning between leaders and workers, such as regular (daily) opportunities for dialog on business issues, in which safety, health and wellbeing are integrated components.
- 'Compliance' is not just on the shop floor, but also for top and middle managers – ensuring they also apply the highest prevention levels of creating safety, and that they are role models and show leadership (not just management).

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

- Understanding and communication of the importance of how and why safety is good business. Migrate from the mind-set of 'we have to do safety' to 'we want to do safety'.
- More focus on the leadership and empowerment of people, to supplement the 'management' of 'systems'.
- Proactive/leading safety indicators, benchmarks and KPIs (see also 3b above) – to ensure compliance with the company's 'safety leadership' principles.

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

- Integrating safety (health and wellbeing) into existing education and training, and avoid it being treated as a silo, but as an integrated part of business and professionalism.
- Identifying positive/proactive leading safety indicators that are meaningful, relevant and effective benchmarks for companies and departments, and as KPIs for top and middle managers and workers.

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?*

- Safety culture/climate research on the importance of leadership safety commitment, empowerment and communication.
  - Hierarchy of controls
  - Recent systematic reviews and meta-analyses providing evidence of the importance of leaders taking part in regular 'briefings' and 'walk arounds' as opportunities for dialog in identifying risks and good practice, and the need for follow-up and learning.

Ravi S. KUDESIA

Assistant Professor at the Fox School of Business at Temple University

He previously earned his Ph.D. in Business Administration from Washington University in St. Louis and served as a research fellow at Future Resilient Systems, a think tank established collaboratively by ETH Zürich and the National Research Foundation of Singapore. In his research, he studies three cognitive processes: attention (what information people notice in a situation), interpretation (how they give meaning to the situation), and energy (how engaged they are in responding to the situation). He particularly emphasizes how these processes transfer across individuals as they assemble into collectives—and how these collectives solve problems and make sense of their environments—in systems including protest crowds, darknet markets, sports teams, and explosive demolition firms. The overall purpose of his research is to understand how people can organize more mindfully, thereby contributing to the resilience of the systems of which they are part. His research embraces both qualitative and quantitative methodologies and has appeared in or been accepted by journals including Academy of Management Review, Journal of Business Ethics, Mindfulness, Organizational Behavior and Human Decision Processes, and Safety Science.

Contact: rskudesia@temple.edu

Ravi KUDESIA's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

   I prefer the latter expression to the former as "Leadership for Safety" seems to better capture the emergent nature of safety in complex systems. In contrast, "Safety Leadership" seems to describe safety as a style of leadership, placing the onus of safety solely or primarily on the leader, when safety actually inheres in the actions of many actors throughout the organization.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

   Leadership for safety would encompass the behaviors leaders enact that directly or indirectly shape organizational safety. Such behaviors would include the codification of knowledge and writing of rules, the design of information flows through the hierarchy, the creation of artifacts, symbols, and routines that influence culture and enhance operator cognition, and so forth.

3. *Based on your experience and research: a. How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)? b. What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?*

   A key source of failure is misaligned risk perceptions at different sites. In a study on government

regulators in the explosive demolitions industry, my colleagues and I found that one way to deal with this issue is to see safety rules as affording different types of social interactions across these sites. Regulators encode rules into operators in a relatively top-down manner during training and certification. But regulators then observe operators as they enact these rules on the front lines. The presence of regulators at the operational site not only helps increase the salience of risks (as their presence helped overcome alternate motivations that weaken safety, like productivity goals), but also gives regulators a chance to learn and improve the relevance of their rules (as regulators often lack the tacit and situated knowledge that operators have). So, I think that information flows across various sites (e.g., regulators, operators) is imperative to developing shared risk perceptions and collectively addressing them in an intelligent manner.

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

Ultimately, I think there are two related factors. First, safety requires unique practices that regulate the ongoing attention among front-line operators. The wrinkle here is that attention degrades at multiple timescales (from momentary lapses into mind wandering that occur cyclically to the gradual quasi-linear decrement of vigilance over the course of work episodes to the gradual inattention that can accompany experience and overconfidence over multiple work episodes). So leaders must design bundles of practices that regulate attention which work at these distinct timescales. Second, provided that front-line operators are attending to safety-relevant information, this information must flow throughout the organization in ways that increase the intelligence of collective action. The primary dilemma here concerns the proper mode of coordination. For instance, autonomy in responding to emerging risks can be useful, but there are dangers also of excessive autonomy (e.g., those on the front-line may lack broader system-level understandings). But there are also dangers in alternate coordination modes like centralizing decision-making authority or standardizing operator actions using fixed rules. So, the question for leaders is how to design loose coupling of these modes of coordination, such that elements of standardization and autonomy are jointly enabled.

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

I think there is much to learn about all of the above: practices that regulate attention, loose coupling of standardization and autonomy through rules and organizational design, etc.

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?*

My emphasis has been on mindfulness and high-reliability organizations, following the seminal work by Weick and Sutcliffe. I think the principles contained in this framework well-describe the social and cognitive processes that enable safety—and I have worked to extend them by more fully considering the role organizational hierarchy and external regulators play in safety.

Eivor OBORN

Professor of Healthcare Management in the area of Innovation and Organisational Change at Warwick Business School

Eivor Oborn is currently the director of the PhD program and the MBA Health Specialisation program at WBS. She earned her PhD at Judge Business School, University of Cambridge, and was a recipient of the Gates Cambridge Scholarship. She is currently an honorary Fellow at Cambridge Judge Business School and Fellow at the Cambridge Centre for Digital Innovation (CDI). Her research interests span digital health, multidisciplinary working, distributed leadership and collaboration during innovation. Her current theoretical interests include digital health and ecosystem formation, the challenges associated with managing dynamic risk in multidisciplinary contexts and the use of algorithms in reshaping service delivery. She has several established international collaborations including with health scholars in Canada, Sweden, Germany and Australia. She has published in numerous elite journals including Information Systems Research, Organisation Science, MISQ and the Academy of Management Journal in the area of managing change and health technology.

Contact: eivor.oborn@wbs.ac.uk

Eivor OBORN's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

I am not organising the workshop so I am not sure what the key goal of all participants are not what the mandate or requirements might be. I expect both constructs will be important to reflect on at the workshop. The former (safety leadership) in my mind is a wider project, and one which is enacted at a higher level. For example, new perspectives that can be given to workers, better frameworks for groups to enact, strategic direction in thinking about risk provides leadership at a meta/field level. The latter construct, leadership for safety, to me is more about what individuals need to do to keep an environment safe. Thus the latter is more micro skills based (deciding who needs to participate in what meetings, for example).

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

I have outlined these above.

3. *Based on your experience and research:*
   a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

In my view/research insight – risk perception is multifaceted. The key dimensions that come together for risk, include 1) individual level understanding, with fact gathering, sensemaking and interpretation skills needed. This understanding can draw from external, industry level knowledge as well as developing situated understanding of the specific and unique circumstances

of the particular location/risk. 2) corroboration component where perception is integrated with the understanding of others, for example checking one's views with those of another disciplinary group. This helps to widen perception (since no one view is complete) and also empowers the individual through the sense checking with others. 3) accounting for a trajectory of the risk, ie is it increasing over time, and at what pace. This focuses more explicitly on temporal dynamics associated with risk and helps implicate the level of urgency associated with the risk perception.

b. What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?

I am not familiar with nuclear sites in particular. My sense would be the siloed nature of work makes it difficult to corroborate risk across the various disciplinary boundaries. In this way each risk worker has a partial understanding but problematically, does not work to map this with other workers' partial understanding to see where particular problems are overlapping.

4. According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?

My view on this is that there is a strong and possibly over reliance on static devices (such as lists of factors to check, series of activities to complete) to assess what is fundamentally a dynamic problem. Judgement is often given low credibility, and safety assumed if 'rules, lists, checks' have been made. Judgement is more difficult to control and assess thus harder to management to trust. Ease of trust the static does not make them correct however.

5. What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?

My thoughts would be that safety needs to be understood in a more multidimensional manner. Safety for whom and safety for what? In contexts such as nuclear industry certain safety dimensions loom large and are so obvious (e.g. explosion) that other and probably very connected dimensions of risk (such as worker fatigue, or geographical incident) are not well connected to overall risk scenario.

6. In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?

I support a multidimensional, and dynamic framework for understanding risk, and safety. It isn't about numbers, but deeply situated and emergent in actual practices and unfolding activities.

Nick OLIVER

Professor of Management at the University of Edinburgh Business School

Nick Oliver is a Professor of Management at the University of Edinburgh Business School, where he also served as Dean from 2007 to 2012.

Nick's research focuses on high-performing organizations. He has conducted research projects on many topics including high-commitment organizations, the management practices of Japanese organizations and their transfer to environments outside of Japan. He has examined the relationship of 'lean' principles to performance, especially in the global automotive industry.

Currently, Nick is researching the characteristics of resilient teams and organizations, i.e. those capable of operating reliably and efficiently in the face of difficult conditions and unexpected events.

Nick has coauthored two books, "The Japanization of British Industry" (1992) and "Crisis, Resilience and Survival: Lessons from the Global Auto Industry" (2016), as well as numerous articles.

Contact: nick.oliver@ed.ac.uk

Nick OLIVIER's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Probably the latter, because it better captures what the leadership is directed towards, what its purpose is. In the former, "safety" could be understood as being about the leadership itself, i.e. "safe leadership" or perhaps risk-averse leadership.

In the UK context "safety" does not carry great associations in many organisations. Many people will think of "Health and Safety" which is usually associated with low level, compliance-type activities.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

The leadership style and activities that support safe, reliable, effective operation, particularly in complex, safety-critical systems.
Keywords: high reliability organising; attention; safety culture; organisational climate; transparency.

3. *Based on your experience and research:*

a. How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?

High situational awareness, born of constant exposure to core activities, that fosters and maintains high (collective) alertness.

b. What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?

Probably complacency and separation between the awareness of risk and the authority to make decisions about it. This is linked to fragmentation, of information, erosion of system-level knowledge etc.

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

My particular area of interest is in HROs and sensemaking, but also in processes that encourage (and impede) speaking up about problems.

The HRO literature says remarkably little about leadership, curiously. Some of Klein's work on naturalistic decision-making is perhaps the most relevant to leadership issues (eg STICC).

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

I find this a hard question to answer and I'm trying to work out why. A lot of the safety literature (which for me is the HRO literature) plays down individual agency because it focuses on systemic or organisational properties. Yet the leadership literature tends to be all about agency, to the neglect of institutional and other forces and constraints. So finding ways to bridge this gap could be important.

6. In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?

More or less the areas mentioned in 2-4, above.

I very much like Syed's "Black-box Thinking" (2015) and also Margaret Heffernan's "Willful Blindness" (2011) and think that both have a lot to offer the field of leadership for safety. Plus the 2015 edition of Weick and Sutcliffe's "Managing the Unexpected" which is rather broader in scope than the earlier editions.

Colin PILBEAM

Reader in Safety Leadership in the Safety and Accident Investigation Centre, Cranfield University

He holds doctorates in both natural and social sciences, respectively from the University of Reading (Agricultural Botany) and University of Bath (Higher Education Management). He has published more than 65 academic journal articles. He is currently co-Vice Chair Special Interest Groups in the British Academy of Management.

He has secured research funding from the Institution of Occupational Safety and Health (IOSH) to investigate (i) safety leadership in service organisations, and (ii) the impact of outsourcing on the management of organisational safety management. Through his safety research he seeks to co-produce knowledge in partnership with national and international companies including K+N, Siemens, GSK and Home Retail Group (formerly the parent company of Argos and Homebase). He has regularly presented this work at the IOSH annual conference and at WOSNet Conferences since 2014.

He has worked with Prof Denyer on the management of change following serious incidents / extreme events. A series of research-based case studies in fire and rescue, acute NHS hospital trusts, oil and gas, and nuclear sectors on this topic were published in 2015 by Routledge, "Managing Change in Extreme Contexts".

He is passionate about doctoral education and is currently supervising a number of PhD students. One is investigating whether national cultural differences generate different constructions of safety through a comparison of ground handling operators in airports in the UK and Libya. Another is investigating how crisis management contributes to organisational resilience in airlines.

Contact: colin.pilbeam@cranfield.ac.uk

Colin PILBEAM's answers

1.   *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Leadership for Safety. Construing the activity as "leadership for safety" helps to raise safety to an executive / board level issue or concern, overcoming one of the key concerns of OSH practitioners.

Safety Leadership suffers from inexorable scope creep – everyone is a safety leader. This diminishes conceptual clarity, and limits its usefulness for both practice and research.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Defining safety leadership is problematic for the reasons noted above. It would include the following key words: Anticipatory; proactive; risk-aware; relational

3. Based on your experience and research:

a. How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?

b. What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?

Most of my research has been conducted in low-hazard, service-sector environment, so I make only tentative suggestions. It seems that risk-perception is formed based on (i) formal guidance obtained from legal requirements and other mandatory codes of practice, and (ii) professional experience, including that of similar others. These simply reflect the drivers of isomorphism identified by DiMaggio and Powell.

Perhaps the biggest challenge in these contexts is complacency. Successful past performance is assumed to be a reliable guide to future success. Developing practical ways to deploy the 5 principles of High Reliability Organisations may deal with these risks.

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

Much of the research on safety leadership is a-contextual, and yet leadership occurs within a context. Understanding how and why leaders respond differently to these changing contexts is a vital next step. Establishing common significant factors across contexts might be useful preparation. However, understanding better individual sense-making and collective mindfulness processes might serve to improve safety leadership.

Taking a behavioural view of leadership improving the adaptability of leaders may help them respond more effectively to unexpected changes in a turbulent and inter-connected environment. Alternatively, un-bundling the components of the practices that constitute leadership for safety would help to identify key practices, the circumstances in which they are useful and how they are enacted. These insights may help to improve safety leadership performance.

If one takes a systems perspective on safety, then understanding how leaders can successfully span the boundaries within the system becomes imperative. This requires a characterisation of the nature of the boundary conditions and how they vary, and the most appropriate ways of acting across them.

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

In addition to the comments above, in an interconnected world it seems necessary to adopt a networked view of leadership. How is leadership achieved in and through the connections between people and people and people and things? Transitioning from the conceptualisation of safety leadership as transformational-transactional leadership or leader-member exchange to shared or distributed (pluralistic) forms of leadership may be more relevant to 21st Century organisations and the context they operate in.

In a similar vein, taking a systems view of safety, there is little conceptualisation and investigation of leadership of a system. Much of the existing work operates on the basis of a dyadic exchange, and assumes that wider leadership is comprised of multiple dyadic exchanges. It may be helpful to take a more holistic systemic view to better understand the variability in these exchange throughout the system, and how the system itself influences the leadership exchange.

Safety leadership is universalist in its orientation. It may be worth challenging that assumption. Is safety leadership construed in the same way everywhere? It seems likely that values and beliefs surrounding both safety and leadership vary across cultures. Greater appreciation of this variation may permit the more targeted development of safety leaders with consequent improvements in safety performance.

Empirical studies of safety leadership have focused mainly on the relationship between the front-line worker and their immediate supervisor. Greater emphasis needs to be placed on how more senior figures in organisations lead for safety. Their practices may differ substantially from those on the front-line. The inclusion of individuals distal to the front-line may include the role of regulators in establishing safety within the wider system. This would extend the investigation of safety leadership beyond the sphere of operations into the sphere of regulation.

Alternative methods for investigating safety leadership should be pursued. For example, leader conceptualisations of safety leadership could be investigated using repertory grid techniques. Observations and ethnographic accounts of safety leadership practices might provide rich insights rarely available from the more commonly used surveys.

6. In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?

One of the greatest challenges for safety leaders is the management of paradox: how to perform two (or more) necessary, organisationally important but conflicting activities simultaneously. This is in addition to the points noted above.

Following Weick's statement that "safety is a dynamic non-event", then the management of safety is an on-going dynamic activity that necessarily involved continuous change. Safety events may also be episodic, especially when they go badly. This too will require the management of change. Change management skills would therefore seem relevant for the training of manages in the field of safety leadership.

Nick TURNER

Distinguished Research Chair in Advanced Leadership in the Haskayne School of Business, University of Calgary, Canada and an organizational psychologist

His research advances understanding of the causes of "healthy work". He focuses on how job design and leadership enhance employee mental and physical health, such as the role of supervision in promoting psychological well-being and occupational safety. His overall research program aims to improve work for well-being and effectiveness. He is the outgoing Editor-in-Chief of *Human Relations*.

Contact: nicholas.turner@ucalgary.ca

Nick TURNER's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Leadership for Safety

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Interpersonal behaviours that help to influence change in some goal, in this case safety.

3. *Based on your experience and research:*
   a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

Perceptions of managerial commitment to safety and situational awareness

   b. *What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?*

Figuring out which organization/managerial practices promote perceptions of managerial commitment to safety and situational awareness

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

Leadership behaviors – there are several meta-analyses looking at the predictors of leadership emergence and leadership effectiveness. Behaviors seem to be the biggest predict of both emergence and effectiveness.

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

Understanding what comprises effective leadership training

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?* Transformational leadership (full-range leadership theory)

Dov ZOHAR

Professor at the Faculty of IE & Management at the Technion - Israel Institute of Technology

DOV ZOHAR received his PhD in Industrial-Organizational Psychology at the University of Maryland in 1975. Since then he has been at the Faculty of IE & Management at the Technion - Israel Institute of Technology, where he is now a Full Professor. Dov Zohar published the original paper on Safety Climate in 1980, which defined the concept and offered a measurement scale whose original and newer versions have become the standard in this field. Since then, Dov has conducted numerous research and consulting projects in countries around the globe. His recent work focuses on development of a conceptual model linking organizational culture and climate; testing the incremental effect of industry-specific safety climate scales; new strategies for safety leadership and safety climate improvement; and the effect of sustainability policy-practice gaps (de-coupling) on relevant organizational performance such as employee safety & health, diversity & inclusion, or justice & ethics.

Dov's work has won the Human Factors & Ergonomics Awards for the Outstanding Scientific Contribution in 1981 and 1982; APA/CDC Best Safety Intervention Awards in 2003 and 2013; and the American Psychological Association Lifetime Achievement Award in 2008. He was also elected as Fellow of the Society of Industrial and Organizational Psychology.

Visiting positions held include: Research Associate at the Tavistock Institute (London), Institute for Work and Health (Toronto), Research Institute for Safety (Boston), National Research Center for the Working Environment (Denmark), and Visiting Professorships at the University of Maryland, University of Calgary, University of Nebraska, University of Washington, and University of Southern California.

Contact: dzohar04@gmail.com

Dov ZOHAR's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

   I will recall is as "Leadership for Safety"

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

   Supervisory leaders are responsible for informing employees the kinds of role behavior likely to be supported and rewarded. Namely, they are managerial safety commitment; safety behavior and social status; work pace and safety; safety training; safety behavior and promotions; and ongoing safety hazards.

3. *Based on your experience and research:*
   a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

b. What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?

Organizations such in nuclear sectors certainly form a high-risk organization. The challenges consists of teaching work teams in working in such organizations is to teach them how to work jointly.

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

The key factors are introduction and subsequent introduction of key safety behaviors.

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

There is a multi-level need in identifying more research that affect the development of models by means of studying of antecedents and consequences of such climate.

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?*

b. Nuclear sectors actors

Usama ABDULKADER
Nuclear safety engineer at CEA Cadarache

After studying nuclear physics at Joseph Fourier University in Grenoble, I have been working in the nuclear industry for 10 years now. My first experience was an internship at EDF on the N4 reactor technology. Then I did a one-year apprenticeship at IRSN on the radioactive waste management. After this experience, I worked 3 years as a nuclear safety engineer for a subcontractor in various facilities at the CEA Saclay (liquid radioactive waste treatment facility, LECI, etc.). In 2014, I was hired at CEA Cadarache to be in charge of the periodic safety review of the LEFCA facility (Laboratory for the study and fabrication of advanced fuels containing plutonium and actinide compounds). Since 2018, I have been working as a nuclear safety engineer on the JHR material testing reactor, working in particular on the design of the experimental devices. I also have experience in nuclear security having been in charge of the nuclear materials management of the LEFCA facility. In addition to my duties, I am currently doing an executive MBA at the IAE in Aix en Provence and I am member of the French Nuclear Energy Society (SFEN).

Contact: Usama.ABDULKADER@cea.fr

Usema ABDULKADER's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Leadership for safety.

2. **How would you define** *safety leadership/leadership for safety*? **Could you please provide a few key words most characteristic of your definition?**

Mindset and soft skills that foster safety culture and keep the people committed

3. *According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?*

The ageing of the facilities. I think that the situation worsen as there are not enough new projects to replace the ageing facilities and keep the industry attractive for the new generation.

4. *What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?*

Training and communication. I think that the accidents that happened are not enough recalled and studied.

5. *What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?*

To my knowledge managers have trainings on leadership but not leadership for safety in managerial practice

6. *What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?*

A specific training on leadership for safety would be an interesting idea. I had the chance to attend the pilot school on leadership and management for safety organised by the IAEA and that was an enriching experience.

7. *What elements should an ideal training program for early to middle career managers with safety responsibilities include?*

Leadership course, communication, cognitive biases, case studies of famous accidents (nuclear or other industries) with a leadership approach

8. *When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?* Yes

9. *When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?*

Yes but I think that my organization need to take better account of the importance of leadership for safety

Hubert DRUENNE

Chief Engineer, Nuclear Processes department, ENGIE/Tractebel

Hubert is graduated from the Faculté Polytechnique de Mons in Mechanical Engineering; he has over 35 years' experience in various nuclear fuel disciplines covering fuel rod design, safety assessment, in-core fuel management and fuel cycle strategy. Has driven various feasibility studies for the Belgian plants (power uprate, burnup extension, MOX introduction) and has been involved in power uprate studies, and has been involved in several nuclear new build projects and analyses of fuel cycle management strategies for ENGIE Group.

He is currently in charge in support to the South African Electric company ESKOM for the review of the safety analyses performed by a Vendor and for the elaboration and the justification in front of the NNR (South Africa National Nuclear Regulator) of the introduction of a Third vendor in this reference frame.

He has authored of several technical publications related to fuel cycle strategies (open and closed cycle including MOX and enriched reprocessed U recycling).

He draws on his in-depth knowledge as lecturer at the University of Liège in the frame of the Belgian Nuclear high Education Network (BNEN an interuniversity master after master in Nuclear science) : Fuel Cycle from ore to waste.

Hubert is Invited Professor at the University of Ghent (Nuclear reactor technology at U-Gent and Safety of nuclear power plants at the BNEN). Lectures at the ISIB (Superior Institute for Engineering of Brussels) and formerly at the Universidad International Menedez Pelayo (Spain). Technical supervisor of the ENGIE Nuclear trainees program and trainer for several courses in this program..

Contact: hubert.druenne@tractebel.engie.com

Answers of the entities of ENGIE involved in nuclear activities

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*
A. For me the second expression (leadership for safety) is the most clear; the goal of leadership is to ensure safety of the personnel, the environment and the technical installation
B. I am not English-speaking. But "Leadership for Safety" seems to me to be more correct within the framework of this training.
C. Leadership for safety. Leadership to inspire safety
D. E. and F. "Leadership For Safety"

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*
A. It is a way of living "sacred way" of everybody in the nuclear industry to ensure that nuclear safety is maintained at a high level in your own activities, of the activities of your co-workers, colleagues and even all others that perform activities that can have an impact on nuclear safety. A way of living, knowledge is key, respectful work environment, safety communication
B. Leadership for Safety is more about using the leadership for safety purpose, safety culture, and therefore using leadership skills to build a strong safety culture. Safety leadership

gives me the notion of trivializing safety like any other area for which leadership is necessary.

C. Behave respecting nuclear safety as an overriding priority, inspires safety in teams. Be an example

D. Développer et promouvoir la maîtrise de la sûreté et exigences associées par :

- Le déploiement d'une organisation capable d'identifier et résoudre les problèmes en matière de sûreté ainsi que d'une organisation apprenante (REX…)
- L'adoption en permanence, à l'échelle de l'individu d'une attitude interrogative, d'une démarche rigoureuse et prudente et d'une communication efficace,
- D'un point de vue technique, la non-agression et le maintien de la qualification des matériels important pour la sûreté (EIP : Elément Important pour la Protection en France).

E. Exemplarity, Foster, doing what I'm saying, showing my commitment

F. The company shows leadership from the highest level, as evidenced by the statement and actions that no compromises are made in the area of safety. It is also demonstrating the capacity to take action, even though it has an impact on the relationship with clients and costs. It is also important to include the opinion of the workers in leadership.

3. *According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?*

A. The main risk for the safe operation is the turnover of the personnel; this way the organisation loses a lot of knowledge that is not easily replaced as the nuclear field is particular with specific risks. The uncertainty of the nuclear industry in Belgium has a huge impact on staffing, combined with the economical/financial pressure within the company makes it very difficult (read impossible) to attract and keep external strong profiles for a long period As for the impact of the nuclear industry on the environment; the rad waste is important aspect of the impact of the nuclear activities, and the "perceived" high risk related to the release of radioactivity into the environment.

B. Again, is it the risks faced by the nuclear industry or the risks that the nuclear industry poses to personnel, the public and the environment? I chose the former.
I see the loss of knowledge and skills, both internally and with our suppliers, as well as the difficulty of still finding equipment that meets the required design and standards.
Suppliers' lack of interest in nuclear power plants is an important factor and the low volume of orders results in very high costs for the specific requirements of nuclear power plants.
Uncertainty about the sustainability of nuclear power generation also makes it difficult to keep qualified personnel in the company or to obtain a commitment from them for the long term.

C. Paper reactor versus real reactor

- Lack of traceability/quality check of references (quick internet search preferred). Use of advanced calculation tools without understanding physical basis (black box)
- Career is seen as made of quick evolutions (risk related to knowledge management)
- Knowledge/Competence management in a country leaving nuclear generation (which career for young people? operators and subcontractors)

D. Nuclear Stakeholder Knowledge and Competence in Nuclear Safety and Safety Culture.
Management of activities→ planning / preparation / definition of resources and means /identification of interfaces
Demonstration/Traceability
Supervision Activities of which subcontracted activities

E. Leaders at every level are not trained as a leader for safety. They are helpless in front of their team when they have to speak about safety

F. Digitisation (human-machine) with all the risks of hacking, wrong decisions, information leaks on social media, inside threats, cybersecurity, thorough training of operators.

4. What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?

A. Classroom training with respect to leadership is in my opinion not a good way to promote a safety culture, learning by doing is the most effective way to be sure that everyone embraces all the safety aspects in their daily activities

B. The Direction and then the management must be impregnated, must integrate the expectations (requirements) of safety and must practice coaching in the field to encourage good practices and correct inadequate attitudes and drive improvements. Be close to people but strong in requirements.

C. Training (including on the job training). Allow human error and learn from it

D. Nuclear safety training/nuclear safety culture + periodic retraining
Hierarchical field visit

E. Independent nuclear safety oversightImportance of the Pre job briefing in particular concerning the impact of the activity with regard to safety and an effective field presence of the leader.

F. Clear and unambiguous policy applying to the entire organization, employee involvement, taking employees seriously into consideration, SMART, rewarding instead of punishment, shows the will to learn from mistakes (no threshold for reporting incidents).

G. Additional discussions:
   - Booklets and advertising campaigns are visible and give the impression of performing a very good job, but it is not sufficient and sometime not efficient at all
   - Coaching on the field is considered as the best practice
   - No blame culture
   - INSO : independent safety oversight

5. What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?

A. There is a manager in the field program, but the expectations with respect to the analysis and reporting of the observations are extremely low, so the impact of the In the field program is low An leadership training for 4 days is giving to people managers explaining the 4-colors of behaviour; this is in my opinion not a very effective way of training.

B. Leadership trainings that lead to an understanding of the different thought patterns and different ways of reacting, acting as a group of people and application to the manager's team.
Field coaching with the help of a referent to accompany managers in their leadership development.
A requirement for field coaching of the people in his team: to understand the problems encountered, to encourage good practices and to improve attitudes when inappropriate.
A network of managers for exchanging practices was suggested.

C. See above. Root Cause Analysis with no blame approach, presentation in all team.
Nuclear safety as a topic in each management meeting

D. Nuclear safety training/nuclear safety culture + periodic retraining
Hierarchical field visit
Independent nuclear safety oversight
Safety reporting to executive board

E. We've launched an activity based on a safety self-evaluation quiz for managers

F. All managers follow at least the Safety training course for Operational managers. The Aware Safe Management training is also being introduced at ENGIE Services Netherlands. Integrity coaches are trained, since safety is also an integrity issue. ENGIE is VCA certified and in 2020 the company will stand up for the Safety Culture Ladder

G. Additional discussion:

- Leadership is very often pointed out as the mean weakness in the NPP
- Nuclear safety should be the first subject of any management meetings; which is often not the case yet in the support entities

6. *What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?*

A. Implementation of an effective in the field program which incorporates a formal reporting and analysis of these reports to proactively observe trends that can have a negative impact on Safety

B. Integrate the requirements of a Safety culture among managers and continue to develop coaching and skills to address discrepancies

C. Select and appoint managers on the basis of their nuclear safety culture

D. Integration of safety objectives and KPIs and safety culture for all managers in charge of nuclear activities and their application in the line of hierarchy

E. I think a specific training about how to lead safety, how to raise safety awareness in your team

F. Make agreements in word and deed about performing work in the nuclear sector (time, quality, capacity). Implementing a REX process (if there is not yet) to learn from each other within the sector. Organizing exchanges to look at each other and learn from it.

G. Additional discussion: Coaching on the field clearly appears as the best way to improve the safety culture => need for the manager to know how to proceed!!

7. *What elements should an ideal training program for early to middle career managers with safety responsibilities include?*

A. Active case studies, teachers testing the students also out of the classroom demonstrates unwanted behaviours (eg housekeeping) and analyse the reactions of the students.

B. Multiple exercises of scenarios of detection, to reveal adequate or not adequate practices and exercises of coaching of people, teams sometimes facing correct practices, sometimes presenting deviations. To develop the ability to observe and evaluate facts and the risks they entail.

C. Discuss and solve case studies. Possible input : INPO training

D. Les principes de la sûreté nucléaire et de la culture de la sûreté nucléaire
The issues at stakes vis-à-vis the operator, the nuclear safety authority, the population and the environment
Control of nuclear safety through systematic demonstration (traceability, communication) of the activities important for safety (or for protection in France, cf AIP)

E. What is safety how to reveal it (because it's completely abstract),how to raise safety awareness in your team , Decision making based on safety

F. Definition of "safety" is different for everyone, so clearly state what we mean by working safely. The importance of achievable goals (consider the impact it has on the people who need to implement it). Approaching safety positively: rewarding safe behavior is better than punishing unsafe behavior. Learning how to address unsafe behavior. Promoting "contradiction" (encouraging employees to speak up if they disagree with something).

8. *When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?*

A. WANO guidelines, NRC Regulatorie guides, WENRA reference levels, ...

B. Yes, but we often refer to other publicatio: WANO guidelines, codes used in the design (10 CFR 50, ASME, …) at WENRA reference levels, guides of the NRC, …

C. Yes (but also WENRA, WANO guidelines, …)

D. Standard issued by the French Nuclear Authority www.asn.fr : publication of safety significant event with the level ≥ 1 on the INES scale

WANO

IAEA standards are appropriate as they provide guidance (in the form of general safety requirements) in terms of leadership and safety management (GSR Part 2).

E. Yes INSAG 4 but also NSC-INPO 12 Traits of a Healthy Nuclear Safety Culture

F. Yes, if there are any, it appears that they are already embedded in existing regulations.

G. Additional discussion:
- good to know: WANO is about to publish a new version of the guideline for leadership for safety
- a digest of the main standards should be given for the manager to know what and where to find info

9. ***When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?***

A. To take the roll of a person with an impact on safety, a degree doesn't show the real behaviour, specific for safety oversight functions, the observation of an good safety culture in practice during activities is needed.

B. Safety and leadership for safety goes beyond theoretical knowledge. The integration of the theoretical knowledge, attitudes and appropriate practices developed are important..

C. Possibly, but as one of the selection criteria.

D. In the context of a career in the nuclear sector, it is indeed fundamental that this aspect be addressed as early as possible in the higher education curriculum in order to grasp the stakes as soon as possible both from a technical, organisational and human point of view (demonstration of safety, identification of Important elements and activities for protection and associated defined requirements (technical control, verification, monitoring), control of subcontracted activities)

E. I Think so !

F. Yes, now academic graduates have a lot of knowledge of technology and management, but not of safety. This would be an appreciated complement, not only for academically educated people, but also for HBO-ers.

G. Additional discussion: of course it is a good point, but the nuclear power plants also have the legal obligation to organize his own education program (detailed in the SAR)

Karolina JANATKOVA

Consultant for the Instrument for the Nuclear Safety Cooperation of the European Commission

Karolina Janatkova is an expert in international relations with focus on security and nuclear safety. She is currently working as Consultant for the Instrument for the Nuclear Safety Cooperation of the European Commission. The Instrument aims at supporting the promotion of a high level of nuclear safety, radiation protection, the safe management of radioactive waste and spent fuel including the environmental remediation of former nuclear sites and the application of efficient and effective safeguards of nuclear material in non-EU countries, worldwide.

Previously, she was working as Inspector for Nuclear Non-Proliferation at the State Office for Nuclear Safety of the Czech Republic, where she liaised with partners on security and defence matters, performed Safeguards Inspections and exercises together with Euratom and the IAEA inspectors, and maintained national Nuclear Material Accountancy with regard to security and hybrid threats.

She has an academic background in International Relations, International Security and Crisis Management. Besides the State Office for Nuclear Safety, she has working experience from the Embassy of the Czech Republic in Vienna, and the Ministry of Interior of the Czech Republic.

Contact: karolina.janatkova@gmail.com

Karolina JANATKOVA's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*
   - Safety Leadership

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*
   - training staff in safety culture and leadership
   - empowering the managers
   - decision-making
   - capacity building in leadership
   - influencing the decision-maker/leader

3. *According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?*
   - unprecedented events
   - lack of training
   - staff retention
   - experts retire -> loss of expertise
   - conflict between individuals, tensions in the team

4. **What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?**
   - cooperation between NRAs and operators when preparing technical training of staff
   - well prepared national training plans
   - motivation of staff through extra training, promotion

5. **What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?**
   - courses for managers are organized on the state level through training for different ministries, and offices of Czech Republic
   - those trainings are not related to safety leadership

6. **What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?**
   - build an international and multidisciplinary network
   - support a creation of an online-platform with study materials
   - promote participation in tutoring

7. **What elements should an ideal training program for early to middle career managers with safety responsibilities include?**
   - case studies with best practices
   - courses on public and crisis communication
   - course on problem-solving
   - course on employee-engagement, empowerment and work delegation
   - course on emotional intelligence and empathy

8. **When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?**
   - yes, IAEA has many excellent publications

9. **When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?**
   - yes, any type of education related to safety or security is considered to be a significant asset
   - most of our young university graduates are coming from law, international relations, security or energy studies background
   - we don't have that many nuclear physicists or engineers anymore

François JEFFROY

Head of the IRSN Social Sciences and Humanities Laboratory, IRSN (France)

François JEFFROY, PhD in Ergonomics (1987). After working in the French computer company Bull in the domain of software ergonomics, I joined IRSN in 1993.

I was first involved in the safety assessment of the first French computerized control-room (N4 power plant) and then in the assessment fuel cycle an nuclear research installations.

I became head of the IRSN Human Factors department in 2003 and head of the IRSN Social Sciences and Humanities Laboratory in 2012. The LSHS researches are related to three main domains: 1) operation of nuclear plant in normal situation, 2) Crisis management covering emergency and post-accidental situations, 3) regulation of nuclear safety. The laboratory staffing is 6 researchers and 6 PhD students (ergonomics, sociology, management sciences).

Contact: francois.jeffroy@irsn.fr

François JEFFROY's answers

1. *Which expression most accurately describes the theme of the ELSE project: « Safety Leadership », or « Leadership for Safety »?*

Leadership for safety, because I don't think there is a specific form of leadership linked to safety

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Safety leadership: the leadership specifically dedicated to safety.
Leadership for safety: it is the use of leadership in order to improve the safety. Leadership is a mean to influence the behavior of people in order to develop safety, in addition to other devices like: organisation, training, tools, etc.

3. *According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?*

Risk of over-proceduralization and over-regulation, risk of loss of expertise linked to lack of attraction, risk of fragmentation of organisations with subcontracting, risk of over-complexification of the socio-technical systems.

4. *What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?*

Multidisciplinary approach of problems, stakeholders' involvement, field studies, combination of "rule based safety" and "adaptive safety".

5. *What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?*

This concept is not integrated in our safety standards.

6. *What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?*

Analyse what kind of leadership or "management style" is promoted by the organisation, understand what kind of socio-technical devices have a positive influence on leadership for safety, identify the different forms of leadership.

7. *What elements should an ideal training program for early to middle career managers with safety responsibilities include?*

Element 1: highlight the different points of view that different actors have on a specific situation,
Element 2: integrate the constraints of real work situations
Element3: highlight the different types of leadership and their relations to different positions in the organisation.

8. *When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?*

Don't know.

9. *When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?*

I think the experience of the ICSI Executive Master on Safety management could help to answer this question.

Valérie LAGRANGE

Safety management & Human Factor Expert at the Corporate level of the French nuclear fleet, EDF, Operation Division

Strategic support for the development of safety management & HF approaches.
Advisor of NPP direction teams & projects manager in the domain.
Experience of international missions for IAEA and WANO.
Previously, in charge of the HF group of EDF research & development centre
Ergonomics PhD as background

Contact: valerie.lagrange@edf.fr

Valérie LAGRANGE's answers

1. **Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?**

For me, it concerns clearly "Leadership for safety". It is matter of Leadership in order to assure safety.

2. **How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?**

Leadership for safety includes values that will guide attitudes, individual and collective behaviours at each level of management, for everybody. It doesn't concern only top level of management, even if they have a crucial role to assure safety.

3. **According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?**

The socio-technical risks concern 3 main domains: positivism and lack of doubt (consecutively, lack of consideration of the human & organizational dimensions) of engineering units, productive pressures & major focus on real time, complication (link to regulations, but also due to the development of prescribed practices). These risks are more & more important, in particular because they reinforce each other.

4. **What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety? In order to improve safety culture**

Improving safety culture requires sharing a common model of the safety of man-machine system; a model in which man has a leading role, and not only to recover in case of malfunction of technical systems. It must also be assumed that safety culture must be developed at every level of the organization, but with a crucial role for high-level managers, leaders, who must put in place the conditions suitable for this development. Consequently, safety culture can only be developed in close connection with the choice and training of managers. Notable values to be translated into

actions, behaviours... are essential: listening to the field, transparency and reporting of difficulties, use of feedback, acknowledgement and cooperation.

5. *What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?*

Different types of actions are carried out which belong to the following main categories:

- a guide, based on the Fleet's experience, presents the principles and practices expected in terms of safety management at different levels (management, department, team),
- A training course is associated with this guide, but also a self-positioning which should allow each manager to question his practices at least every 2 years, but also to allow collectives of managers to debate together,
- a multi-annual safety culture roadmap is to be drawn up by each site; it is challenged annually by the national level; it covers all the actions to be carried out, with three pillars of change management: training, questioning/acting, talking safety regularly.
- A safety culture "feedback" - based on a questionnaire on the perception of safety, but also on observations, individual interviews and focus groups - carried out at the demand of site management, which leads a share in the management team, between department managers and, of course, within the teams.
- Approaches and tools on the different areas of safety culture: decision-making, field activities, feedback, etc.
- Experts in charge of accompanying the process and supporting managers

6. *What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?*

It would be necessary to develop the competence of nuclear organisations (WANO, IAEA, NEA, ...) in the domain, in particular by acquiring experts and developing partnerships with academics.

7. *What elements should an ideal training program for early to middle career managers with safety responsibilities include?*

In order to be effective, it should be possible to train managers over several periods allowing for concrete/real learning, with acquisition and integration of theoretical knowledge, sequences to acquire practices, but also support in a time of implementation in the field of the managers.

8. *When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?*

Of course, the INSAGs, like some tech docs, are essential references (n° 1329, series 11, ...).

9. *When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?*

Yes, but unfortunately, almost exclusively if it is for a job in safety domain.

Maria J. MORACHO RAMIREZ

Senior Nuclear Safety Officer, IAEA

Ms Moracho holds a Licentiate degree in physics and a master's degree in nuclear engineering. She has 26 years of professional experience in the nuclear field, including regulatory work in Probabilistic Safety Assessment, Human and Organizational Factors, Safety Culture and Operational Experience Feedback. She was the Manager Director for one year of a joint research project between the Spanish Regulator and the Spanish utilities Association (UNESA) and participated in the Nuclear Energy Agency/Committee on the Safety of Nuclear Installations (NEA/CSNI). As a guest scientist at the OECD/Nuclear Energy Agency/Halden Reactor Project, she conducted 2 years of Research and Development in Human Factors in Halden, Norway. She worked for 4 years as Detached National Expert at the European Commission in Brussels, Belgium and for 3 years in the Western European Nuclear Regulatory Authorities in the Reactor Harmonization Working Group (WENRA/RHWG).

In 2006 she joined IAEA as a nuclear safety training coordinator and in 2016, she joined the Program and Strategy Coordination Section of the IAEA Nuclear Safety and Security Department, where she initiated and led the development of the concept for the IAEA International School of Nuclear and Radiological Leadership for Safety.

Ms. Moracho has published 2 papers on simulator-based studies in human factors, a joint paper in BWR (Boiling Water Reactors) and is a contributing author to the book: "Infrastructure and Methodologies for the Justification of the First Nuclear Energy Program", Woodhead Publishing, 2012, in the area of training and leadership.

Contact: M.Moracho.Ramirez@iaea.org

Maria J. MORACHO RAMIREZ' answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Probably Leadership for Safety

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Competences, soft skills and leadership attributes that prioritize safety and security in nuclear and radiological applications

3. *According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?*

Aging of existing reactors, lack of safety infrastructure for countries developing its first nuclear programme or reactor, increased use of radioactive sources, security of radioactive sources and cyber security, waste management and long term storage, regulatory effectiveness and communication with interested parties. Please also refer to the 2019 IAEA Nuclear Safety Review https://www.iaea.org/sites/default/files/gc/gc63-inf3.pdf

4. *What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?*

Adequate integrated management systems that promote learning organisations, leadership that creates a culture for safety and ensures the three elements: priority of safety, questioning attitude and continuous improvement

5. *What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?*

The IAEA has a comprehensive programme on leadership for safety, safety and security culture. It provides support for self-assessment, capacity building and training, as well as safety standards and security guidance. It promulgates international adherence to legally binding instruments and provides for peer reviews and advisory services.

6. *What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?*

To conduct rigorous self-assessments, benchmarking, training to fill the gaps and implement sound leadership for safety programmes at all levels, ensuring the priority of safety over production.

7. *What elements should an ideal training program for early to middle career managers with safety responsibilities include?*

A sound and document programme, including resources for self-study, access to literature and the IAEA safety standards, experiential learning activities, mentoring and coaching, follow up and periodic assessment.

8. *When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?*

The IAEA safety standards follow a rigorous production process in cooperation with the IAEA Member States, they represent an international consensus on safety and are the reference for Peer Review and Safety Conventions. They are supported by a comprehensive suite of guidance and technical documents containing the best of the state of the art in the various safety areas. They are used as the basis for the IAEA training activities.

9. *When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?*

It should be.

Vincent NYS

Federal Agency for Nuclear Control (Belgium)
WENRA

Federal Agency for Nuclear Control (Belgium) working at FANC since 2007

Master's Degree (Advanced Degree) Engineer in Nuclear Physicist (ULB) 1979 - 1984
Mathematics bachelor (LLN)   1985 – 1986
History of Art and Archaeology: Bachelor (ULB) in 2019 and on-going Master 2014 -2019
AFCN/FANC - Safety senior expert, Project Management Officer & Strategic Plan officer since 2013
AFCN/FANC - Head of section - Safeguards and Physical protection   2012 – 2013
AFCN/FANC - Project Leader of Near Surface Disposal Facilities   2007 - 2011
-           Elaboration and implementation of strategic regulatory plan
As senior expert, I actively contribute and supervise the elaboration and the follow-up of the 10 years FANC strategic plan, the 3-years and 1-year operational plan (methodology, approbation process, follow-up). This implies also the identification and the measurement of the KPI for the strategic, three years and annual FANC operational plans.
-           Management System based on IAEA GSR Part 2 and old IAEA GSR-3
As management system coordinator of the "FANC Management System", I'm in charge of the development, the implementation and the follow-up of the FANC management system. FANC management System is structured around 15 policies covering all FANC legal missions.
-           Radioactive Waste disposal facilities
Having a strong regulatory experience in the field of radioactive waste management and, safety analysis for disposal Facilities and in developing specific regulations in line with licensing process for disposal facilities. I also have some in-depth experiences in the reviewing of safety Case.
-           Project manager Officer
I supervise all FANC strategical projects as Project Manager Officer. Regular feedbacks and KPI are discussed with the Board of Directors.
-           Review and Assessment of Nuclear Power Plan
Since more than 10 years (Bel V), I worked as safety expert reviewing and assessing fuel core reload and safety analysis of nuclear power plan.

Contact: vincent.nys@fanc.fgov.be

Vincent NYS' answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

As Safety supersedes any other considerations such as economical consideration, I have some preferences for "Leadership for Safety" expression. "Safety leadership" expression seems to suggest that other leaderships exist and they are equivalent, at the same level of importance as Safety

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

"Leadership for Safety" could be defined as a continuous questioning attitude regarding safety, open mind set that maintains dialogue in any circumstances and managing by example.

3. *According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?*

To be blind with the accumulation of small minor changes. Years after years small evolutions mask the progressive loss of margins regarding safety.

In a phase-out context, human behaviour and organisational decisions are of great importance. Phase-out means a loss of awareness regarding safety. Why should we continue to train and to invest in knowledge if in a short period of time (2 or 3 years) the facility will be closed?

4. What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?

Managing by example from the hierarchy, still continuing to invest in human skills and competences, promoting group discussions and dialogue, encouraging self-responsibilities and autonomy, having clear operational target, having a clear decision process and implementing the decision.

5. What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?

Open culture for discussions and exchanges and no competition between experts promote exchanges, discussions and dialogue. Appropriate safety approach regarding the different tasks. Each process has its own RACI table where the responsibilities are clearly identified. As regulators, regulations are only a starting point for safety not the end-point

6. What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?

- To promote intern mobility such that the expertise panel of the experts is enlarged.
- To develop more systematically groups debriefing of incidents looking at all aspects not only the most obvious one.

7. What elements should an ideal training program for early to middle career managers with safety responsibilities include?

An ideal training program should obviously contain academical, technical and operational training but should also give quite great importance to soft skills.
Regular coaching with an individual senior expert mentor should be developed where positive feedbacks and regular new objectives should be set.

8. When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?

Of course, IAEA publications should be considered as basis documents. Complementary to IAEA publications, experiences feedbacks should be provided. IAEA publications are needed but should not be considered as sufficient.

9. When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?

Certainly, it would help a lot in term of safety culture.

Cyril PINEL

Director of International Affairs of the Institute for Radiation Protection and Nuclear Safety (IRSN).

He has succeeded Marc-Gérard Albert since January 2- 2018.

Prior to this assignment, Cyril Pinel was since September 2014 Nuclear Advisor at the French Embassy in London, in charge of Northern Europe, the United Kingdom and Finland in particular. Born in 1965 and a lawyer by trade, Cyril Pinel became in 1998, after a few years with the Atomic Energy Commission (CEA) in Paris, France, the Nuclear Attaché at the Permanent Mission of France to the United Nations Office (IAEA) and other International Organizations in Vienna, Austria. He was in charge of the relations with the I.A.E.A. for issues relating to non-proliferation, safeguards and nuclear safety.

From 2002 to 2005 he was appointed Nuclear Counselor at the French Permanent Representation to the European Union, in Brussels, Belgium. He was the French Representative to the Atomic Questions Group (AQG) and the Joint Research and Atomic Questions Group at the Council of the European Union.

From 2006 to 2009, he is the Director for International Relations at the French Nuclear Safety Authority.

From 2009 to 2011, he was Special Adviser on Nuclear Affairs to the General Director for Globalization at the French Ministry of Foreign Affairs.

From 2011 to 2014, he joined the French Embassy in Washington DC as Nuclear Advisor for the United States and Canada.

Contact: cyril.pinel@irsn.fr

Cyril PINEL's answers

> **10. Which expression most accurately describes the theme of the ELSE project: « Safety Leadership », or « Leadership for Safety »?**

> **11. How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?**

The key words who are most characteristic of my definition of safety leadership/leadership for safety are « decision making process », « safety culture » and « prime responsibility for safety».

> **12. According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?**

The main socio-technical risks are the credibility and the legitimacy of experts. The trend of evolution are the expertise and science.

> **13. What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?**

A transparent and clear government policy and a communication strategy towards the public.

14. What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?

A strong transparent strategy at top management level and a renewed organization.

15. What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?

There should be a systematic safety message at the beginning of each meeting.

16. What elements should an ideal training program for early to middle career managers with safety responsibilities include?

It should be possible to share international practices with these managers.

17. When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?

I consider it relevant.

18. When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?

Yes.

Dounia TAZI

Operations director of Icsi Institute for an industrial safety culture

Dounia Tazi hold a PhD in Chemical Engineering, and since 2005 has specialised in human and organisational factors, safety leadership and safety culture in international industrial groups and their sub-contractors.

She currently supports various executive committees in the implementation and monitoring of safety culture programs and safety leadership programs internationally.

Since 2019, she is the operations director of Icsi Institute for an industrial safety culture.

Contact: Dounia.Tazi@icsi-eu.org

Dounia TAZI's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*
   Safety leadership

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*
   Inspire, intrinsic values, influence, safe behaviour
   Safety leadership is the ability of a person to influence behaviour so that it becomes safer.

3. *According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?*

   Sociotechnical systems that have been designed to fulfil regulations constraints but not taking enough into account real activities. Managers that feel uncomfortable in the field

   Sociotechnical systems that work well in nominal - as per designed situations, but are not resilient to unexpected situations. These risks are growing.

4. *What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?*
   Work on these principles/expectations of a safety leader:

1. Create the safety vision: give meaning to safety policies
2. Share the safety vision: create employee buy-in and involvement
3. Be credible: align safety practices and speeches
4. Give safety its rightful place in decision making & trade-offs: create a technical and organizational environment that encourage safety attitudes & practices
5. Be present on the field: Articulate management requirements and the reality of the field
6. Foster team spirit and transversality: Develop shared vigilance in and between teams

7. Recognize good practice and apply a fair sanction: establish a fair culture and a climate of trust

5. ***What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?***
Safety leadership programs, including training, coaching, workshops beginning from the top management to the first line managers

6. ***What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?***
Make it real, sustainable, more based on emotional commitment and not a program to comply with

7. ***What elements should an ideal training program for early to middle career managers with safety responsibilities include?***

8.

Based on emotional intelligence, with simple principles and sustainable practices. Example a safety leader is not someone who say safety first but someone that take into account the safety impacts of each of his decisions.

9. ***When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?***
Yes, but the goal is not to have a program which aims at complying with IAEA publications or regulations.

10. ***When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?***

For sure it has to be, but the organization has also to include theses aspects on its integration pathway to make the principles/concepts of safety leadership aligned with the organisation culture.

c. Scientific directors of university programs on safety and risk management interested in safety leadership training

Marek CALA

Professor at the Department of Geomechanics, Civil Engineering & Geotechnics Faculty of Mining & Geoengineering; AGH University of Science & Technology, Cracow, Poland.

Contact: cala@agh.edu.pl

Publications:

➢ Over 140 scientific papers (journal publications, book chapters, conference papers); Publications in such journals as: Archives of Mining Sciences; Studia Geotechnica et Mechanica; Rock Mechanics and Rock Engineering; Engineering Geology, 9 books;
➢ Over 300 consulting works for the mining and civil engineering industry (Poland, Norway, Vietnam, Sierra Leone, Chile)

Academic & professional appointments:

2015 Full professor of mining engineering and underground construction.
2010 AGH UST Professor of Mining Engineering, Specialization: Geomechanics, Special Construction & Geotechnical Engineering
2008 Doctor of Science in Technical Science, Mining Engineering and Engineering Geology. Thesis title: "Numerical methods in slope stability engineering".
1997 Ph.D. (with honours). Thesis: "Rock bolting design in the light of rock geology and properties".
1992 M.Sc. Thesis: "The improvement of opening stability due to rock bolting".
Membership & Functions
2016 – now Chairman of the International Organizing Committee of World Mining Congress
2016 Dean of Faculty of Mining & Geoengineering, AGH UST.
2010- now Member of World Mining Congress International Organising Committee.
2008-now Vice-Dean of Faculty of Mining & Geoengineering for Science, Finances & Development, AGH UST.
1999-now Member of International Association of Soil Mechanics & Geotechnical Engineering & Section of Rock Mechanics, Committee of Mining, Polish Academy of Science.
1994-now Member of International Society of Rock Mechanics.

Main research fields:

➢ Solving geomechanical and geotechnical problems utilising numerical methods (FDM and FEM).
➢ Stability of underground excavations and tunnels.
➢ Interaction of various supports and reinforcement with rock mass during underground mining and tunnelling.
➢ Application of numerical methods in slope stability engineering.
➢ Seismic events and rock burst hazard in underground mining.
➢ Remediation, reclamation and revitalisation of brownfields and post-mining areas.

AGH University of Science and Technology (AGH UST) is one of the best and most renowned modern Polish universities. For many years it has been ranked in the top of the list of institutions of higher education. AGH UST is a leading Polish university in modern technologies, and belongs to a group of prestigious international educational centres. Currently about 30 000 students are enrolled in undergraduate, graduate and PhD programs offered by AGH UST. About 2000 scientist and lecturers are hosted in 16 faculties and 2 research centres. Researches and students are utilising more than 600 laboratories.

International cooperation plays a very important role in academic research. The AGH University of Science and Technology has signed over 400 direct collaboration agreements with foreign partners in Europe, North and South America, and Asia. They aim at multidimensional cooperation in the fields of education and academic research. Each year, in collaboration with foreign partners, the university conducts approximately 200 research projects. International collaboration is treated as one of the most important elements of the educational and academic development of the university, as well as the maintenance and enhancement of its international prestige. In addition, AGH UST is a member of many international organisations. As a university of practical character, AGH UST has always focused on collaboration with business and industry. It has signed partnership agreements with approximately 300 industrial plants, including large international corporations.

The Faculty of Mining and Geoengineering (Faculty of Mining until 2002) is the oldest faculty of the university established by Józef Piłsudski in 1919. At present, the faculty staff actively work on the reclamation of mining land, solve the problems of economics, organization and management in mining, as well as deal with water, gas, and heat hazards. The faculty actively collaborates with industry by exporting Polish know-how to nearly all countries. The faculty participates in carrying out general agreements signed with numerous institutions in Poland and abroad (R&D collaboration, the improvement of laboratories, students' practical training, and the mutual employment policy of university graduates).

The teaching of **occupational health and safety** occupies a special place within the educational activities at the Faculty of Mining and Geoengineering of the AGH University of Science and Technology. The process of educating students about work safety regulations is carried out within subjects (modules) which encompass different kinds of hazards within both the work environment and the natural environment, connected to the course being completed by the student, as well as the area of their expected employment upon finishing University. The particular impact is placed on the subject of work safety regulations being covered as soon as during the course of 1st degree studies (engineering studies). Considering the fact that a graduate of these studies will undertake work, in which they will have to face the issue of work safety regulations, it is key that graduates, who go on to be employed in managerial positions, have a direct influence over the shaping of safety management in the companies that they manage.

The way that the teaching of the subject of work safety regulations is presented to students is a mix of the following: lectures, laboratory classes, project classes, and meetings with specialists in the field of work safety. The practical classes are the most popular, as they allow the students to verify the usability of the knowledge that they have already acquired, as well as gain new skills, while improving their existing ones. These classes are an integral part of the teaching process, which results in a skilled workforce (i.e. miners and builders), ready to work in fields filled with significant occupational hazards.

The graduates of the Faculty of Mining and Geoengineering - due to the characteristics of their future employment (providing services in the face of many hazards, including natural hazards, providing help to people injured in the course of employment) – require an especially throughout preparation in terms of knowledge, skills, and vocational basics. Interacting with practitioners and

specialists in the field creates great development opportunities, as well as to profile the employment opportunities and competencies of the future graduates.

In the academic year of 2015/16, within the course of Management and Production Engineering (2nd degree Master's studies), at the Faculty of Mining and Geoengineering, the specialisation of Management of Work Safety was first introduced. The introduction of this offer of education was due to the demand, as expressed by production and service companies, who had clearly indicated the need for specialists (inspectors), who possess the knowledge, competencies, and skills in the field of work safety, as well as the need for the graduates of 1st degree studies to possess these skills. The specialisation's programme includes subjects such as: Work Protection Law, Ergonomics, Hazardous, Damaging and Disruptive Factors, Workplace Accidents, Occupational Disease, Assessment of the Workplace Risks, Work Safety Management in Companies, Material Work Environment, Managing Rescue Missions, Occupational Psychology, and Methodology and Conduction of Training.

The innovative programme of teaching within this specialisation considers the current trends of the labour market both in Poland and in Europe. It allows the graduates to live up to their employers' needs and expectations, in the face of changing job conditions, the emergent of new threats, and law requirements. A student graduating upon the completion of the specialisation of Management of Work Safety can take up employment at any company, working within the field of work safety. Upon the completion of relevant internships and apprenticeships, they will also be able to be employed on managerial positions within the field, in accordance with the law.

The great interest that the students of the Faculty of Mining and Geoengineering are expressing in the field of Work Safety results in many of them basing their theses around Work Safety. For example, some theses in the past have been based around the recognition and analysis of occupational hazards, accidents in the work place, occupational illnesses in mining, as well as the measured of individual protection and prevention regarding natural hazards.

Thanks to the cooperation with the Labour Inspectorate, students of the 2nd degree studies in the last semester of their degree have an opportunity to participate in training courses, which cover the topics regarding i.e. kinds of contracts, time of work, and fair compensation. The aim of the training courses is for the soon-to-be graduates to be familiarised with labour law by experts in the field, prior to the students entering the workforce.

The Polish law requires Work Safety inspectors and specialists to have higher education or have completed postgraduate studies in the field of Work Safety. In line with this, in 1998, The Faculty of Mining and Geoengineering has created the opportunity for students to study the field of Work Safety at a postgraduate level. As of 2018, this course has been completed by over 2,000 students. Postgraduate courses are carried out in the form of courses: general, mining (dedicated to the employees of companies which have to adhere to geological and mining law), and civil engineering (meant for the future coordinators of Work Safety who work in the construction sector).The conference, titled "Work Safety – education and good practices" is aimed at scientists and Work Safety practitioners. It will be a great occasion to exchange scientific achievements and experiences between scientists and specialists working in the field of Work Safety.

Based on the presented examples of educational activities regarding Work Safety at The Faculty of Mining and Geoengineering of the AGH University of Science and Technology in Cracow, it can be said that the Faculty is one of the leading faculties among academic institutions, educating future specialists in the field of Work Safety.

Christophe DEN AUWER

Professor Université Côte d'Azur Institut de Chimie de Nice, UMR 7272

Scientific activities: My research interests cover environmental and human radiochemistry and are dedicated at the fate and impact of radionuclides on the hydrosphere, biotope and human. The approach consists in combining analytical and molecular chemistry for a comprehensive description of the transfer processes, accumulation and internalization of radioisotopes including human nuclear toxicology. The core of the research is structured around 3 main topics: (i) Transfer, reactivity and localization of radionuclides in the environment, (ii) Chemistry and reactivity of radionuclides in living organisms, including human, (iii) Spectroscopy of the actinides. Regarding the human compartment, the main objective is to characterize the interaction between radioelements and biomolecules, combining analytical techniques such as radiometry and spectroscopic tools among which X-ray spectroscopy plays a central role.

Contact: christophe.denauwer@univ-cotedazur.fr

Christophe DEN AUWER's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Safety Leadership

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Awareness, responsibility, personal involvement

3. *Based on your experience and research:*
   a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

With practice, personal involvement

   b. *What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?*

Dilution of responsibility, routine work, over risk perception

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

Technical knowledge and practice, responsibility

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

One danger is "safety for safety" without enough consideration for technical skills

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?* Don't know enough about the subject

Dennis FOX

Professor in the Geography Department of Université Côte d'Azur

Dennis Fox is a graduate of the University of Toronto (Canada). As a member of the UMR ESPACE CNRS laboratory, he is interested in the impacts of land use and climate change on natural hazards, including flooding, forest fires, and soil erosion. Most of his research is conducted in field sites located in Mediterranean France

Contact: Dennis.fox@unice.fr

Dennis FOX' answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

    Preparing people to better manage risk situations.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

    Preparation; protocols; decision-making; uncertainty; resources.

3. *Based on your experience and research:*
    a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

    Communication through internal documents, but especially through training and crisis simulation exercises.

    b. *What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?*

    Finding the political motivation and time to train and practise exercises.

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

    Real-time data collection and algorithms that provide an accurate assessment of the risk level.
    An efficient communication system to warn the people at risk.

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

    Frankly re-reading crises situations and how the situation was dealt with without the risk of "blame" for errors.
    Digital 3-D simulation environments that can reproduce realistic situations that require decision-making.

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?*

    No idea.

Aurelie JEANSON

Research engineer CNRS

Works in radiochemistry research laboratories since 2005 as PhD student then Research engineer (CEA, CNRS/Univ).

Since 2018: PCR (Personne Compétente en Radioprotection) at ICN.

Contact: aurelie.jeanson@univ-cotedazur.fr

Aurelie JEANSON answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Leadership for safety

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Safety leadership: leadership dedicated for safety only
Leadership for safety: leadership including safety as one of its main concerns

3. *Based on your experience and research:*
   a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

Risk perception comes from all the rules that govern the organization, often seeming exaggerated from the worker's point of view.

   b. *What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?*

Making people (all kind of workers) realize that risks are real and that rules are here to prevent accident, not to prevent them from working. Thus, rules must be "reasonable".

4. *According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?*

See point 3.b. Better communication between the "leadership" and the workers regarding safety.

5. *What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?*

See point 4.

6. *In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?*

Feedbacks from real incidents/accidents that happened in the past.
+ Better communication skills between managers and workers.

Gabriel PAVEL

Executive Director, ENEN

PhD.eng Currently, Executive Director for European Nuclear Education Network and assistant professor at University „Politehnica"of Bucharest department of Nuclear Engineering. He finished Faculty of Power Engineering in 2004, Nuclear Power Plants Department followed by a Master degree in nuclear engineering. He started working at the University in the same year and also did his PhD in the same period. During 13 years of activity he followed several specialization courses in Research Centers and Universities from Austria, Czech Republic, France, Hungary, Romania, South Korea and Slovakia. As teaching activities (courses and/or seminars) following topics can be mentioned: nuclear engineering, nuclear materials, non-power generating use on nuclear technologies, dosimetry and protection against radiation in Environmental Department -courses offered for Nuclear Engineering Department students. He is board member of AREN, Romanian Association for promotion of Nuclear Energy. He was involved in various projects by EC and Cohesion funds dedicated to Human Resources and communication in nuclear field: FP7 EAGLE project (http://eagle.sckcen.be/) dedicated to communication strategy in nuclear filed with deep involvement of different stakeholders, civil society representatives and decision makers; Erasmus+ BRIDGE project (http://bridge.pub.ro/), the only project in the nuclear field funded under Erasmus+; SOREL (http://sorel.pub.ro/) a project funded by Cohesion funds with over 2000 participants from power industry. **Contact: gabriel.pavel@enen.eu**

Gabriel PAVEL's answers

1. **Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?**

"Leadership for Safety"

2. **How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?**

Required skills and competences needed to provide appropriate actions to ensure Safety for the person itself and for the others.

3. **Based on your experience and research:**

   a. **How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?**

Risk perception is a very sensitive description that a person uses in order to justify a set of actions developed to ensure it's personal comfort/state of mind and for the others. Risk perception has a direct relationship with the level of knowledge and comprehension of the activity/action that triggers inside an individual the perception of risk.

   b. **What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?**

Training and education-helps the individual take the right or the best decisions when risk arises.

4. **According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?**

Capacity to guide the individuals through a set of attitutdes aimed at improving thee topic.

5. **What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?**

Insisting on providing the best trainings for individuals involved.

6. **In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?** Always analyse and improve! "Repetitio est mater studiorum"

d. ELSE Project Team

Catherine THOMAS
(ISEM / UCA) - ELSE Coordinator

She is Professor in Management at the University of Nice Sophia Antipolis (UNS) (member of University of Côte d'Azur UCA - France) and a member of the GREDEG (Groupe de Recherche en Droit, Economie et Gestion, UMR 7321, CNRS) research center where she is co-directing the project "Innovation Ecosystem and Learning". Her current research interests include strategic organizing, organizational attention, organizational learning and knowledge management. She has coordinated an interdisciplinary project "Knowledge Management Platform" whose objective was to develop and implement a competence-based web site for a network of firms and research institutions in the telecommunication industry. She is currently developing research in the nuclear and cement industries; more specifically, she supervises a PHD project on how to learn from rare and complex experiences such as accident and co-supervises another on how to develop safety leadership. The results of her research are published in leading international journals in the field of innovation management and organization sciences. Examples include Advances in Strategic Management, British Journal of Management, Journal of Knowledge Management, Management International, and Regional Studies.
Contact: catherine.thomas@univ-cotedazur.fr

Renata KAMINSKA

(SKEMA / UCA) - ELSE Key Expert

She is Associate Professor of Strategy and Innovation at SKEMA Business School (University of Côte d'Azur- France). She is a member of SKEMA KTO (Knowledge Technology and Organization) and of the GREDEG (Groupe de Recherche en Droit, Economie et Gestion, UMR 7321, CNRS) research centres. She holds a Bachelor of Arts from the University of Western Ontario (Canada), a Graduate degree in Business Administration and a Doctorate in Management from the University of Nice (France). She is a visiting fellow at Krakow University of Economics and Kozminski University (Poland). In the past, she was scientific director of a continuing education program STEM and a Master of Science of International Business at SKEMA. Currently she is co-directing a UCA Master of Science of Research in Management and Innovation. Her current research revolves around organizational dynamics, knowledge management and creativity. She co-supervises a PHD project on how to develop safety leadership. Her research is published in many international journals such as Advances in Strategic Management, Knowledge Management Research and Practice, European Management Journal, Management International and Journal of Business Strategy.
Contact: renata.kaminska@skema.edu

Natalia JUBAULT KRASNOPEVTSEVA

(SKEMA / UCA) - ELSE Research and Training assistant. UCA/SKEMA PHD Student in management

She holds a Graduate degree in Corporate Strategy and International Development from the University of Nice Sophia Antipolis. She has experience in financial and organizational consulting. In 2017, she received a scholarship from the University Côte d'Azur to prepare a thesis on safety leadership in complex environments in the context of the nuclear sector. Her research interests include organizing in high-risk environments, resilience, mindfulness, organizational attention and organizational learning.
Contact: natalia.krasnopevtseva@univ-cotedazur.fr

C. THOMAS, R. KAMINSKA and N. KRASNOPEVTSEVA's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

We suggest 'leadership for safety'. This term refers directly to the literature on leadership as a key theme of the future training program. Leadership is a goal-oriented process. Safety is an organizational goal with particular features, that in turn influence the leadership process.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Leadership for safety is a contextually rooted and safety-goal-oriented process of influence. Based on the interactions leaders establish with their socio-technical environment, leadership for safety aims to influence individuals and groups in their understanding of and adherence to organizational safety goals as well as the means to achieve them (e.g. through the development of operational mindful behaviors).

Key-words: Influence processes, managed safety, resilience, mindfulness, safety rules, organizational dynamics

3. *Based on your experience and research:*
   a. *How does risk perception form in high-risk/highly regulated organizations (such as the nuclear sector)?*

Abundant literature sheds light on the social construction of risk. In complex, socially constructed systems, risk perception is based on the subjective judgment. It involves the creation of meaning by the different social groups relative to their experience of harm and hazard. Risk perception results from the interaction of the group reasoning, personal experience, social communication and cultural traditions. The eco-system of relations in the nuclear industry is extremely complex and involves a diversity of stakeholders at the different organizational levels: front-line agents, management and experts in firms operating in the nuclear sector, external experts, politicians as well as national and international regulatory bodies. Social construction related to experience has two main consequences: first, the different actors can develop very diverse and sometimes conflicting perceptions of risk: second, in a

complex and multi-level system, experience-based risk perception can lead to superstitious learning, which in turn highlights the necessity to develop deliberate learning processes.

b. What are the biggest challenges and most efficient/relevant ways of dealing with risk in such organizations?

Risk is linked to uncertainty. There are two ways of dealing with uncertainty – the first involves diminishing uncertainty (regulated safety) and the second involves managing uncertainty (managed safety). The biggest challenge is to articulate these two complementary approaches to dealing with uncertainty. Unfortunately, today regulated safety (reducing freedom, standardizing technology and processes, increasing control and segmentation of tasks, etc.) has a tendency to jeopardize actor's capacity to deal with uncertainty (managed safety).

4. According to the state of the art knowledge in your specific scientific domain, what factors are essential for the improvement of safety leadership/leadership for safety?

We consider leadership as an influence process, which is embedded in a multi-level organizational context. The traditional research on leadership for safety studies this influence mainly in terms of leaders' traits and behavioural styles (e.g. transformational leadership). We suggest to look beyond leadership styles and to acknowledge social, dynamic and contingent nature of leadership. The leadership influence process is rooted and unfolds in organizational dynamics. One of the main challenges of leadership for safety research is to better understand the interactions between the influence process and the different facets of organizational dynamics. The effectiveness of leadership for safety depends on the ability to perceive and understand the organizational complexity in order to implement effective practices that can influence and guide actors in the development of reliable safety practices and behaviours (e.g. how to translate safety values into operational behaviour).

5. What do you think are the most important future research avenues in order to improve knowledge pertinent for the further development of safety leadership/leadership for safety?

Future research could focus on multiple tensions, still present in the field: managed versus regulated safety; compliance versus interrogative attitude, control versus autonomy, etc. Mindfulness, organizational attention and organizational learning constitute interesting frameworks to study these tensions.

Concerning leadership for managing safety, the capacity to handle organizational complexity is a key issue. In other words, it is important to understand the organizational embeddedness of leadership influence processes in order to develop effective leadership practices.

6. In your opinion, what are the most relevant theories/frameworks/elements of knowledge to support higher education and training of managers in the field of safety leadership/leadership for safety?

Mindfulness, organizational attention, organizational dynamics and organizational learning may be useful theoretical frameworks to develop a leadership for safety training. Since leadership is difficult to teach, there is a need to develop situation-based pedagogical methods, especially for continuing education contexts. The situation-based pedagogical approach is best able to help trainees to reflect upon their mode of information processing concerning risk perception, the ways of deal with uncertainty and to manage tensions.

Didier LOUVAT (ENSTTI)

ELSE consortium member

Didier LOUVAT is the Managing Director of the European Nuclear Safety Training and Tutoring Institute, ENSTTI, an educational initiative supported by the European Technical Safety Organizations. From 2003 to 2010, He led the IAEA Programme on Radioactive Waste Management as Head of the Waste and Environmental Safety Section in the IAEA Department of Nuclear Safety and Security.

Previous to that he headed the radioecological studies laboratory of the French Institute for Radiation Protection and Nuclear Safety, IRSN. Before he holds several positions at the Department of Nuclear Fuel Cycle of the French Atomic Energy Commission, CEA, where he developed programmes related to disposal of radioactive waste and environmental impact assessment. Didier LOUVAT graduated in Geology at Paris University and completed his PhD in Isotope Geochemistry at the same University in 1987.

Contact: didier.louvat@enstti.eu

Anna BENATTAR (ENSTTI)

ELSE consortium member

Anna BENATTAR is the Chief Financial and Administrative Officer of ENSTTI since 2013. Before joining ENSTTI, she worked as Head of Administration of Support Departments at the Institut de Radioprotection et de Sûreté Nucléaire, IRSN, one of the ENSTTI Members.

Previously, she had a career in financial controlling both in public and private organisations. She graduated from INSEEC PARIS, a management and business school, completed by an accounting and finance diploma.

Contact: anna.benattar@enstti.eu

Didier LOUVAT and Anna BENATTAR's answers

1. *Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?*

Leadership for Safety would be better, first because it is consistent with the terminology of the IAEA Safety Requirement GSR Part 2 and also because it suggests a broader context/sense/perspective.

2. *How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?*

Best to start with the IAEA GRS Part 2 definition: *'Leadership' is the use of an individual's capabilities and competences to give direction to individuals and groups and to influence their commitment to achieving the fundamental safety objective and to applying the fundamental safety principles, by means of shared goals, values and behaviour.*

3. According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?

Socio-technical risks in nuclear industry evolve with the technology and society evolutions. At present, the loss of competences both in term of understanding and maintaining the safety functions of a nuclear facility represents a serious challenge to the industry. Some of the reasons are the improper application of the management system, the lack of trained staff, the use of sub-contractors.

4. What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?

First to analyse the state of Safety Culture of the organisation and to use the result to train adequately the staff.

5. What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice?

n.a.

6. What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?

To develop adequate training.

7. What elements should an ideal training program for early to middle career managers with safety responsibilities include?

The programme should illustrate how to demonstrate leadership. It should be followed by a presentation/discussion on actions related to safety leadership in dealing with ionizing radiation and in particular in planning, operating and dismantling nuclear facilities. Eventually, the programme should include working groups on practical cases.

8. When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?

Yes

9. When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?

n.a.

Jacques REPUSSARD (J Repussard Conseil)

ELSE Contractor, Chair Steering Committee

Jacques Repussard, is a former French top civil servant who ran French public bodies and spent some of his career in Brussels, developing the European standardization system in close cooperation with EC, in response to the challenge of setting up the European internal market.

After having led the French Institute for Radiation Protection and Nuclear Safety (IRSN) between 2003 and 2016 (a public body set up in 2002, with a budget of circa 300 M€ and 1700 staff), and having during his mandate developed a solid experience in nuclear safety international issues and scientific cooperation in this field, J Repussard set up his own consulting company, JC Repussard Conseil, dedicated to the provision of services to public stakeholders of nuclear safety and radiation protection. Actions implemented so far include the following:

- Advising Ukrainian authorities and research organisations on an action plan to increase the country's contribution to Euratom research in the field of radiation protection (EC funded);

- Advising a consortium of European associations for the development of clinical radiological reference levels (EC funded)

- Developing and leading the Stakeholder Board in the European research project MEDIRAD (EC funded)

- Leading IAEA experts' group on the development of a pilot school in the field of leadership for safety, and contributing to the performance of the experimental session in Nice, Oct 2017 (IAEA funded)

- Leading a task within the IAEA strategic action to develop TSO capabilities in embarking countries (IAEA funded)

- Advising European Fusion for Energy (F4E) on strategic issues of nuclear safety policy, including leadership for safety (F4E funded).

Contact: jrepussard@aol.com

Jacques REPUSSARD's answers

1. Which expression most accurately describes the theme of the ELSE project: "Safety Leadership", or "Leadership for Safety"?

The expression "Leadership for safety" seems best because it puts the emphasis on the word "leadership". The goal is to develop an educational project for enhancing leadership capabilities in a context of high safety constraints, and related regulations.

2. How would you define safety leadership/leadership for safety? Could you please provide a few key words most characteristic of your definition?

For the purpose of the project, the definition given by IAEA *(GSR-2, Introduction)* provides a suitable frame to initiate discussions from a consensus already achieved in the international context of nuclear safety standards.

*« The use of an individual's **capabilities and competences** to give direction to individuals and groups, and to influence their commitment to achieving the fundamental safety objective and to applying the fundamental safety principles, by means of shared goals, values, and behaviour. »*
Words in bold characters are essential to this definition. The goal of the ELSE project is to research and to experiment how such "individual capabilities and competences" may be enhanced through education/training. This objective probably requires to address other mental abilities such as curiosity, interrogation, imagination, doubt, capacity of attention, empathy, respect for others, etc, which need to be harnessed for effective leadership development.

3. According to your experience, what are the main socio-technical risks in the nuclear industry? What do you think is the trend of evolution?

"Human and organisational factors" may affect all stages of nuclear industry operations, from the design, construction and licensing steps of facilities to every operational activity, including maintenance, waste management and ultimate decommissioning. They form a wide ranging spectrum of risk generating potential situations, from relatively simple man-machine interface difficulties right to complex safety culture deficiencies across the operating and licensing organisations. These risks may render dangers stemming from technology failures more potent. Nuclear safety doctrines have identified these risks, resulting in requirements to consider management systems and safety culture development as an integral component of risk reduction and mitigation in nuclear operations. However, the active deployment of what is recognised as standard "good practice" in terms of managing safety may also in time create a false impression that "human and organisational risks" are adequately dealt with. This is why individual leadership for safety, at all levels of an organisation, should be encouraged as a way to create multiple human redundancy in the capacity of analysis and mitigation of risks.

4. What do you consider to be efficient key practices related to human and organizational issues to promote safety culture and achieve the highest levels of safety?

- To analyse key elements of the existing safety culture, in order to identify areas of potential improvement, which may be addressed through a "top down" approach, and issues around which training of managers should best be articulated in order to enhance safety performance, in a "bottom up" approach.

- To maintain an ongoing educational and training effort, at all managerial levels of an organisation, on safety principles, strategy and practical implementation including leadership for safety operational results.

5. What actions are developed in your organization/institution to strengthen safety leadership/leadership for safety in managerial practice? N/A
6. What should further be done to enhance safety leadership/leadership for safety in the managerial practice of the nuclear sector?

Much has been done in recent years to recognise the importance of safety culture and of management systems for achieving and maintaining high levels of safety, and to elaborate international standards that provide guidance in this field. This includes the recognition of the importance of leadership for safety at an individual level, for all managers with safety responsibilities in an organisation.

However, much remains to be done to effectively ensure that leadership capabilities are developed and effectively implemented at an individual level. Similarly, methods to evaluate those individual capabilities, and their effectiveness within a given organisation could be improved.

The availability of higher education courses providing a basis for understanding the concepts and importance of leadership for safety managerial abilities would also be a benefit for students who consider technical careers in the nuclear sector, and for industry beyond the nuclear sector.

7. ***What elements should an ideal training program for early to middle career managers with safety responsibilities include?***

A training program should be based on a suitable mix of four pedagogic approaches, inducing the trainee to want to rethink his managerial practice when back at his/her job:

- Understanding why and how individual managerial practice has a deep influence on safety achievements, for a given group of persons in the organisation, and a given set of available technical knowledge and information,
- Understanding how individual general qualities, which are always present to varying degrees in each personality, are related to leadership potential, and how they can be mustered to improve leadership abilities,
- Understanding and practicing methods which may be applied for an effective leadership for safety performance in a nuclear environment, characterised by a high complexity of technologies and organisations, as well as by a working environment strongly encompassed by stringent operating procedures and regulations. These methods should address the issues of managing people, information, and work processes.
- Understanding how individual leadership for safety relates to the collective safety culture at the level of an organisation, and how it contributes to the overall demonstration of compliance with safety objectives.

These pedagogic approaches may be built on conferences, on the study of case studies, and on monitored practice at the trainee's current managerial position.

8. ***When addressing regulatory standards related issues in the course of the ELSE project, do you consider appropriate to refer to relevant IAEA publications?***

Yes, in principle. IAEA publications provide a good basis and reference for initiating discussions on the topic of regulation in this field. However, this should not pre-empt the possibility that discussions in the context of ELSE project could refer to other good regulatory practice which may exist in other fields or at a national level. It should also be recognised that there are issues beyond the context of regulatory standards which need to be addressed for the purpose of developing leadership for safety in individual managerial practice.

9. ***When recruiting young university graduates for technical careers, would a Masters diploma including a curriculum on safety leadership/leadership for safety be likely to be considered in your organization/institution as a significant asset?***

N/A

In the picture (from left to right): Gevrasoni Laurence, Abdellatif Marwa, Kaminska Renata, Jubault Krasnopevtseva Natalia, Thomas Catherine, Gherardi Silvia, Rouby Evelyne, Pavel Gabriel, Benattar Anna, Kudesia Ravi S., Jeanson Aurélie, Moracho Ramirez Maria, Tazi Dounia, Louvat Didier, Repussard Jacques, Pilbeam Colin, Grote Gudela, Ermine Jean-Louis, Oborn Eivor, Denyer David, Den Auwer Christophe, Guntzburger Yoann, Jeffroy François, Turner Nick, Lagrange Valérie, Druenne Hubert, Journe Benoit, Oliver Nick, Hofmann David A., Abdulkader Usama, Janatkova Karolína, Nys Vincent, Flin Rhona
Second day of the Workshop the 23th of January 2020 - Coffee break
Photographer: Marwa Abdellatif
Place: MSH Nice, France

In the picture (from left to right): Gevrasoni Laurence, Abdellatif Marwa, Kaminska Renata, Jubault Krasnopevtseva Natalia, Thomas Catherine, Rouby Evelyne, Gherardi Silvia, Benattar Anna, Jeanson Aurélie, Louvat Didier, Pavel Gabriel, Moracho Ramirez Maria, Pilbeam Colin, Denyer David, Repussard Jacques, Oborn Eivor, Kudesia Ravi S., Druenne Hubert, Lagrange Valérie, Guntzburger Yoann, Oliver Nick, Tazi Dounia, Ermine Jean-Louis, Janatkova Karolína, Den Auwer Christophe, Grote Gudela, Jeffroy François, Journe Benoit, Abdulkader Usama, Nys Vincent, Flin Rhona, Turner Nick, Hofmann David A.
Second day of the Workshop the 23th of January 2020 - Coffee break
Photographer: Marwa Abdellatif
Place: MSH Nice, France

ELSE

UNIVERSITÉ
CÔTE D'AZUR

enstti

J Repussard
Conseil