

## 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.*

**OCR** Engineering Level 1/2 **Cambridge NATIONALS**

**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.

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