Receptivity to expert advice, education and training is highly dependent on situational and cultural context

Hugh Wilkins, Clinical Scientist, Independent MPE and RPE, UK

European ALARA Network (EAN) Workshop 2-4 October 2023, Vienna
ALARA for interventional radiology & nuclear medicine
Session 4: Education and training; culture
3 October 2023

Receptivity to expert advice, education and training is highly dependent on situational and cultural context

I keep six honest serving-men

(They taught me all I knew)

Their names are What and Why and When

And How and Where and Who

Rudyard Kipling *Just so stories* (1902)

Foundations of the system of radiological protection

The **system of radiological protection** is based on:

- the **science** of radiation, combining scientific knowledge from different disciplines
- a set of **values** rooted in ethics and morality
- **experience** accumulated from the day-to-day practice of radiological professionals

ICRP Publication 138. **Ethical foundations of the system of radiological protection**. *Ann. ICRP* 47(1), 21 2018

RP is much more than time/distance/shielding/containment of radioactivity … It also involves culture (attitudes, beliefs, behaviours) and requires soft skills, including communication.

"There's nothing soft about soft skills."

Communicating radiation risks to non-specialists is challenging

Radiation risks are poorly-understood by most people

Radiological science is complex, and incomplete

Radiation metrology is baffling to most people

Radiation protection jargon can be a foreign language to lay people

Radiation safety concepts and culture may be unfamiliar to others

Widespread intolerance of ambiguity and statistical uncertainty

Communicating radiation risks is important

Communicating in a crisis exacerbates the challenges

Radiation Protection Practitioners need good communication skills

They should be able to translate relevant science, legislative requirements, regulator expectations and complex technical jargon into language right for the audience: orally, in writing and visually.

But there's more to it than that. Good communication of messages requires:

- good creation/articulation of message (oral/written/visual ...)
- good channels of communications to target audiences
- good listening skills and willingness to listen

transmission

reception

Effective communication implies 2-way communication, engagement and follow up action

Elements of communication

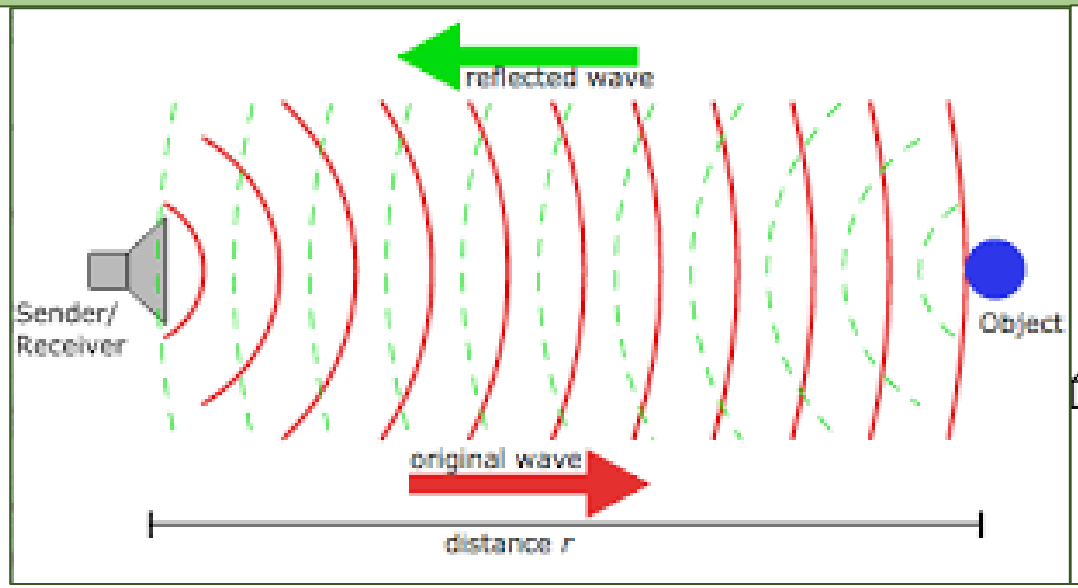
- Composing and sending message
- Transmission of the message
- Receiving and understanding message

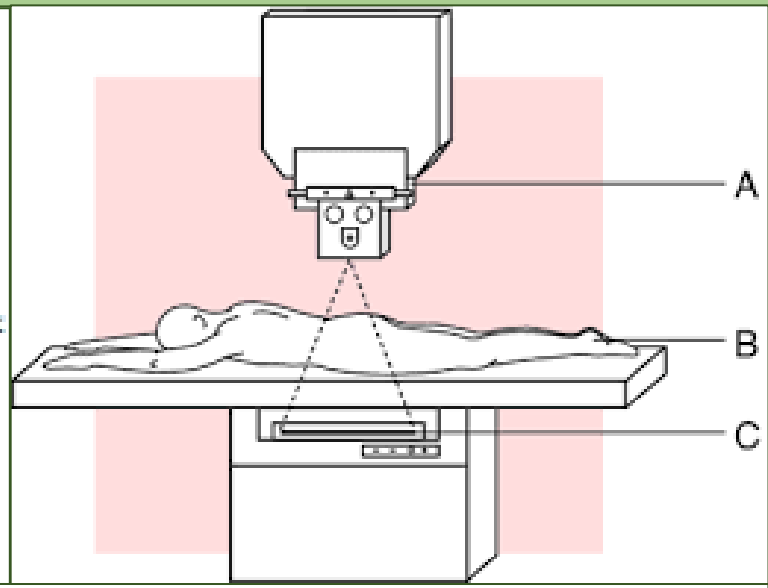
Parallels between communication and imaging systems

Source

Medium

Receiver





Good communication requires a high signal:noise ratio

- Clear message, tailored to the particular audience
- Loss-less medium through which the message is transmitted without deleterious attenuation
- Sensitive audience attuned to the message

Risk, risk communication and perception of risk

Risk: combination of:

- severity/consequence/impact of harm
- likelihood/probability that harm will occur

Risk communication: exchange of information about risks

Perception of risk - may differ markedly from scientific assessment of risk

Context and the wider risk landscape

Risk communication and decision-making involve situational awareness and understanding how particular risks relate to other risks

Know your audience and **understand their viewpoint(s)**

Context, communication channels and situational awareness are very important in communication and decision-making

Balancing radiation and other risks

Decision-makers, whether in government (local/national), regulators, emergency services, other agencies, nuclear site operators, hospitals, universities, other organisations *and* individual members of the public, often need to consider, juggle and try to balance many types of risk … of which radiation is just one of many.

Types of risk

- Health (physical, psychological)
- Quantitative / Qualitative
- Individual / Population
- Reputational
- Financial
- Legal
- Societal
- ….

Quantitative / Qualitative communication of x-ray imaging risks

Quantitative risks e.g. (from ICRP 103):

Nominal risk coefficient for stochastic effects after exposure to radiation at low dose rate:

Cancer: 5.5×10^{-2} Sv^{-1} (whole population) / 4.1×10^{-2} Sv^{-1} (adults)

Heritable effects: 0.2×10^{-2} Sv^{-1} (whole population) / 0.1×10^{-2} Sv^{-1} (adults)

Qualitative risks (see e.g. Wall, Kendal, Edwards et al, BJR 79 (2006), 285–294):

Risk band	*Risk Range*	*Typical type of X-ray examination*
Negligible	< 1-in-a-million	Radiography of chest/limbs/teeth
Minimal	1-in-a-million to 1-in-100,000	Radiography of head/neck/joints
Very low	1-in-100,000 to 1-in-10,000	Radiography of spine/abdomen/pelvis
Low	1-in-10,000 to 1-in-1,000	CT/angiography/interventional radiology
Moderate	> 1-in-1,000	High dose (CT/angioplasty/interventional radiology procedures - risk depends on anatomical site exposed, and patient's age, sex, prognosis)

Why are radiation risks difficult to understand?

- Radiation cannot be detected using the five human senses (sight, hearing, touch, smell, taste)
- Unclear relationship between dose and risk at low doses and low dose-rates
- Radiation metrology is baffling to most non-specialists
- Receiver(s) of message unfamiliar with concepts of statistical probability and uncertainty
- Manifestation of radiation-induced pathology is delayed, sometimes for decades
- Radiation-induced cancer is indistinguishable from cancer from other causes
- Qualitative risk semantics may not be persuasive (esp. high consequence, low likelihood risks)
- Quantitative (numerical) risks are often poorly-understood
- Low dose radiation risks are a matter of (legitimate) scientific debate
- Prejudicial predisposition (e.g. anti-science/anti-nuclear lobbies; personal/political agendas)
- Radiation ticks many *fright factor* boxes

Fright Factors

Risks seen as being more worrying (and less acceptable) if perceived

to be **involuntary** (such as exposure to pollution) rather than voluntary (dangerous sports or smoking)

to be **inequitably distributed** (some benefit while others suffer the consequences)

to be **inescapable** through taking personal precautions

to arise from an **unfamiliar or novel** source

to result from **man-made, rather than natural**, sources

to cause **hidden and irreversible** damage, such as through the onset of illness many years after exposure

to pose some particular danger to **small children or pregnant women**

or, more generally, to **future generations**

to threaten a form of death (or illness/injury) arousing **particular dread**

to damage **identifiable rather than anonymous victims**

to be **poorly understood by science**; and

to be subject to **contradictory statements** from responsible sources (or, even worse, from the same source)

Radiation risks tick many *'fright factor'* boxes

Fright Factor (modified by context)	Medical exposures	NPP accident → emergency release of radioactivity to environment
involuntary	-	✓✓✓
inequitably distributed	-	✓✓✓
inescapable	-	✓✓
unfamiliar or novel	-	✓✓✓
man-made, rather than natural	✓	✓✓✓
hidden and irreversible	✓	✓✓
small children or pregnant women	✓✓	✓✓✓
future generations	✓	✓✓✓
particular dread	✓	✓✓✓
identifiable victims	✓	✓✓✓
poorly understood by science	✓	✓
contradictory statements	✓	✓✓✓

Impact of poor channels of communication on decision-making

Poor channels of communication can → suppression of messages

Likelihood increases with number of tiers through which messages pass

Can lead to distortion and misrepresentation of original message

Can happen if corporate structures allow messages to be filtered by multiple hierarchical tiers before reaching decision-makers

Organisational change and loss of organisational memory may exacerbate these barriers to good communication

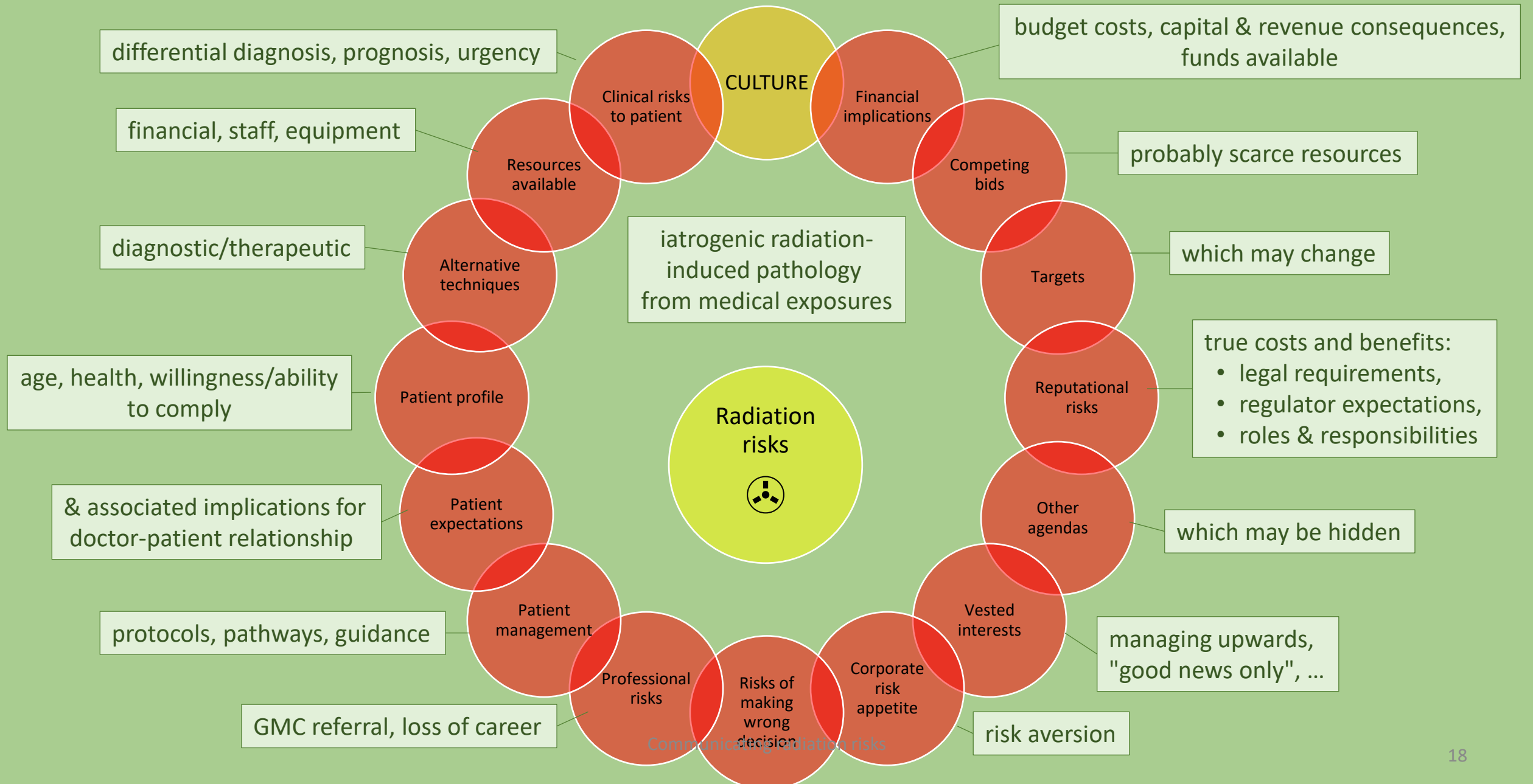
Good communication also requires receptivity to message

Recipients of messages should:

- Be attentive and curious:
  - Listen completely and attentively
  - Maintain a sense of curiosity and appreciative inquiry
- Be aware
  - Be mindful of what's going on
- Be aware of their own biases, preconceptions and limitations
  - Be alert to bias (including Dunning-Kruger Effect) and preconceived ideas
  - Welcome input from subject matter experts
- Respond appropriately
  - Acknowledge message, provide feedback, follow up action as required
- Develop active listening skills

10 tips for active listening - Heart Matters magazine – BHF ; 16 ways to improve your communication skills with patients - BHF

Risks from medical exposure to radiation in context of other risks



Willingness of decision-makers to listen?

Good news only culture → problems

"Hear no evil, See no evil, Speak no evil"

Kikazaru (hear not)

Iwazaru (say not)

Mizaru (see not)

Images: Three wise monkeys - Wikipedia

What is culture? [1]

Amongst many definitions of culture, Matsumoto has defined it as:

The set of attitudes, values, beliefs and behaviours shared by a group of people, but different for each individual, communicated from one generation to the next (1996)

Culture is a dynamic system of rules, explicit and implicit, established by groups to ensure their survival, involving attitudes, values, beliefs, norms and behaviours (2004)

See also:

- *Culture, context, and behavior* (Matsumoto, 2007)
- *Culture, psychology, and education* (Matsumoto, 2011)

https://www.worldcat.org/title/culture-and-psychology/oclc/32347701

https://mrmikesibpsychology.weebly.com/cultural-norms.html

http://davidmatsumoto.com/content/2007%20Matsumoto%20JOP.pdf

https://scholarworks.gvsu.edu/orpc/vol2/iss1/4/

What is culture? [2]

Culture is:

- ***"the way we do things round here (deliberately or non-deliberately, consciously and unconsciously)"***
- ***"what people do when no-one is looking"***
- ***"all about the behaviours that people demonstrate"***

https://www.management-issues.com/opinion/6719/whats-culture-and-whats-yours/

What is culture? [3]

"Culture shapes the way we think about the world, even the way we see the world.

This is why we are often blind to our own biases."

Heinrich J. *The weirdest people in the world: how the west became psychologically peculiar and particularly prosperous* (2020) Publisher: Allen Lane ISBN-13 : 978-1846147968

Park et al. *Culture Wires the Brain: A Cognitive Neuroscience Perspective*. Perspectives on Psychological Science, 2010; 5 (4): 391

Khamsi R. *Can culture dictate the way we see? (*2007) https://www.newscientist.com/article/dn11785-can-culture-dictate-the-way-we-see/

IAEA understanding of culture

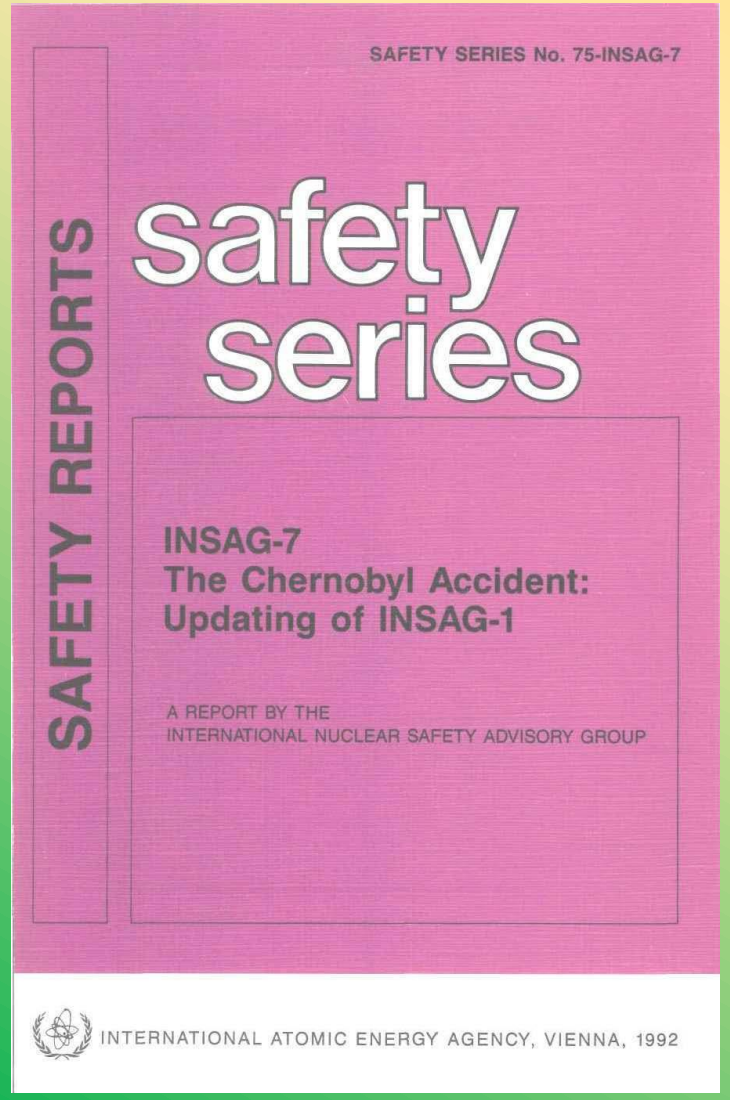
The culture of the organization comprises the mix of shared values, attitudes and patterns of behaviour that give the organization its particular character. Put simply, it is 'the way we do things round here'.

INSAG-13 *'Management of operational safety in nuclear power plants'* (1999)

https://www.iaea.org/publications/5830/management-of-operational-safety-in-nuclear-power-plants

The Chernobyl accident (INSAG-1, INSAG-7)

International Nuclear Safety Group, 1986. Revised 1992 (INSAG-7)



In its report on the Chernobyl accident, INSAG coined the term **'safety culture'** to refer to the safety regime that should prevail at a nuclear plant

Safety culture … is primarily generated by the attitudes of managers

New information has highlighted a number of broader problems contributing to the accident. These include: … *A general lack of safety culture in nuclear matters, at the national level as well as locally*

INSAG concluded that the need to create and maintain a 'safety culture' is a precondition for ensuring nuclear power plant safety

The concept of 'safety culture' relates to a very general concept of dedication and personal responsibility of all those involved in any safety related activity

https://www-pub.iaea.org/MTCD/publications/PDF/Pub913e_web.pdf

https://www.iaea.org/publications/3598/summary-report-on-the-post-accident-review-meeting-on-the-chernobyl-accident

Radiation Safety Culture (*Health Physics Society* definition)

Radiation Safety Culture is the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment.

Definition adopted from the U.S. *Nuclear Regulatory Commission* (NRC) definition of *Nuclear Safety Culture* (NRC 2011), with its applicability expanded to include non-NRC regulated sources of radiation such as machine-produced radiation and natural background sources of radiation

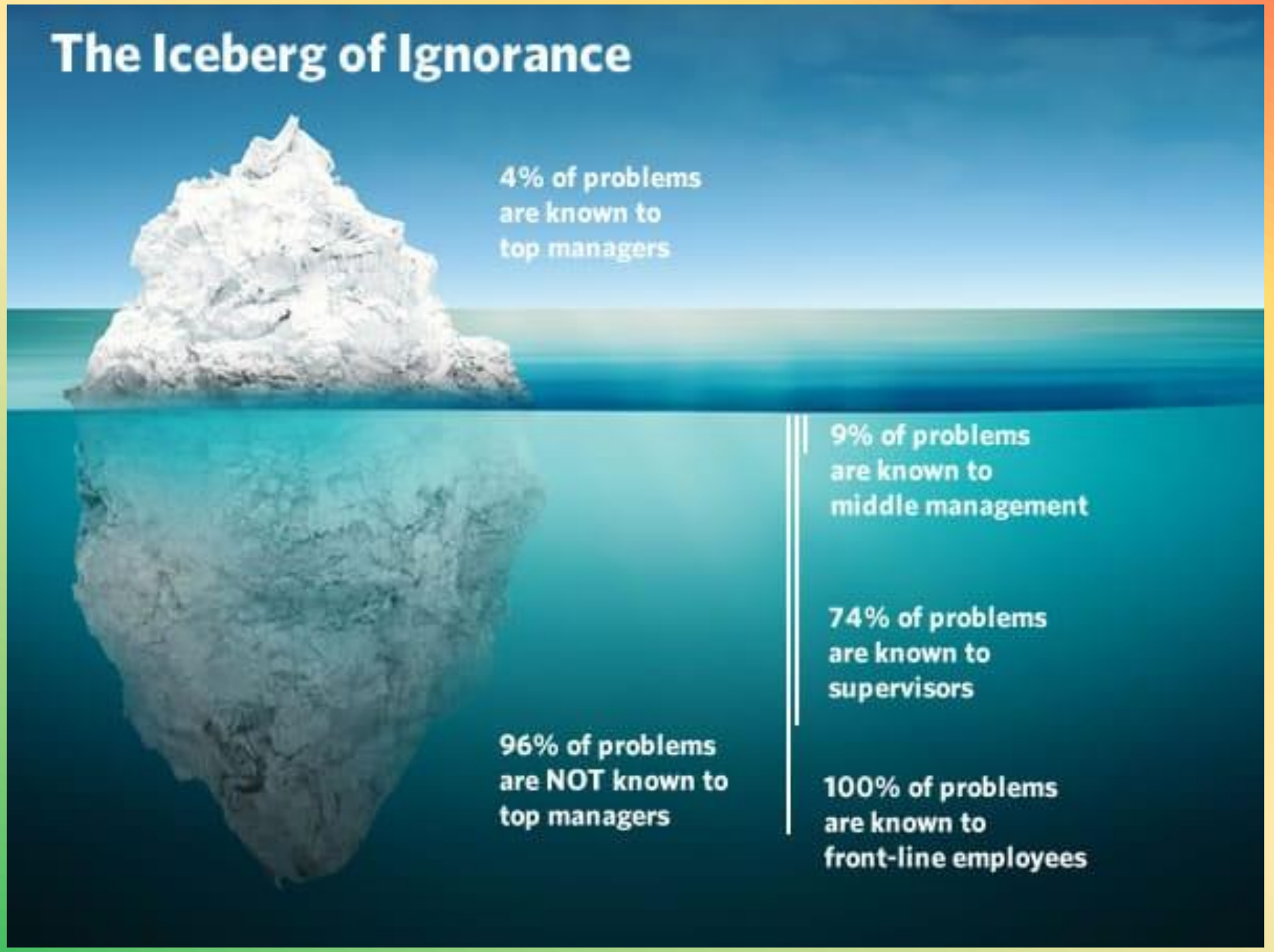
PS026-0 Radiation Safety Culture (hps.org)

Key Safety Culture Characteristics (IAEA)

- **Senior management commitment**, involvement and visible leadership in safety
- **Effective** and **open communications**
- **Availability** of **sufficient** and **competent** staff and quality training
- **Effective learning**, questioning attitude
- **Ownership** of safety and self-assessment
- Recognise strategic business importance of safety
- Absence of safety vs. production conflict
- Quality documentation and procedures
- Clear roles, responsibilities, accountabilities
- Human, technology and organisation knowledge
- Good working conditions
- Employee awareness of work process and safety

The Iceberg of Ignorance

Yoshida, S. (1989) *International Quality Symposium, Mexico*



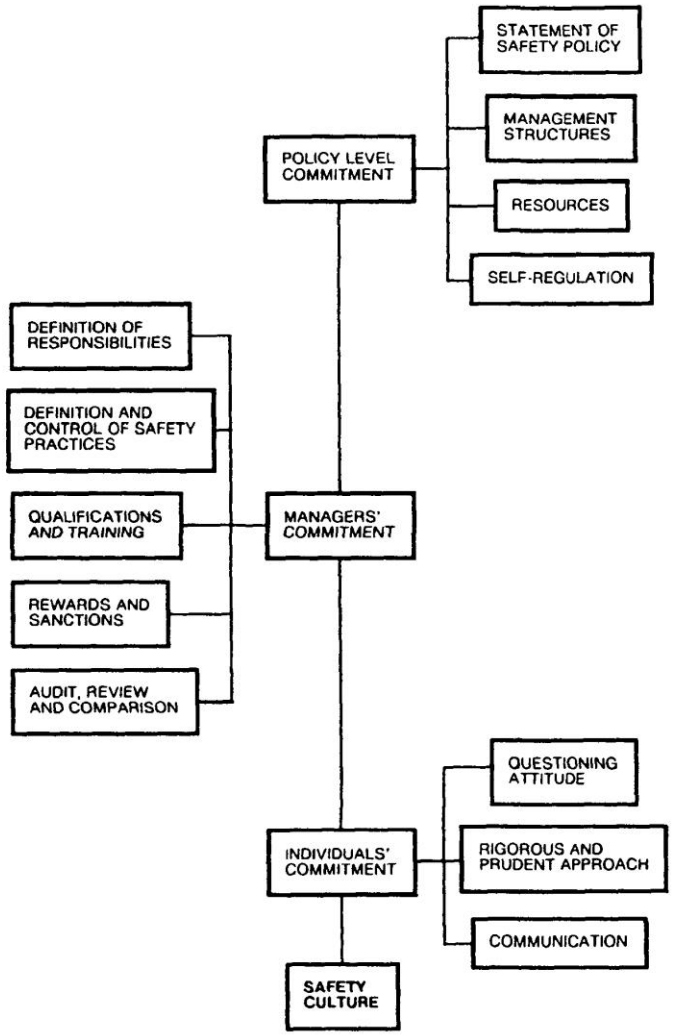
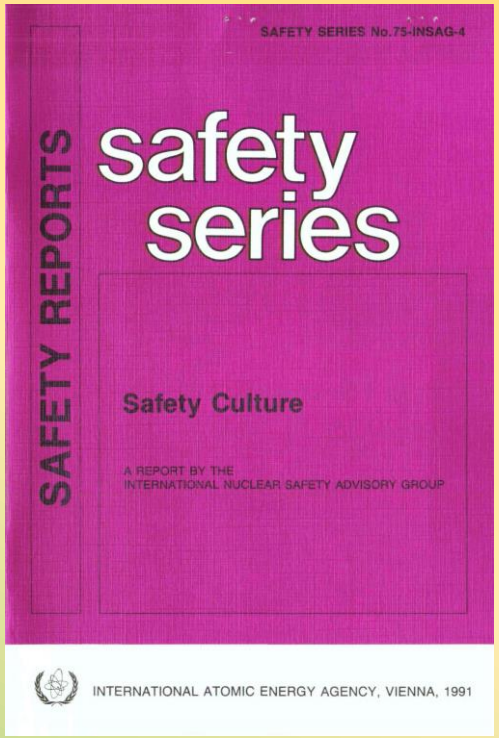


FIG. 1. Illustration of the presentation of safety culture.

Safety Culture (INSAG-4)

International Nuclear Safety Group, 1991



Policy-level commitment

↓

Managers' commitment

↓

Individuals' commitment

↓

Safety culture

https://www-pub.iaea.org/MTCD/Publications/PDF/Pub882_web.pdf

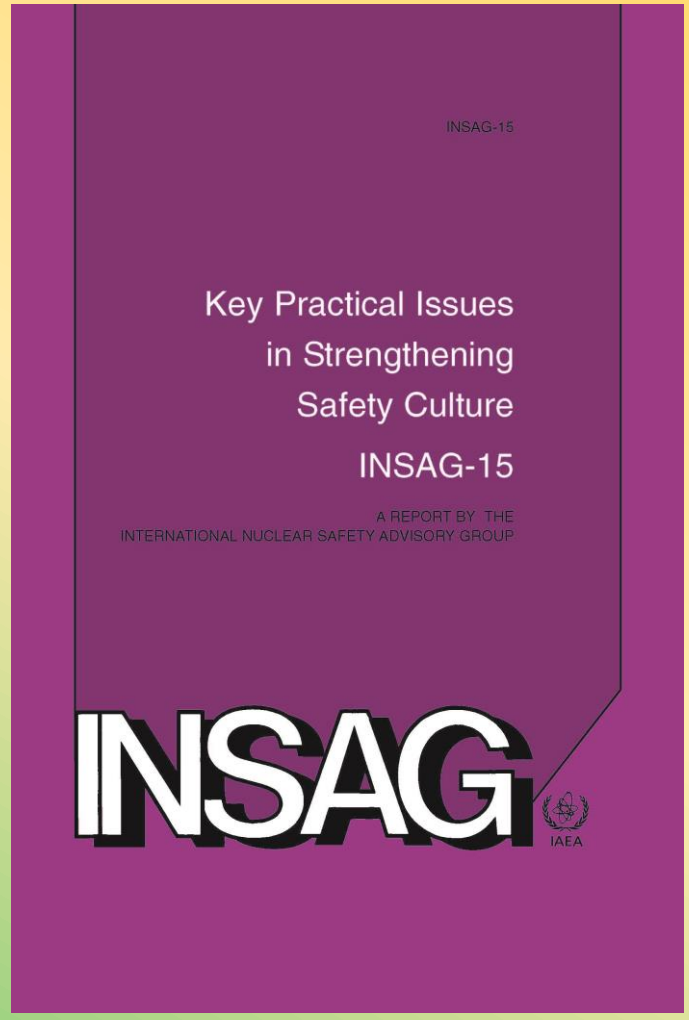
Key Practical Issues in Strengthening Safety Culture (INSAG-15)

International Nuclear Safety Group, 2002

Key issues in safety culture

1. Commitment
2. Use of procedures
3. Conservative decision making
4. A reporting culture
5. Challenging unsafe acts and conditions
6. The learning organization
7. Underpinning issues:
   - Communication
   - Clear priorities
   - Organization

https://www-pub.iaea.org/MTCD/publications/PDF/Pub1137_scr.pdf



Nuclear and radiological safety are the prime concerns of this report, but the topics discussed are so general that successful application of the principles should lead to improvements in other important areas, such as industrial safety, environmental performance and, in some respects, wider business performance.

This is because many of the attitudes and practices necessary to achieve good performance in nuclear safety, including visible commitment by management, openness, care and thoroughness in completing tasks, good communication and clarity in recognizing major issues and dealing with them as a priority, have wide applicability.

Influence of organisational culture on safety

An organisation's culture can have as big an influence on safety outcomes as the safety management system. 'Safety culture' is a subset of the overall company culture.

Many companies talk about 'safety culture' when referring to

the inclination of their employees to comply with rules or act safety or unsafely.

However, we find that **the culture and style of management is even more significant**,

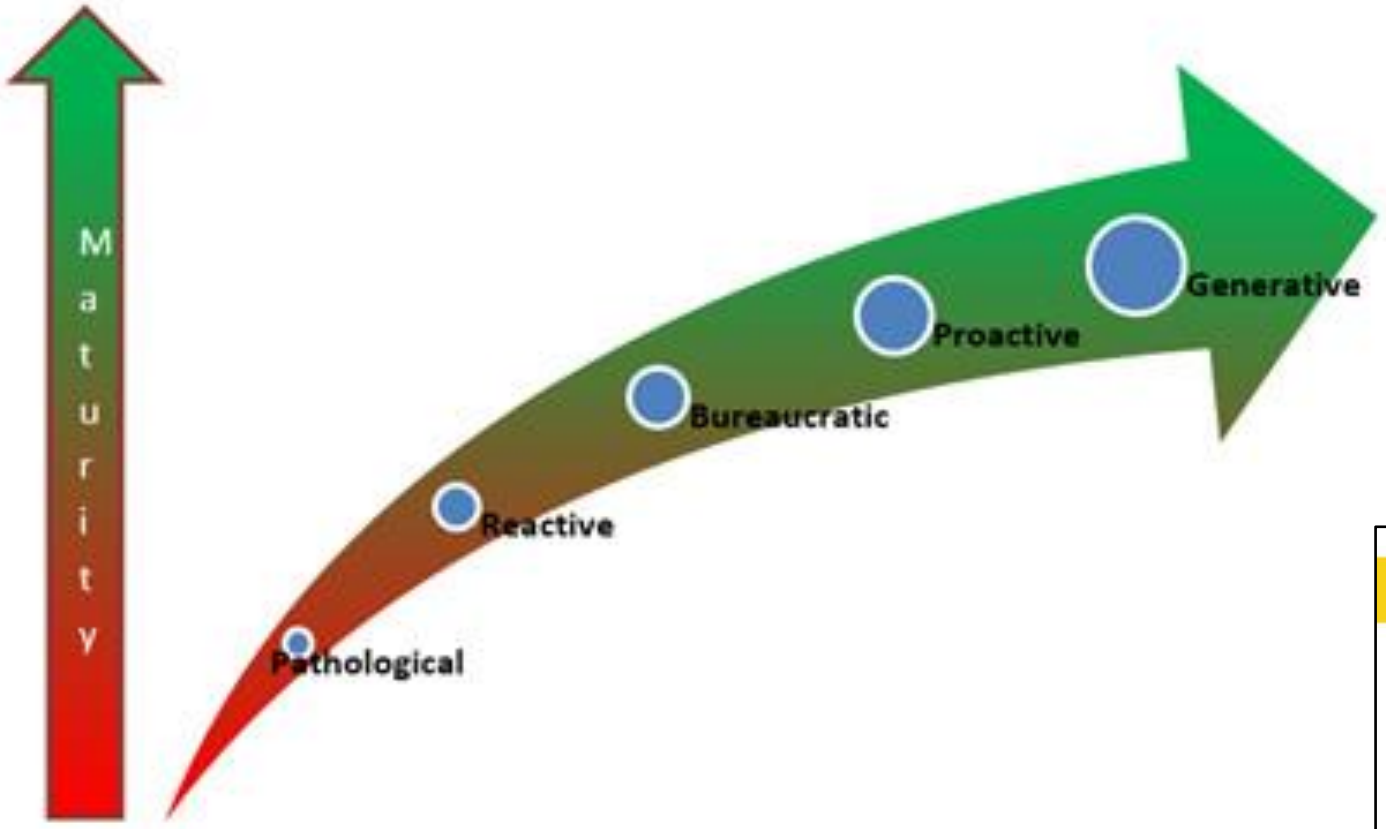
for example a natural, **unconscious bias for production over safety**,

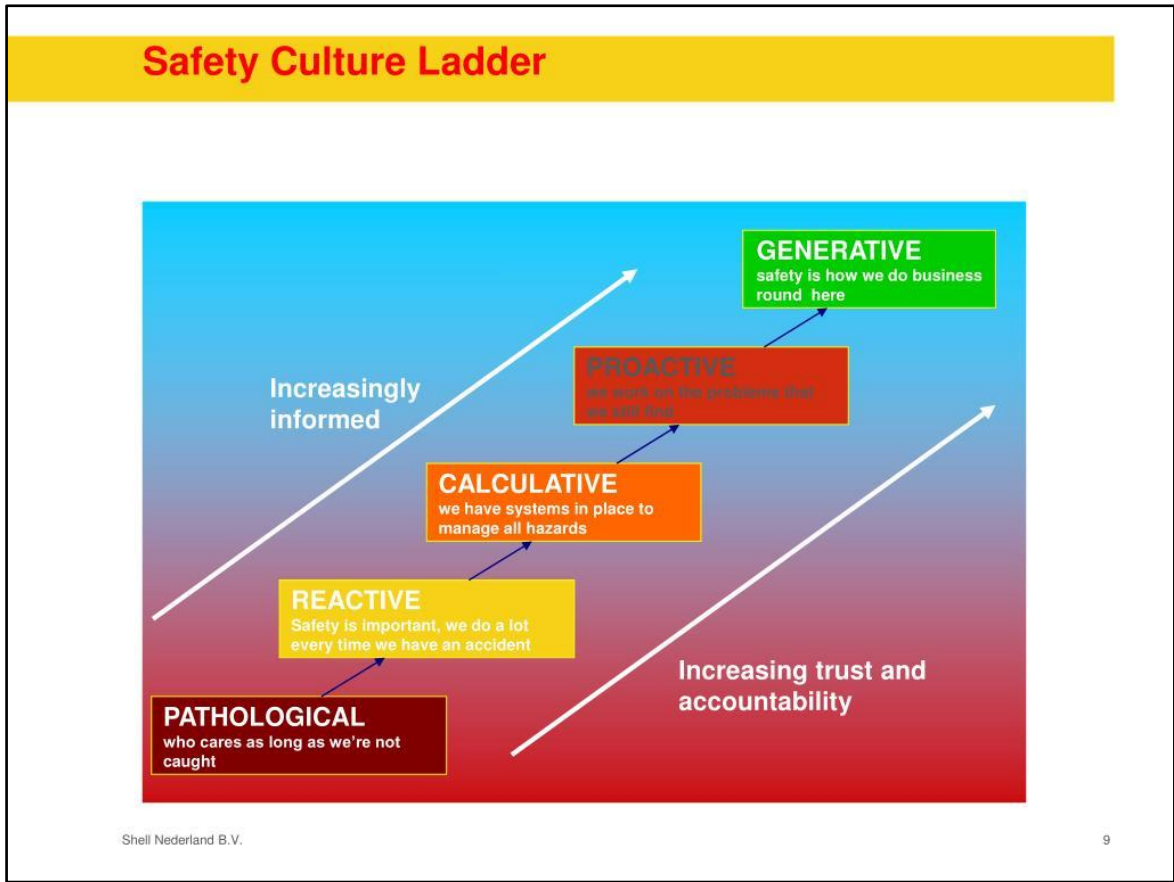
or **a tendency to focussing on the short-term and being highly reactive**.

HSE Common Topic 4: Safety culture

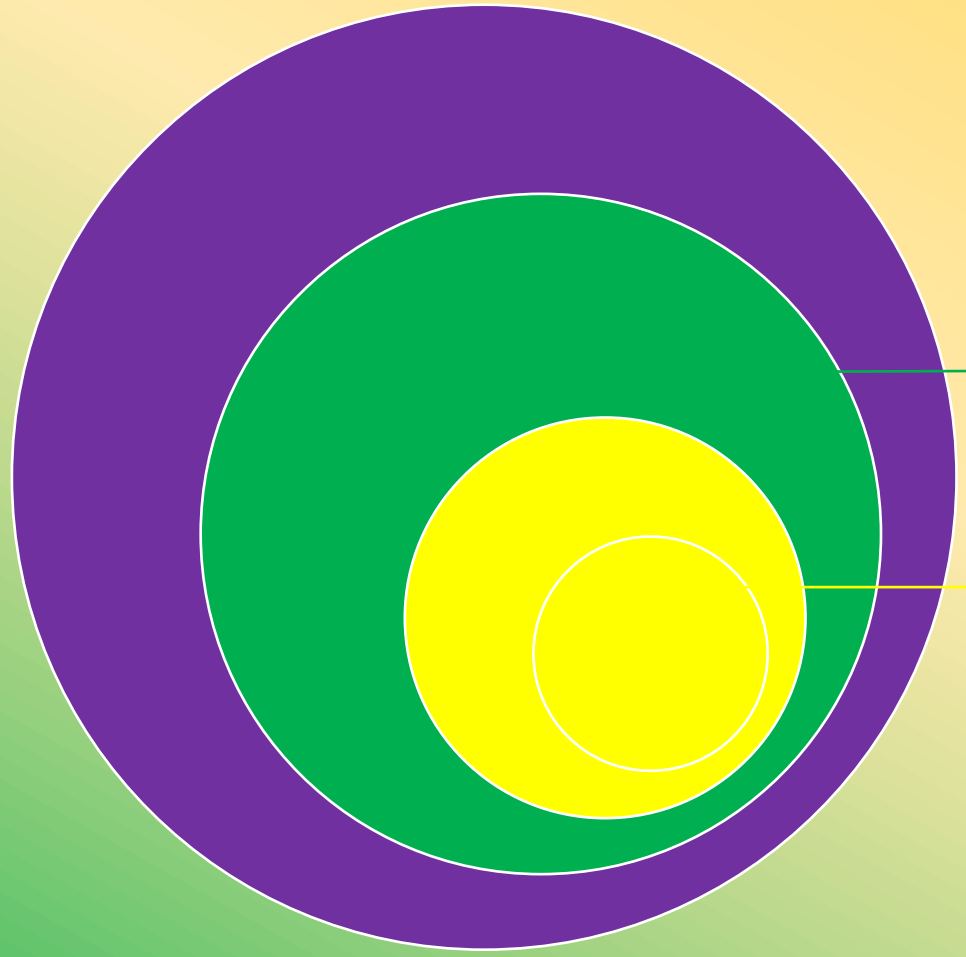
https://www.hse.gov.uk/humanfactors/topics/common4.pdf

Maturity of organisational safety culture





Radiation Safety Culture within an organisation



Organisational culture

Safety culture

Radiation Safety culture

Promoting Radiation Safety Culture in the UK

Society for Radiological Protection (SRP)

THE SOCIETY FOR RADIOLOGICAL PROTECTION

The UK Associate Society Affiliated to

The Society was formed in 1963 and received a Royal Charter in 2007. It has a Sector and Topic committees and a programme of scientific meetings plus o activities. It has over 1600 members plus some 500 'International Membe the Partner Societies (shown below) that are IRPA affiliated members.

BIR BNMS IPEM RCR

Promoting Radiation Safety Culture in the UK

John Croft, Roger Coates, Christine Edwards, Claire-Louise Chapple, Karl Davies and Axel MacDonald

John Croft

Introduction

SRP, together with its Partner Societies (PSs), provided significant input to the IRPA document on Guiding Principles for Establishing a Radiation Protection Culture, which was published in 2014. Section 8 of this emphasised the role of Associate Societies (ASs) in supporting RP professionals who are in the front line of promoting RP Culture. SRP had already recognised this by including in its Strategic Plan for 2013 to 2017, the major Goal, to "Promote a strong radiation protection culture in the UK". This clearly requires working across several sectors of radiation uses, and pursuing this Goal was tasked to SRP's International Committee, which includes members from the PSs and is the main forum for interaction with IRPA.

The intention was to build on significant existing initiatives on Safety Culture in general, and the radiation protection orientated "ALARA Culture", which can be traced through the European ALARA Network (EAN) Newsletters and Workshops [1].

Overall Work Programme

In developing a programme of work to pursue this Goal it was felt it would be useful to produce a baseline of the then current thinking and the issues and challenges that would need to be addressed in the UK. The paper addressing this [2] reviewed the roles of management and leadership, the Radiation Protection Adviser (RPA), the Radiation Protection Supervisor (RPS), the professional bodies and the regulators. It identified generic challenges and sector specific factors and produced outline improvement plans.

In parallel to this it was decided to establish four sector specific Working Groups (WGs) shown below: together with an overarching Coordinating WG.

Each sector specific WG would review the current level of achievement, identify the driving forces and propose a framework for improvement, including tools and goals. Some general early milestones were set including reporting progress at the SRP 2015 Annual conference [3,4] and submitting a suite of papers from the WGs to the IRPA14 International Congress in Cape Town, May 2016.

Early Outcomes

One of the generic points coming out of the early work in the medical and research and teaching sectors was that the term "RP culture" did not resonate with non-RP professionals, but that the term "Radiation Safety Culture" had more impact; being seen as a subset of Safety Culture. It was therefore decided by the Coordinating WG that we would re-brand documents and papers with the term Radiation Safety Culture.

How to engage managements in each sector will be important, particularly in the non-nuclear sectors, where Radiation Safety Culture can struggle to compete with other organisational priorities, such as meeting production/ service delivery targets and financial constraints. Each sector will need to develop ways of addressing this. However it was identified that whilst RP professionals have the necessary technical knowledge and skills, there were possible gaps in the "Soft Skills" inherent in influencing managements, and other groups, in improving the Radiation Safety Culture. To address this, SRP is arranging a pilot Workshop on the subject, and aims to develop a training programme from this.

A good regulatory infrastructure is seen as key to setting the context in which a safety culture can be developed and maintained. The routine annual Inspections by the regulator of radioactive source holdings were seen as having had a positive effect on management attitudes. However there were concerns over the effects of reduced budgets in the public sector and particularly over a reduced regulatory presence by specialist inspectors. In respect of the latter, SRP and its PSs have entered into a positive dialogue with the regulator.

On-Going Programmes of Work

The sector specific WGs have each developed their own programmes of work, which are reported on in papers and posters at this Congress. In general, the programmes are at the stage of assessing the current levels of radiation safety culture and the attitudes and driving forces of the various stakeholders. Some existing resources and tools that could be made more use of have been identified; as has the need for some new ones.

The overall aims are to optimise the beneficial influence of stakeholders and to produce a range of resources and tools aimed at improving Radiation Safety Culture; and to make them available as part of a "Culture Pack" available from SRP and our PSs. This programme will take several years to implement and assess its effectiveness. Progress will be reported at IRPA's European Regional Congress in the Hague, Holland in 2018.

References

[1] http://www.eu-alara.net

[2] P Cole et al, Developing the Radiation Protection Safety Culture in the UK; JRP Vol 34, No 2.

[3] https://srp-uk.org/_getDocument/765

[4] https://srp-uk.org/_getDocument/766

For more information contact John Croft (john.croft3@ntlworld.com) or Roger Coates (coates.roger@tiscali.co.uk)

Radiation Safety Culture can struggle to compete with other organisational priorities, such as meeting production / service delivery targets, particularly in the non-nuclear sectors.

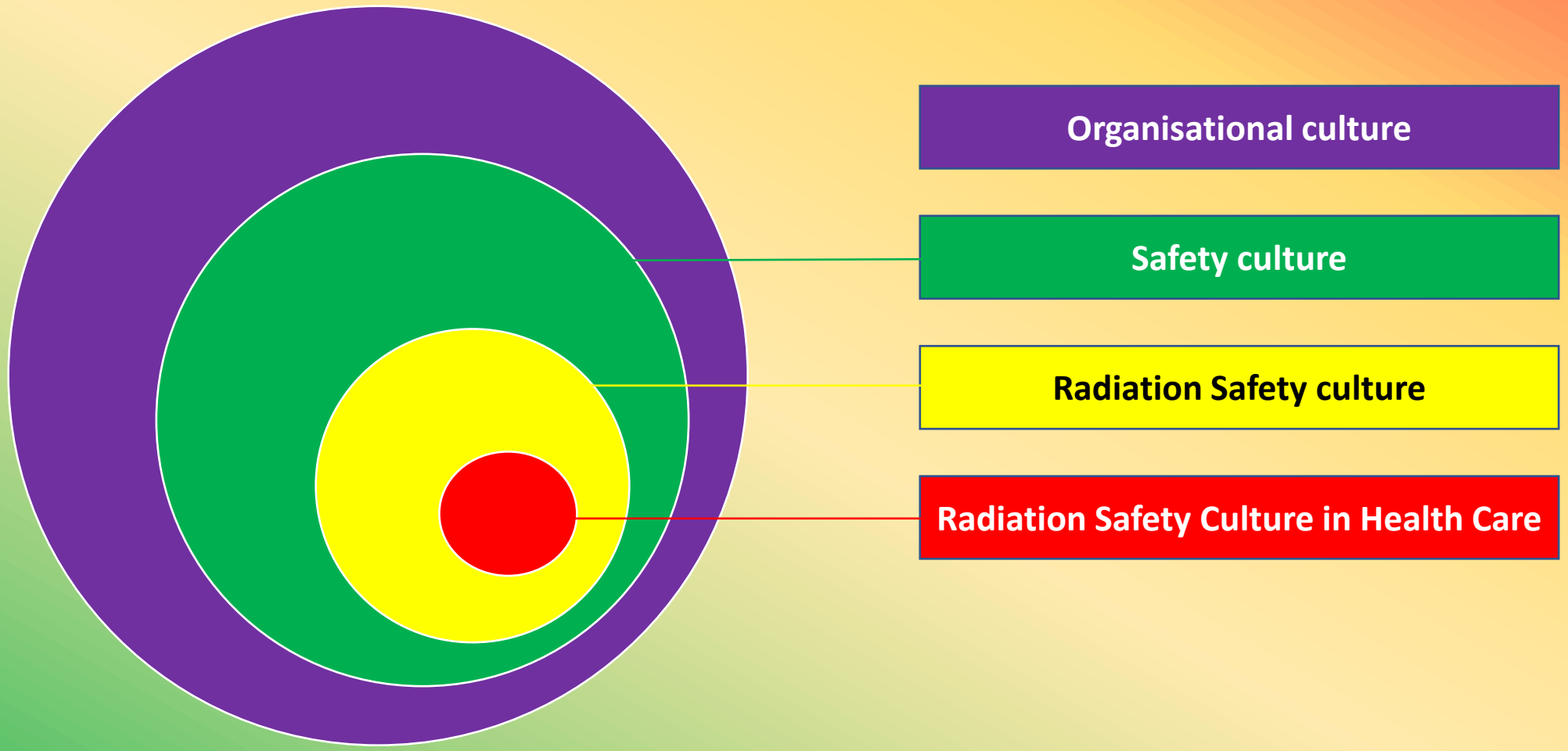
Four sector-specific Working Groups were established, together with an overarching coordinating group, to review the current level of achievement, identify the driving forces and propose a framework for improvement.

Sector-specific working groups:

- Medical
- Nuclear
- Research & Teaching
- General Users

https://srp-uk.org/resources/radiation-safety-culture

Radiation Safety Culture in Health Care



Bonn Call for Action (IAEA/WHO Position Statement)

International Conference on Radiation Protection in Medicine: Setting the scene for the next decade, Bonn 3-7 December 2012

Actions considered to be essential to strengthen radiation protection in medicine

1. Enhance the implementation of the principle of justification
2. Enhance implementation of principle of optimization of protection and safety
3. Strengthen manufacturers' role in contributing to the overall safety regime
4. Strengthen radiation protection education & training of health professionals
5. Shape & promote strategic research agenda for radiation protection in medicine
6. Increase availability of improved global information on medical & occupational exposures in medicine
7. Improve prevention of medical radiation incidents and accidents
8. Strengthen radiation safety culture in health care
9. Foster an improved radiation benefit:risk dialogue
10. Strengthen the implementation of safety requirements globally

https://www.iaea.org/resources/rpop/resources/bonn-call-for-action-platform

Safety Culture Traits

A Harmonized Safety Culture Model (IAEA, 2020)

- **Individual Responsibility**
- **Questioning Attitude**
- **Communication**
- **Leader Responsibility**
- **Decision-Making**
- **Work Environment**
- **Continuous Learning**
- **Problem Identification and Resolution**
- **Raising Concerns**
- **Work Planning**

A Harmonized Safety Culture Model

IAEA Working Document (2020)

The following are qualities or traits of a healthy organization culture for safety and apply to all organizations that deal directly or indirectly with ionizing radiation.

https://www.iaea.org/sites/default/files/20/05/harmonization_05_05_2020-final_002.pdf

Safety Culture Principles (*A Harmonized Safety Culture Model*, IAEA Working Document 2020)

Overarching principles that provide traits and attributes that are present in organizations with a healthy safety culture

INDIVIDUAL RESPONSIBILITY:	All individuals are personally accountable for safety
QUESTIONING ATTITUDE:	Individuals remain vigilant for assumptions, anomalies, conditions, behaviours or activities that can adversely impact safety and then appropriately voice those concerns
COMMUNICATION:	Communications support a focus on safety
LEADER RESPONSIBILITY:	Leaders demonstrate a commitment to safety in their decisions. Leaders are role models for safety
DECISION-MAKING:	Decisions are systematic, rigorous, thorough, and prudent
WORK ENVIRONMENT:	Trust and respect permeate the organization
CONTINUOUS LEARNING:	Learning is highly valued
PROBLEM IDENTIFICATION AND RESOLUTION:	Issues potentially impacting safety are systematically identified, fully evaluated, and promptly resolved according to their significance
RAISING CONCERNS:	Personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment or discrimination
WORK PLANNING:	The processes of work planning and controlling work activities is implemented so that safety is maintained

Safety Culture Traits, Principles and Attributes: Communication

A Harmonized Safety Culture (IAEA, 2020) - Trait 3

Safety Culture Principle 3

Communications support a focus on safety

Leaders use formal and informal communication to frequently convey the importance of safety.

The organization maintains a variety of communication channels including direct interaction between managers and workers.

Effective dialogue is encouraged.

Effective communication in support of safety is broad and includes workplace communication, reasons for decisions and expectations.

Attributes (Trait 3)

CO.1	**Free flow of information**
CO.2	**Transparency**
CO.3	**Reasons for decisions**
CO.4	**Expectations**
CO.5	**Workplace communication**

Communication attributes (safety culture trait 3)

Principle 3: *Communications support a focus on safety*

CO.1 **Free flow of information:** *Individuals communicate openly and candidly, both up, down, and across the organization. The flow of information up the organization is considered to be as important as the flow of information down the organization.*

CO.2 **Transparency:** *Communication with oversight, audit, regulatory organizations and the public is appropriate, professional and accurate.*

CO.3 **Reasons for decisions:** *Leaders ensure that the reasons for technical and administrative decisions are communicated to the appropriate individuals in a timely manner.*

CO.4 **Expectations:** *Leaders frequently communicate and reinforce the expectation that safety is emphasized over competing goals.*

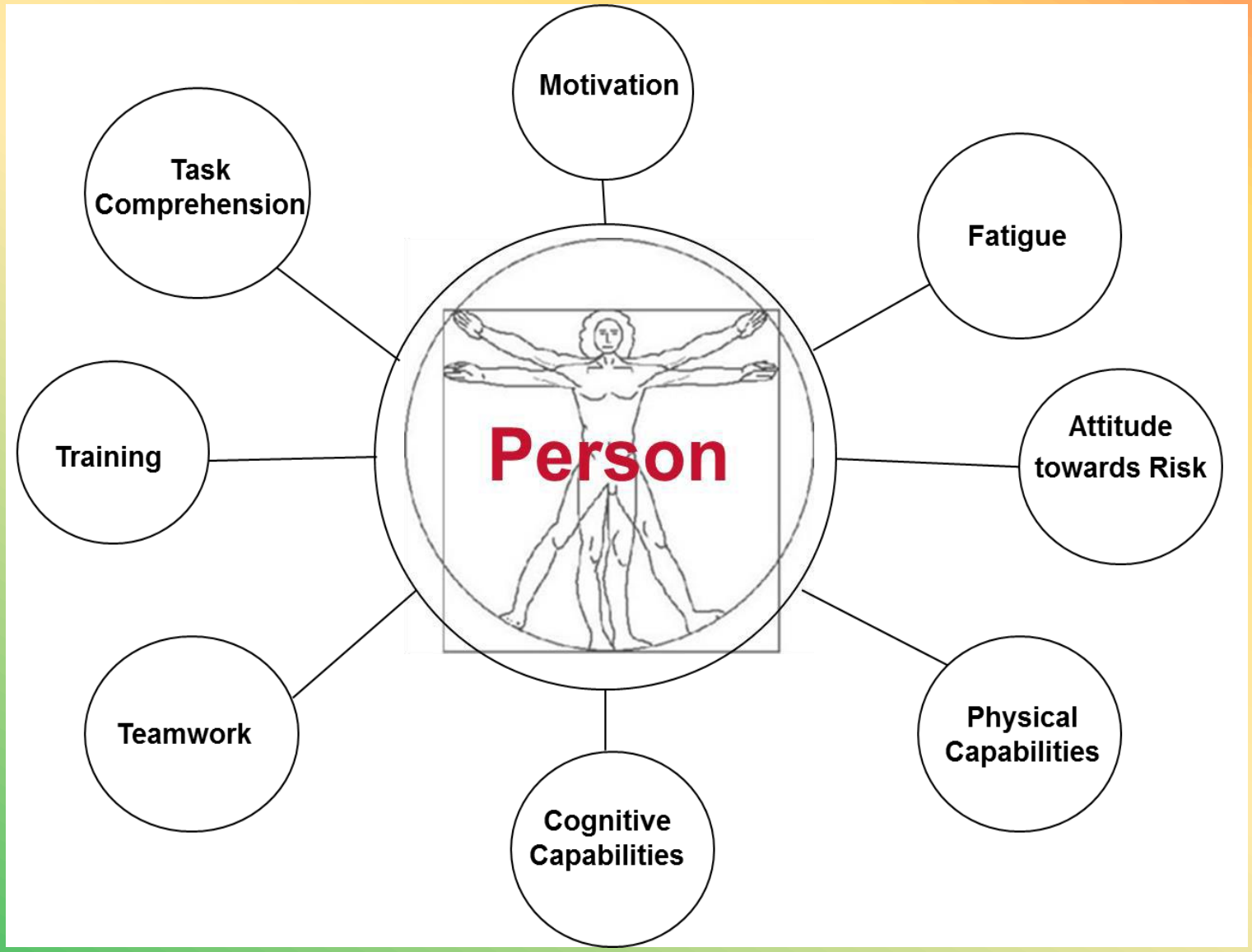
CO.5 **Workplace communication:** *Communication about safety is included in all work activities so that everyone has the information necessary to work safely and effectively.*

Human Factors / Ergonomics (HF/E)

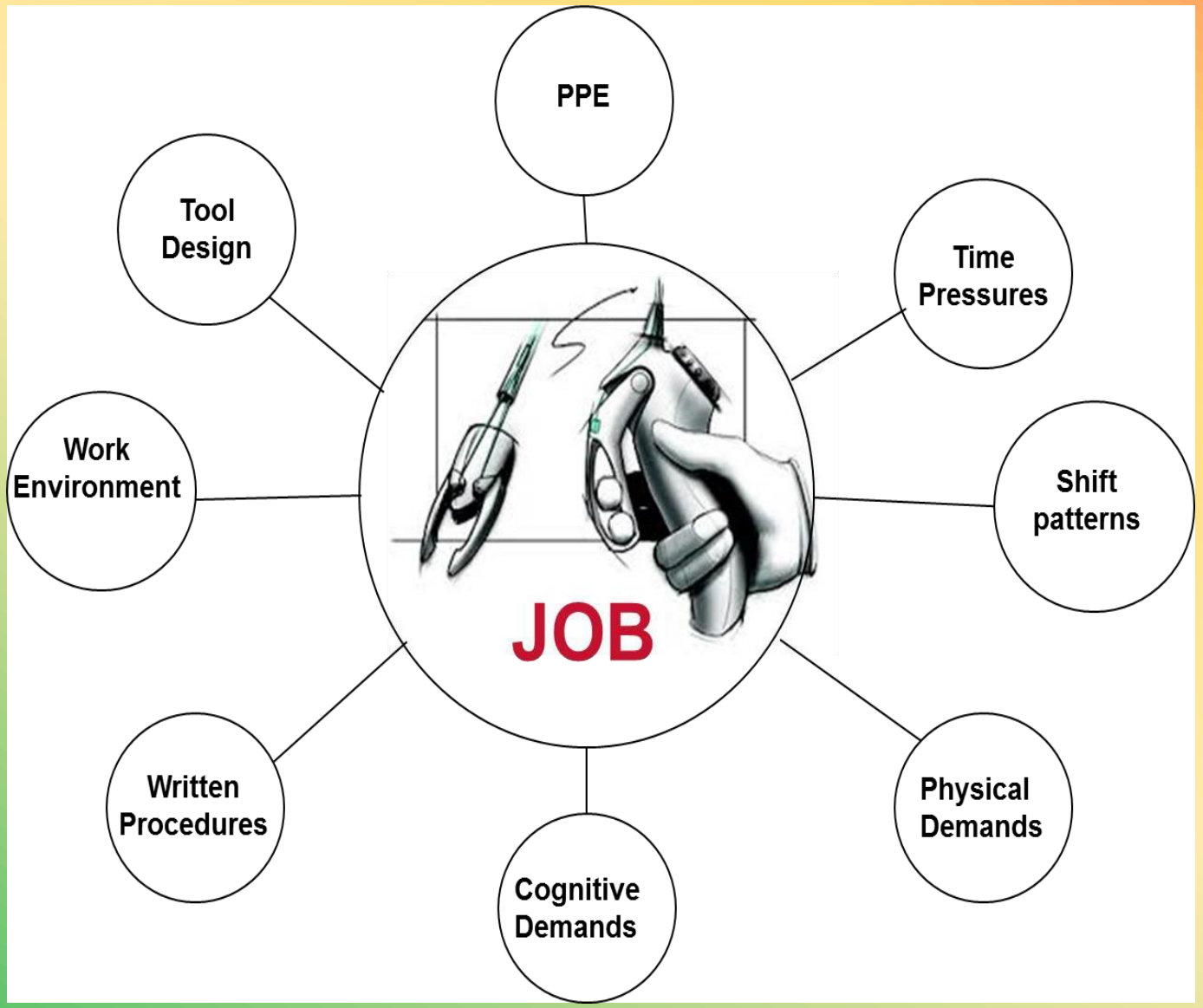
HSE describe Human Factors as:

"environmental, organisational and job factors, and human and individual characteristics which influence behaviour at work in a way which can affect health and safety"

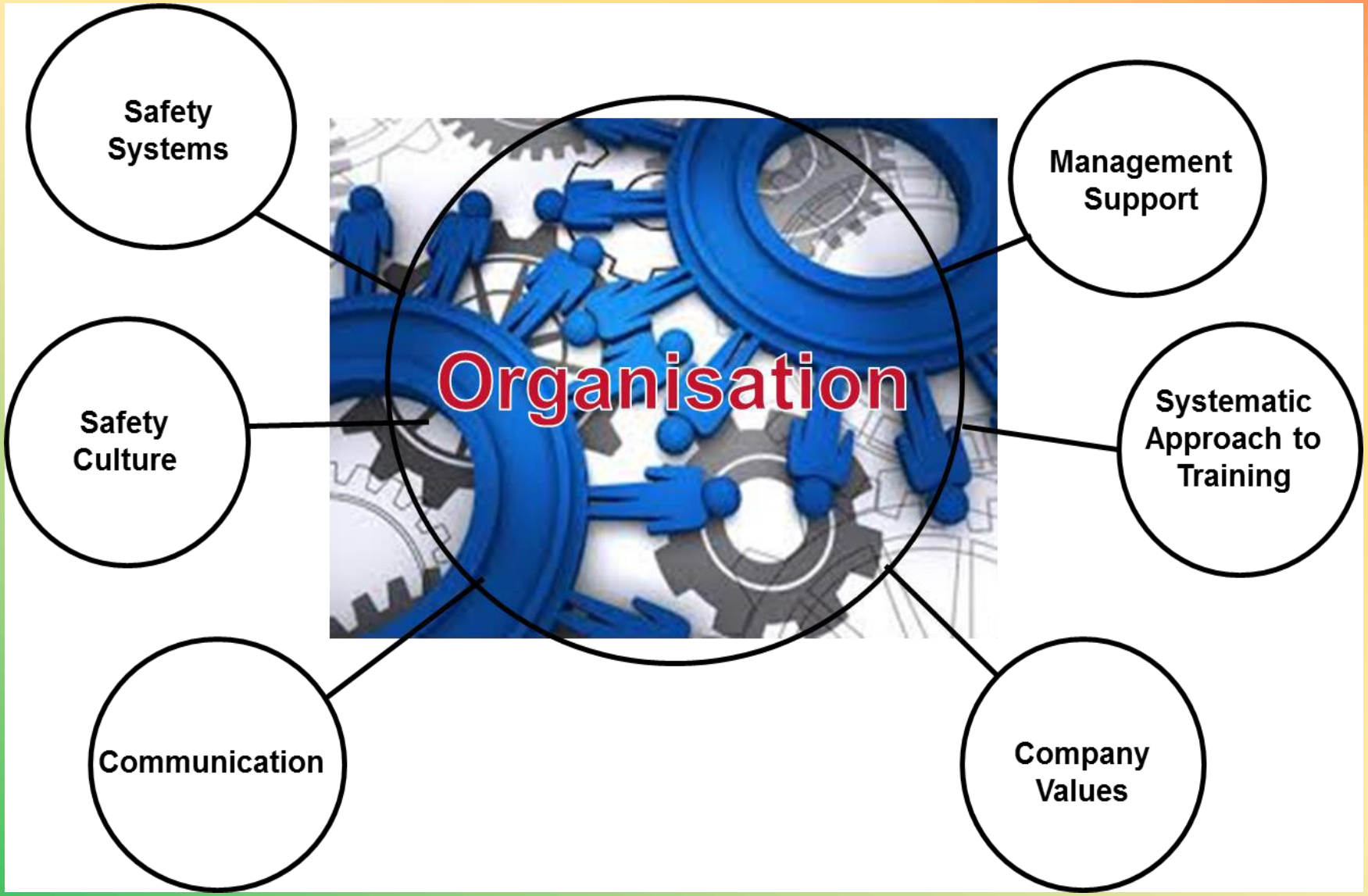
The Person


Motivation
Task Comprehension
Fatigue
Training
Person
Attitude towards Risk
Teamwork
Physical Capabilities
Cognitive Capabilities

The Job


PPE
Tool Design
Time Pressures
Work Environment
Shift patterns
JOB
Written Procedures
Physical Demands
Cognitive Demands

The Organisation



Industries in which HF/E and safety culture are well established

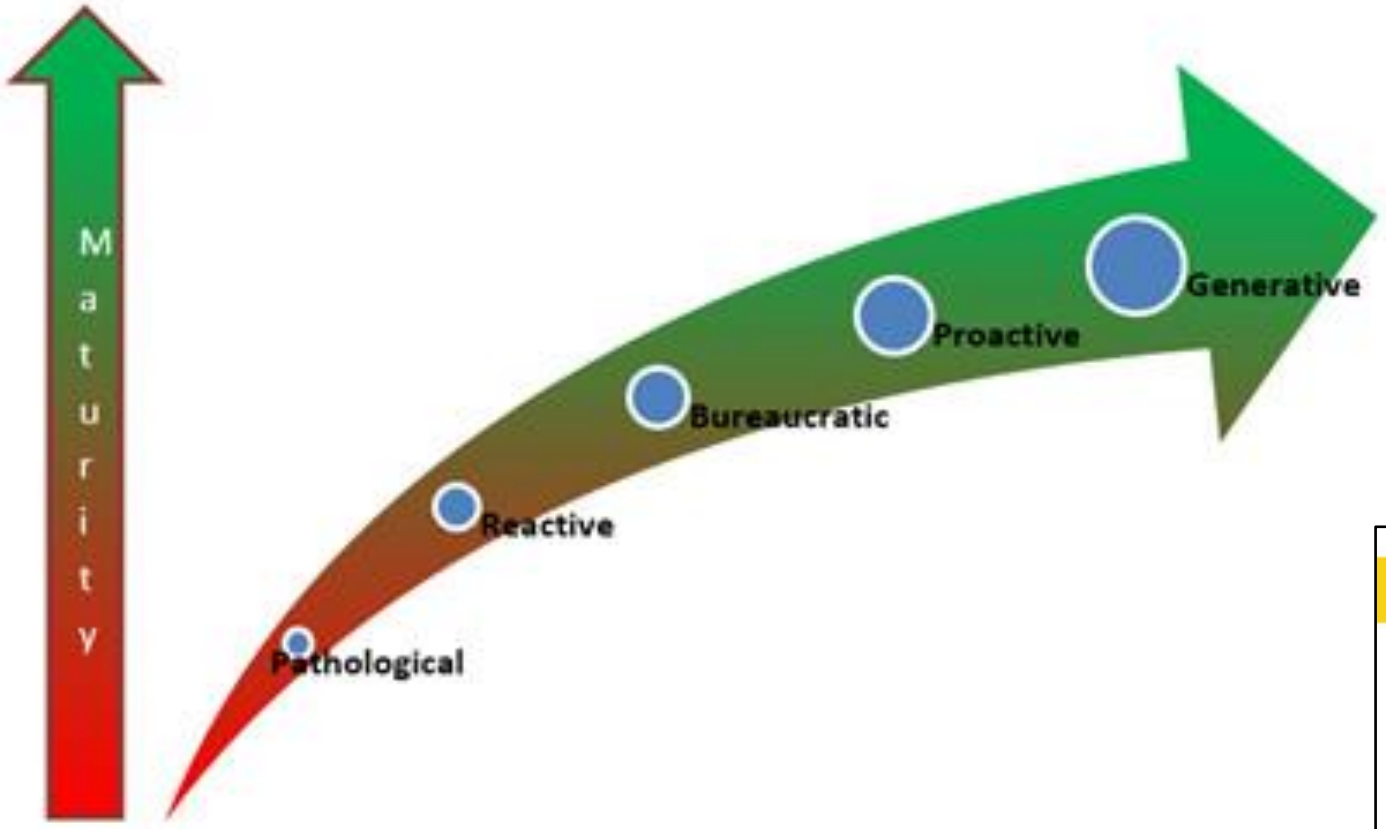
High risk industries:

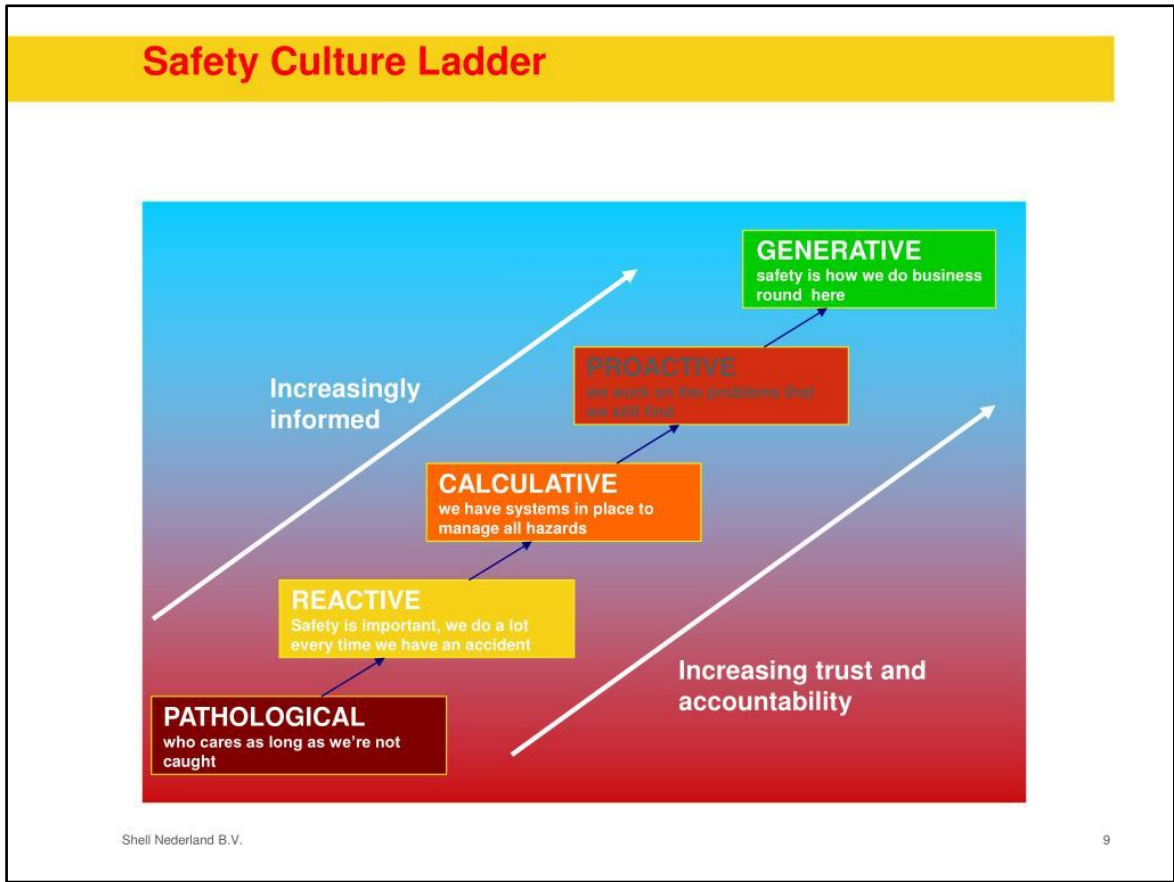
- Aviation
- Nuclear
- Rail
- Oil
- …

Others in which there is much scope for improvement: e.g.

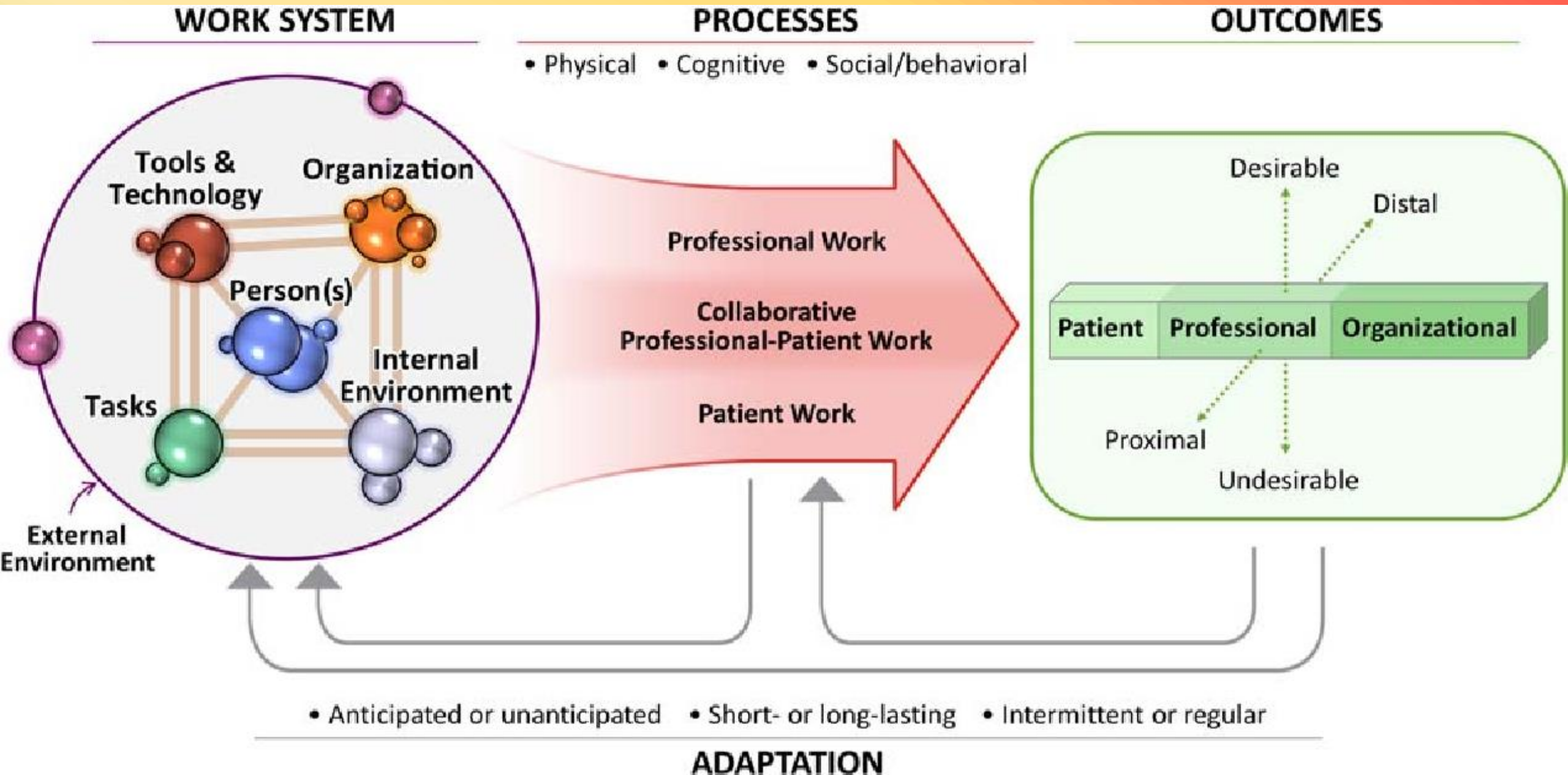
- Healthcare
  - Clinical Human Factors Group (CHFG)
  - System Engineering Initiative for Patient Safety (SEIPS) framework
  - …

Maturity of organisational safety culture



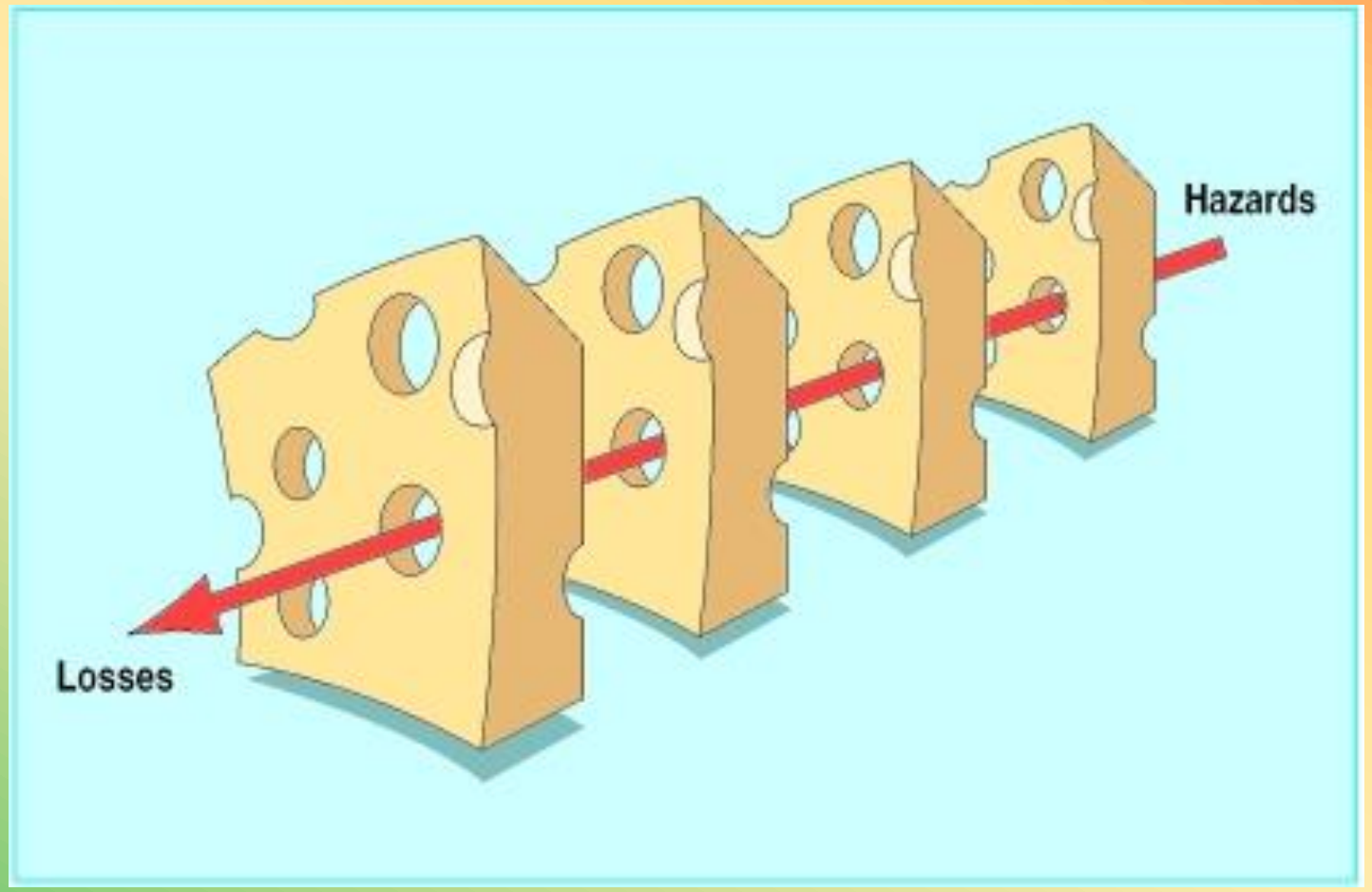


SEIPS (System Engineering Initiative for Patient Safety



The Swiss cheese model of system accidents

The Swiss cheese model of how defences, barriers and safeguards may be penetrated by an accident trajectory



James Reason, Human Error: models and management, *BMJ* 2000;320:768-770 https://www.bmj.com/content/320/7237/768

James Reason Human Factors Swiss Cheese Model

In the Swiss Cheese model, an organisation's defences against failure are modelled as a series of barriers, represented as slices of the cheese.

The holes in the cheese slices represent individual weaknesses

in individual parts of the system,

and are continually varying in size and position in all slices.

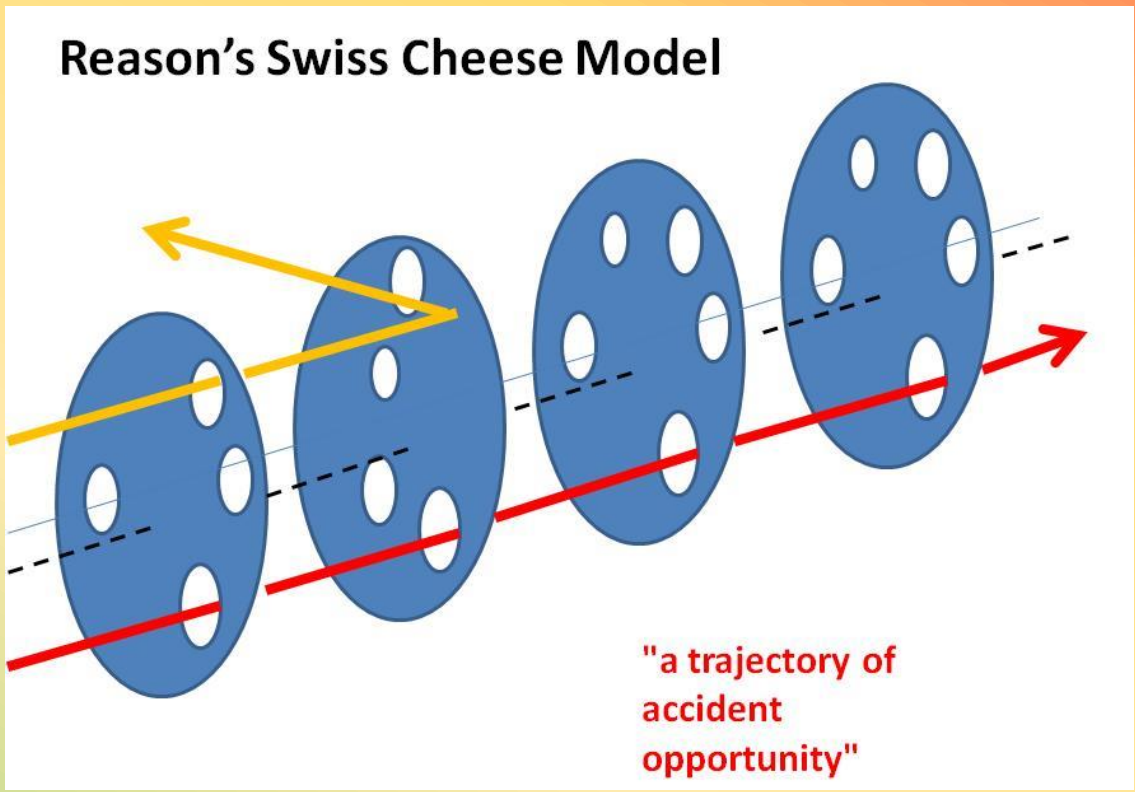
The system as a whole produces failures

when holes in all of the slices momentarily align,

permitting *"a trajectory of accident opportunity"*,

so that a hazard passes through holes in all of the defences,

leading to an accident.



https://www.skybrary.aero/index.php/James_Reason_HF_Model

IAEA definition of safety culture *(IAEA Safety Glossary - 2018 edition)*

The assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, protection and safety issues receive the attention warranted by their significance.

For a more detailed discussion of safety culture, see INSAG-4, *Safety Culture* (1991)

Also INSAG-15, *Key Practical Issues in Strengthening Safety Culture* (2002)

https://kos.iaea.org/iaea-safety-glossary/334.html