European Maritime Safety Agency

Training on Accident Investigation

Human Element

Marine Accident Investigation

EMSA

Learning goals

Knowing

- You can explain human behaviour based on human factors models.

Applying

- You can use the SHELL and human factors models to classify and examine human behaviour.

Analysing

- You can investigate a SHELL factor that influences human performance.

How you will learn

Knowing

- Receive instructions on the SHELL and explanation of human factors models

Applying

- You will apply these models on a casus

Analysing

- You will go in depth on a certain human factor

Content

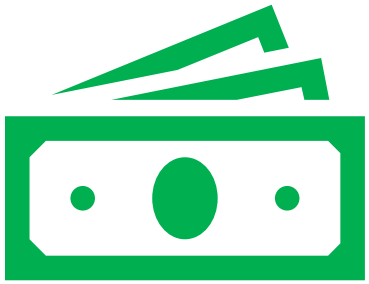
1. Introduction

Exercise

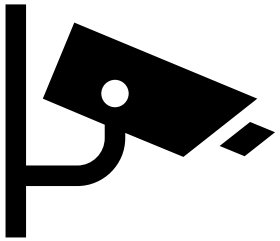
- Lift your arms above shoulder
- Open and close hands continuously

- For 15 minutes…

Reward



Punishment



You will not succeed

- Because you are human
- No matter how much rewards of punishment policies
- Because of movement science we know!

Exercise

Remember as much letters as possible

A	G	V
P	W	S
L	R	U

Remember middle letter of bottom row

A	G	V
P	W	S
L	R	U

What happened?

- Same environment
- Different task
- One task successful, other not
- Because of cognitive psychology!

Human Factors

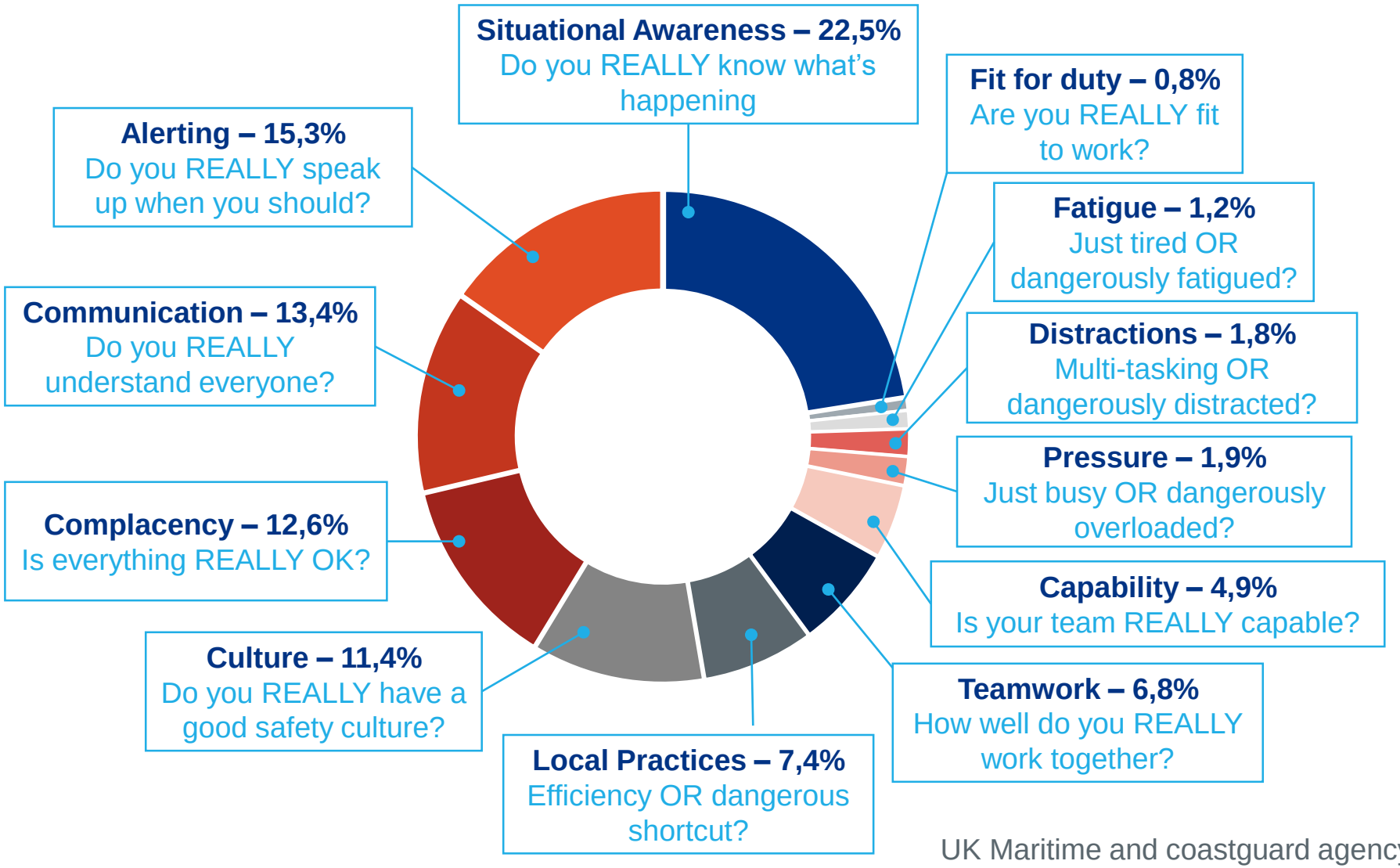
People work according to certain ‘laws’

- Psychology
- Physiology
- Sociology
- Movement science
- Consumer behaviour
- Etc.

We will apply these ‘laws’ in our investigation

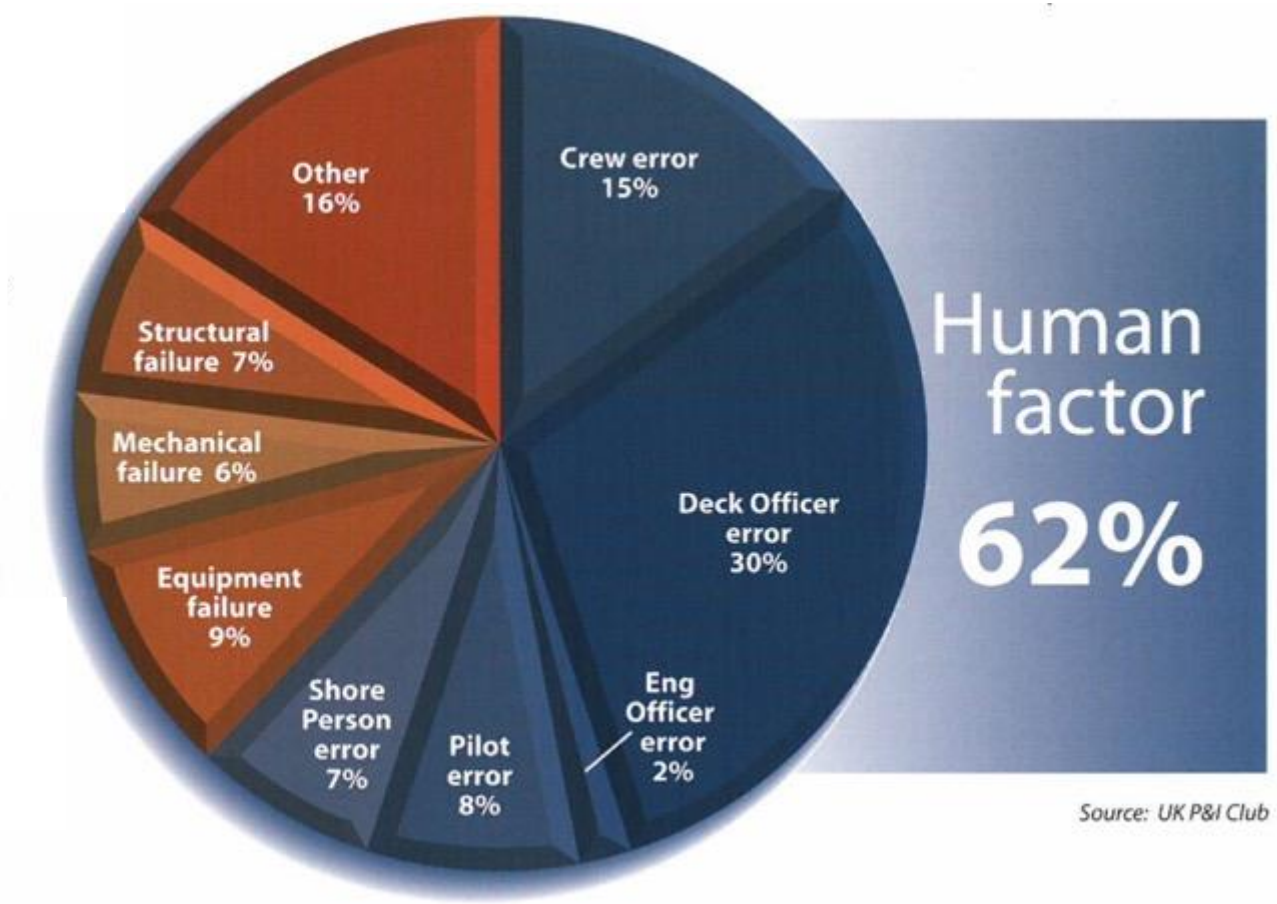
2. Relevance of Human Factors

Deadly Dozen – UK maritime & coastguard Agency



UK Maritime and coastguard agency

UK P&I Club


Other 16%
Crew error 15%
Structural failure 7%
Mechanical failure 6%
Deck Officer error 30%
Equipment failure 9%
Shore Person error 7%
Pilot error 8%
Eng Officer error 2%
Human factor
62%
Source: UK P&I Club

About human error

- Human error = label given in hindsight to categorize human behaviour;
- Humans are fallible
- Day-to-day variation;
- Humans are the source of both success and failure;

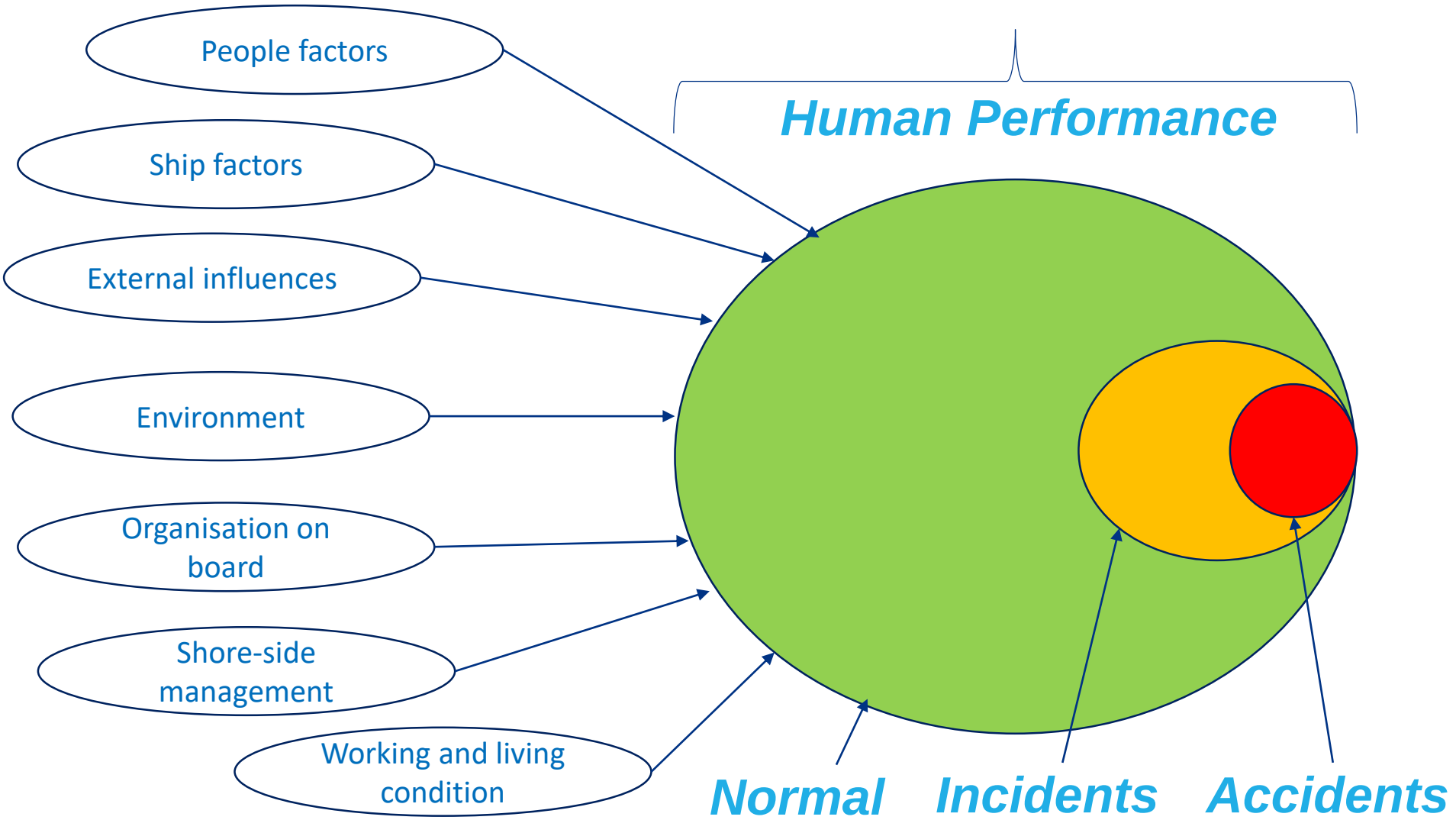
3. Definitions

IMO definition

Human Factors is..

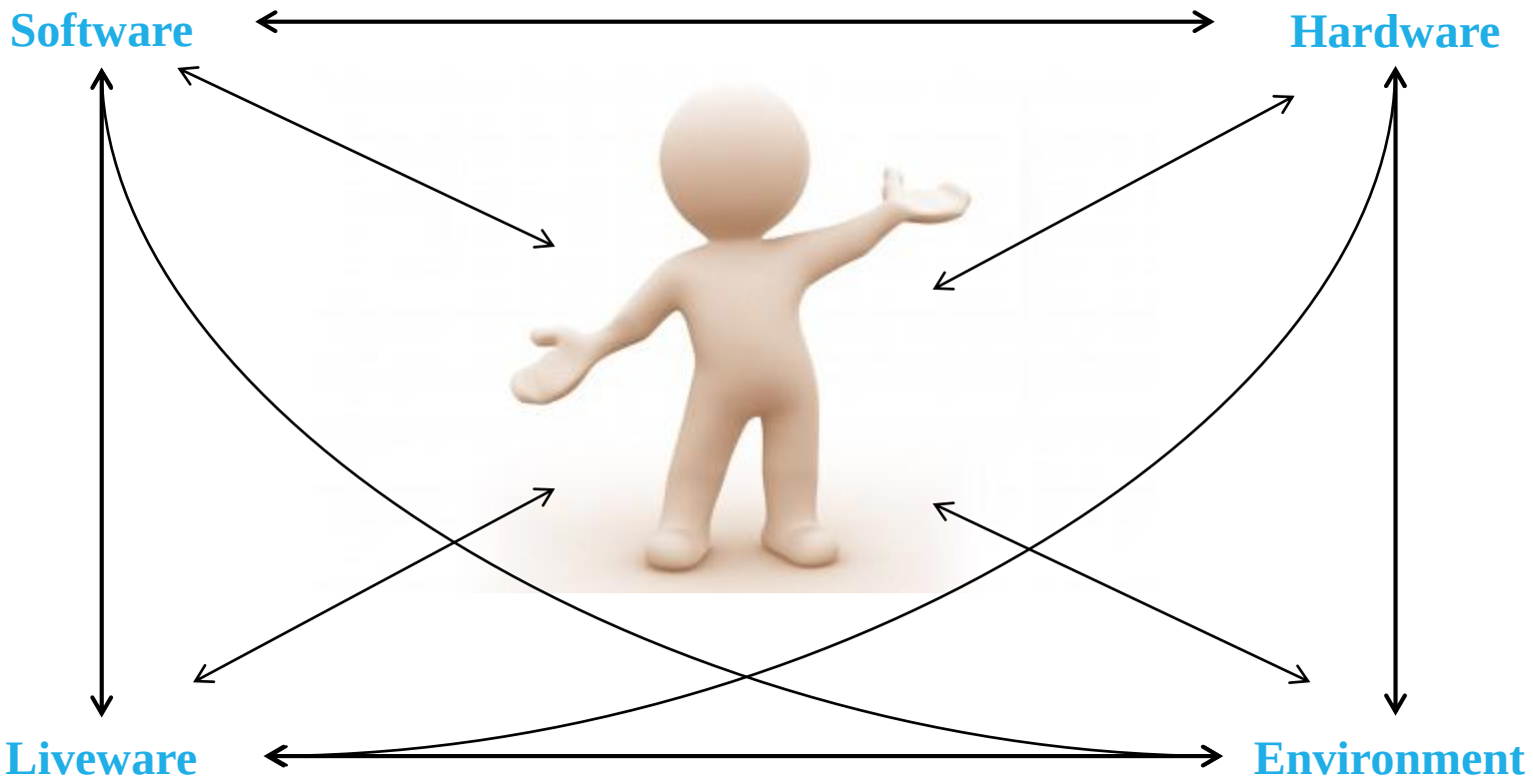
"..information related to ability, skill, knowledge, personality, physical condition, behaviour and attitude and its interaction with the assigned duties, organisation on board, working and living conditions, ship factors, shore-side management and external influences and management"

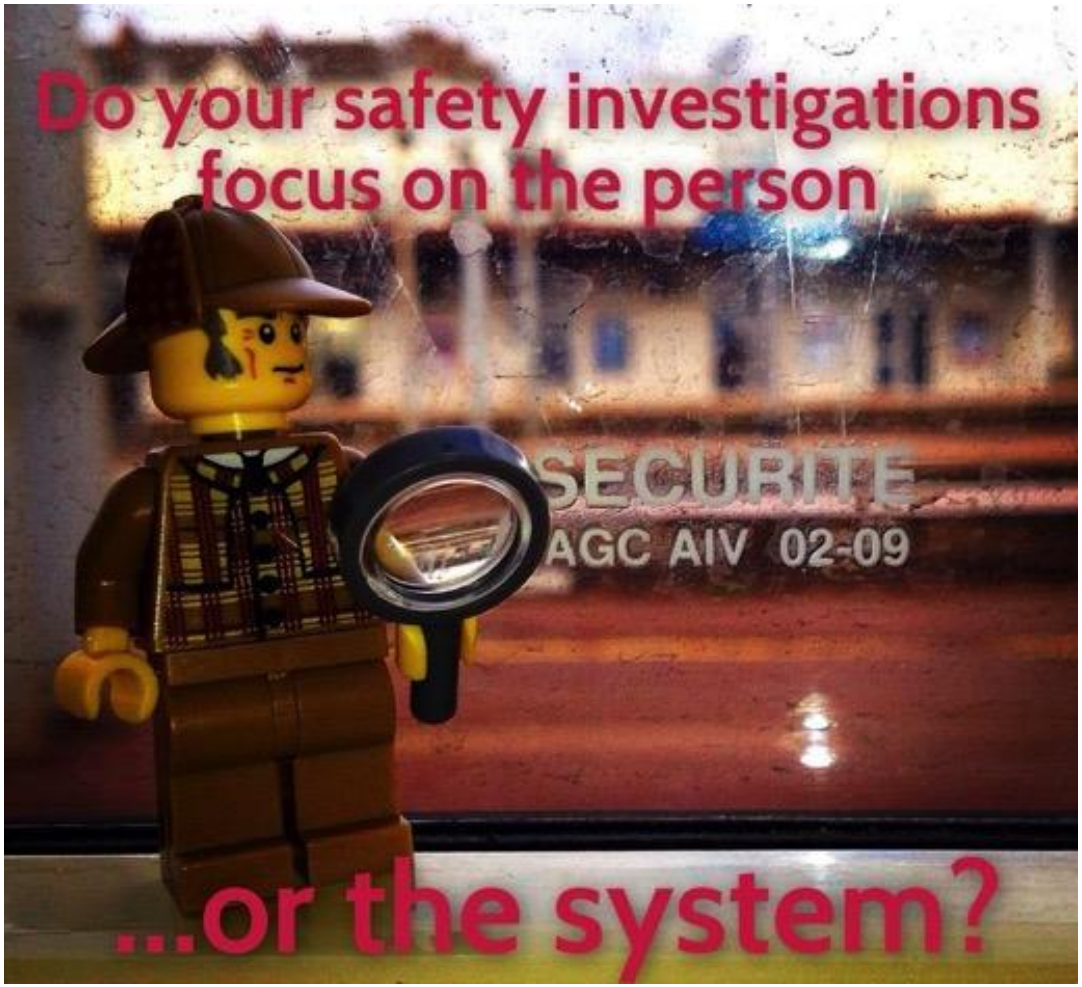
MAIIF


People factors
Ship factors
External influences
Environment
Organisation on board
Shore-side management
Working and living condition
Human Performance
Normal
Incidents
Accidents

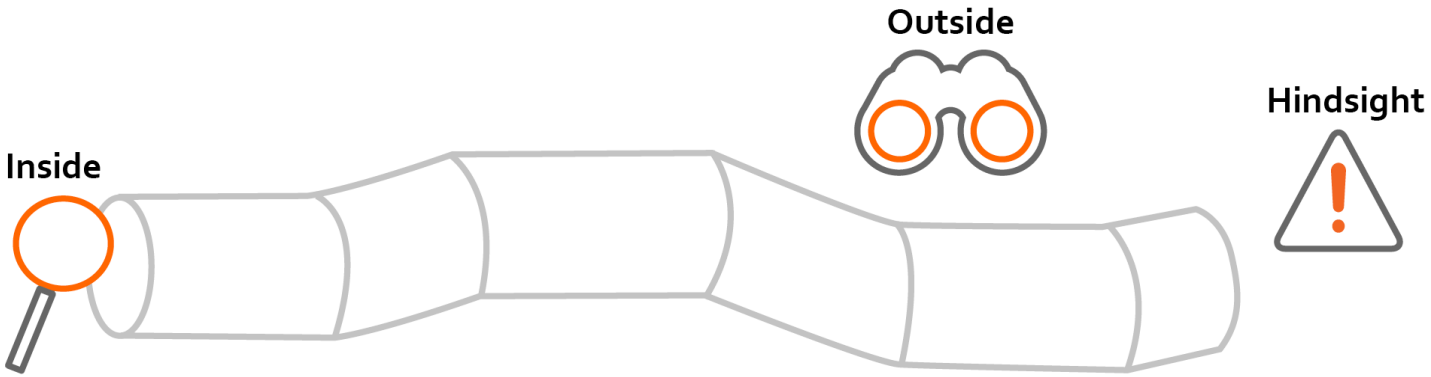
4. Humans working in systems

SHELL model




Do your safety investigations focus on the person
SECURITE
AGC AIV 02-09
...or the system?

General remark 1: “Human error”

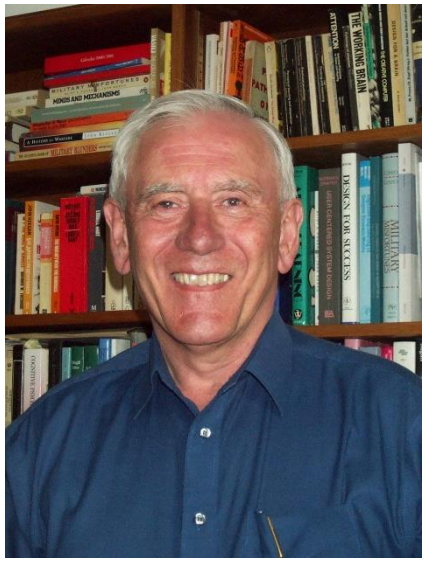


Human error

- Human error can never be an end conclusion of an investigation
- Rather, it is the start of an investigation
- Human error (and incidents) are symptoms of not-well organized organisations.

We cannot change the human conditon, but we can change the conditons under which humans work

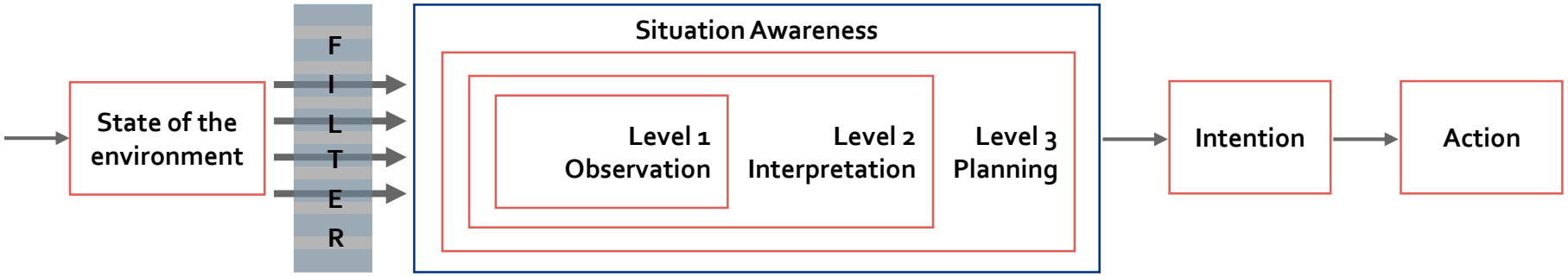
- James Reason



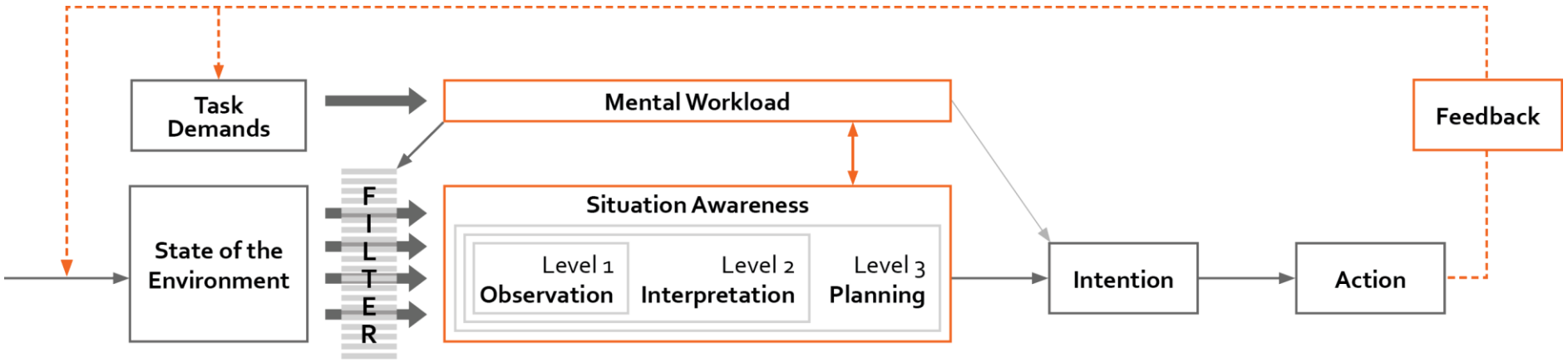
People make errors because they work in suboptimal and error-inducing environments

5. Human Factors

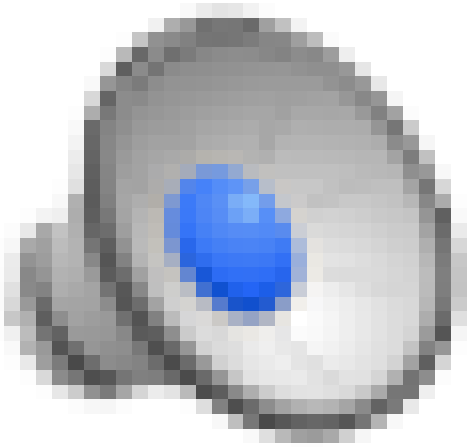
Situation Awareness



Situation awareness



Whodunnit



5. Evidence collection using SHELL

Evidence collection

- Software
- Hardware
- Environment
- Liveware
- Liveware

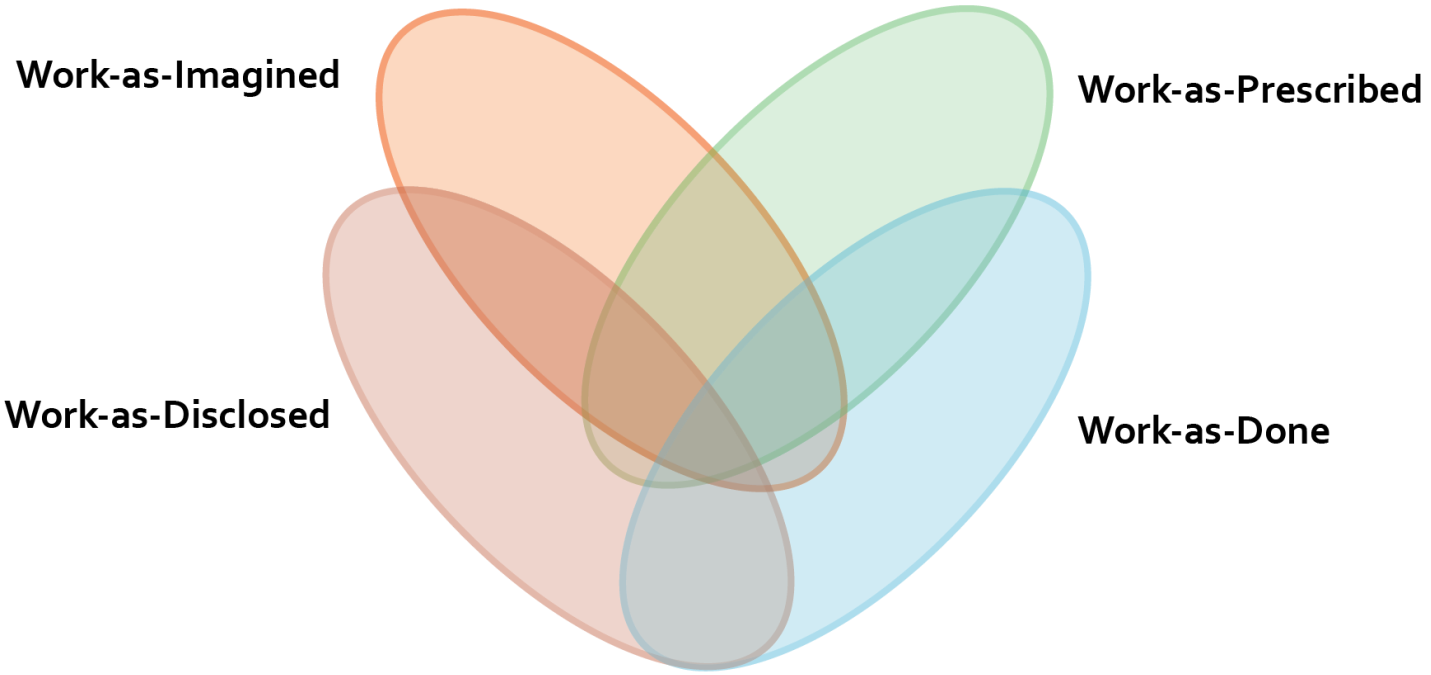
- Guides your evidence collection

Software

Information and support systems guiding people

- SMS, procedures, checklist etc.

WAI-WAP-WAD-WAD



WAI-WAP-WAD-WAD

WAI – Work-as-Imagined

The expectation of people in the organization about how work is done/ or should be done in practice.

WAP – Work-as-Prescribed

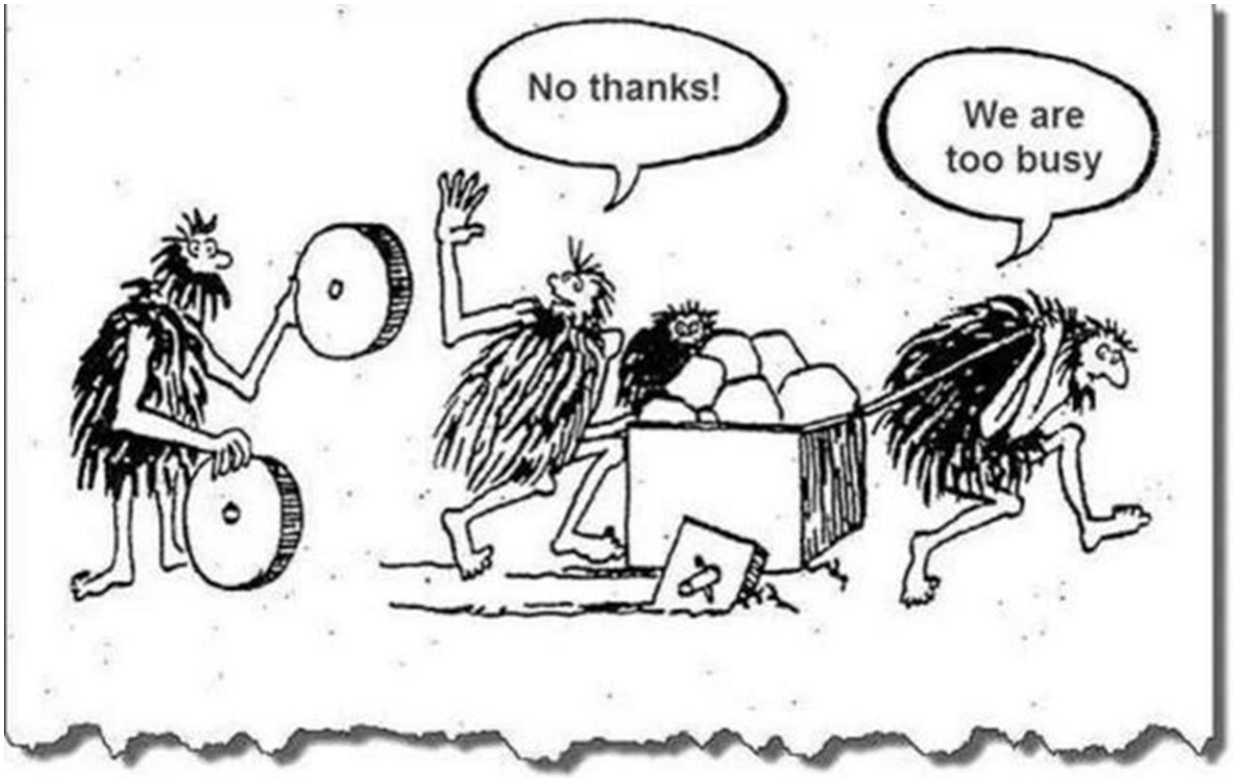
The prescribed way of working in job descriptions, procedures, rules or management systems.

WAD – Work-as-Disclosed

The way the work is explained to the persons concerned.

WAD – Work-as-Done

The actual way of working of the persons concerned.


No thanks!
We are too busy

Hardware

Ships, facilities, machinery, cargo, equipment etc. people have to work and interact with.

- Alarms, displays, tools, equipment.

Usability of systems

USABILITY

The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

Effectiveness	Efficiency	Satisfaction

Interaction design supports usability

Dialogue principles (ISO 9241-112)

	Suitability for the task	Self-Descriptiveness	Comformity with user expectations
Controllability	Error Tolerance	Suitability for individualization	Suitability for learning

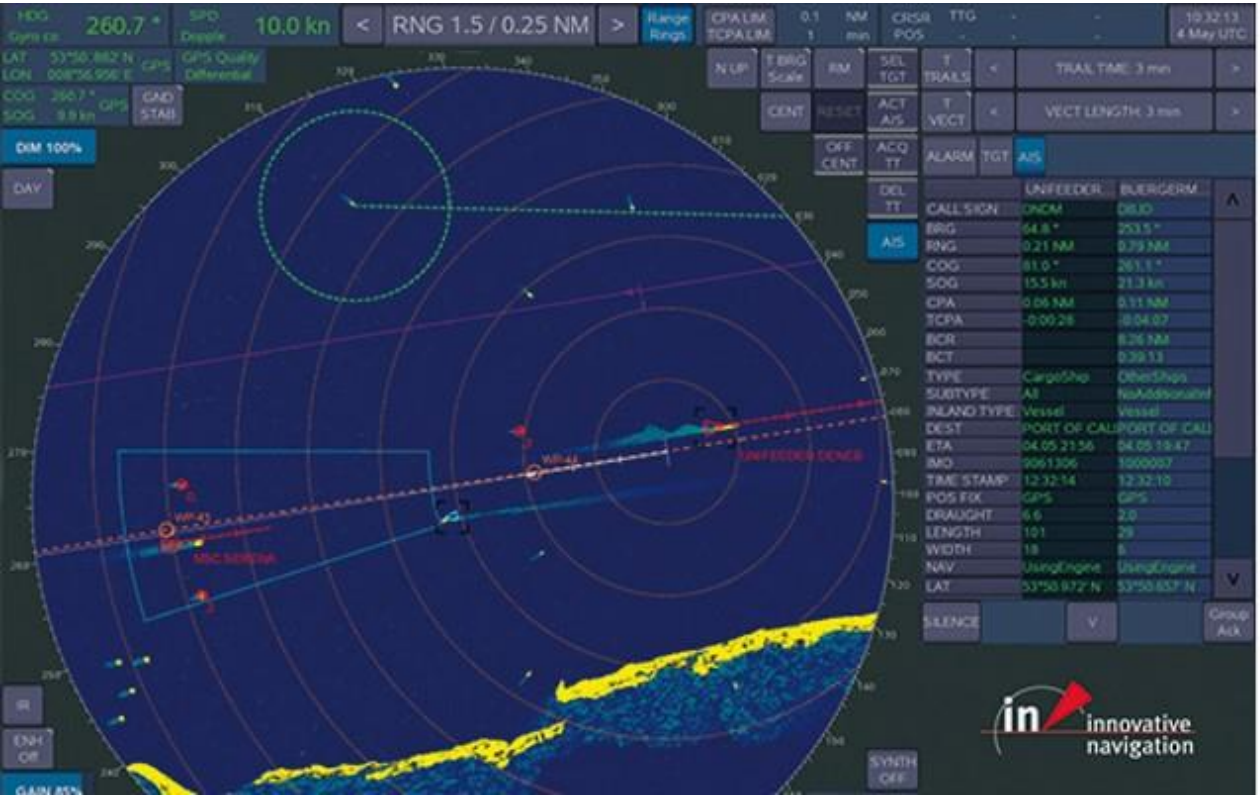
Information design supports interaction design

Characteristics of presented information (ISO 9241-125)

Freedom from distraction	Detectability	Discriminability
Interpretability	Conciseness	Consistency

Adapted from Ergonomics of human-system interaction; dialogue principles, ISO 9241-110

Example



In practice

Is the interface and the presented elements..

- Free from distractions?
  - E.g. Only task-related information
- Multi-interpretable?
  - Information should be unambigous
- Detectable?
  - Can you see and understand it?

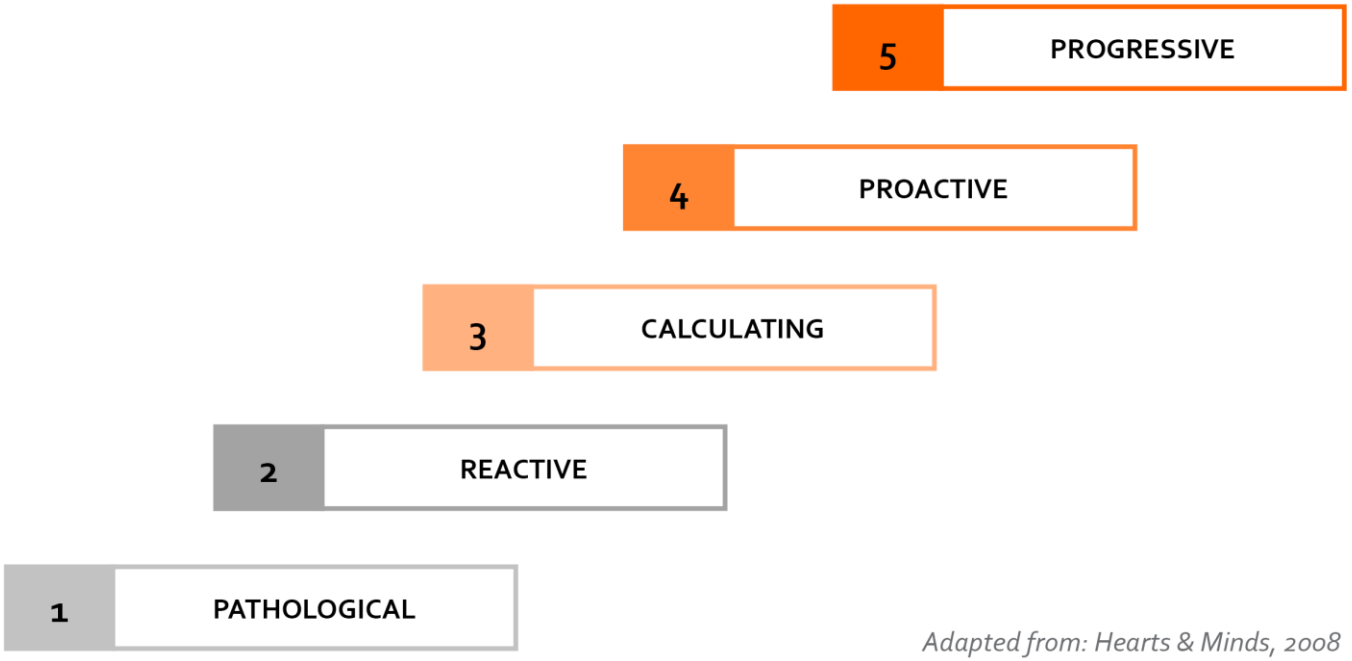
In practice

Is the interface and the presented elements..

- Concise?
  - Use as less info as possible. One word instead of one sentence (keep it simple)
- Distinctive
  - Other symbols, groupings etc. for different functions?
- Consistent?
  - E.g. are elements always presented in the same way?

Internal & external environment

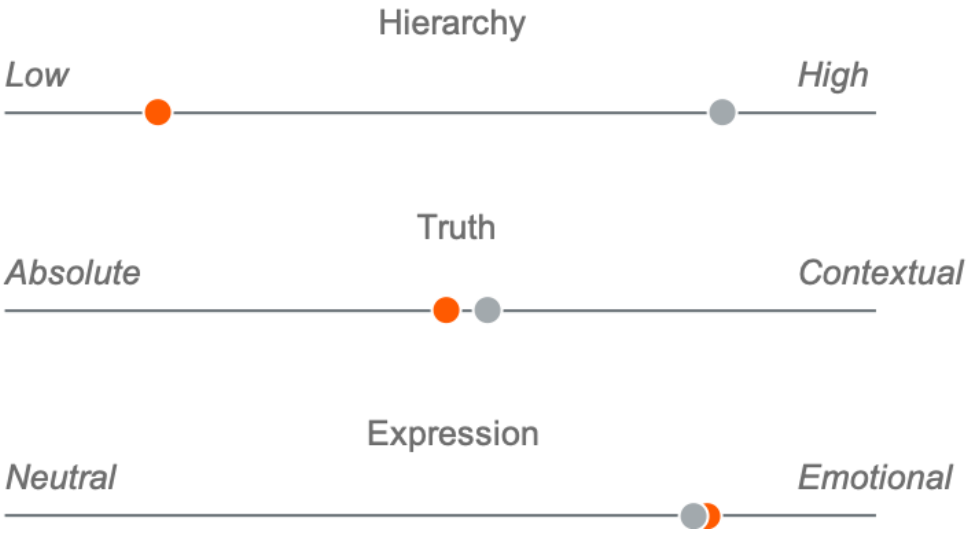
- Safety culture, weather, atmosphere



Adapted from: Hearts & Minds, 2008

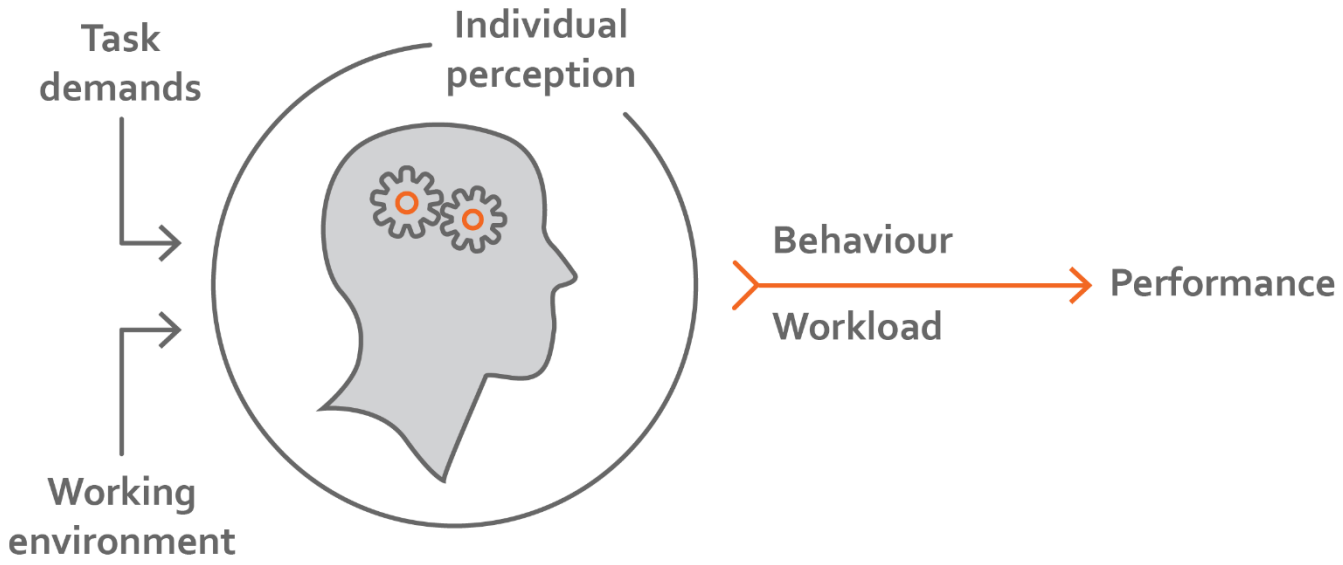
Influence of other people involved

- Communication, culture & language differences, supervision etc.



Key person involved

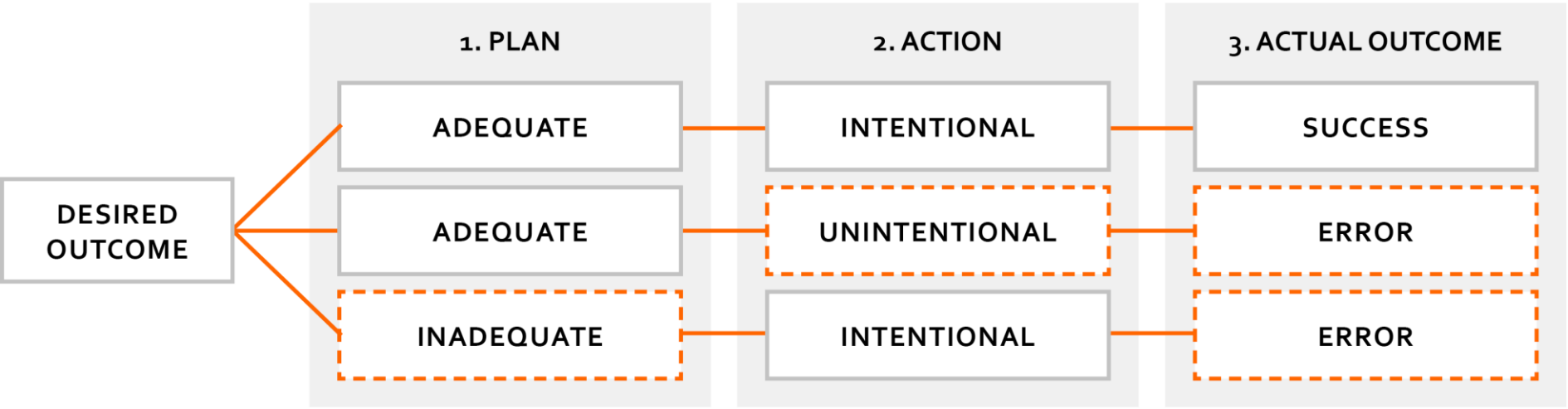
- Physical and mental capability, knowledge, training etc.



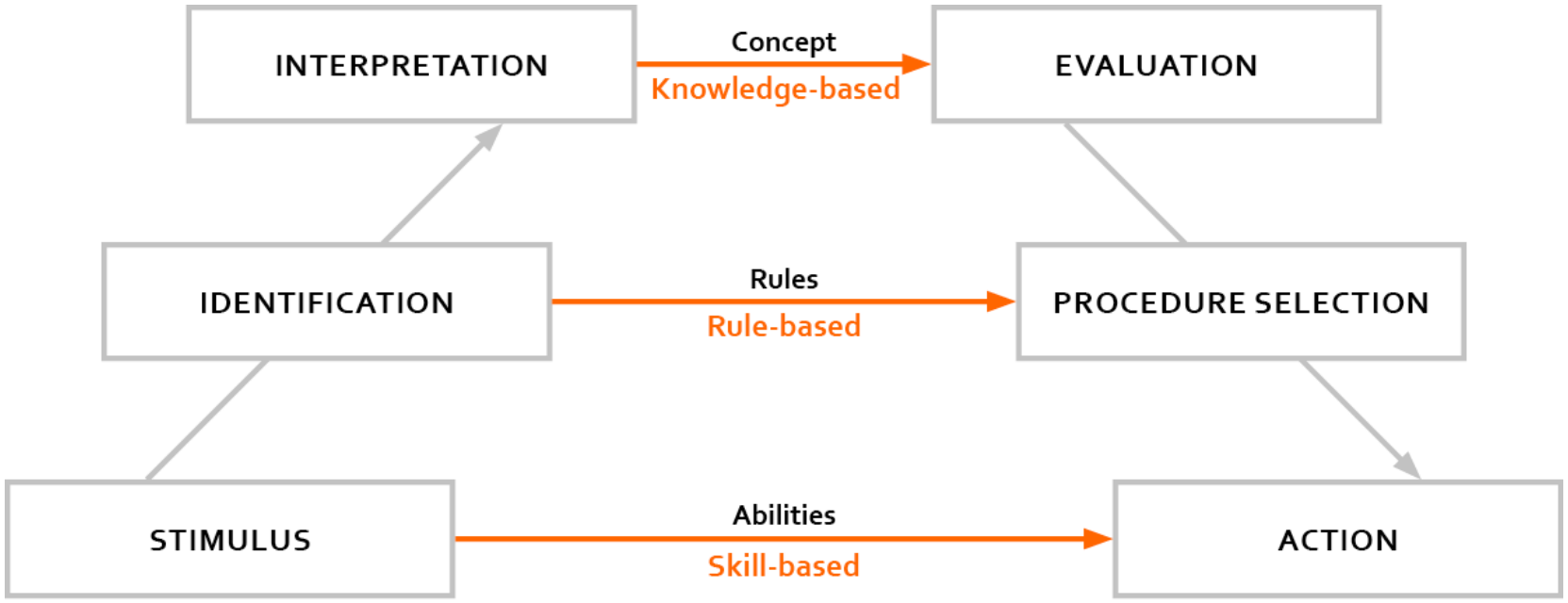
Exercise

- Read the case ‘marine casualty at sea’
- Make groups of 4
- Use the SHELL model in the marine casualty scenario to identify possible Human Factors at stake
- You can write on the paper
- 30 minutes exercise
- 10 minutes discussion

7. Categorisation of human behaviour


1. PLAN
2. ACTION
3. ACTUAL OUTCOME
DESIRED OUTCOME
ADEQUATE
INTENTIONAL
SUCCESS
ADEQUATE
UNINTENTIONAL
ERROR
INADEQUATE
INTENTIONAL
ERROR

SRK-model (Rasmussen)



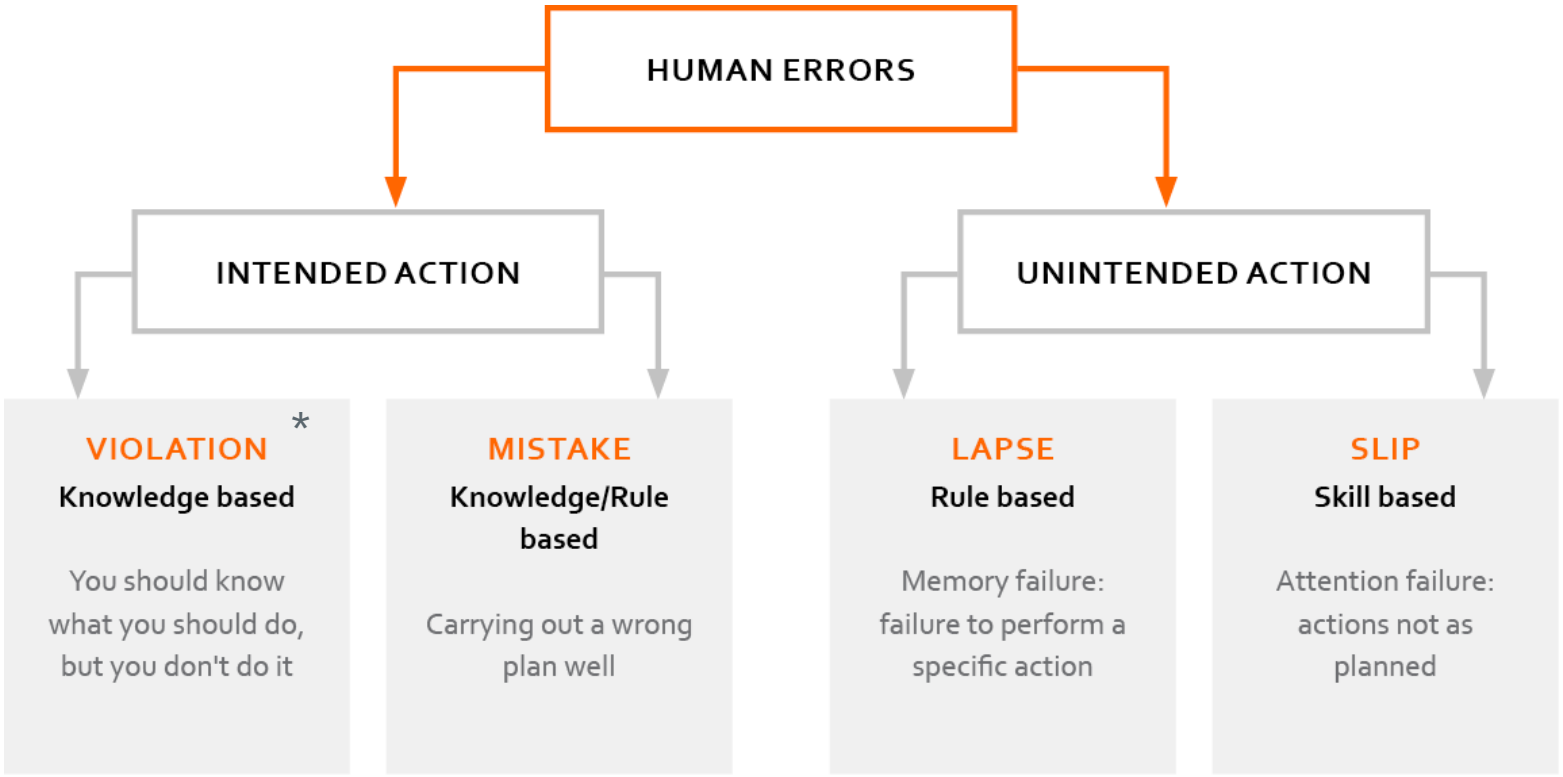
Adapted from: Rasmussen, 1983

SRK model

Factors influencing SRK

- Task design
  - Repetition
  - Time pressure
  - Amount of attention required
- Personal factors
  - Fatigue
  - Experience and training
- Work environment
  - Design of stimulus
  - Design of equipment

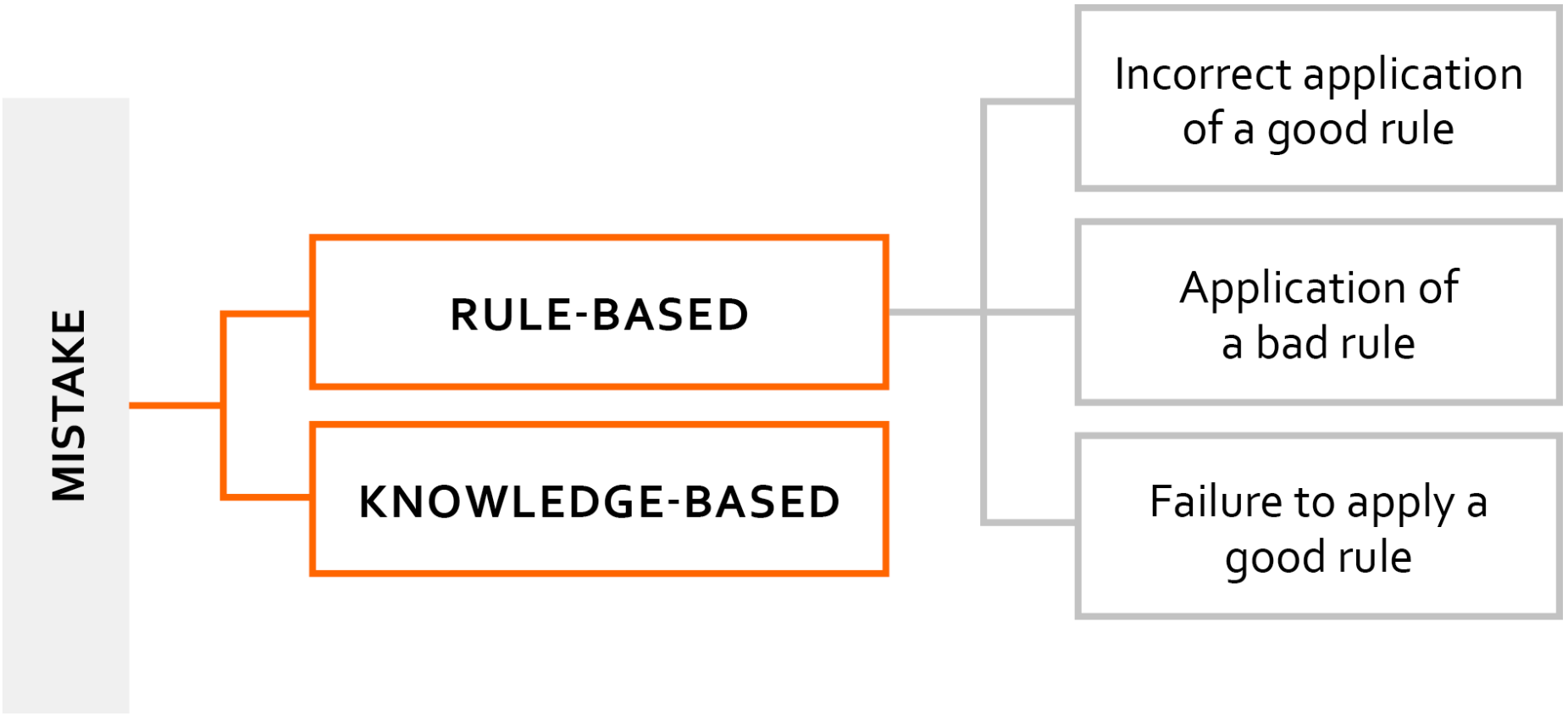
Human errors (Reason)

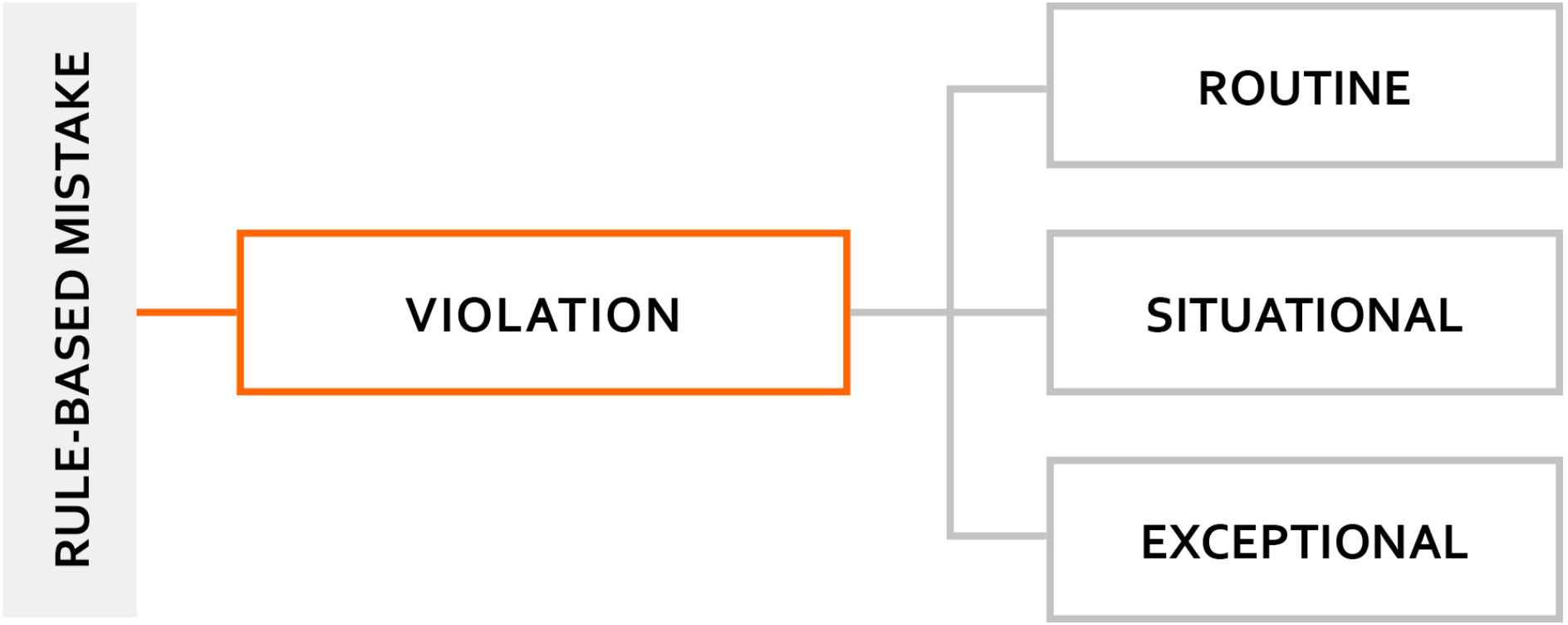


Adapted from: Reason, 1997

* In psychological sense, not legal.

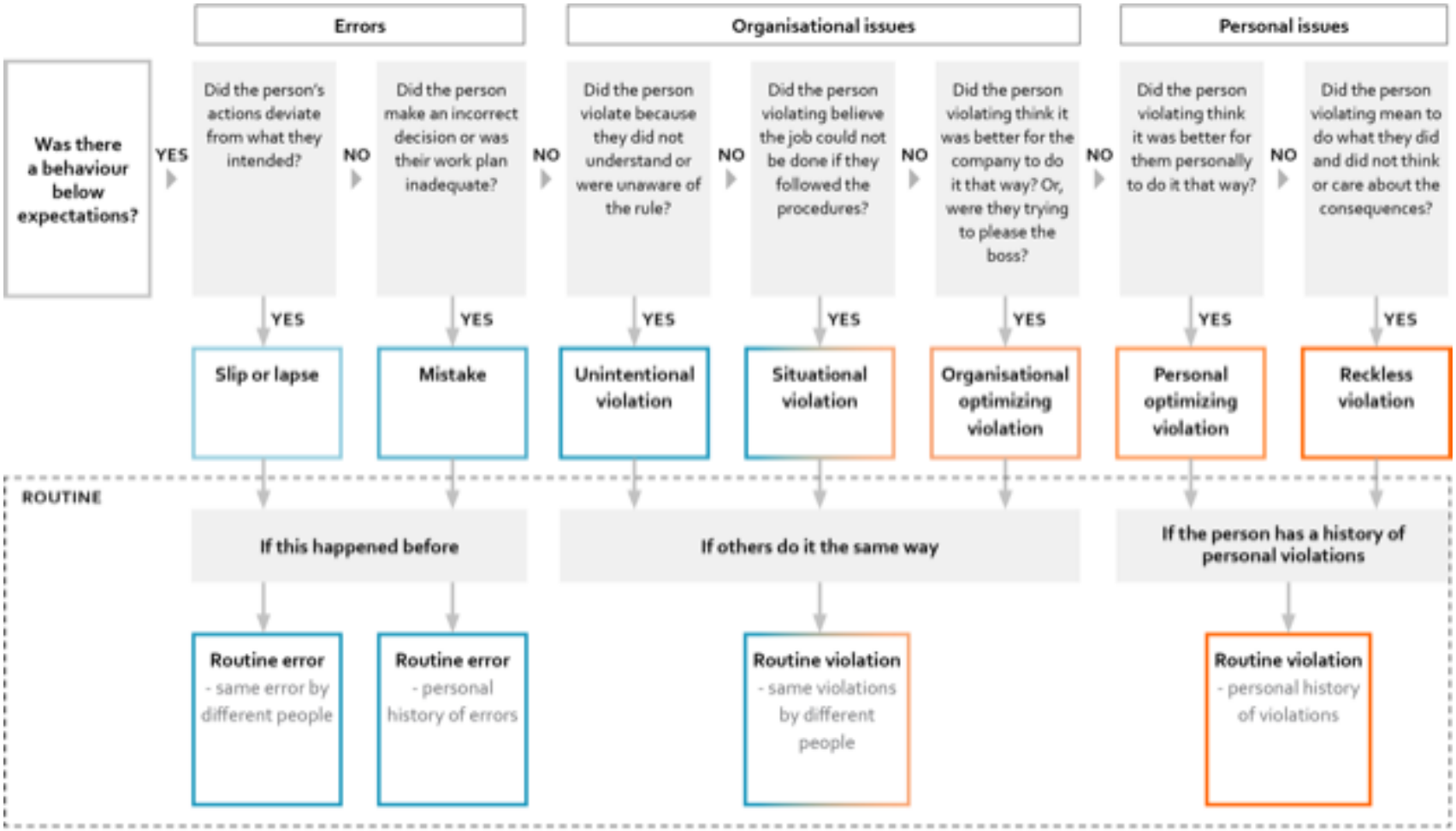

NEWSFLARE
LAD
BIBLE


MISTAKE
RULE-BASED
KNOWLEDGE-BASED
Incorrect application of a good rule
Application of a bad rule
Failure to apply a good rule


RULE-BASED MISTAKE
VIOLATION
ROUTINE
SITUATIONAL
EXCEPTIONAL

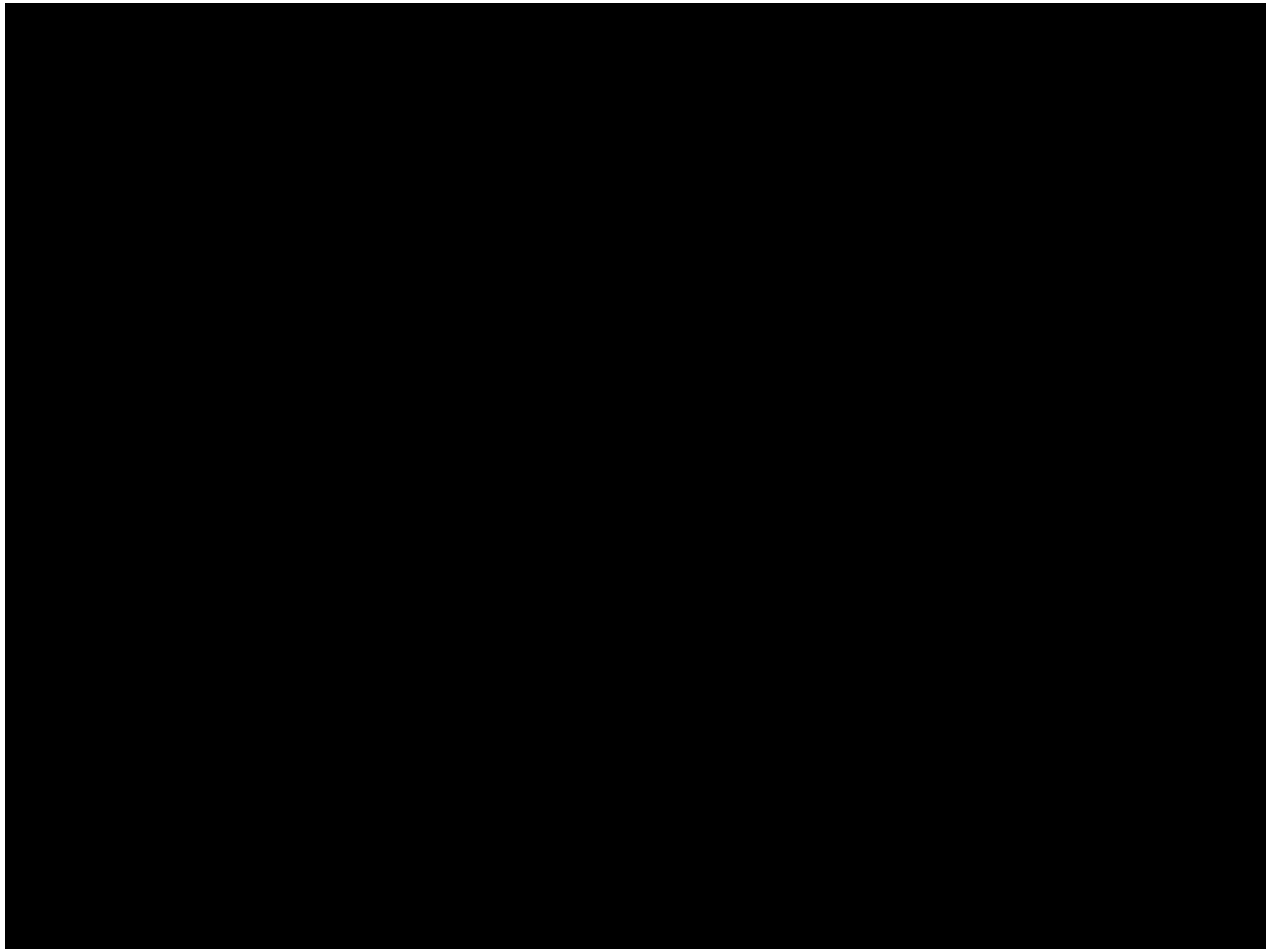

CH3
05/01/2016

Classification



The Human Error and Violation Decision Flowchart

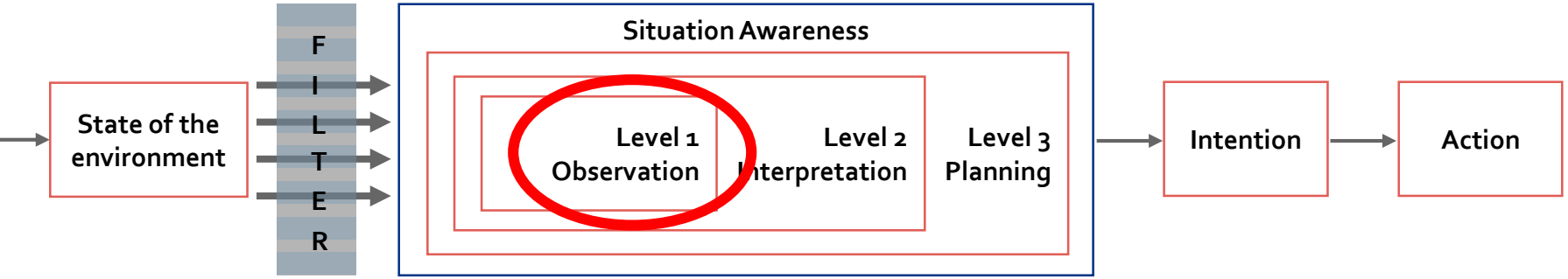
Adapted from: Hearts & Minds



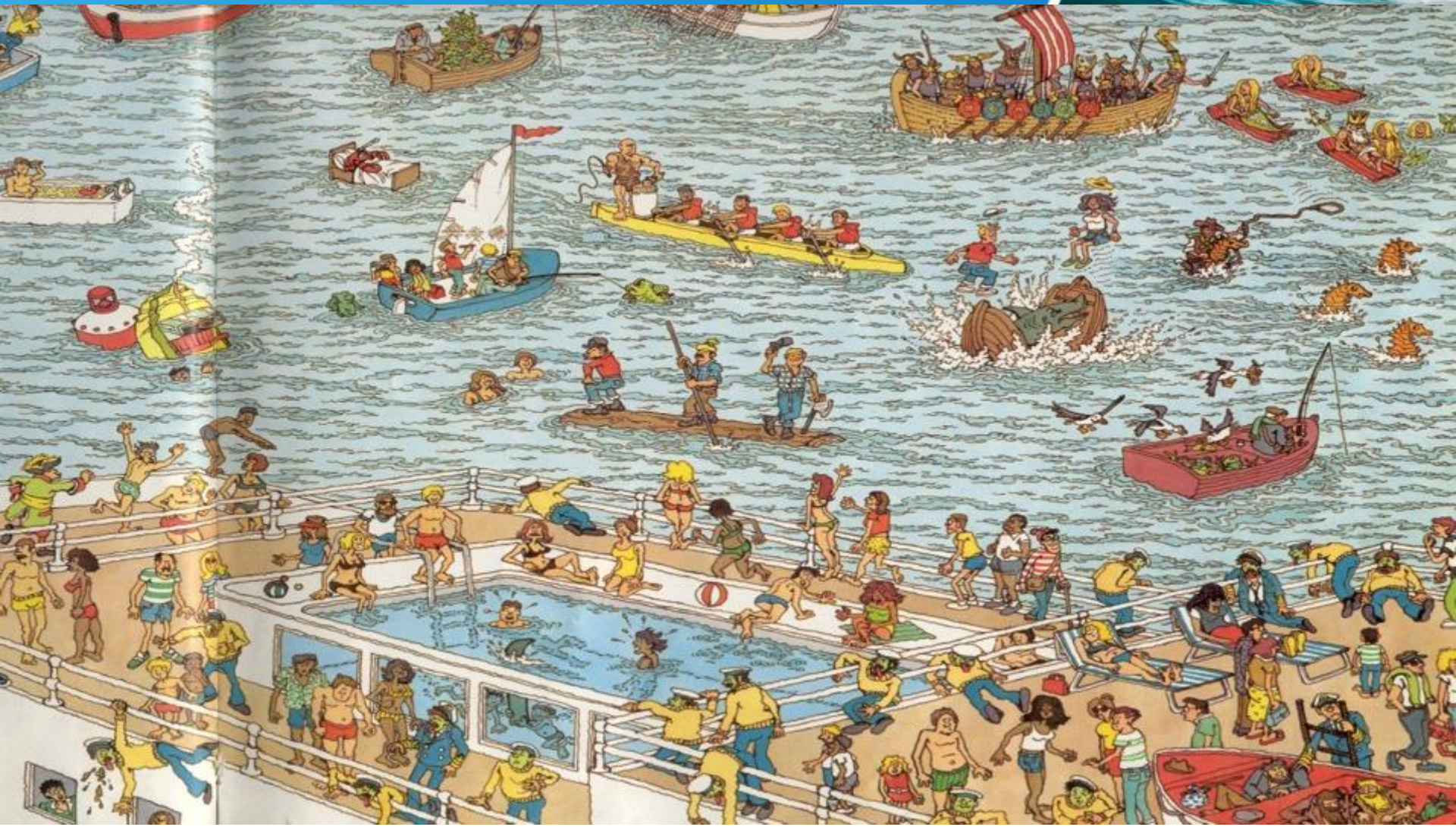
Exercise

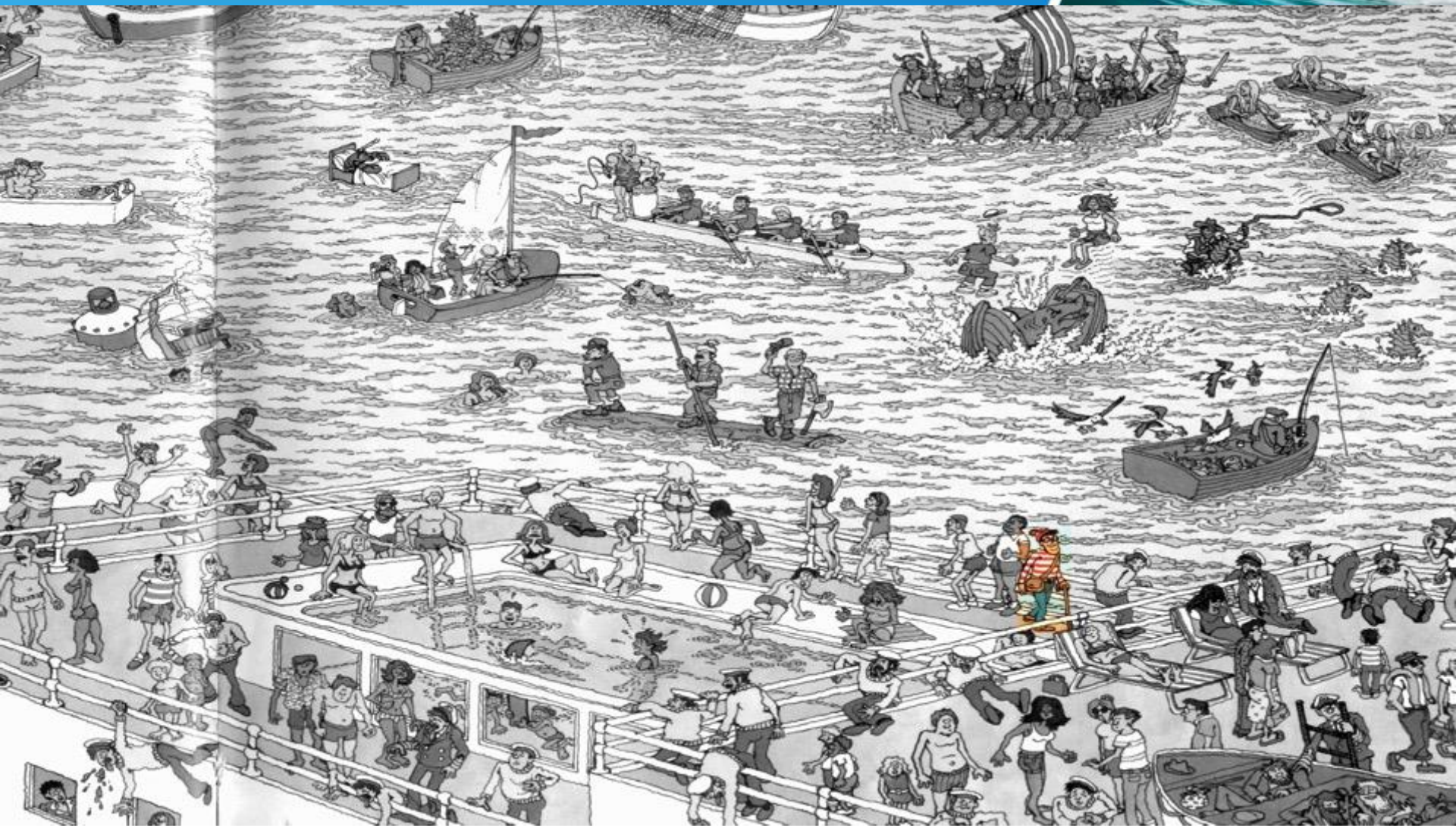
Categorize the human behaviour described in the case (in the same groups as the previous exercise)

EMCIP error types & Situation awareness

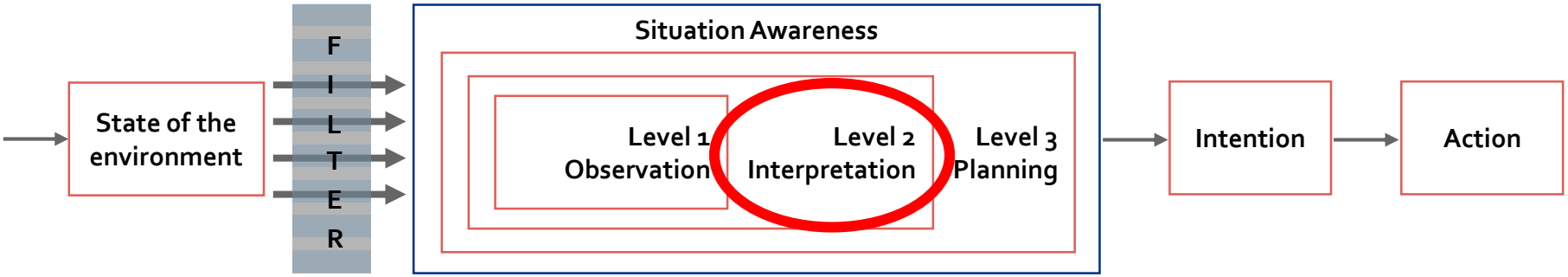


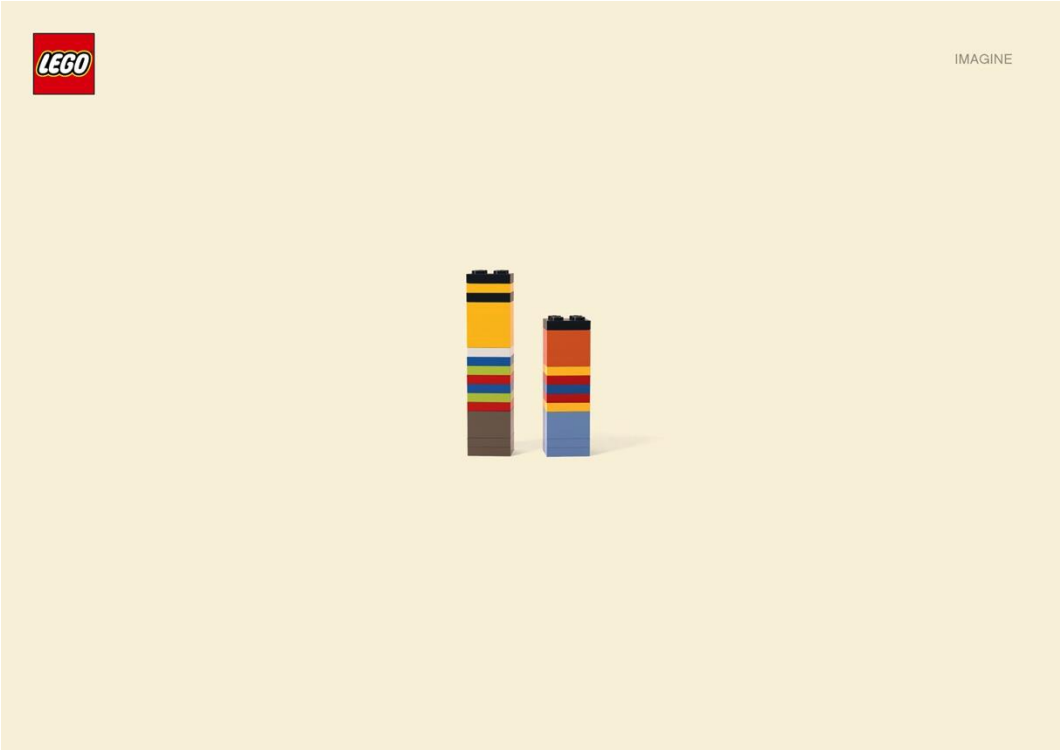
Where is Wally?

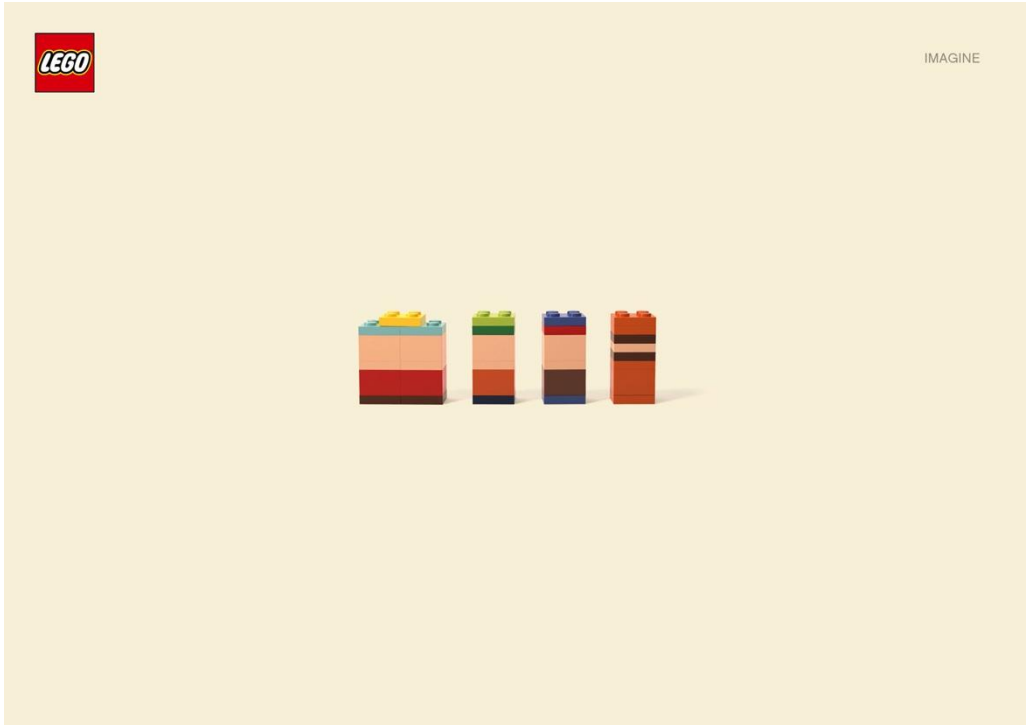


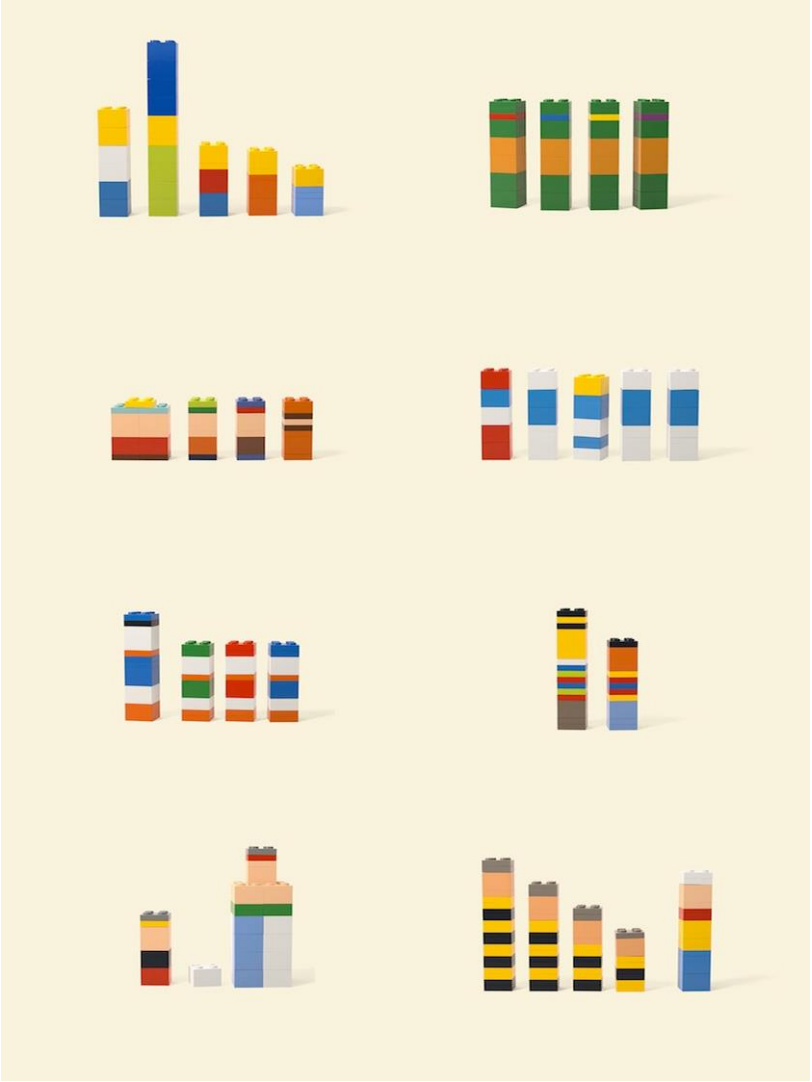


EMCIP error types

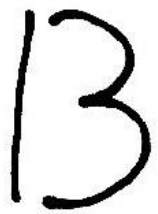



LEGO
IMAGINE

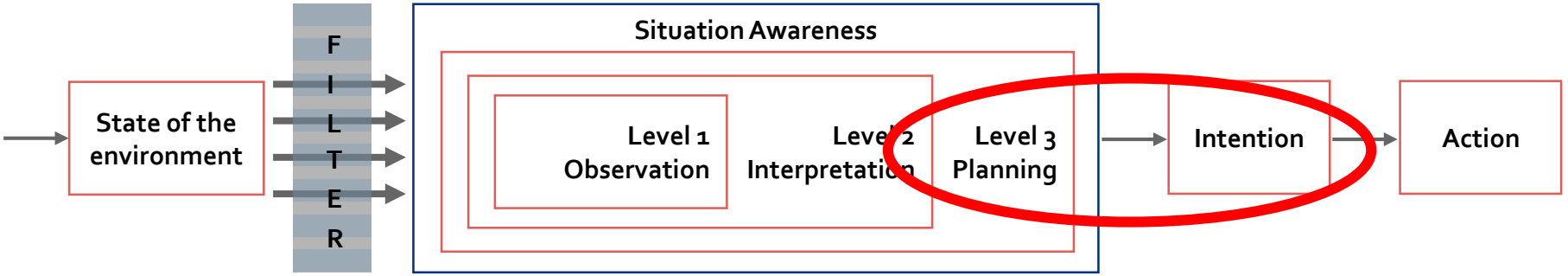

IMAGINE



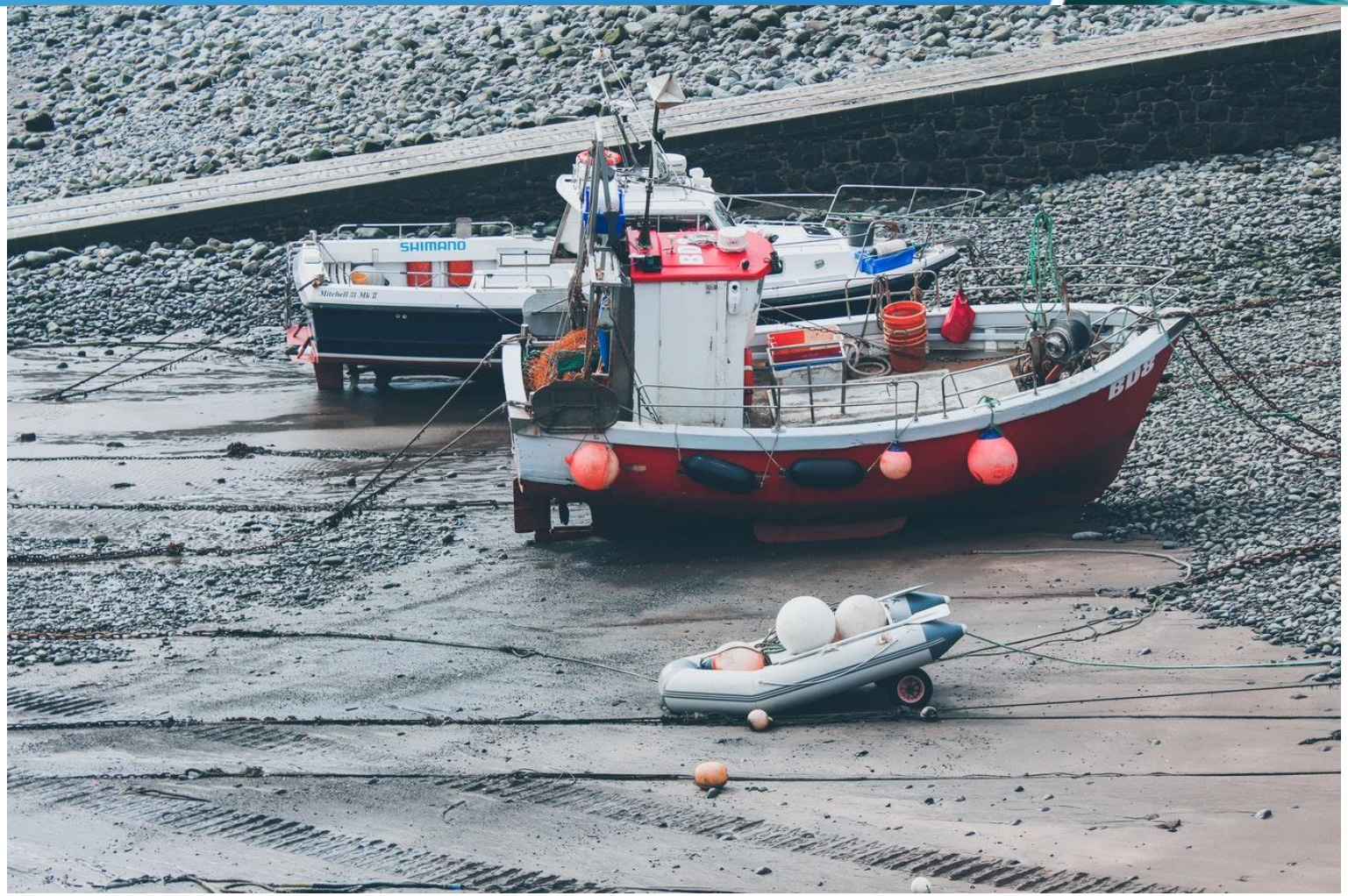
13



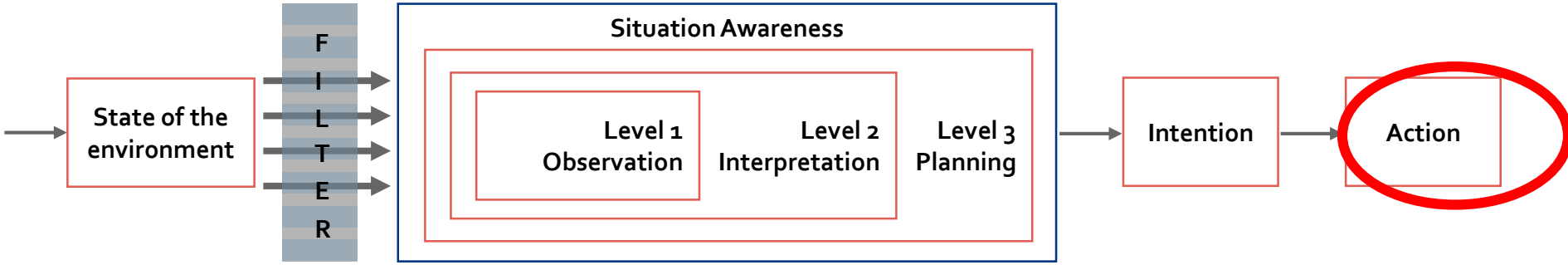
EMCIP error types



EXAMPLE



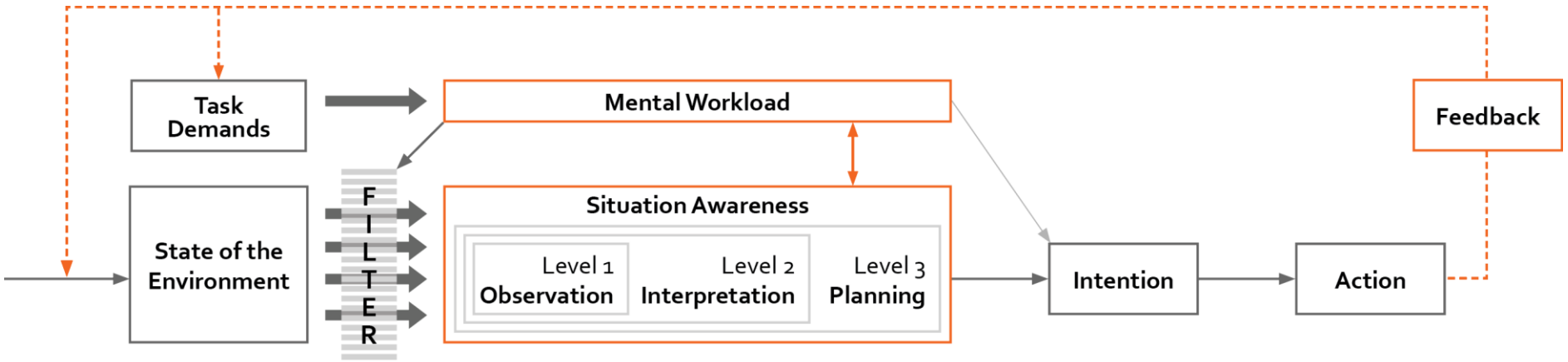
EMCIP error types



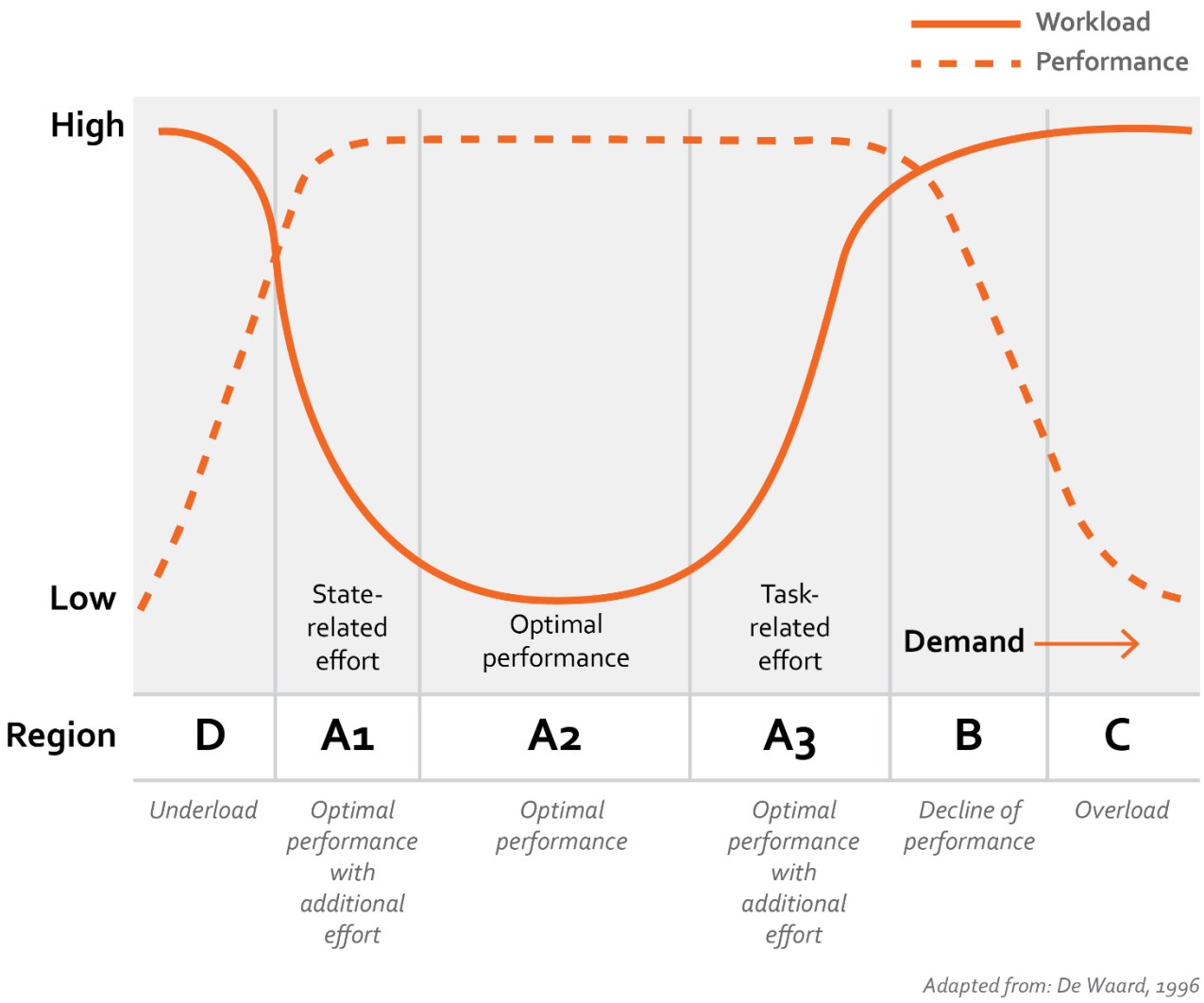
Example

8. Workload and fatigue

Factors influencing SA



Mental workload



Adapted from: De Waard, 1996

Fatigue

"A reduction in physical and / or mental capability as the result of physical, mental or emotional exertion, which may impair nearly all physical abilities including:

- *Strength*
- *Speed*
- *Reaction Time*
- *Co-ordination*
- *Decision making*
- *Balance*

Principles of fatigue management

Risk based rosters

- Which factors are included when designing rosters?
- Safety critical task
- Circadian rhythm

Compliance check

- How is compliance with rosters and regulations monitored?

Training and education (entire crew)

- How to recognise fatigue and what to do?

Principles of fatigue management

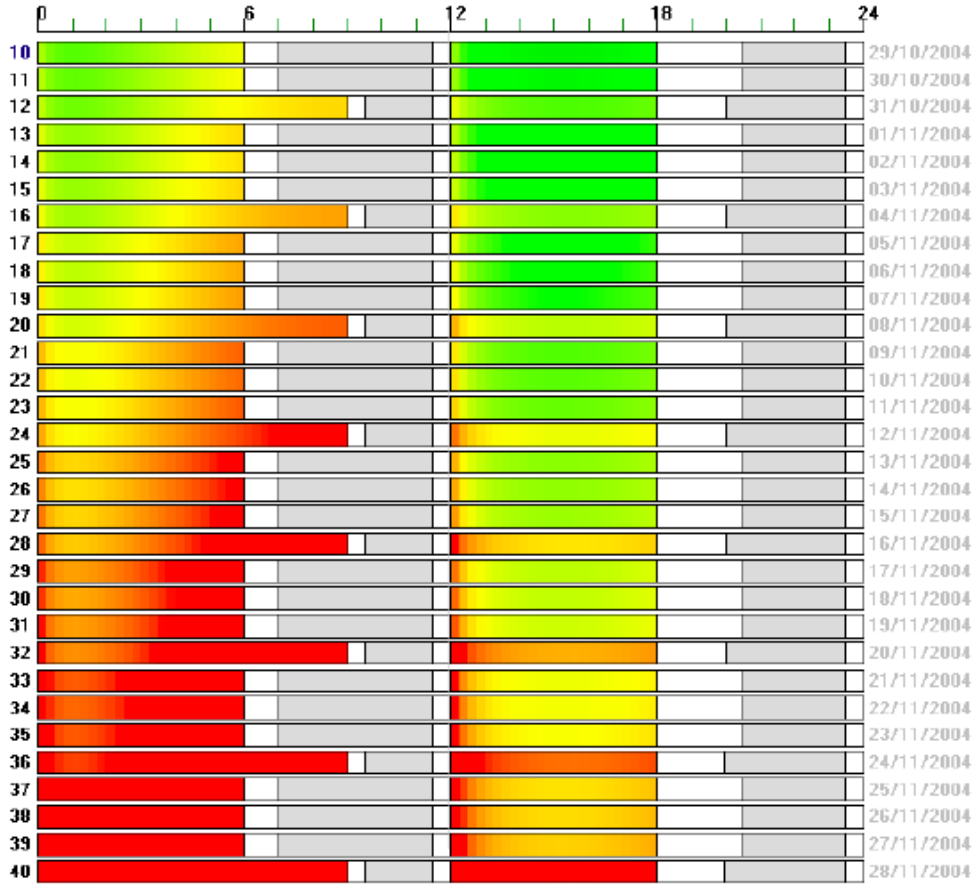
Healthy lifestyle education

- How to rest during off-duty
- Effect of lifestyle choices on fatige and alertness (smoking, drinking, eating etc.)

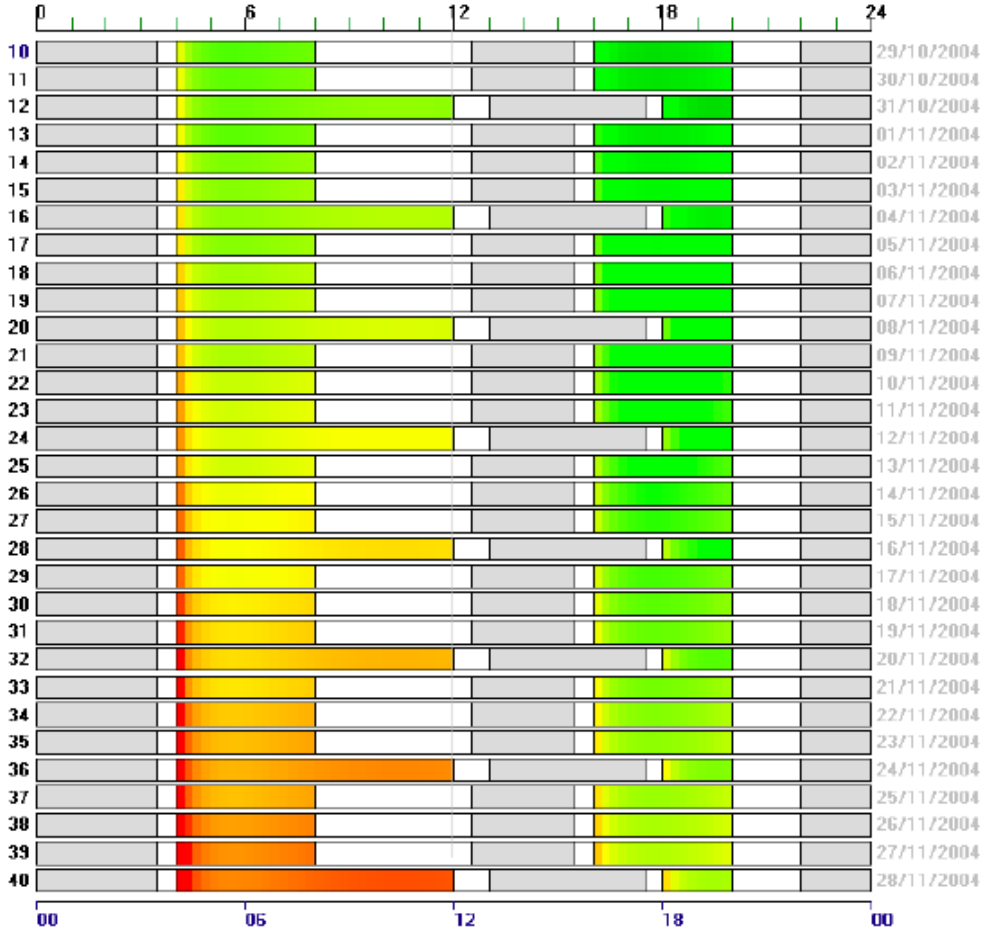
Risk assessment

- Which tasks require alertness?
- Where is fatigue a real threat and what are the buffers?

6on/6off Chief officer



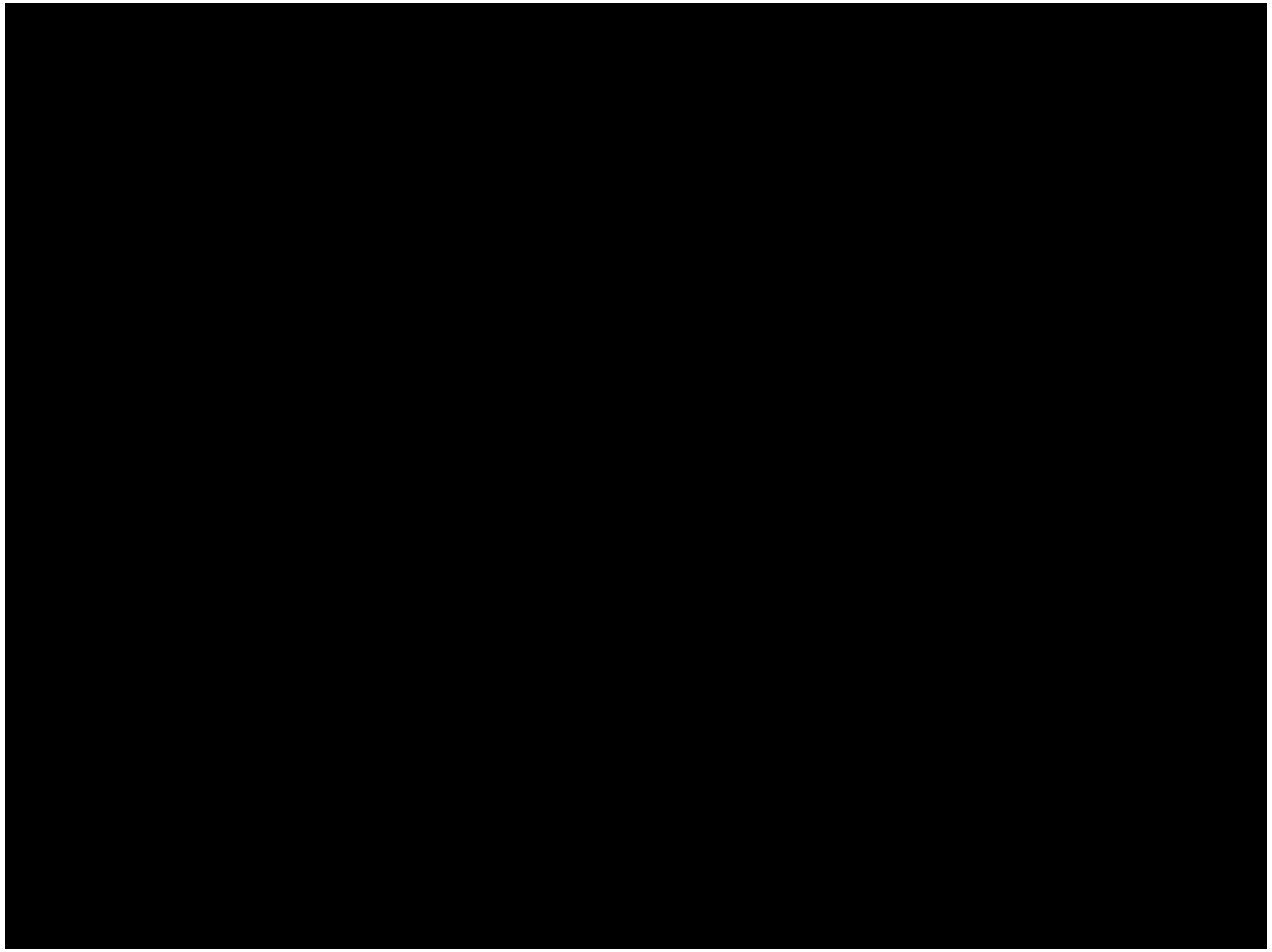
4on/8off Chief officer

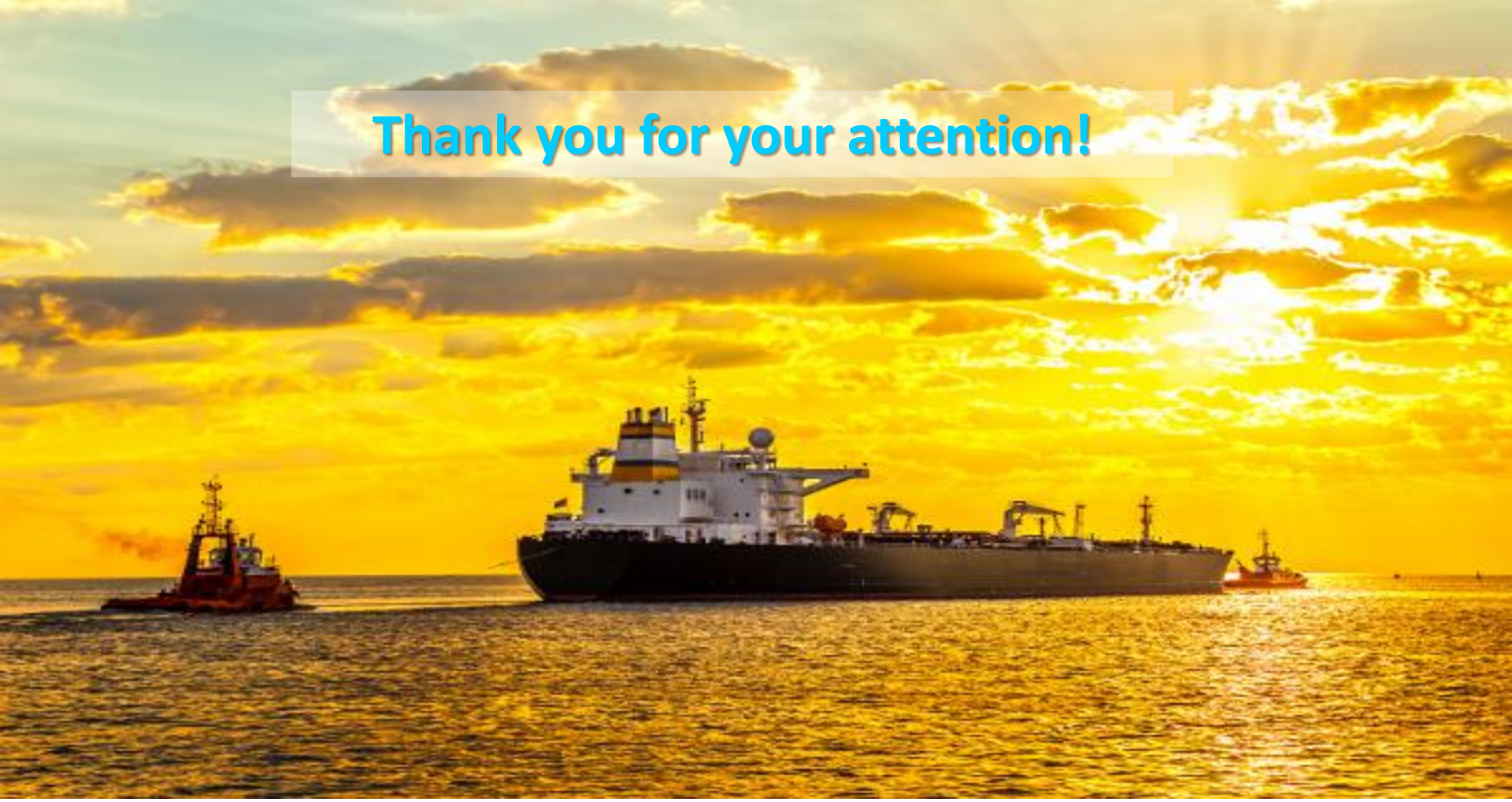


Exercise – Marine casualty

Which domains would you examine to assess if fatigue is a factor?

Basket Ball





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EMSA

European Maritime Safety Agency