LECTURE 13

Lecture Title: Task Analysis (Ergonomics & H&S)

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Undergraduate Diploma in Occupational Health and Safety

Monitoring and Auditing Risk Controls

AIM of Lecture

- Understanding Ergonomics at the work place.
- Task Analysis

ERGONOMICS

What do you understand by *ergonomics* in the workplace?

ERGONOMICS

Definition

Ergonomics, also known as **human factors** or **human factors engineering** (**HFE**), is the application of psychological and physiological principles to the engineering and design of products, processes, and systems.

Primary goals of human factors engineering are to reduce human error, increase productivity and system availability, and enhance safety, health and comfort with a specific focus on the interaction between the human and equipment.

ERGONOMICS

What is Ergonomics?

Ergonomics is the science of:

- Designing work to fit the worker.
- Improving:
  - Safety
  - Comfort
  - Performance

KEY PRINCIPLE

Fit the job to the person, not the person to the job

ERGONOMICS

Why Ergonomics Matters in the Workplace

Poor ergonomics leads to:

- Musculoskeletal disorders (MSDs)
- Fatigue
- Errors
- Low productivity

Good ergonomics leads to:

- Fewer injuries
- Better performance
- Higher job satisfaction

ERGONOMICS

Common Ergonomic Risk Factors

- Repetitive movements
- Awkward postures
- Forceful exertions
- Prolonged sitting or standing
- Poor workstation design

ERGONOMICS

Ergonomics and Health & Safety

Ergonomics supports:

- Risk assessment
- Accident prevention
- Human error reduction
- Vision Zero goals

ERGONOMICS

Types of Ergonomics

Physical ergonomics
Posture, lifting, manual handling

Cognitive ergonomics
Mental workload, decision-making

Organisational ergonomics
Shift work, workload, work design

ERGONOMICS

Ergonomics in Real Workplaces

Examples:

- Office workstations
- Manufacturing lines
- Manual handling tasks
- Healthcare work

Question:

Where have you seen poor ergonomics?

ERGONOMICS

Ergonomics in Real Workplaces

Examples:

- Office workstations
- Manufacturing lines
- Manual handling tasks
- Healthcare work

ERGONOMICS

WORK PLACES (HEALTH, SAFETY AND WELFARE) REGULATIONS

MINIMUM HEALTH AND SAFETY REQUIREMENTS FOR WORK WITH DISPLAY SCREEN EQUIPMENT REGULATIONS

PROTECTION AGAINST RISKS OF BACK INJURY AT WORK PLACES REGULATIONS

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TASK ANALYSIS

"We are getting reports of wrist and neck pain, also error rates are unacceptable and we are not pleased with their production rates either! We need your help..."

Where to start??

TASK ANALYSIS

Task analysis allows the task to be described in terms of the sequence of task steps involved, the technology used in completing the task (controls, displays etc) and the sequence of the task steps involved.

TASK ANALYSIS

The following task analysis methods help ergonomists understand work activities so that Safety, Performance and Design can be improved.

- **Hierarchical Task Analysis (HTA) - HTA breaks a task into goals, sub-goals, and steps to show how work is carried out in sequence.**
- **Tabular Task Analysis (TTA) - TTA presents task steps in a table to clearly show actions, tools used, and potential risks at each stage.**
- **Verbal Protocol Analysis (VPA) - VPA analyses a task by asking workers to verbalise their thoughts while performing the activity.**

TASK ANALYSIS

The following task analysis methods help ergonomists understand work activities so that Safety, Performance and Design can be improved.

- **Goals, Operators, Methods, and Selection Rules (GOMS)**

GOMS examines the mental processes involved in completing tasks, focusing on decision-making and efficiency.

- **Sub-Goal Template (SGT) - SGT structures tasks into smaller sub-goals to help understand how complex activities are achieved.**

NOTE: To focus on HTA, as it is the most commonly used method in ergonomics and safety.

Hierarchical Task Analysis (HTA)

Hierarchical task analysis (HTA)

- **Involves describing the activity under analysis in terms of a hierarchy of goals, sub-goals, operations and plans**
- **The technique is generic and can be applied to any domain**

Stanton (2004) highlights applications of HTA including: interface design and evaluation training, allocation of functions, job description, workload assessment, and procedure design.

Hierarchical Task Analysis (HTA)

If you wanted to boil some water in a kettle what steps would you follow?

Hierarchical Task Analysis (HTA)

Step 1: Define task(s) under analysis & purpose of analysis:
e.g. Boiling of kettle to predict design induced error

Step 2: Data collection process:
e.g. Steps involved; technology used; interaction man-machine, team members; decision making; time constraints

Step 3: Determine overall goal of the task:
e.g. Boil water in kettle

Step 4: Determine task sub-goals:
how many steps?

Step 5: Sub-goal decomposition:
divide sub-goals into further steps until operations identified

Step 6: Analysis of plans:
dictate how goals are achieved

Hierarchical Task Analysis (HTA)

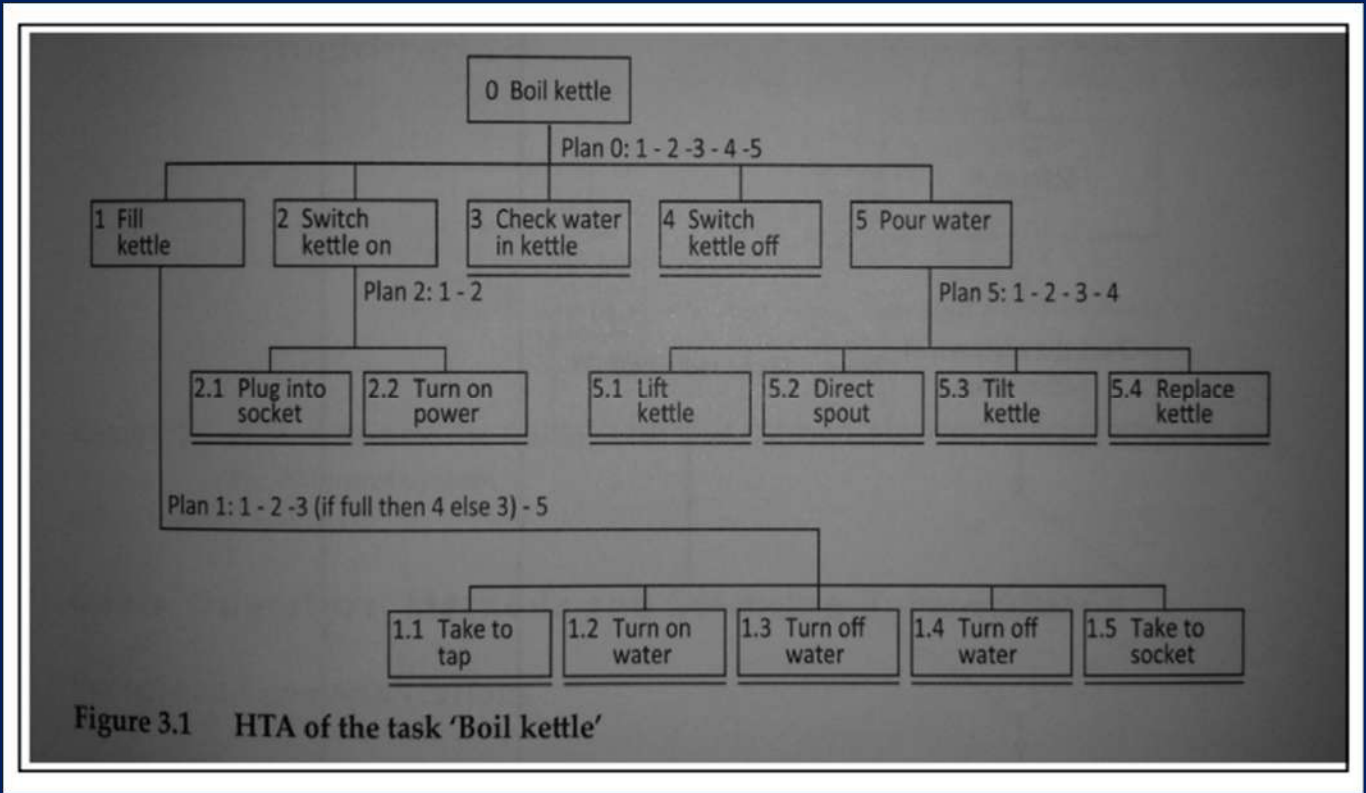
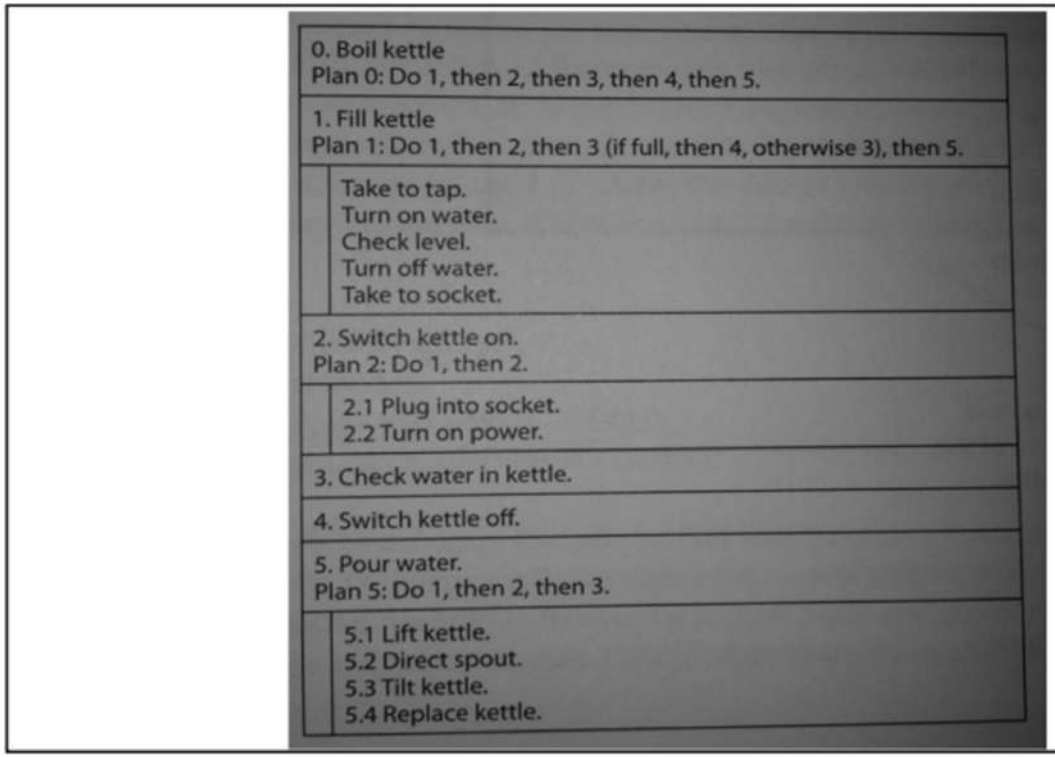


Figure 3.1 HTA of the task 'Boil kettle'

Hierarchical Task Analysis (HTA)



Hierarchical Task Analysis (HTA)

Advantages

- Requires minimal training.
- Useful output, provides comprehensive description of task under analysis.
- Flexible technique, can be applied to any task in any domain.
- Can be quick to use.
- Used extensively in a wide range of contexts.
- Tasks can be analysed to any required level of detail, depending on purpose.

Hierarchical Task Analysis (HTA)

Disadvantages

- HTA provides descriptive, rather than analytical, information.
- It contains little that can be used directly to provide design Solutions.
- It does not cater for the cognitive components *(mental process – thinking, remembering etc)* of the task under analysis
- HTA can be laborious and time-consuming with complex tasks
- Not always reliable – different assessors presenting different HTAs

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