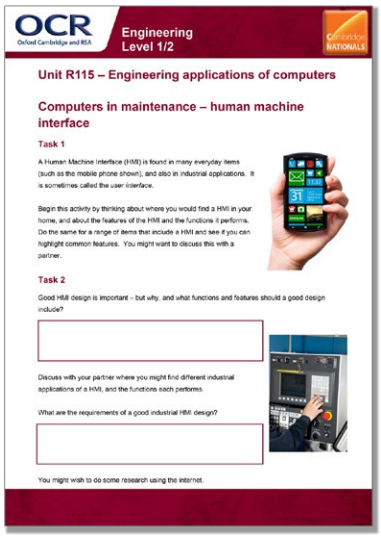
Unit R115 – Engineering applications of computers

Computers in maintenance – human machine interface

Instructions and answers for teachers

*These instructions should accompany the OCR resource **'Computers in maintenance – human machine interface'** activity which supports OCR Cambridge Nationals in Engineering.*


Engineering
Level 1/2

Unit R115 – Engineering applications of computers

Computers in maintenance – human machine interface

Task 1

A Human Machine Interface (HMI) is found in many everyday items (such as the mobile phone shown), and also in industrial applications. It is sometimes called the *user interface*.

Begin this activity by thinking about where you would find a HMI in your home, and about the features of the HMI and the functions it performs. Do the same for a range of items that include a HMI and see if you can highlight common features. You might want to discuss this with a partner.

Task 2

Good HMI design is important – but why, and what functions and features should a good design include?

Discuss with your partner where you might find different industrial applications of a HMI, and the functions each performs.

What are the requirements of a good industrial HMI design?

You might wish to do some research using the internet.

The Activity:

This resource comprises of 2 tasks.

This activity offers an opportunity for English skills development.

Associated materials:

'Computers in maintenance – human machine interface' activity sheet

The tasks are best completed individually by learners.

Suggested timings:

Tasks 1 and 2: 1 hour

Task 1

For Task 1 learners are required to consider where else in the home a human machine interface (HMI) might be found, and the features and functions it performs.

Examples might include mobile telephone (smart phone), kitchen appliances (eg microwave oven, cooker), hi-fi and video equipment, personal hi-fi devices (eg iPod).

Learners should discover common features of HMI (user interfaces) which include:

- Inputs to the system (eg buttons, switches, touch screen)
- Outputs giving an indication of system operation (eg indicators, LCD screen, audible outputs)

They may also begin to identify the requirements of a good HMI such as:

- Ease of use – intuitive to use
- Self explanatory
- Efficient operation
- Ergonomic and psychological considerations
- Enjoyable to use (user friendly)

Task 2

For Task 2 learners are required to find out about the functions an industrial HMI might perform, and the features it might include for good HMI design.

Industrial applications of a HMI might include:

- Computer operating systems and software (eg computer aided design drawing and simulation software)
- Hand tool operation (eg portable tools)
- Heavy machinery operation (eg programming and operating computer numerically controlled (CNC) machinery)
- Process control operations (eg process plant control and monitoring – conveyor belt, robot etc).

A HMI might also be used in maintenance operations in the detection and diagnosis of operating and fault conditions.

Features are similar for home-based equipment and will include inputs and outputs, and often networking to a process control system.

As for home-based equipment, good industrial HMI design requirements might include:

- Ease of use – intuitive to use – safe to use
- Self explanatory
- Efficient operation – minimal inputs for desired operations with minimum undesired outputs to the human
- Ergonomic and psychological considerations
- Enjoyable to use (user friendly)
- Design for safety-critical interactions (eg stop switches, condition indication)
- Interfacing requirements to control systems (eg industrial standard electrical networks)

For Task 2, learners might present one or two particular applications of a HMI in more detail.

The teacher might extend these activities by tasking learners to present their findings as a poster or as a PowerPoint presentation.