EUROPEAN LEADERSHIP FOR SAFETY EDUCATION

ELSE SCIENTIFIC WORKSHOP

13-14 JUNE, 2023
Université Côte d'Azur
Nice (France)

Funded by
the European Union

ELSE European Leadership for Safety Education

UNIVERSITÉ CÔTE D'AZUR

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1. ELSE Closing Workshop Presentation

1.1. Objectives

The ELSE project aimed to develop an innovative science-based approach for education in the domain of leadership for safety. This required the integration scientific knowledge from various academic disciplines with empirical insights from the nuclear industry.

The first workshop, organized at the project's outset in January 2020, brought together numerous academics and nuclear industry experts working on topics related to management and leadership for safety. By encouraging multiple interactions, the workshop served a dual purpose:

- To facilitate the identification of existing knowledge on the subject of leadership for safety, thereby aiding in the design of a training program for managers and students;
- To foster research collaborations among scientists from various disciplines and between scientists and stakeholders of the nuclear industry. These collaborations ensure the ongoing development of knowledge on leadership for safety.

As we approach the conclusion of the ELSE project on December 31, 2023, this closing workshop organized in June 2023 had three primary objectives:

- To share experiences from the first edition of the ELSE training;
- To introduce perspectives for the future, including the continuation and dissemination of the ELSE Project and the Decommissioning Management and Leadership for Safety Education (DMaLSE) Project (2023 – 2026);
- To identify new research avenues and foster further cooperation between universities, industry experts, and regulatory bodies in the field of safety management and leadership for safety.

1.2 Methodology

Based on the experience gained during the first workshop, we reused and adapted the co-creation process developed in the first workshop. The co-creation process can be synthetized as follows:

1) Three groups discuss a preselected theme.
2) Each group discusses for 45mins: open discussion 30 mins, summary 15 mins.
3) To make the discussion more efficient a researcher briefly presents (15 mins), before the discussion, his or her research on themes 2 and 3.
4) Two members of the project team moderate each group.
5) Each group synthetizes the conclusions of the discussion in a poster.
6) In a plenary session, each group presents the conclusion of its collective work with the help of the poster.

The workshop primarily revolved around two types of sessions: group work on predefined themes and collective debriefing. Three groups concurrently focused on the same theme. These working sessions were subsequently followed by a session of collective debriefing session involving all workshop participants. Each group consisted of members from various stakeholder categories, including academic, nuclear industry professionals, and scientific directors of university programs.

Building upon the initial ELSE training experience and challenges we need to address, we have identified three key themes:

1) How to Disseminate the ELSE Training: This theme focuses on strategies and methods for effectively spreading and making the ELSE training widely accessible.
2) Dealing with Ambiguity and Uncertainty: The Role of Organizational Limits: This theme explores how organizations can effectively navigate ambiguity and uncertainty, with specific emphasis on the role of organizational limits.
3) The Role of Mindfulness in Leadership for Safety: This theme delves into the significance of mindfulness in the context of leadership for safety, examining how mindfulness practices can enhance safety outcomes.

These sessions were complemented by two keynote presentations during plenary sessions. The first session was related to theme 1, addressing the topic of disseminating the ELSE training. The second session was linked to theme 2, focusing on dealing with ambiguity and uncertainty and more specifically, exploring the role of organizational limits in this context.

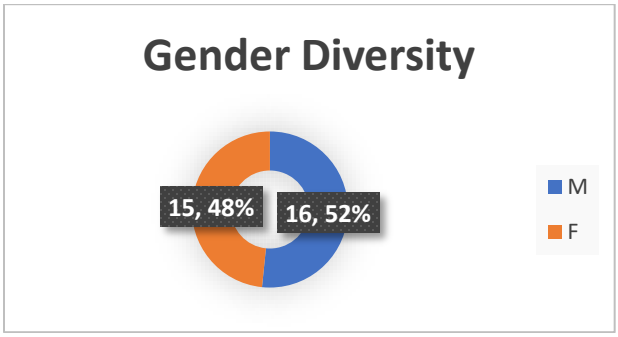
1.3 Participants

The ELSE closing workshop brought together a total of 31 participants, comprising:

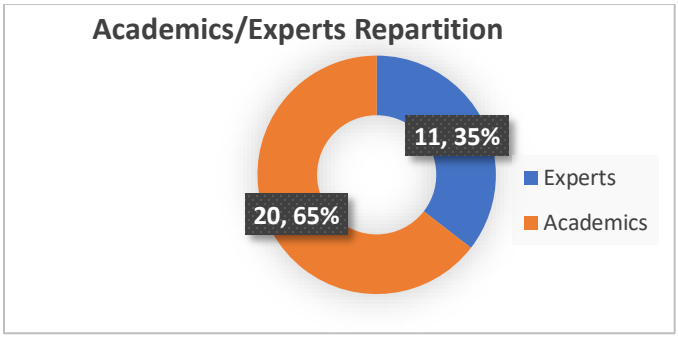
- 12 academics specializing in leadership for safety or related topics
- 7 nuclear industry experts
- 12 members of the ELSE team supplemented by the DMaLSE team.

Each category of participants included individuals who had previously participated in the first workshop, representing the core of the ELSE network, aa well as newcomers, who contributed to the expansion and diversification of the ELSE network. For a comprehensive list of participants, please refer to Appendix 1.

Gender parity in terms of participation was closely observed with 48,4% of participants being women and 51,6% being men. This balanced representation is a positive aspect of the workshop's inclusivity:



The chart below, which includes the members of the ELSE and DMaLSE teams, indicates the repartition between the academics and experts who attended the workshop.



1.4. Program

European Leadership for Safety Education (ELSE) Scientific Workshop

13-14 June, 2023, Université Côte d'Azur, Nice, France

Program Day 1

Tuesday 13 June 2023		
09h00-09h30	Participant registration/Welcome	Entry hall
09h30-10h15	Welcome speeches • Muriel Dal Pont Legrand, Vice-Présidente Enjeux Europe et Territoires (Université Côte d'Azur) • Xavier Pinsolle, Project Manager – Nuclear Safety and Safeguards DG International Partnerships, Unit F1 – Climate Change and Sustainable Energy; Nuclear Safety (European Commission) • Jacques Repussard, ELSE Project Partner, Chair of the ELSE Steering Committee (ELSE Project)	Room 203
10h15-10h30	"*Nuclear Energy Agency activities*" by Tatiana Ivanova, NEA Head of the Division of Nuclear Science	Room 203
10h30-12h00	The ELSE training results, followed by the panel discussion	Room 203
12h00-12h30	The future of the ELSE project Presentation of the DMaLSE project	Room 203
12h30-13h30	Lunch	Hall "Avant-scène"
13h30-14h00	Panel session: Presentation *"Safety training in context"* by Colin Pilbeam (Cranfield University)	Room 203
14h00-14h45	Group work session 1: "*How to disseminate the ELSE training*"	
	Group A	Room 202
	Group B	Room 203
	Group C	Room 205
14h45-16h00	Debriefing session 1 "*How to disseminate the ELSE training*" (40 min), following by a summary presented by Réne Amalberti, Director of the FonCSI, Foundation for an Industrial Safety Culture, ELSE project external evaluator (20 min)	Room 203
16h00-16h30	Coffee break	Hall "Avant-scène"
16h30-17h15	Key-note presentation by Moshe Farjoun, Schulich School of Business York University: "*Interlocking surprises: their nature, implications and responses"*	Room 203
17h15-18h00	Panel discussion "*Interlocking surprises and their implications for research and training"*	Room 203
19h30-21h30	Diner	Restaurant "Le Safari"

Program Day 2

Wednesday 14 June 2023		
09h30-10h00	Coffee break, informal networking with the participants of the IAEA School on Nuclear and Radiological Leadership for Safety	Hall "Avant-scène"
10h00-11h00	Group work session 2: *"Dealing with ambiguity and uncertainty: the role of organizational limits"*	Room 203
	Group A. Presentation by Gudela Grote, ETH Zürich University	Room 203
	Group B. Presentation by Kristina Potočnik, University of Edinburgh Business School	Room 205
	Group C. Presentation by Yoann Guntzburger, SKEMA Business School	Room 202
11h00-12h00	Debriefing session 2 *"Dealing with ambiguity and uncertainty: the role of organizational limits"*	Room 203
12h00-13h30	Lunch	Hall "Avant-scène"
13h30-14h30	Group work session 3 "*The role of mindfulness in leadership for safety*"	
	Group A. Presentation by Ravi S. Kudesia, Fox School of Business	Room 205
	Group B. Presentation by Mario Martinez-Corcoles, University of Valencia	Room 202
	Group C. Presentation by Rhona Flin, University of Aberdeen	Room 203
14h30-15h30	Debriefing session 3 "*The role of mindfulness in leadership for safety*"	Room 203
15h30-16h00	Coffee break	Hall "Avant-scène"
16h00-17h00	Panel discussion on collective book	Room 203
	End of the workshop	

Group A	
René Amalberti	*Director of the FonCSI, Foundation for an Industrial Safety Culture, France*
Carole Daniel	*SKEMA Centre on Sustainability, France*
Jean-Louis Ermine	*Institut Mines-Telecom, Jean-Louis Ermine Consulting, France*
Moshe Farjoun	*Schulich School of Business, York University, Canada*
Gudela Grote	***ETH Zürich, Switzerland***
Ravi S. Kudesia	*Fox School of Business, Temple University, USA*
Gilles Motet	*INSA Toulouse, Institut National des sciences appliquées, France*
Joseph Ridao Cabrerizo	*Karlsruher Institut für Technologie (KIT), Germany*
Moderator(s) session 1: Natalia Jubault Krasnopevtseva & Evelyne Rouby - *Université Côte d'Azur*	
Moderator(s) session 2: Renata Kaminska & Evelyne Rouby - *SKEMA Business School/Université Côte d'Azur*	
Moderator(s) session 3: Catherine Thomas & Saveria Cecchi - *Université Côte d'Azur*	

Group B	
Nancy Bellingan	*FH Aachen, Germany, France*
Pierre Daniel	*SKEMA Business School, France*
Tatiana Ivanova	*NEA Nuclear Energy Agency*
Valérie Lagrange	***EDF Electricité de France, France***
Mario Martinez-Corcoles	*IDOCAL, University of Valencia, Spain*
Maria Moracho Ramirez	*IAEA International Atomic Energy Agency, Austria*
Colin Pilbeam	*Cranfield University, United Kingdom*
Kristina Potocnik	*University of Edinburgh Business School, United Kingdom*
Jacques Repussard	*President of the Institut pour la maîtrise des risques, France*
Moderator(s) session 1: Renata Kaminska & Saveria Cecchi - ***SKEMA Business School/Université Côte d'Azur***	
Moderator(s) session 2: Catherine Thomas - *Université Côte d'Azur*	
Moderator(s) session 3: Natalia Jubault Krasnopevtseva & Evelyne Rouby- *Université Côte d'Azur*	
Group C	
Rhona Flin	*Aberdeen Business School, Robert Gordon University, United Kingdom*
Yoann Guntzburger	*Université Côte d'Azur/SKEMA Business School, France*
Didier Louvat	***Expert, former IRSN, France***
Shahid Mallick	*IAEA International Atomic Energy Agency, Austria*
Vincent Nys	*WENRA, Western European Nuclear Regulators Association, Belgium*
Kateryna Piliuhina	*ENEN European Nuclear Education Network, Belgium*
Xavier Pinsolle	*DG International Partnerships, European Commission*
Céline Poret	*IRSN, Institut de radioprotection et de sûreté nucléaire, France*
Hans-Jürgen Steinmetz	*FH Aachen, Germany*
Moderator(s) session 1: Yoann Guntzburger & Catherine Thomas - ***SKEMA Business School/Université Côte d'Azur***	
Moderator(s) session 2: Natalia Jubault Krasnopevtseva & Saveria Cecchi- *Université Côte d'Azur*	
Moderator(s) session 3: Renata Kaminska - ***SKEMA Business School/Université Côte d'Azur***	

- ***Greening***

Demonstrating the commitment to sustainability is a core value of the ELSE project. The ELSE team organized this workshop with a strong emphasis on environmental best practices, including: Paper Smart Documentation: the ELSE team made a concerted effort to minimize paper usage. Instead of printed materials, digital documentation was provided to participants.
Recycled Materials: the use of recycled materials was prioritized. This included using recycled paper, bags and ink.

Waste reduction: participants were encouraged to minimize waste by using reusable items like water bottles and coffee cups. Additionally, recycling stations were set up to ensure that any generated waste was properly sorted and recycled.

2. ELSE Closing workshop results

The workshop took place in two main stages, each taking place over one day. The first was devoted to challenges related to training in leadership for safety. We first presented the results of the first ELSE training session and future perspectives. Later in the afternoon, a group work session on the challenges related to the dissemination of the training and, more generally, of the knowledge developed within the framework of the project was organized. The second part, more research-oriented, was devoted to exchanges and discussions around two key themes related to the effective implementation of safety leadership: dealing with uncertainty and individual and collective mindfulness.

2.1 Challenges to develop leadership for safety training

2.1.1 ELSE result presentation and feedback

First, the ELSE team provided an overview of the outcomes from the first ELSE training. The key highlights include:

1. Trainees' Recruitment: The first ELSE training program saw the participation of 22 trainees, comprising 16 from INSC (International Nuclear Safety Center) countries and 6 from European countries.
2. Geographic Diversity: The team emphasized the remarkable geographic diversity among the trainees, with representatives from 13 different countries.
3. Gender Balance: Notably, the first ELSE training achieved a perfect gender balance, with 11 women and 11 men participating. This commitment to gender equality is a significant achievement in the context of the nuclear industry.
4. Diverse Institutional Backgrounds: Trainees came from a variety of nuclear industry institutions, with a majority of representatives originating from regulatory bodies.
5. Profiles Diversity: Trainees' profiles were diverse not only in terms of their years of professional experience but also in other aspects. The diversity in experience levels and backgrounds enhances the depth of knowledge exchange within the ELSE training program.

These achievements reflect the ELSE team's dedication to creating a diverse and inclusive learning environment.

Second, the ELSE team detailed the training timeline, structured into three key phases: the MOOC, the face-to-face (F2F) session, and personal tutoring projects. The team also shared the

positive feedback and evaluations received from trainees, emphasizing the high quality, relevance, and originality of the ELSE training program.

MOOC Feedback:

Regarding the MOOC, trainees' evaluations were also highly positive:

- 50% of trainees (11 individuals) rated the quality and relevance of the content as a 4;
- 50% of trainees (11 individuals) rated it as a 5.

Additionally, nine trainees praised the high quality, detailed, and explicit content of the MOOC, while six trainees considered it to be rich and educational.

This overwhelmingly positive feedback from trainees underscores the effectiveness and impact of the ELSE training program, highlighting its ability to provide high-quality, relevant, and engaging content throughout its various phases, ultimately contributing to the development of leadership for safety skills within the nuclear and radiological sector.

For the detailed feedback on the MOOC, please refer to appendix 2.

Face-to-Face Session Feedback:

Trainees' feedback on the face-to-face session was assessed through various indicators. One of the most significant indicators was their satisfaction with the quality and relevance of the content presented during this session. On a scale of 1 to 5:

- 54.5% of trainees (12 individuals) rated the content as a 4;
- 40.9% of trainees (9 individuals) rated the content as a 5:
- Only 1 trainee (4.5%) indicated a rating of 3.

Furthermore, fifteen trainees expressed that the F2F session had excellent quality, found it interesting, and highlighted the presentation of useful concepts. Additionally, three trainees specifically appreciated the effectiveness of the pedagogical methods used, particularly the case studies presented during this session.

For the detailed feedback on the F2F session, please refer to appendix 3.

The ELSE team also shared valuable insights from trainees' feedback on the **personal tutored projects**:

- 52.6% of trainees (10 individuals) rated the degree to which the tutored project helped them better understand and apply different concepts as a 4;
- 42.1% of trainees (8 individuals) rated it as a 5;
- Only 1 trainee (5.3%) indicated a rating of 3.

These positive evaluations indicate that the personal tutored projects were effective in enhancing trainees' understanding and practical application of the concepts learned throughout the training program.

A final evaluation was also conducted in June 2023. The trainees gave their feedback on the content of the ELSE training, but they also provided a general evaluation on different logistical / organizational aspects. The feedback was assessed through various indicators. One of the most significant indicators was their satisfaction with the relevance of the ELSE training content to understand safety management challenges. On a scale of 1 (dissatisfied) to 5 (satisfied):

- 63.2% of trainees (12 individuals) rated the content as a 5;
- 36.6% of trainees (7 individuals) rated the content as a 4.

Another question addressed to the trainees, assesses their satisfaction regarding the ELSE training content to improve their leadership for safety capabilities. On a scale of 1 (dissatisfied) to 5 (satisfied):

- 63.2% of trainees (12 individuals) rated the content as a 5;
- 31.6% of trainees (4 individuals) rated the content as a 4;
- 5.3% of trainees (1 individual) rated the content as a 3.

For the detailed feedback on the ELSE training, please refer to appendix 4.

Overall, trainees confirmed the relevance and impact of the three steps of the training program (MOOC, face-to-face, and personal projects) based on their experiences. They particularly highlighted the program's significance in comprehending safety management challenges and enhancing leadership for safety capabilities.

The ELSE team presented enhancements for the next ELSE training, which were informed by the valuable feedback provided by the first cohort of trainees. This iterative approach ensures that the program remains dynamic, relevant, and continually aligned with the evolving needs of participants in the field of leadership for safety.

Third, the ELSE team provided an overview of the dissemination efforts and plans for the future of the ELSE project:

ELSE MOOC Dissemination:

The ELSE MOOC, functioning as a standalone product, demonstrated its appeal to both nuclear industry students and professionals, resulting in a growing number of registrations. This success

highlights the broad interest in leadership for safety education within the nuclear and radiological fields.

Development of the Master Module:

Building on the ELSE syllabus, the ELSE team has been actively involved in developing a Master Module. This initiative has led to collaborations with universities in various countries, signaling a commitment to expanding the reach of leadership for safety education internationally.

Discussion on Further Improvement:

Despite the success of the first training, the workshop participants engaged in discussions about ways to further enhance the ELSE training. Some key areas of focus included:

- Enhancing the training's appeal to operators;
- Optimizing training logistics;
- Continuing the dissemination of the ELSE syllabus, particularly through "train the trainers" sessions, which have for objective to empower educators to deliver the training effectively.

Future of the ELSE Project:

The ELSE team outlined their vision for the future of the ELSE project, highlighting opportunities for training sustainability and announcing a new timeline for the upcoming ELSE training. Additionally, they introduced a new project called DMaLSE (Decommissioning Management and Leadership for Safety Education), which began in January 2023 and is developed as a natural extension of the ELSE project. This expansion underscores the commitment to advancing management and leadership for safety within the context of decommissioning nuclear facilities.

Detailed slides presented during the session are available in appendix 5 (Presentation of the ELSE results and future of the ELSE project) and appendix 6 (ELSE workshop DMaLSE presentation).

2.1.2 Keynote presentation by Colin Pilbeam (Cranfield University) "Safety training in context"

Colin Pilbeam, Professor of Organizational Safety at Cranfield University, presented his research highlighting the importance of considering the context when delivering safety training. According to Professor Pilbeam, several factors must be taken into account to define the specific context in which the safety training will be implemented. These factors include the individual, organizational, or supra-organizational levels and various technical, cultural, and political elements.

Understanding the organizational context is paramount as it significantly influences the outcomes of safety training. Specifically, it impacts knowledge maintenance, knowledge generalization, and translation competence. Knowledge maintenance refers to the ability of individuals or organizations to retain and apply the safety knowledge acquired during the training. Knowledge generalization involves the capacity to transfer safety practices from the training setting to real-life situations. Lastly, translation competence denotes the ability to adapt and apply safety practices across different organizational contexts, increasing the likelihood of achieving organizational safety goals.

By considering these contextual factors, safety training programs can be better tailored to meet the specific needs and challenges of organizations, leading to more effective safety outcomes.

For more information on the presentation of Colin Pilbeam, please refer to appendix 7.

2.1.3 Group session 1 report: How to disseminate the ELSE training?

The discussion in each group focused on challenges related to the dissemination of the ELSE training. Three groups exchanged in parallel on the same theme. The conversation was structured in two 20-minute time periods focused on two topics:

- How to disseminate the ELSE Training for Universities?
- How to disseminate the ELSE Training for companies/institutions?

The synthesis of each session was formalized in a poster represented in the following figure.

These working sessions were followed by a session of collective debriefing with all workshop participants. In the plenary session, each group presented the conclusions of its collective work with the help of the above poster.

Group A

The group discussion allowed to identify avenues for further ELSE training dissemination. During this group discussion, several points were addressed to enhance the outreach of the training program in universities and companies. For dissemination in universities, the participants stressed the relevance of the MOOC in making the training visible and promoting the specific approach proposed by ELSE (i.e., the ELSE added value). They proposed to disseminate information about the MOOC and training opportunities to new audiences (e.g., the engineering community). The participants also suggested to develop specific training sessions for professors (i.e., a training for trainers), leading to a specific trainer certification. Such training sessions for trainers could take the form of “a master class” including thematic/sub-modules and global coordination with the ELSE pedagogical team in order to ensure new trainers’ ELSE overview and their appropriation of the ELSE program’s spirit and DNA. The main challenge related to implementing a training for trainers involves knowledge transfer by providing some basic resources such as a handbook (including the definition of ELSE key concepts as well as their relationships), case studies and pedagogical notes of which the format remains to be designed. For the dissemination in companies, the participants highlighted the importance to work on boundary objects to co-construct with professionals a common understanding of ELSE training’s concepts and general philosophy (for example, through action research, serious games and simulations).

Group B

During their group session, Group B delved into several crucial topics related to the ELSE training. The **first issue** focused on strategies for reaching a broader audience and generating demand for the training. Group B discussed various promotional methods and outreach efforts to raise awareness about the training's availability. The **second issue** revolved around showcasing that the ELSE approach to Leadership for Safety is more comprehensive and, consequently, more effective than other existing training programs. The **third issue** addressed the challenge of convincing operators and regulators of the importance of allowing their employees to participate in the ELSE training. This involved discussions about how to present the training as a valuable investment in leadership for development and how to address any concerns or hesitations from employers and regulatory bodies.

The solutions envisaged to promote the ELSE training included: 1) presentations of the training at the different professional workshops and conferences; 2) developing information campaigns

specifically aiming regulators, so that they can act as relays in disseminating the training not only within their organizations, but also within the operators; 3) and elaborating a newsletter, which could be sent to the different organizations.

Regarding the delivery of the training, the group discussed ways of overcoming the constraint relative to the limited human resources of the ELSE team and the difficulty of satisfying the growing demand for the implementation of the training in different parts of the world. One solution proposed involved “training the trainers” or, in other words, creating a community of trainers. On this point the group B participants highlighted the necessity to maintain the high quality of the training, which would require the creation of professional certification for the trainers.

Group C

During this group discussion, several key points were addressed to enhance the outreach of the training program to universities and companies. Participants emphasized the need to "train the trainers", concerning both professors and instructors. They highlighted the urgency of this action to maintain the momentum of the initiative. They also discussed the possibility of leveraging the European Nuclear Education Network (ENEN) platform for upcoming events and sharing relevant training materials. Additionally, the group proposed to develop a survey to assess specific needs in terms of training.

The discussion within Group B also touched upon two significant and strategic points:

1) Development of a Technical Document (TECDOC): The group recognized the potential value of creating a Technical Document (TECDOC) that would serve as a comprehensive summary of the key elements and insights from the ELSE training. Such a document would not only summarize the training content but also provide it with a higher level of legitimacy and recognition within the professional community. This TECDOC could become a valuable resource for professionals in the nuclear industry, serving as a reference guide for safety leadership practices and principles derived from the ELSE training.

2) Building and Managing a Community of Alumni: Acknowledging the importance of post-training engagement, the group emphasized the need to establish and maintain a community of alumni. This community would serve as a platform for past participants to stay connected, exchange knowledge, and collaborate on ongoing projects. Managing this community effectively would be vital in fostering long-term collaboration and ensuring the continuous exchange of insights and experiences among safety leadership professionals. Networking opportunities and ongoing support can be invaluable in professional development and the sustainability of the ELSE initiative. These strategic considerations align with the goal of not only providing high-quality training but also nurturing a supportive and engaged professional network in the field of

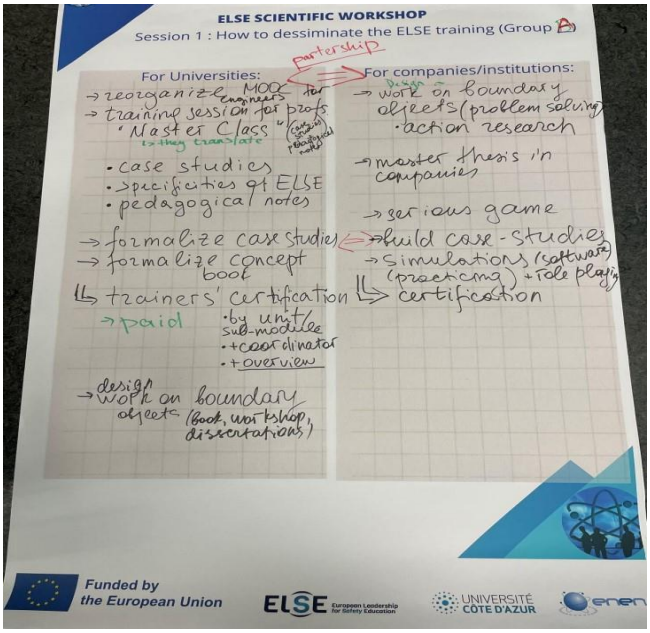
leadership for safety within the nuclear industry. Both the TECDOC and the alumni community can contribute to the long-term impact and success of the ELSE program.

To further expand the program's reach, participants suggested actively disseminating information about the MOOC and training opportunities to various professional networks (need to identify relevant existing networks). The aim is to attract a diverse and engaged audience. The group also highlighted the significance of strategic advertising through channels such as the Global Nuclear Safety and Security Network (GNSSN), European Commission (EC), and Nuclear Energy Agency (NEA) to promote the MOOC and link it with other relevant resources.

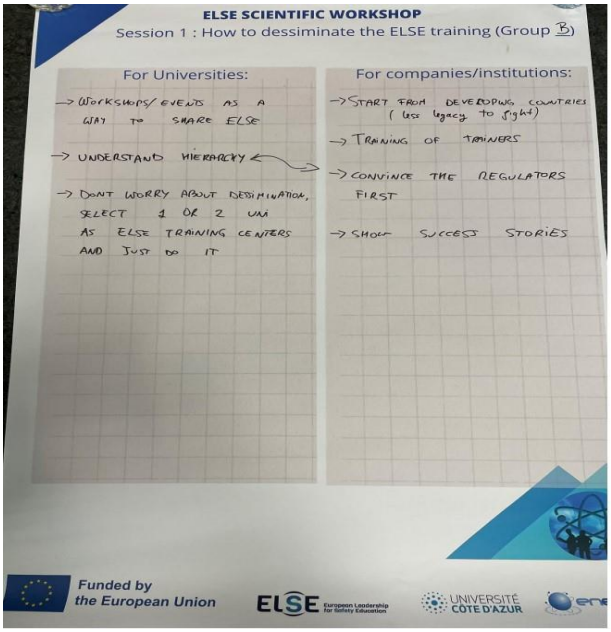
Debriefing of the group session 1: How to disseminate the ELSE training?

Debriefing of the group session 1 allowed to share and discuss group discussion outcomes synthetized in the following posters:

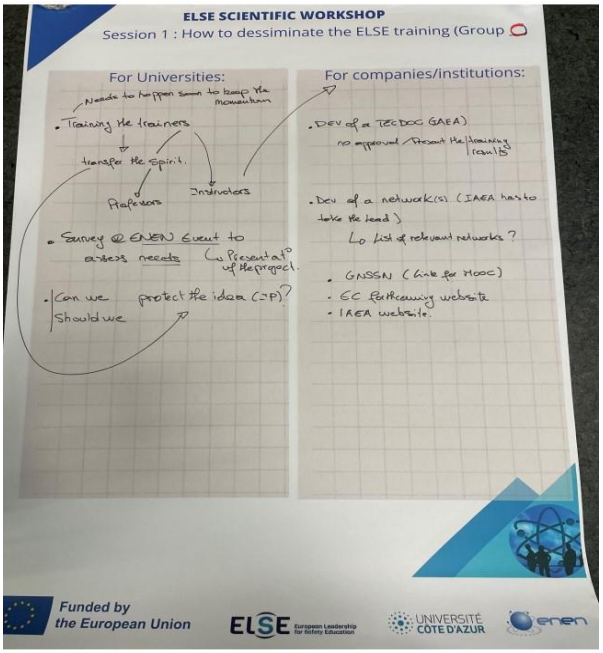
Session 1: Group A



Session 1: Group B



Session 1: Group C



The discussion on strategies for disseminating the ELSE training highlighted several key approaches:

1) Emphasis on the MOOC: Participants recognized the significance of the MOOC in increasing the visibility of the training program and promoting the unique approach offered by ELSE. The MOOC serves as an accessible and widespread method for introducing individuals to the core concepts and principles of leadership for safety.
2) Creation of a Handbook: Another strategy proposed was the development of a Handbook. This Handbook could serve multiple purposes, including legitimizing the training program and providing a foundational resource for training trainers. It can serve as a comprehensive reference guide that encapsulates the key elements and insights from the ELSE training, making it accessible to a wider audience.
3) Training Trainers: To expand the reach of the training program to multiple universities, the idea of training trainers was discussed. This strategy involves transferring the knowledge and expertise of the ELSE pedagogical team to educators who can then deliver all or part of the ELSE training within their respective institutions. However, the success of this approach hinges on maintaining the quality and consistency of the training provided. Ensuring that trainers meet certain standards and guidelines is essential.

René Amalberti's proposed a strategic four-point framework for the dissemination of ELSE training and knowledge:

1) To clearly identify the target (mass/elite, student/professionals and European countries/INSC countries) in order to offer different training packages;
2) To demonstrate the unique value proposition of the ELSE training by showing that ELSE offers a deeper and more comprehensive understanding of leadership for safety in comparison to the existing trainings. This added value justifies its longer duration and appeals to highly educated students and professionals;
3) To develop a community of trainees and trainers in the nuclear sector. An appointed community manager can play a key role in animating and nurturing this community, ensuring its vitality and engagement.
4) To promote the ELSE training, particularly with regulators in order to disseminate it more easily among operators (lobbying activities).

Finally, most participants recognized that dissemination activities represent considerable effort and require dedicated resources (human and financial). However, it was emphasized that this effort must be done quickly in order to capitalize on the success of the first ELSE training.

2.2 Challenges to deal with uncertainty and develop mindfulness.

2.2.1 Key-note presentation by Moshe Farjoun, Schulich School of Business York University: "Interlocking surprises: their nature, implications and responses"

During his keynote presentation, Moshe Farjoun, Professor of Strategy and Organization at the Schulich School of Business, York University, drew on a wide range of process theories, such as pragmatism, dialectics, and evolutionary, to discuss how surprises coevolve and the challenges they present for firms and individuals.

More specifically, Professor Farjoun presented his reflections on the concept of "interlocking surprises". He proposed a reading of the notion of surprise from the angle of a processual (cumulative event chain) and relational (ecology) ontology. He put forth that this revised ontology provided a new way of looking at risk and at ways of managing it, which made it particularly relevant for dealing with uncertainty and complexity in high-risk and highly regulated organizations.

To find more information on the presentation of Moshe Farjoun, please refer to appendix 8.

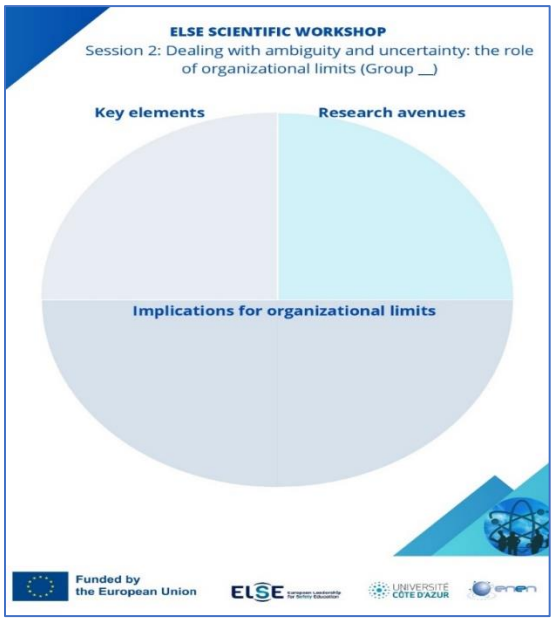
2.2.2 Group session 2: "Dealing with ambiguity and uncertainty: the role of organizational limits."

The discussion in each group focused on challenges related to dealing with uncertainty and the role of organizational limits. Three groups worked in parallel on the same theme. The conversation was structured in three 20-minute time periods focused on three topics:

- Key elements
- Research avenues
- Implications for organizational limits

To make the discussion on the key elements and research avenues more efficient, one researcher briefly presented his or her research on this theme.

The synthesis of each session was formalized in a poster represented in the following figure:



These working sessions were followed by a session of collective debriefing with all workshop participants. In the plenary session, each group presented the conclusions of its collective work with the help of the above poster.

Group A. Presentation by Gudela Grote, ETH Zürich University

Gudela Grote, Professor of Work and Organizational Psychology at ETH Zürich, presented her research on: "How to balance safety, autonomy and uncertainty". Professor Grote first highlighted two different approaches to safety management: 1) the classic approaches that favored centralized decision-making in organizations to allow stability through hierarchical control and adherence to predefined procedures; 2) the more recent approaches that stressed the need for decentralized decision-making to enable flexibility through fast local adaptations and improvisation in unprecedented situations, thereby confronting the apparent contradiction between safety and autonomy. In this perspective, autonomy can be seen as an opportunity rather than a threat. Then, Professor Grote identified three main mechanisms allowing to balance safety and autonomy in face of uncertainty. These mechanisms involve managing rules to find a balance between fix and flexible rules as well as leadership and culture. Based on these mechanisms she proposed a model of uncertainty regulation.

In terms of research avenues, a core area of interest was identified. To better leverage the balance between safety, autonomy and uncertainty, there is a need for a more comprehensive understanding of how to adapt individual and collective uncertainty mindset (i.e., core individual and organizational beliefs regarding uncertainty). Then, a major question that calls for more theoretical and empirical investigation was formulated: how to prepare individuals and the entire organization, i.e., train people at all levels of the organization, to build and share an appropriate uncertainty mindset? More particularly, what kind of training is needed, with what kind of tools? Learning through training appears as a key challenge to be met.

Regarding the implications for organizational limits, the discussion revolved around the role of rules making as well as that of the design of performance indicators. It also revolved around uncertainty transfer and high order autonomy as a lever for collective mindfulness. Finally, organizational limits were discussed as related to legal implications.

To find more information on the presentation of Gudela Grote, please refer to appendix 9.

Group B. Presentation by Kristina Potočnik, University of Edinburgh Business School

Kristina Potočnik, Professor of Organizational Behaviour at the University of Edinburgh Business School, presented her research on the role of organizational limits in dealing with ambiguity and uncertainty. First, drawing on the work of Farjoun and Starbuck (2007), Kristina Potočnik pointed to the fact that organizations cannot do everything they envision or, in other words, that they have "limits" to what they can do with their current capabilities. Second, she made a distinction between exogenous and endogenous roots of these limits. While exogenous limits are restrictions on action that come from environmental factors such as, for example, physical laws, socially constructed constraints such as rules, laws, regulations or budgets, endogenous limits are restrictions on action that come from within the entities such as, for example, the level of organizational resilience that has been built into the system or the level of mindful organizing between the actors. These limits can explain how much an entity can achieve (or not) due to its current capabilities.

The talk further explored the interplay between cognition, technology and organizational limits in organizations in which safety and reliability are crucial. The main idea put forth was that failures and accidents occur when entities (e.g., systems, teams, crews, or organizations) attempt to operate at and beyond their limits. To illustrate the relationship between organizational limits and accidents, Kristina Potočnik referred to two previously published case studies on: 1) the 2003 space shuttle Columbia disaster (Starbuck and Farjoun, 2005) and 2) the 2009 loss of Air France 447 (Oliver, Calvard and Potočnik, 2017, 2019). The reasons of both accidents have been attributed to both NASA and the AF447 crew having operated at and beyond their limits.

In terms of research avenues, one main idea was put forth - it is crucial to better understand the limits of a system because this understanding can contribute to reducing the uncertainty to some extent. For example, it appears that exogenous limits reduce uncertainty by restricting the repertoire of actions. However, paradoxically, their pervasive use to control variety and reduce uncertainty progressively leads to an erosion of capabilities to deal with variety and uncertainty. This points to the idea that operating close to the limit may have benefits in terms of learning and capability development. Many issues were raised pointing to some important research avenues.

One issue concerned the definition of where a limit starts and ends, particularly in case of "soft" limits. The participants also discussed the necessity to develop training programs helping operators to develop the capability to respond to the unexpected allowing them safely to expand their endogenous limits.

Regarding the implications for organizational limits, the discussion mainly focused on the difficulty faced by high-risk and highly regulated organizations to operate close to their limits, but without exceeding them. At the heart of this difficulty resides the necessity for operators and decision-makers to continually learn and this depends on their exposure to the full range of behaviour of the systems that they have to safely manage.

To find more information on the presentation of Kristina Potočnik, please refer to appendix 10.

Group C. Presentation by Yoann Guntzburger, SKEMA Business School

During this session Yoann Guntzburger, professor in Science and Technology Studies, presented his work on ethics in the nuclear industry, and the role of ethics in management and leadership for safety.

He first emphasized that ethics in the nuclear industry is typically embedded in codes of conduct, providing sets of principles, or through values. This substantive approach aims at prescribing what is expected and valorized in terms of organizational behaviours or decision-making. Nonetheless, organizational studies have, over the years, highlighted the limitations of such an approach in practice, especially if not embedded in a larger organizational program set to enhance ethical behaviour. This approach usually leads to limited ownership from collaborators, as no clues are usually given to translate these principles or values into concrete actions.

On the other hand, Yoann argued that a procedural approach to ethics, which would focus on the **process** of reaching a desirable decision or action rather than on the nature of such decision or action, is potentially more suitable and relevant as it would empower people to use the principles or values. He therefore defines ethics as "a **process of critical reflection** aimed at identifying,

justifying, and applying criteria for making good decisions and establishing good practices, **with and for others**, in just institutions" (definition based on Ricoeur, 1990).

In terms of safety, such an approach of ethics is embedded in what is called the "deliberative approach to risk management", which, being grounded in dialogue with oneself and others, allow to address the concrete and complex reality of the situation (not abstract principles).

Yoann concluded his presentation by a discussion on how stakeholders engagement programs in the nuclear industry have the potential to integrate such approach, but still remain limited as they are mostly operationalized very vertically (more substantive than procedural) which may lead to counterproductive results (loss of trust, frustration, sarcasm, etc.). He illustrated this with the recent example of the public consultation for the Flamanville EPR NPP.

He finally framed this discussion within the organizational limits concept, and presented an interesting, less binding, more empowering example: Responsible Care and the national advisory panel, from the chemical industry.

The discussion that ensued after this presentation manifested as a debate between advocates of the substantive approach (particularly Hans-Jürgen Steinmetz) and those (notably the keynote speaker) who championed the processual approach. The debate underscored the entrenched nature of the substantive approach within the nuclear industry and illuminated the challenges that lie ahead in revisiting this approach.

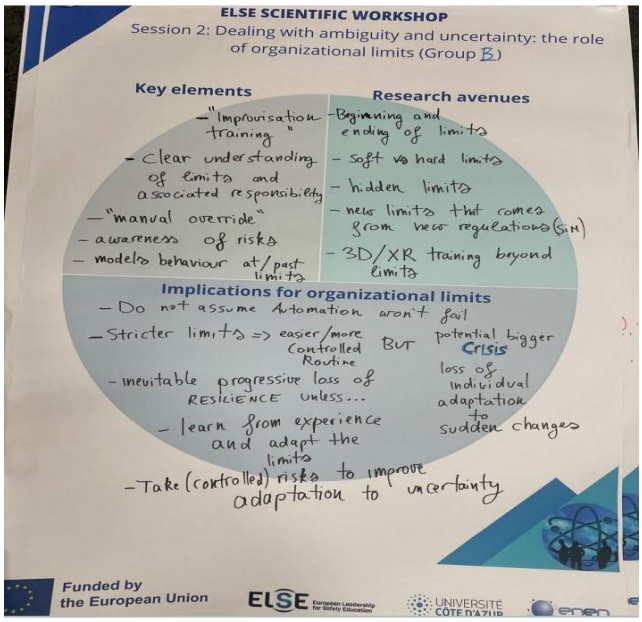
To find more information on the presentation of Yoann Guntzburger, please refer to appendix 11.

Debriefing of group session 2: "Dealing with ambiguity and uncertainty: the role of organizational limits"

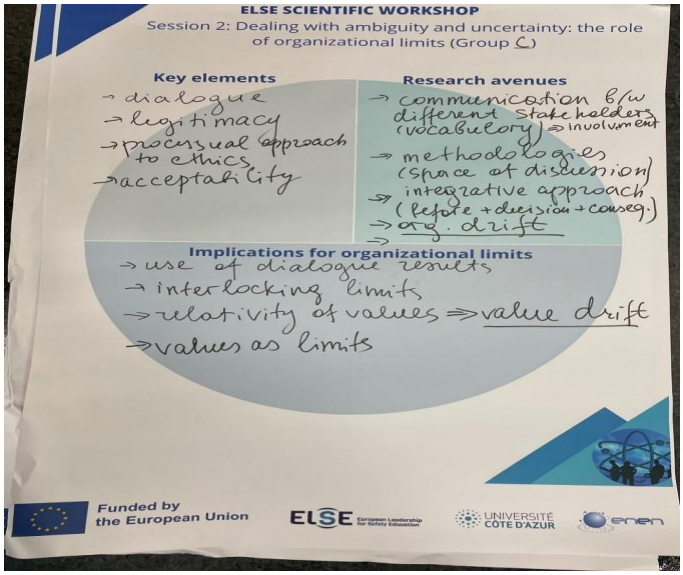
Debriefing of the group session 2 allowed to share and discuss groups works results synthetized in the following posters:

Session 2 : Groupe A

Session 2 : Groupe B



Session 2 : Groupe C



The session concluded that (endogenous) organizational limits may originate from rules, automation, but also uncertainty perception, and even from values (their relativity and acceptability) and process of ethical decision making.

The panel discussion highlighted the importance of a clear understanding of limits and the danger of hidden limits. In particular, the role of regulation and rules was mentioned. Although procedures and rules were designed to reduce uncertainty, their use may paradoxically reduce the capabilities to deal with uncertainty due to their potential to constrain reactions and lead to a loss of resilience.

During the debriefing session the discussion emphasized the need for flexibility to adapting the limits while dealing with uncertainty, particularly focusing on the necessity for flexible rules. Discussion participants agreed that this flexibility relies to a large extent on learning. In this context, training emerges as a crucial learning strategy. For instance, training could facilitate the development of an appropriate uncertainty mindset or introduce actors to the deliberative approach for ethical decision-making.

Finally, participants discussed the role and potential features of tools to help actors learn to become more at ease with uncertainty.

2.2.3 Group session 3: "The role of mindfulness in leadership for safety"

The discussion in each group focused on the role of mindfulness in leadership for safety. Three groups worked in parallel on this theme. The conversation was structured in three 20-minute time periods focused on three topics:

- Key elements on mindfulness
- Research avenues on mindfulness
- Implications for leadership for safety

To make the discussion on the key elements and research avenues on mindfulness more efficient, one researcher briefly presented her research on this theme.

The synthesis of each session was formalized in a poster represented in the following figure:

These discussion sessions were followed by a session of collective debriefing with all workshop participants. In the plenary session, each group presented the conclusions of its collective work with the help of the above poster.

Group A. Presentation by Ravi S. Kudesia, Fox School of Business

This session on the role of mindfulness in leadership for safety was based on the rich and fruitful presentation of Ravi S. Kudesia. Mr. Kudesia presented his innovative and integrative theoretical framework entitled "the attention-based view of systemic crises". In this theoretical framework, mindfulness is approached in its Western version and is defined as a quality of attention at the individual and collective levels. In this perspective, mindfulness means: (a) a stable attention, which refers to a sustained focus on a single issue; (b) a vivid attention, which equals a rich interpretation of complex cues; and (c) a coherent attention, which refers to an alignment of issues across actors while attention is distributed within the organization. Actors' capabilities to achieve such a stable, vivid and coherent attention support resilience capabilities which are defined as capabilities to manage complex, ambiguous and uncertain ongoing situations by being able to make sense of them in the "here and now" and develop customized responses. These capabilities are built in an organizational context in which structure and action interrelate with each other. Structure and action are defined through the lens of the theory of structuration developed by the influential social theorist Anthony Giddens. The structure refers to a set of rules and resources which enable and constrain action. It is enacted within three different and intertwined modalities (domination, signification, and legitimation), which provide basis for action via mechanisms. Action takes place through different practices and produces or reproduces the structure.

In terms of research avenues, two areas of interest were identified. First, to better understand the place of mindfulness in leadership for safety, there is a need for an in-depth theoretical understanding of how the literature on crisis management and the literature on high reliability organizations (HROs) could interrelate and be combined. Second, to better leverage mindfulness in leadership for safety, there is a need for a more comprehensive understanding of how individuals coordinate in the "during phase" of the crisis, that is to say, when the crisis is in incubation or has just occurred. How individuals are able to inquire, make sense of, frame and reframe the processes of inquiring and sensemaking, and challenge assumptions working with others, become essential to promote.

Regarding the role of mindfulness' implications for leadership for safety, the discussion revolved around the role of leadership in shaping the relationships between structure and action, and in attending the diverse stakeholders, creating an environment that nurtures individual and collective mindfulness. The discussion also revolved around the need for both a rotative and emergent leadership.

To find more information on the presentation of Ravi S. Kudesia, please refer to appendix 12.

Group B. Presentation by Mario Martinez-Corcoles, University of Valencia

Mario Martinez-Corcoles, Associate Professor of Work and Organizational Psychology at the University of Valencia, presented two recent studies: one about mindful organizing (anchored in HRO research stream) and the second about the positive effect of empowering leadership on mindful organizing. Empowering leadership was proposed as a predictor of mindful organizing which in turn would be related to positive changes in safety compliance and safety participation. More specifically, he hypothesized that mindful organizing would mediate the relationship between empowering leadership and two indicators of safety performance, safety compliance and safety participation. The results supported the first hypothesis (safety compliance), but surprisingly not the second (safety participation).

The group discussion first highlighted the difficulties of transferring individual mindfulness into collective mindfulness (or mindful organizing) and of measuring collective mindfulness. The participants then stressed the complex interplay between organizational mindfulness, safety culture and safety performance and the risk to oversimplify these relationships in a linear model. Finally, the question of how the structure and more particularly the power structure shaped these relationships arose.

To find more information on the presentation of Mario Martinez-Corcoles, please refer to appendix 13.

Group C. Presentation by Rhona Flin, University of Aberdeen

This session on the role of mindfulness in leadership for safety brought to light crucial elements at both the individual and organizational levels. Professor Flin's presentation and the discussion emphasized the significance of striking an equilibrium between maintaining focus and considering the larger picture, as mindfulness is intricately linked to situational awareness. Within academic literature, some authors view mindfulness as an inherent personal trait, others highlighted its potential for acquisition and development through appropriate training. However, the concept's practical application remains too vaguely defined, warranting further exploration and clarification.

In terms of research avenues, several key areas of interest were identified. To better leverage mindfulness in leadership for safety, there is a need for a more comprehensive understanding of the underlying mechanisms at both individual and organizational levels. Robust evidence demonstrating the tangible benefits of mindfulness for safety outcomes is essential to encourage wider adoption and implementation. Additionally, the significance of reconciling western and eastern approaches to mindfulness has been acknowledged, which could foster a comprehensive and culturally inclusive understanding of its potential applications in the context of leadership for safety.

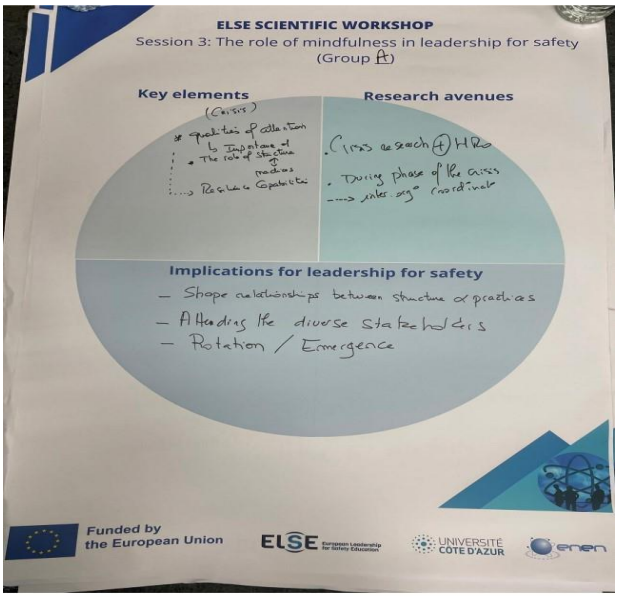
Regarding its implications for leadership for safety, the discussion revolved around the role of organizations in providing a sense of purpose and responsibility, creating an environment that nurtures mindfulness.

To find more information on the presentation of Rhona Flin, please refer to appendix 14.

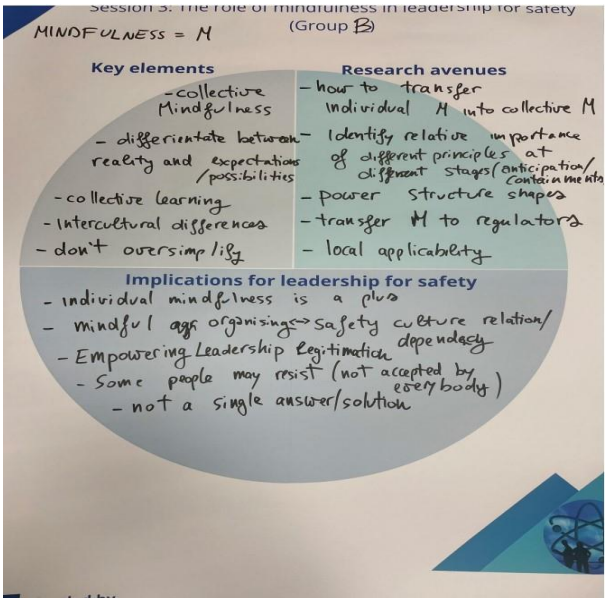
Debriefing of group session 3: "The role of mindfulness in leadership for safety"

Debriefing of the group session 3 allowed to share and discuss groups works results synthetized in the following posters:

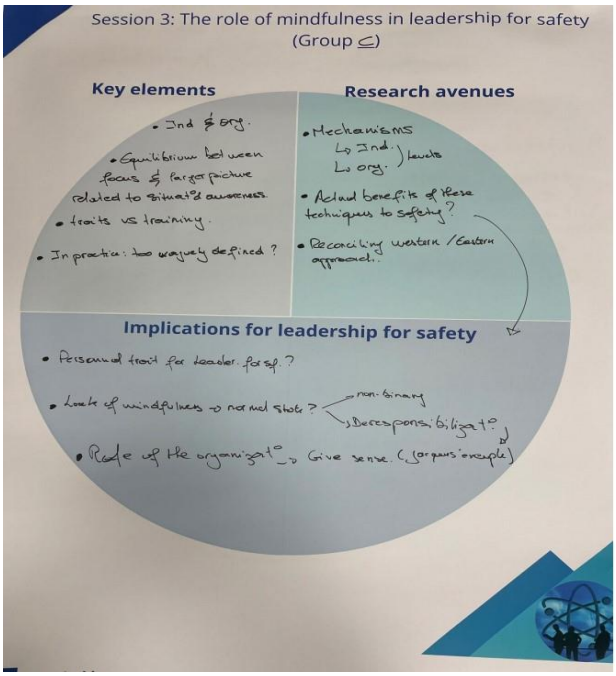
Session 3 : Groupe A



Session 3 : Groupe B



Session 3 : Groupe C



The concluding session encapsulated and extended the multifaceted discussions on the intricate interplay between mindfulness and its implications for leadership in the realm of safety. The

discourse underscored the inherent interconnectedness of individual and collective approaches to mindfulness highlighting the pivotal role of organizations in facilitating mindful practices. The sensemaking of the diverse and heterogeneous stakeholders has been pointed as a challenge.

A pivotal theme that surfaced was the necessity of reconciling individual and collective paradigms of mindfulness. The dialogues converged on the importance of fostering both personal mindfulness and cultivating a collective mindfulness ethos within the organizational context.

Central to the conversation was the pronounced significance of leadership in shaping the intricate tapestry of relationships between organizational structure and action. Participants emphasized that leadership acts as the linchpin in nurturing an environment that promotes both individual and collective mindfulness. The need for leadership to stimulate an atmosphere of curiosity, adaptive learning, and the reexamination of assumptions resonated as paramount for enhancing an organization's adaptability in addressing safety challenges.

Within the discourse, the concept of distributed forms of leadership emerged as an intriguing avenue. The prospect of sharing leadership responsibilities across various levels and fostering a sense of collective ownership over safety-related initiatives garnered enthusiastic consideration. Moreover, the empowering role of leadership garnered attention as a powerful mechanism. Empowering leadership was hailed as a driving force in cultivating accountability, promoting mindfulness, and augmenting safety endeavors.

Participants also addressed the complexities of transitioning individual mindfulness into a collective, organization-wide state—a challenge often referred to as mindful organizing. This transition was acknowledged as intricate, involving the alignment of diverse perspectives and the cultivation of a shared mindfulness culture. Measuring collective mindfulness, the discussion noted, poses its own set of intricate challenges that warrant further exploration.

In summary, the general discussion brought forth an integrated understanding of mindfulness's integral connection to effective leadership for safety. It reinforced the importance of reconciling individual and collective approaches, the significance of leadership in shaping organizational dynamics, and the imperative role of organizations in fostering a culture of mindfulness.

2.2.4 Panel discussion on a collective book

The workshop ended with a collective discussion on the opportunity to develop a collective book on the main concepts, processes and practices developed within the framework of the ELSE project.

This panel gathered all participants of the ELSE final scientific workshop. The main objective was to follow-up on a discussion, which started at the end of the ELSE face-to-face training in Nice in September 2022, where some members of the ELSE pedagogical team expressed their interest in a publication of a collective book to capitalize on the ELSE experience. Many issues were raised during this final discussion including: the nature/target of the potential publication (research versus textbook), the publisher (academic or professional), the timing and the potential interest in contributing. The consensus seemed to emerge that the most relevant format would be a collection of chapters based on research conducted by the ELSE pedagogical team members in line with the ELSE training. Kristina Potočnik recounted her experience with Springer Open Access (Springer open access books | Springer — International Publisher) and Maria Moracho Ramirez from IAEA suggested a possibility of publishing a collective book on the IAEA website. The group decided to further discuss it at a later date. Renata Kaminska committed herself to follow-up this dossier.

Appendix 1. List of workshop participants

Appendix 2. Detailed feedback on the MOOC session

Appendix 3. Detailed feedback on the Face-to-face session

Appendix 4. Detailed feedback on the ELSE training

Appendix 5. Presentation of the ELSE results and future of the ELSE project

Appendix 6. ELSE workshop - DMaLSE presentation

Appendix 7. Presentation of Colin Pilbeam

Appendix 8. Presentation of Moshe Farjoun

Appendix 9. Presentation of Gudela Grote

Appendix 10. Presentation of Kristina Potočnik

Appendix 11. Presentation of Yoann Guntzburger

Appendix 12. Presentation of Ravi S. Kudesia

Appendix 13. Presentation of Mario Martinez-Corcoles

Appendix 14. Presentation of Rhona Flin

Appendix 1 : List of participants

The ELSE Second Scientific Workshop gathered **12 renowned academics** from 11 diverse universities and 6 countries, detailed in the following table:

Name	Occupation	University / Institution	Country
DANIEL Carole	Associate Professor	SKEMA Business School	France
STEINMETZ Hans-Jürgen	Professor	FH Aachen	Germany
BELLINGAN Nancy	PhD Candidate	FH Aachen	Germany
PORET Céline	Researcher	IRSN	France
MARTINEZ-CORCOLES Mario	Associate Professor of Work and Organizational Psychology	IDOCAL, University of Valencia	Spain
FARJOUN Moshe	Professor of Strategy and Organization	Schulich School of Business, York	UK
GROTE Gudela	Professor of Work and Organizational Psychology	ETH Zürich	Switzerland
KUDESIA Ravi S	Assistant Professor of Human Resource Management	Temple University Fox School of Business	USA
PILBEAM Colin	Professor of Organizational Safety	Cranfield University	UK
POTOCNIK Kristina	Professor of Organizational Behaviour	University of Edinburgh Business School	UK
FLIN Rhona	Professor of Industrial Psychology	Aberdeen Business School, Robert Gordon University	UK
MOTET Gilles	Professor	INSA Toulouse	France

The ELSE Scientific Workshop also gathered **7 experts** from the nuclear industry:

Name	Occupation	Institution	Country
LOUVAT Didier	Expert	Independent	France
AMALBERTI René	Expert	FonCSI	France
LEMAIRE Philippe	Head of O&M and Nuclear Safety	ENGIE	Belgium
MORACHO RAMIREZ Maria	Senior Safety Officer	IAEA	Austria
ERMINE Jean-Louis	Consultant, Professor emeritus	Institut Mines-Telecom	France

NYS Vincent	Project Manager Officer	FANC	Belgium
IVANOVA Tatiana	Head of the Division of Nuclear Science	Nuclear Energy Agency	France

Xavier Pinsolle, the Project Manager of Nuclear Safety and Safeguards at DG International Partnerships, Unit F1, Brussels/Belgium, along with **11 members** of the ELSE and DMaLSE teams, also participated in the ELSE closing Workshop:

Name	**Occupation**	**University / Institution**	**Country**
DANIEL Pierre	Associate Professor	SKEMA Business School	France
RIDAO CABRERIZO Joseph	Research Associate	Karlsruher Institut für Technologie (KIT)	Germany
KAMINSKA Renata	Professor	SKEMA Business School	France
ROUBY Evelyne	Professor	UCA	France
THOMAS Catherine	Professor	UCA	France
GUNTZBURGER Yoann	Assistant Professor	SKEMA Business School	France
KRASNOPEVTSEVA Natalia	ELSE Research and Training assistant	UCA	France
SECCHI Saveria	Postdoctoral Researcher	UCA	France
PILIUHINA Kateryna	ENEN Project Manager	ENEN	Belgium
REPUSSARD Jacques	Director of IRSN, Chair of ELSE Steering Committee	IRSN	France
BARSKE Jenna	Project Manager of DMaLSE	UCA	France