

HAS OUR SAFETY THINKING CHANGED?

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OVERVIEW

- The Aviation Academy
- Research in Safety Thinking
 - Background and Theoretical Framework
 - Analysis Results
 - Conclusions and Next Steps
- Opportunities for Collaboration with Greek authorities and companies

THE AVIATION ACADEMY

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AMSTERDAM UNIVERSITY OF APPLIED SCIENCES



Some facts:

- a total of 43,000 students
- a total of 80 bachelor and master programs
- seven faculties

Aviation Academy is part of the Faculty of Technology.

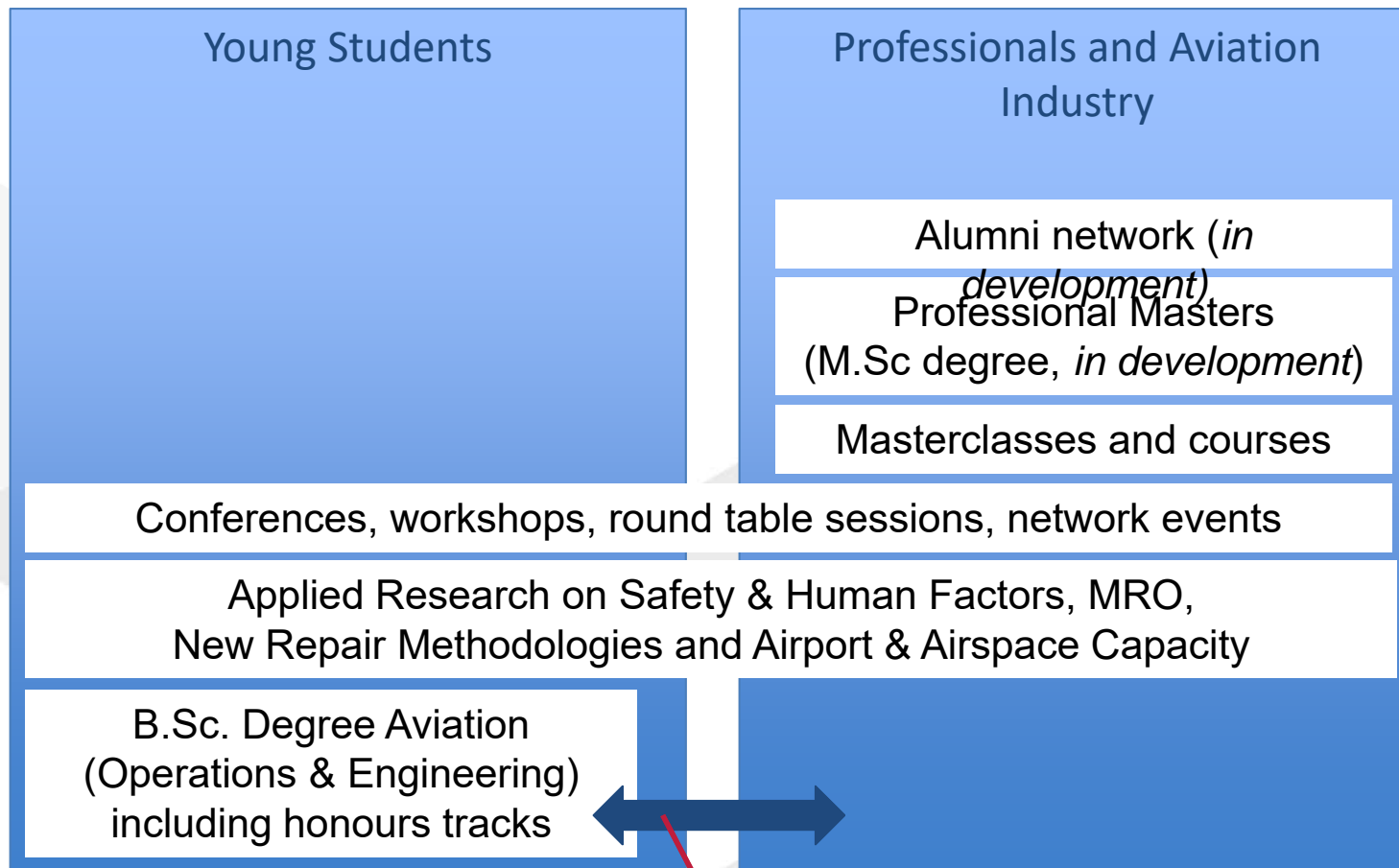
- 425 new students each year
- A total of 1300 students



AVIATION ACADEMY: MAIN THEMES

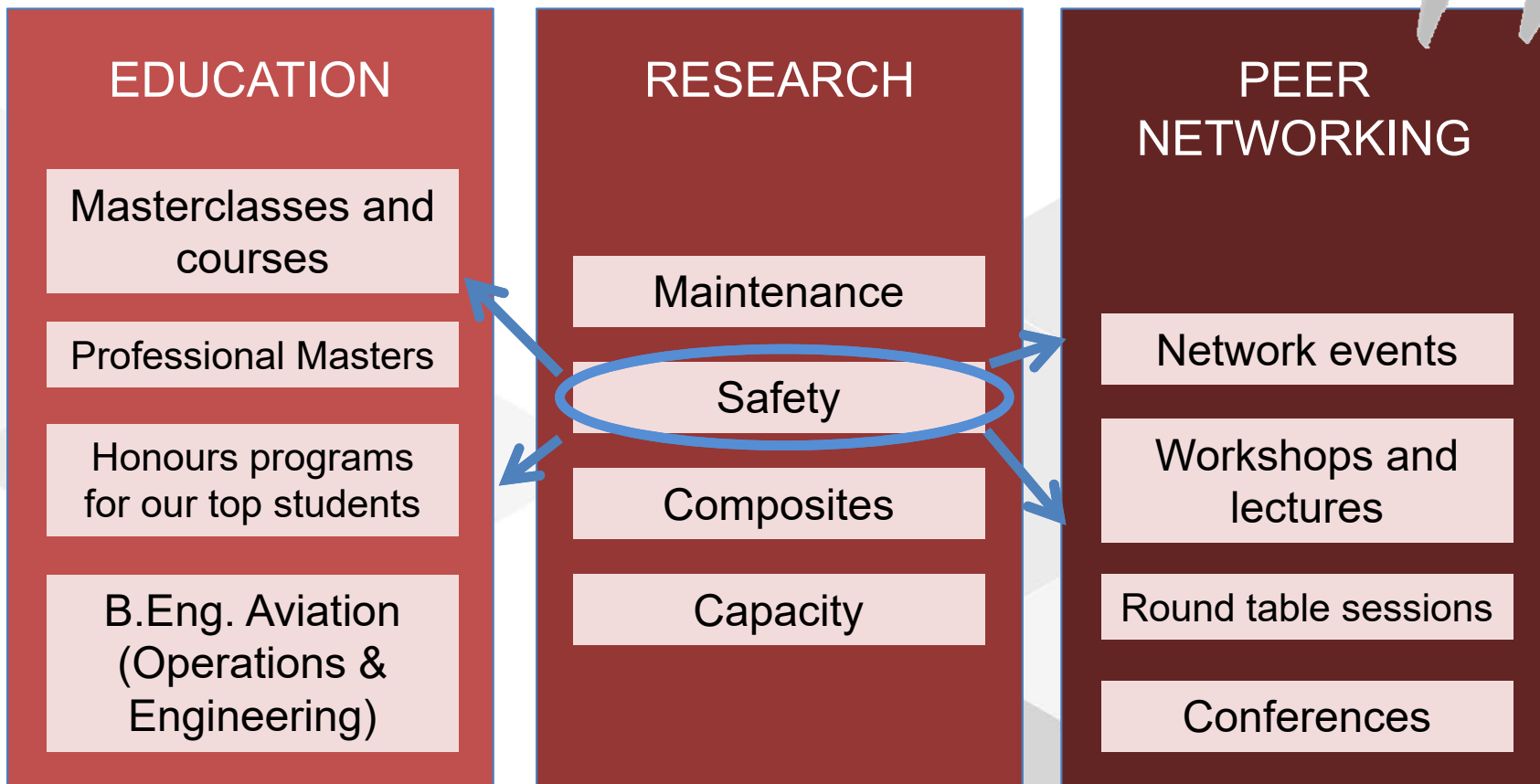


AVIATION ACADEMY: ACTIVITIES

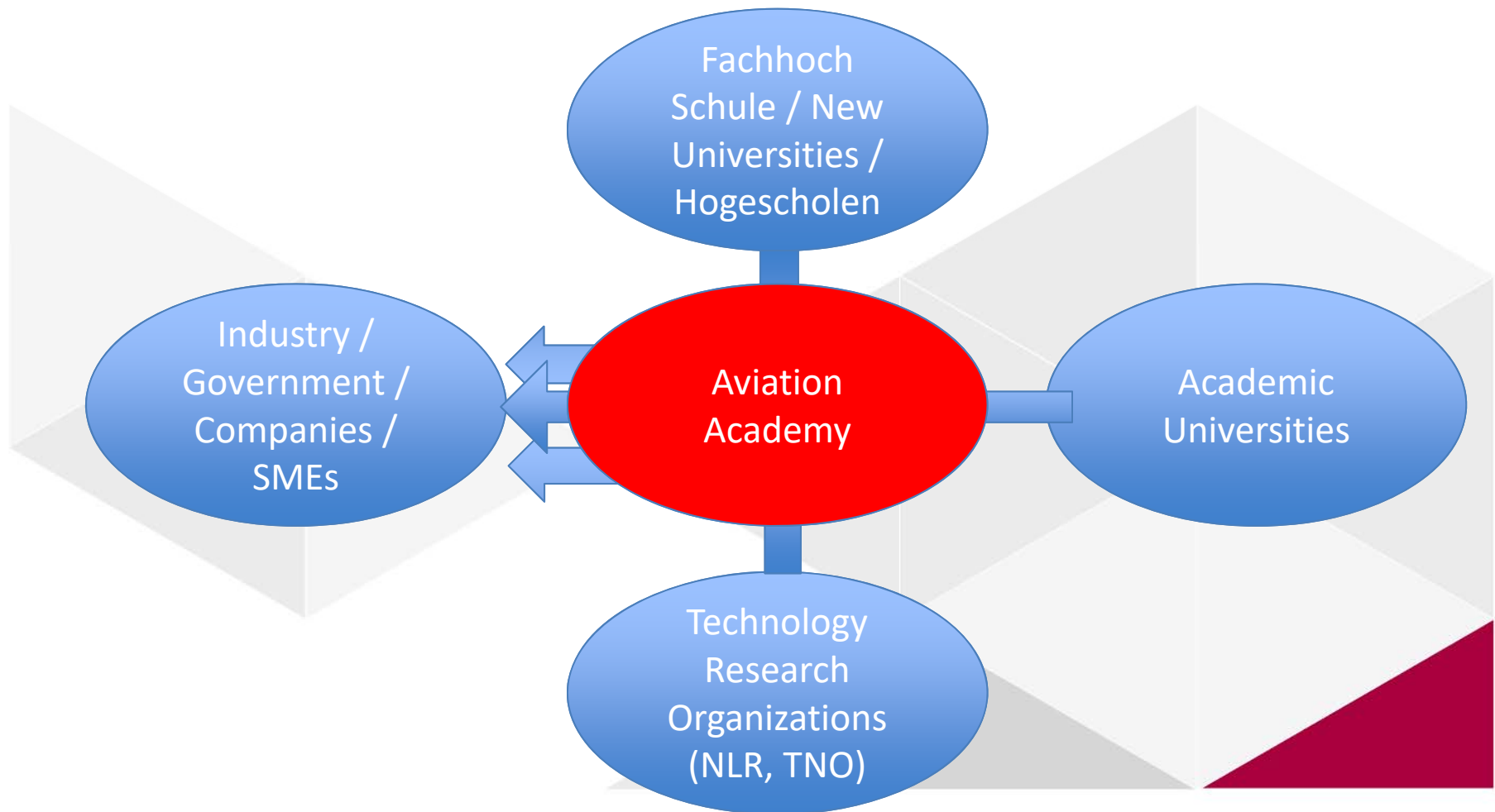


Young Professionals, Internships, industry involvement in curriculum

PEER AND INDUSTRY NETWORKING

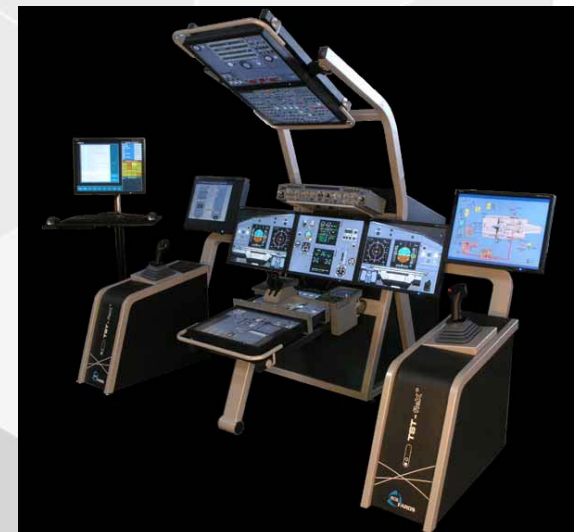


BRIDGING THE GAP BETWEEN SCIENTIFIC KNOWLEDGE AND PRACTICE



HUMAN FACTORS & SAFETY

- Safety management
 - Improvement of Safety Management Systems
 - Quality of safety investigation reports & recommendations
 - Safety culture development
 - Fatigue recognition through speech characteristics
- CRM
 - Sociometric CRM: defining quality of crew cooperation through voice analysis
- Partners:
 - KLM, Arkefly, EASA, MIT, VU, TUD, EPST, VNV / ALPA-NL, OKG, NedTrain etc.



RESEARCH ON SAFETY THINKING: BACKGROUND AND THEORETICAL FRAMEWORK

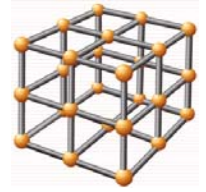
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RESEARCH BACKGROUND

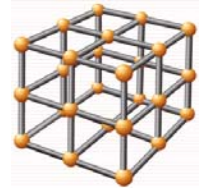
- Evolution in safety thinking:
 - Accident causation models: from root cause, to epidemiological and systemic approaches.
 - New views in human error: from blaming, to understanding the end-user's decisions and actions.
- Research question:
 - What is the extent to which current practice has embraced academic thinking in regard to accident models and human error views?



ASPECTS OF THE ANALYSIS FRAMEWORK: HUMAN ERROR SEEN AS SYMPTOM

Old View	New View
Human Error is seen as the principal cause of accidents.	Searching for factors that contributed to Human Error.

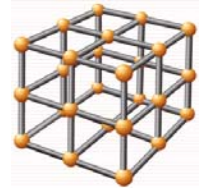
(Dekker, 2006)



ASPECTS OF THE ANALYSIS FRAMEWORK: HINDSIGHT BIAS AVOIDANCE

Old View	New View
Looking to the event backwards and simply recording errors, inaccurate assessments and wrong decisions.	Consider why choices made sense to users at that time, and what options they had prior to the accident.

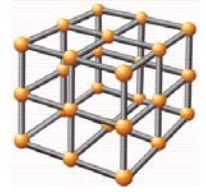
(Dekker, 2006)



ASPECTS OF THE ANALYSIS FRAMEWORK: SHARED RESPONSIBILITY

Old View	New View
Focus on end-user(s) without exploring influences of other organizational levels.	End-user is not the focal point; organizational factors are also investigated.

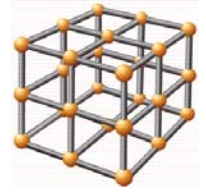
(Catino, 2008; Dekker, 2006)



ASPECTS OF THE ANALYSIS FRAMEWORK: NON-PROXIMAL

Old View	New View
Shared responsibility might be discussed, but investigators persist on investigating in detail the end-user level.	Equal investigation of all organizational functions.

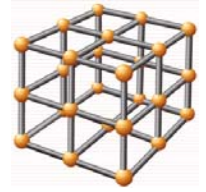
(Dekker, 2006)



ASPECTS OF THE ANALYSIS FRAMEWORK: LACK OF FOLK MODELS

Old View	New View
Adopting abstract statements (e.g., loss of situation awareness, complacency).	Decomposing and explaining the problems.

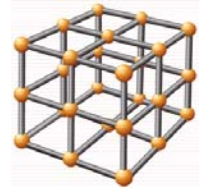
(Dekker & Hollnagel, 2004; Dekker, 2006)



ASPECTS OF THE ANALYSIS FRAMEWORK: NON-COUNTERFACTUAL

Old View	New View
Merely comparing human performance against standards and procedures.	Exploring the reasons for deviating from standards. Examining the assumptions the standards were based on.

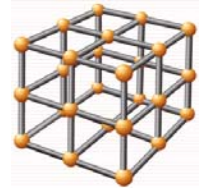
(Dekker, 2006)



ASPECTS OF THE ANALYSIS FRAMEWORK: NON-JUDGMENTAL

Old View	New View
Actions are compared with norms and expectations (e.g., knowledge, experience and training).	Exploring the reasons for not meeting expectations. Examining the validity of established norms and expectations.

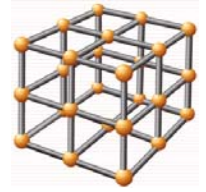
(Dekker, 2006)



ASPECTS OF THE ANALYSIS FRAMEWORK: SAFETY-II

Old View	New View
<p>Humans are predominantly seen as a hazard. Emphasis on explaining failures.</p>	<p>Humans are seen as a resource necessary for system flexibility and resilience. Need to explain successes in addition to failures.</p>

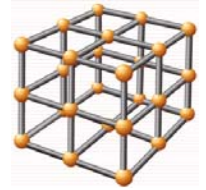
(Hollnagel, 2014)



ASPECTS OF THE ANALYSIS FRAMEWORK: CONTROL LOOPS

Old View	New View
Feedback mechanisms not systematically investigated.	Feedback mechanisms between different parties involved are systematically considered.

(Leveson, 2011)



ASPECTS OF THE ANALYSIS FRAMEWORK: ACCIDENT MODELS

	Sequential models	Epidemiological models	Systemic models
Search principle	Specific causes and well-defined links.	Carriers, barriers and latent conditions.	Tight couplings and complex interactions.
Analysis goals	Eliminate or contain causes.	Make defences and barriers stronger.	Monitor and control performance variability.

(Underwood & Waterson, 2013; Hollnagel & Goteman, 2004; Leveson, 2004, 2011; Reason et al., 2006)

RESEARCH SAMPLE AND VARIABLES

Authority & reports	Time period		End-user involvement		Fatalities	
	1999-2006	2007-2014	YES	NO	YES	NO
DSB – 52 rep.	26	26	29	23	4	48
ATSB – 45 rep.	24	21	25	20	9	36
UK CAA – 60 rep.	30	30	31	29	19	41
TCA – 60 rep.	30	30	44	16	27	33
Total	217 safety investigation reports					
Remarks:	Used to explore differences over time	Used to assess if approaches changed depending on end-user's direct engagement in the accident		Used to evaluate if safety views differed due to emotional pressure.		

DSB: Dutch Safety Board
 ATSB: Australian Transport Safety Bureau
 UK CAA: UK Civil Aviation Authority
 TCA: Transport Canada

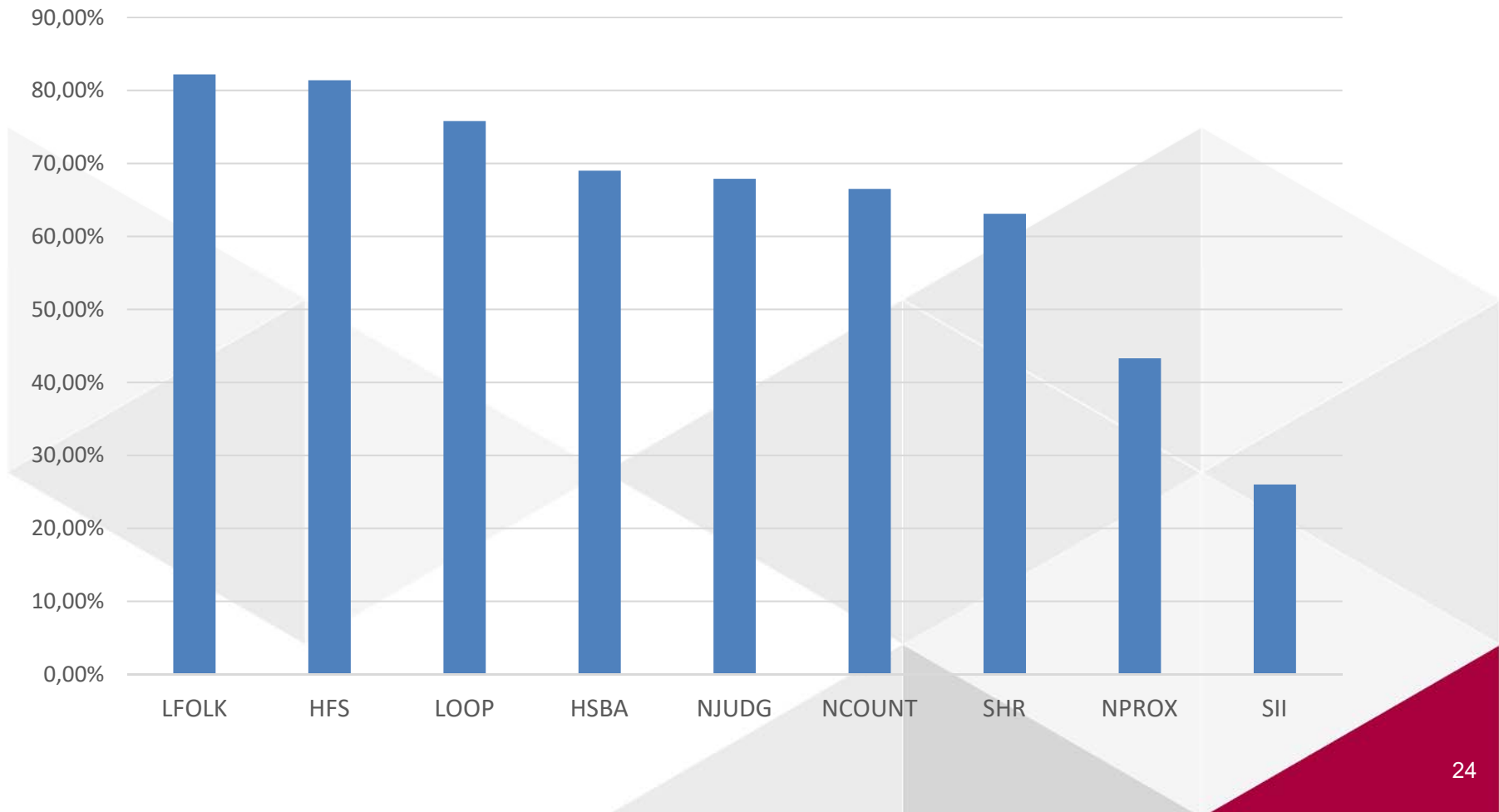
RESEARCH ON SAFETY THINKING: ANALYSIS RESULTS

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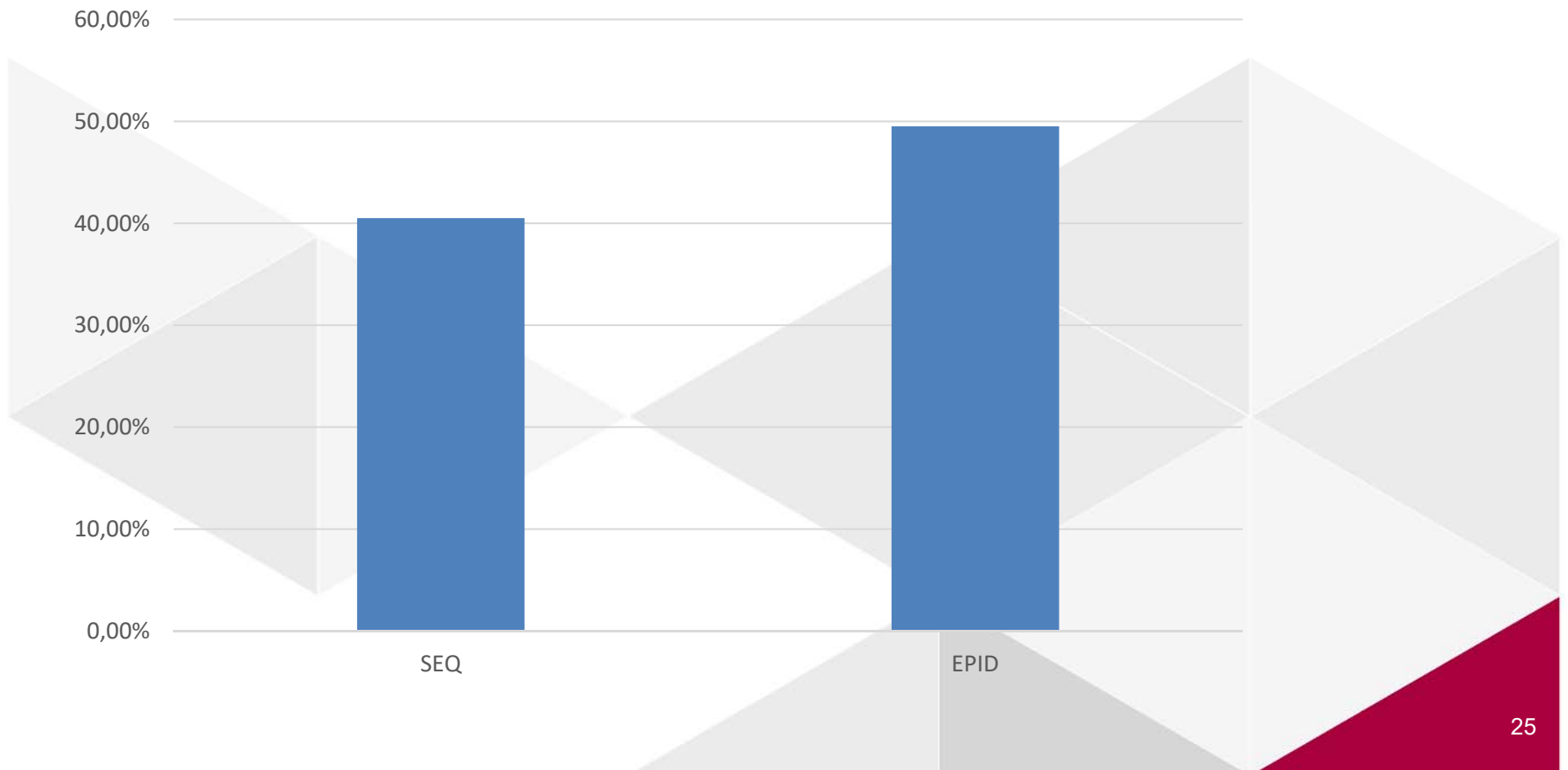
NEW VIEWS ON HUMAN ERROR

FREQUENCIES OF SAFETY THINKING ASPECTS



ACCIDENT MODELS

FREQUENCIES OF ACCIDENT MODELS



SIGNIFICANT DIFFERENCES AMONGST AUTHORITIES

Framework Aspect	ATSB	DSB	TCA	UK CAA
Human Error Seen as Symptom	78%	69%	79%	96%
Hindsight bias avoidance	93%	46%	55%	78%
Shared responsibility	77%	59%	45%	75%
Non counterfactual	82%	66%	50%	66%
Safety-II	53%	14%	13%	28%
Non judgemental	86%	63%	62%	60%
Non proximal	75%	54%	20%	38%

SIGNIFICANT DIFFERENCES OVER TIME

	Time period with significantly higher frequencies				
Framework Aspect	WHOLE SAMPLE	ATSB	DSB	TCA	UK CAA
Human Error Seen as Symptom				2	
Non proximal		2			
Lack of folk models		2	2		1

SIGNIFICANT DIFFERENCES FOR END-USER (EU) INVOLVEMENT

	Significantly higher frequencies for EU				
Framework Aspect	WHOLE SAMPLE	ATSB	DSB	TCA	UK CAA
Non judgemental	LOWER				
Safety-II	LOWER	LOWER			
Control loops		HIGHER			
Accident model	EPID	EPID			

SIGNIFICANT DIFFERENCES FOR FATALITIES

	Significantly higher frequencies for fatalities				
Framework Aspect	WHOLE SAMPLE	ATSB	DSB	TCA	UK CAA
Shared responsibility				LOWER	
Non proximal	LOWER				
Safety-II	LOWER	LOWER			
Control loops	LOWER			LOWER	

RESEARCH ON SAFETY THINKING: CONCLUSIONS AND NEXT STEPS

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CONCLUSIONS (1/3)

- The framework has the potential to uncover the extent to which new views on human error and accident models have been embraced by organizations.
- The framework can be used for:
 - evaluating the distance between theory and practice
 - assessing differences among authorities, companies etc.
- Epidemiological models are used more frequently than sequential models, a transition to systemic models is not visible.
- Analysis of success not much applied in accident investigation.
- Although authorities recognize the contribution of various organizational factors, there is tendency to analyze mostly the sharp-end.

CONCLUSIONS (2/3)

- When considering the whole sample:
 - Safety thinking of the authorities considered in the researched has not significantly changed over time.
 - Authorities tend to be more judgmental and address successes less when there has been end-user involvement in the accident course.
 - Safety II, control loops and non-proximal aspects scored lower when the accidents resulted to fatalities.

CONCLUSIONS (3/3)

- The results from the analysis suggest that the 4 authorities have embraced new safety thinking at a different degree.
- 3 out of the 4 authorities embraced after 2007 more frequently some of the aspects, whereas one authority scored lower in one aspect after 2007.
- The frequency of 3 out of the 10 framework aspects was affected by the end-user involvement into the accidents in the case of one authority.
- Fatalities were associated with lower frequency in 3 aspects across 2 authorities.

NEXT STEPS

- The distance between academia and industry needs to be explained and minimized.
- There has been no scientifically proven relation between human error views / accident models and safety performance.
- Analyse accidents from more authorities to increase the sample and identify further differences.

OPPORTUNITIES FOR COLLABORATION

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OPPORTUNITIES FOR COLLABORATION

- Organization and/or attendance of professional masterclasses – seminars:
 - Advanced Safety & Human Factors
 - Systemic Hazard Analysis
 - Safety Culture Development
- Participation in projects as partners (e.g., safety, human factors, capacity optimization, maintenance optimization).
- Co-organization / sponsoring of international events

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Questions?

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CREATING TOMORROW

