KEEPING THE TIGER IN THE CAGE

Barry Davies is a Chartered Psychologist and an Associate Fellow of the British Psychological Society. He is a Principal Consultant within the human factors team of Environmental Resources Management Limited (ERM), a leading global provider of environmental, health, safety, risk, social consulting services and sustainability related services. He specialises in helping firms to understand the limitations of human performance in safety critical industries.

HUMANS ARE AMAZING (BUT HAVE LIMITATIONS)

Human's brains are amazing but they're also lazy, picky and pre-historic, and they like to play tricks. Armed with this knowledge it should be possible to design out the potential for human error in safety critical systems.

Yet some 70-90% of incidents arise from human error or organisational failure, rather than mechanical or technical reasons. We know more about human performance now than we ever done but fail to use this knowledge effectively.

Psychology and physiology can be used to help understand human errors and design them out of the process. Especially in industries where the limitations of human performance can be safety critical - oil and gas, petrochemicals, mining, mass transit and railways to name but a few.

If we recognise that early on when designing or creating new things, we can work with engineers to design error traps out of the system. And conversely we can design in mechanisms to control or prevent human failure. We need engineering solutions to behavioural problems, not behavioural solutions. We need to design out the failures, that means asking three big questions.

one:

IS THE ROLE OF THE HUMAN FEASIBLE?

Can we actually do the thing we're supposed to be doing? And have we factored in the right resource level?

A four man boat is not much use if it takes five men to carry it. If an oil platform that is supposed to be entirely automated takes more people to maintain than would be needed to run it manually, it has failed the feasibility test - the greatest risk in offshore operations is getting people to and from the asset. If the construction of a high-rise building has been based on it being built in countries where the average temperature is 16˚C, and then we ask workers to build it in temperatures that vary between -10˚C and 36˚C we should not be surprised when they have problems. Learning memory and reasoning deteriorate by 28% when the temperature drops below +10˚C.

two:

IS IT USABLE?

Are we giving people procedures, processes and equipment that they can actually use to do what they are being asked to do? Ergonomics matter – optimising the man-machine interface.

Equipment, procedures and processes need to be designed in a way that people can use them. For example, if you have machinery with buttons being used in a cold climate, have you left enough space between the buttons so that someone can press the right button when wearing thick gloves?

Faced with a choice of pressing a green button or a red one with no further instruction, we'll always press the green one if we want something to happen (proceed, action, initiate, etc.) We're conditioned to think red means 'stop' or 'cancel' or 'alarm'. When faced with a car park ticket machine with a red button and a green button you would expect the green button to provide the ticket and not the red one, as it doesn't conform to our stereotypes or expectations.

Any piece of machinery that needs a handwritten note explaining how to use it has failed the usability test.

three:

IS IT RELIABLE?

What can go wrong? Can we predict that and design it out of the system? We need to perform a human error review which looks at all the tasks and the threats and consequences that go with them.

As an example, picture a tiger in a cage in a zoo. The tiger is a hazard and as long as it is in the cage it should not pose a danger. If the tiger gets out of the cage, it may injure people or itself. We have to consider how the tiger can get out of the cage and design controls to prevent its escape – and how these controls can be defeated either deliberately (violation) or inadvertently (mistakes, slips and lapses). For example, we should think about having a self-closing door mechanism, however that can be defeated by the keeper using a door wedge. Why might a keeper use a door wedge? They may have been issued with a wheel barrow and the change management analysis missed how the keeper gets the barrow through the door and so on.

ENGINEERING SOLUTIONS

Often these kinds of solutions appear to be just common sense, but in that case why aren't they always implemented in the first place? Pointing out the obvious is all very well, but this needs to be backed-up with sound psychological evidence associated with the predictability of human error, cognitive biases and performance shaping factors (e.g. influences such as temperature, lighting noise, fatigue, etc.).

Speed limit signs indicating 20 mph limits don't usually result in average speed reduction – on their own. Speed zones where the signs are supported by engineering controls, such as sleeping policemen and lane narrowing, do work. It's the engineering behind the visual cue which makes the solution effective. You can tell people after an incident to do better next time but without appropriate barriers or engineering controls you're setting them up (or their colleagues) to fail next time around.

Thinking carefully about human behaviour alongside those design solutions can help you determine the right control and management strategies. They reduce risk, prevent claims and improve safety. They keep the tiger in the cage.