

Workplace Safety,
Error Prevention

&

Risk Management

Occupational Health & Safety Authority Act

- The legal framework promotes, stimulates and encourages high standards of health and safety in places of work. It protects employees and the public from potentially harmful work activities.
- Everyone has a duty to comply with the Act, including employers, employees, trainees, self-employed.

Sources: Occupational Health & Safety Authority Act (CAP. 424); Work Place (Provisions of Health and, or Safety Signs (Amendment) Regulations, 2015 (L.N. 199 of 2015)

Employer's Key responsibilities



Provide and maintain equipment and safe systems of work

Ensure materials used are properly stored, handled, used and transported

Provide information, training, instruction and supervision

Provide a written safety policy/risk assessment

Provide a safe working environment

Look after the health and safety of others, for example the public

Employee's key responsibilities

- Take care of their own health and safety and that of other persons (employees may be liable)
- Co-operate with their employers
- Not interfere with anything provided in the interest of health and safety

GROUP ACTIVITY



As a Consultant you are asked to re-design a shop – floor in factory to make it more efficient.

WHAT HEALTH & SAFETY FACTORS MIGHT YOU NEED TO CONSIDER?

Examples

Sufficient heating / lighting

Noise levels – Non-damaging to health & communication between employees

Fire exits clearly marked – especially if in a new position

Employee's are adequately trained on any new equipment introduced

A thorough risk assessment on the new layout is conducted & written up

Further Reading Material:

- Regulations on Health and Safety
- Employment and Industrial Relations Act (CAP. 452)
- General Provisions for Health and Safety at Work Places Regulations (S.L.424.18)
- Minimum Requirements for the Use of Personal Protective Equipment at Work Regulations (S.L.424.21)
- Occupational Health & Safety Authority Act (CAP. 424)

What is **Safety Culture/Climate**?
Why are they important in the workplace?





Safety Culture vs. Climate?

- Safety Culture is not always apparent
- It is the underlying shared values, beliefs and habitual working practices that influence health and safety performance.



Safety Culture vs. Climate?

- Safety Climate is measurable.
- It relates to the perceptions held across the workforce at a given moment in time, about the way things are done around here.



Safety Culture



Pidgeon (1991) defined safety culture as:

“a set of beliefs, norms, attitudes, roles, social and technical practices that are concerned with minimizing the exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious.”

Safety Culture

Wiegmann et al.(2002) identified 7 basic commonalities found in definitions of safety culture:

- It is a concept defined at the group level or higher, which refers to the shared values among all the group or organisation members.
- It is concerned with formal safety issues in an organisation, closely related to, but not restricted to, management and supervisory systems.
- It emphasises the contribution from everyone at every level of an organisation.
- It has an impact on the behaviour of an organisation's personnel when at work.
- It reflects the contingency between reward systems and safety performance.
- It reflects an organisation's willingness to learn from errors, incidents and accidents.
- It is relatively enduring, stable and resistant to change.

Safety Culture

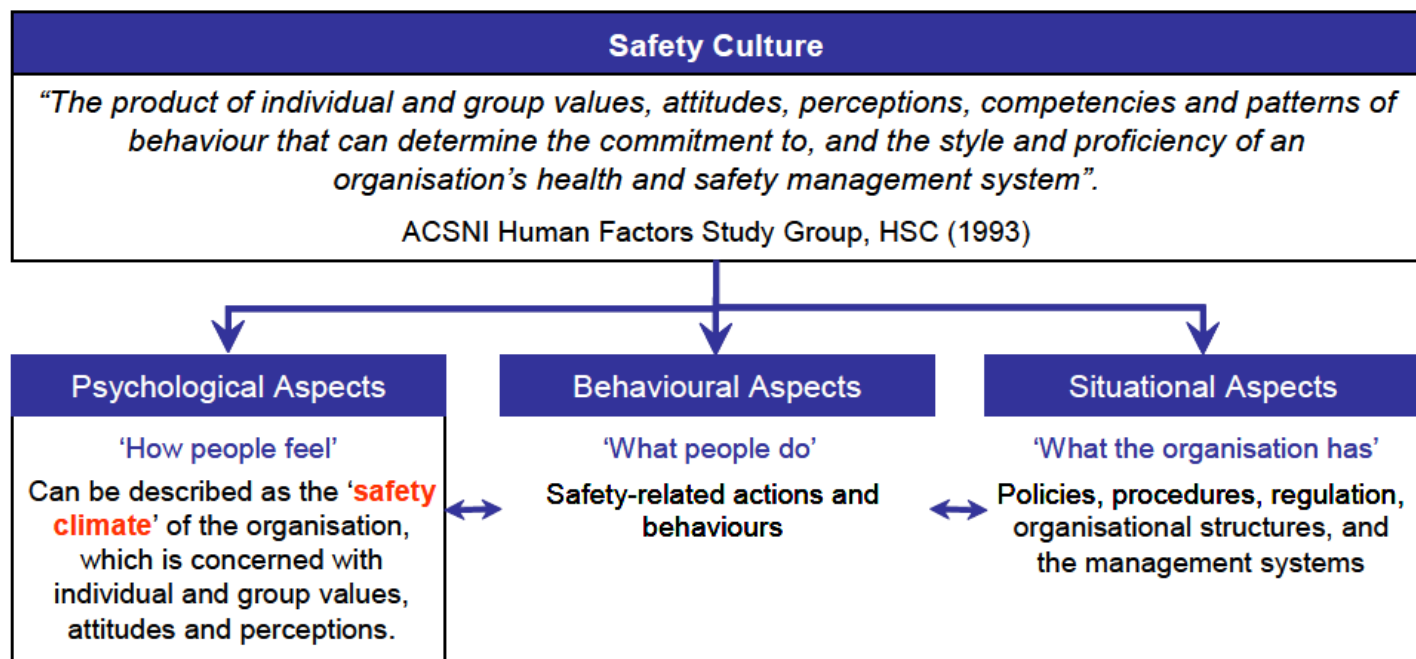


Figure 1 - A Three Aspect Approach to Safety Culture (based upon Cooper, 2000)

Safety Culture

- As part of the Ladbroke Grove Rail Inquiry (HSC 2001), the HMRI reviewed safety culture and safety climate and identified 5 aspects which can influence safety culture (HMRI Project Specification, 2004):
 - Leadership
 - Two-way communication
 - Employee involvement
 - Learning culture
 - Attitude towards blame

Safety Culture

Pidgeon & O'Leary (2000) suggest a positive safety culture is based upon:

- Senior management commitment to safety
- Realistic and flexible practices for handling hazards
- Continuous organisational learning
- A care and concern for hazards within the workplace

Safety Culture

Our company has a good safety culture because:

- Managers regularly visit the workplace and discuss safety matters with the workforce
- The company gives regular, clear information on safety matters
- We can raise a safety concern, knowing the company take it seriously and they will tell us what they are doing about it
- Safety is always the company's top priority, we can stop a job if we don't feel safe
- The company investigates all accidents and near misses, does something about it and gives feedback
- The company keeps up to date with new ideas on safety
- We can get safety equipment and training if needed – the budget for this seems about right
- Everyone is included in decisions affecting safety and are regularly asked for input
- It's rare for anyone here to take shortcuts or unnecessary risks
- We can be open and honest about safety: the company doesn't simply find someone to blame
- Morale is generally high

Safety Climate

Zohar (1980)

“the shared perceptions of employees about the task behaviours that are appropriate and adaptive in their work environments”

Chmiel and Talis (2013) – consensus concerned with

“an organization’s policies, procedures, and practices related to safety.” (p. 359)

Safety Climate

Three commonalities have been noted in definitions of safety climate:

- It is a **psychological phenomenon**, usually defined as the perceptions of the state of safety *at a particular time*.
- It is closely **concerned with intangible issues** such as situational and environmental factors.
- It is a **temporal phenomenon**, a 'snapshot' of safety culture and is relatively unstable and subject to change.

Safety Climate

Zohar (1980) – important dimensions

1. Workers' perceptions of importance of safety training
2. Management attitudes to safety
3. Effects of safe conduct on promotion opportunities
4. Level of risk in the workplace
5. Pace of work demands related to safety
6. Status of the safety officer
7. Effects of safe conduct on social status
8. Status of the safety committee

What is the importance of safety climate?

- Barling et al. (2002) found positive safety climate associated with lower self-reported frequency of injury involvement.
- Meta-analysis by Clarke (2006) found a positive relationship between measures of safety climate and safety performance.
- Meta-analysis by Beus et al. (2010) found that a positive safety climate was associated with a lower rate of accidents and injuries.

Guidelines for Creating A Safety Climate

Research suggests organisations should emphasise that **safety is a high priority** and **an integral part of the job** (see Weiner et al., 2012, chpt. 23).

Guidelines for creating a safety climate based upon Wilson-Donnelly et al. (2005) and Chmiel and Taris (2013) are:

1. Make people believe in safety and start at the top
2. Send appropriate signals that safety matters
3. Encourage discussion and documentation of errors
4. Examine all levels when searching for solutions
5. Prepare people thoroughly through training



Measures of Safety Culture

Table 1: The analytic, academic and pragmatic approach towards safety culture

| Main approach | Time focus | Information aimed to retrieve | Research characteristics | Assessment strategy and methods |
|-------------------------------------|------------|---|--------------------------|---|
| Academic (anthropological) | Past | Qualitative information | Descriptive | Fieldwork, ethnographical-inspired methods (e.g. document analysis, observations, focus groups, interviews, etc.) |
| Analytical (psychological) | Present | Quantitative information, on the safety climate | Descriptive | Safety climate scales, questionnaires |
| Pragmatic (experience based) | Future | Safety culture maturity (level) | Normative, prescriptive | Behaviourally Anchored Rating Scales (BARS) |

Measures of Safety Climate

Table 2: Non-exhaustive list of safety climate questionnaires and toolkits

| Title/Name (Acronym) | Developer/Author | Country of origin | Sector of origin |
|--|--|-------------------|--|
| Loughborough Safety Climate Assessment Toolkit (LSCAT) | Loughborough University, Health & Safety Executive (HSE), and a number of offshore organisations (Cox & Cheyne, 2000) | UK | Offshore oil and gas installations (but adaptable for broader use) |
| Safety Health of Maintenance Engineering (ShoMe) Tool | UK Civil Aviation Authority (CAA) (Developed by Health and Safety Engineering Consultants (HSEC) Ltd.) | UK | Aviation maintenance |
| Safety Culture Toolbox | Eurocontrol (Developed with the help of Aberdeen University) | EU | Air Navigation Services Providers (ANSP) |
| HRMI Safety Culture Inspection Toolkit | Her Majesty's Railway Inspectorate (HMRI) (Developed by Human Engineering Ltd. (HSE, 2005a/b)) | UK | Railway |

Measures of Safety Climate

| | | | |
|---|--|------------------|--|
| RSSB Safety Culture Improvement Toolkit | Rail Safety and Standards Board (RSSB) | UK | Railway |
| Multilevel Safety Climate (MSC) Scale (Organisational and Group-level Safety Climate) | Zohar (1980), Zohar and Luria (2005) | Israel | Manufacturing |
| Offshore Safety Questionnaire (OSQ) Offshore Safety Climate Questionnaire (OSQ99) | Robert Gordon University / Aberdeen University (Mearns et al., 1998, 2003) | UK | Offshore oil and gas installations |
| Commercial Aviation Safety Survey (CASS) | Federal Aviation Administration (FAA) (Developed by University of Illinois) (Wiegmann, 2003, 2004) | US | Commercial aviation, aviation maintenance |
| Norwegian Offshore Risk and Safety Climate Inventory (NORSCI) | International Research Institute of Stavanger (IRIS) (Tharaldsen et al., 2008) | Norway | Offshore |
| Nordic Occupational Safety Climate Questionnaire (NOSACQ) | Consortium of Scandinavian organisations (Kines et al., in press) | Nordic countries | Construction (now in high-risk industries) |
| HSL Safety Climate Tool (SCT) | Health & Safety Laboratory (HSL) | UK | |

Safety Management

- Safety Culture is highly related to Safety Management processes in an organisation
- Safety Management is partially (but not exclusively) about error management:
 - avoid errors;
 - trap errors;
 - and/or mitigate the consequences of errors.



Nine Principles for Safety Management

- Senior management's commitment to the management of safety.
- Effective safety reporting.
- Continuous monitoring.
- Sharing Information.
- Investigation of safety occurrences.

Nine Principles for Safety Management

- Sharing safety lessons learned and best practices.
- Integration of safety into all training for personnel.
- Effective implementation.
- Continuous improvement of the overall level of safety.

Safety Management Programmes

Reason (1997) suggested safety management programmes may be either:

- Reactive
- Proactive
- Predictive

Implementation of Safety Programmes

Wickens et al. (2004) suggest following requirements:

- Management involvement
- Safety rules
- Personal protective equipment (PPE) standards
- Employee training
- Suggestion and safety promotion schemes
- Accident/incident reporting

Measuring Safety Performance

Two main categories:

- **Leading Indicators** - useful in being able to predict or prevent future events and often linked to processes or targeted activities. They can be measured without an incident, accident or property damage occurring.
- **Lagging indicators** - show the number and or severity of events which have occurred.

Risk Assessment

- A risk assessment is not about creating huge amounts of paperwork , but rather about identifying sensible measures to control the risks in your workplace.
- How to assess risks in the workplace:
 1. Identify the hazards
 2. Decide who might be harmed and how
 3. Evaluate the risks and decide on precautions
 4. Record your significant findings
 5. Review your assessment and update if necessary

Ergonomic and Human Factors

What do you think the study of ergonomics and human factors involves?

Why do you think ergonomics and human factors are important in the workplace?

Definition

“The terms ‘ergonomics’ and ‘human factors’ can be used interchangeably, although ‘ergonomics’ is often used in relation to the physical aspects of the environment, such as workstations and control panels, while ‘human factors’ is often used in relation to wider system[s] in which people work.”

“Ergonomics is a science-based discipline that brings together knowledge from other subjects such as anatomy and physiology, psychology, engineering and statistics to ensure that designs complement the strengths and abilities of people and minimise the effects of their limitations.”

Chartered Institute of Ergonomics and Human Factors

Definition

“Human factors refer to environmental, organisational and job factors, and human and individual characteristics, which influence behaviour at work in a way which can affect health and safety”

UK, Health and Safety Executive

Ergonomics and Human Factors

Previously concerned with the **interactions between humans and technology** but is **now much broader**.
(Individuals, work environment, technology, health and safety etc.)



Ergonomics and Human Factors

Involves the assessment of factors such as:

- Design and use of tools
- Design and layout of the work environment
- Posture and movement
- Repetitiveness of a task
- Physical strength required to complete a task



Ergonomics and Human Factors

Aims to:

- Reduce the likelihood of **accidents** at work
- Improve **health and safety** in the workplace



Ergonomics and Human Factors

Involves the assessment of factors such as:

- Design and use of tools
- Design and layout of the work environment
- Posture and movement
- Repetitiveness of a task
- Physical strength required to complete a task



History of Ergonomics and Human Factors

- Came to the fore with the composition of the Ergonomics Society in 1959 – although can be traced back nearly 50 years before then
- **Taylor (1911)** – provided each worker with a shovel that suited their weight and height and found that the workers effectiveness tripled.



History of Ergonomics and Human Factors

- **The motion studies** - Frank and Lillian Gilbreth (1900s) sought one ideal way to complete a job or task using a motion-picture camera.
- Continuing research and development took place throughout the 1900s with the **Hawthorne Studies** in the 1920s, and in 1921 the **Industrial Fatigue Research Board** was formed, which researched topics such as the work environment and job design.
- The discipline has continued developing in areas such as **computer technology, automation** and **health and safety at work**.

The Link between Ergonomics and Economics



“Human factors/ ergonomics professionals have long recognized the tremendous potential of our discipline for improving the health, safety, and comfort of persons, and both human and system productivity. Indeed, through the application of our unique human-system interface technology, we have the potential to truly make a difference in the quality of life for virtually all persons on this globe.”

Hendrick (1996)

The Link between Ergonomics and Economics

“In light of our potential, why is it, then, that more organizations, with their strong need to obtain employee commitment, reduce expenses, and increase productivity, are not banging down our doors for help, or creating human factors/ ergonomics positions far beyond our capacity to fill them?”

- Previous exposure to bad ergonomics?
- Everyone is an operator?
- Ergonomics is the right thing to do but investment in it has to be justified?
- Ergonomists have done a poor job of documenting and advertising the cost-benefits of good ergonomics?

Categories of Ergonomics

Ergonomics can be categorised into four main areas:

1. Physical ergonomics
2. Cognitive ergonomics
3. The physical work environment
4. Health and safety related to the workplace



Physical Ergonomics

“How the human body functions and how physical aspects of the individual affect their work capabilities”

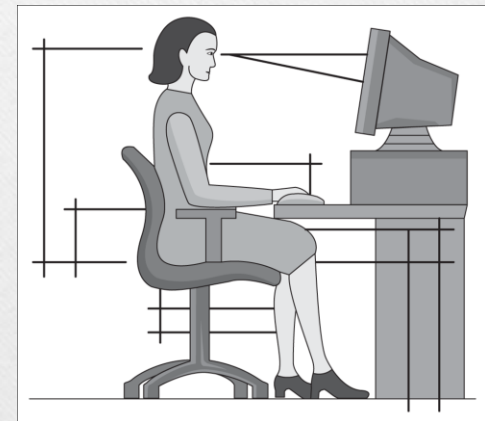
When designing work environments, consideration should be given to:

- Physical requirements as well as the mental aspects of the employees working in them, E.g. posture, arm reach and clearance such as leg-room, elbow-room and head-room.
- An individual's body dimensions (anthropometry) (An individual's body shape and size). E.g. By designing workplaces for the average person

Physical Ergonomics

Example

- Consider the picture of the computer operator
- **The back of the chair** supports the computer operators lower back with the seat fixed at a comfortable height, which can be adjusted for different computer operators.
- **The height of the table** is level with the bent arms of the operator, ensuring that the keyboard is within comfortable reach.
- **The computer screen** is at a comfortable height for the user and at an angle that will cause minimum strain to the eyes.
- Poorly designed workplaces can cause a number of health problems such as eye strain, back pain, repetitive strain injury and musculoskeletal disorders.



Can you think of any examples? Perhaps based on previous experience

Cognitive Ergonomics

“Considers the human brain and sensory system in the processing of information (E.g. touch, smell, taste, hearing and vision)”

- Focuses on the fit between a person's cognitive ability, the work task and the work environment.
- May involve designing a warning sign or designing a software package. The aim is that the majority of people will understand its meaning and act in the appropriate manner.

Cognitive Ergonomics

Example

Consider driving a car that has a speedometer that beeps when you have exceeded the speed limit.

It is expected that the majority of people will recognise the beep as referring to the need to reduce the speed and the majority of people will ease the pressure on the accelerator pedal and reduce the speed at which the car is travelling.

- Cognitive ergonomics is important in the use of highly complex technology.

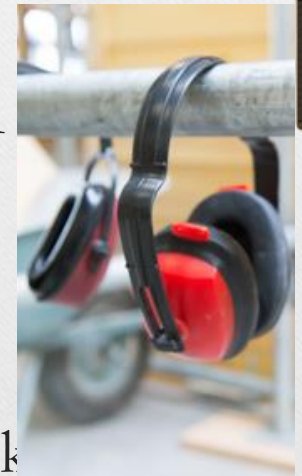


Can you think of any examples? Perhaps based on previous experience

The Physical Work Environment

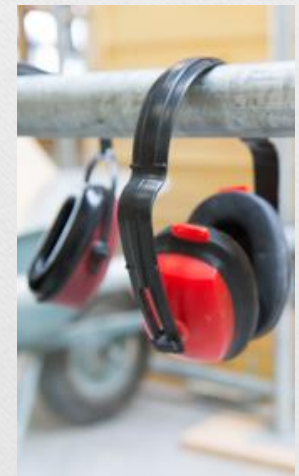
Environmental factors also require consideration when designing workspace:

- **Noise** – Can result in issues with hearing, as well as result in communication issues in the workplace
- **Lighting** – Can result in eye strain as well as headaches or may make it difficult to see the work being carried out



The Physical Work Environment

- **Air quality** - Can cause breathing problems, asthma attacks and lung disorders
- **Radiation** – Can lead to skin cancers
- **Vibration** - Can cause damage to an employees spine, hands and stomach



The Physical Work Environment Assessment

- There are three primary methods of assessing how humans respond to their work environments:
- **Subjective methods** - Rating scales such as those from 1 (completely dissatisfied) to 5 (completely satisfied)
- Easy to carry out
- **Objective methods** - Direct measures of a persons response such as their body temperature, and levels of vibration experienced by the individual when carrying out a task
- **Behavioural methods** - Assessing a persons change in posture when conducting a job as well as making adjustments to the environment so that they can work more quickly and more efficiently.
- Requires the observation of the behaviour by a trained observer
- Health and Safety Legislation





Learning Outcomes

-
- Health and Safety Act.
 - Safety Culture vs. Safety Climate
 - Safety Management
 - What is involved in Risk Management?
 - The aim of ergonomics and human factors
 - What ergonomics and human factors involve
 - The four main areas of ergonomics

*Thank
you*



See you next week

for

Lecture 8

Work

&

Well-Being