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The **Challenges** and **Opportunities** of **Robots** in a healthy working environment

This handout includes notes from the talk, as the slides on their own do not contain much text. Videos have been replaced with URLs so you can find them yourselves. In some cases, I've made suggestions of where to look for information, rather than repeat my interpretation of that information. There are some extra links at the end.

The media tend to talk about **threats**, rather than **challenges**. We will talk about some of the downsides, but it is important to see these as challenges we need to identify, risk assess and manage, not as threats which should stop us looking at robots in more detail

More interesting to see what opportunities there are to use robots to make workplaces safer, healthier and more productive environments

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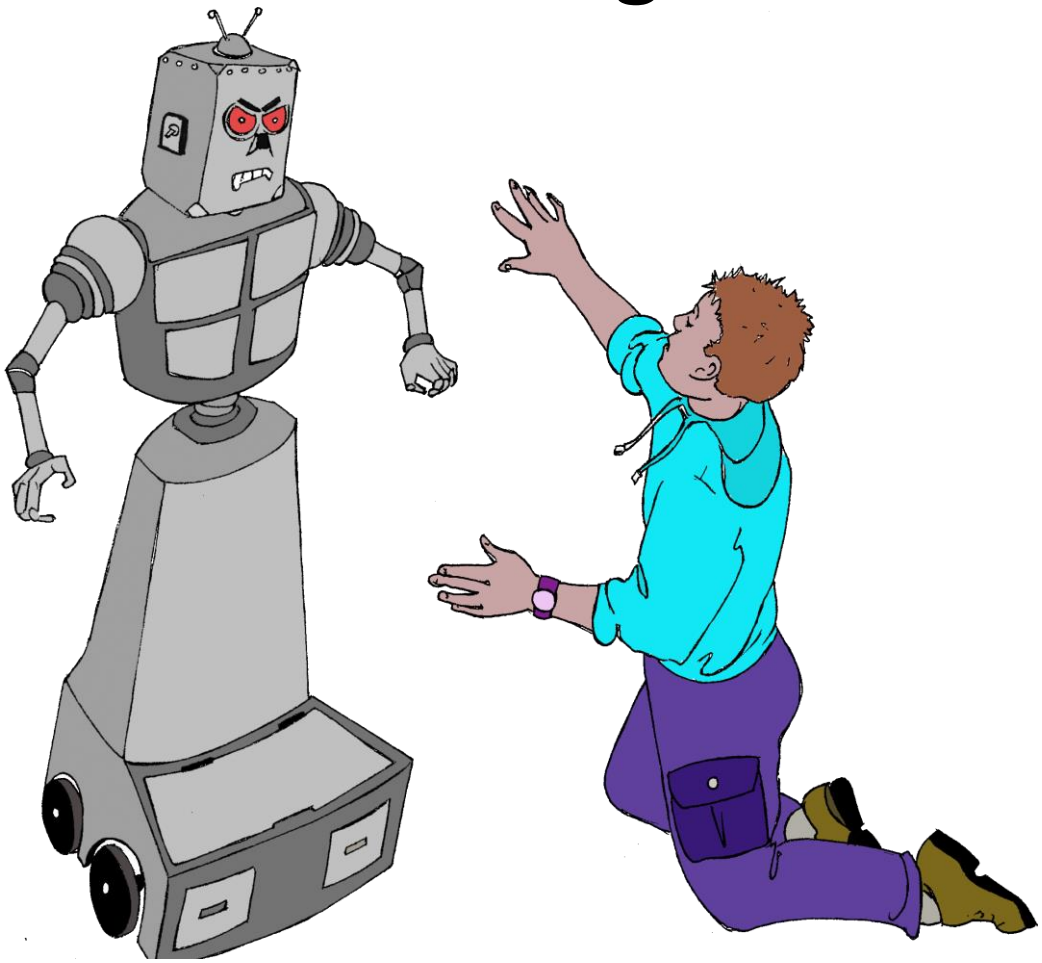
Challenges?



Opportunities?

Credit: Jeannie McMillan Banham

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Which is a robot?

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What is a robot?

‘automatically controlled, reprogrammable, multipurpose manipulator programmable in three or more axes’ (ISO)

’it senses, and it thinks, and it acts’

Gill Pratt, Toyota Research Institute

‘can be programmed, has sensors, and mobility, as a result of which it is able to carry out a task autonomously’ (TNO)

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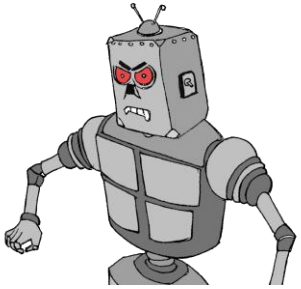
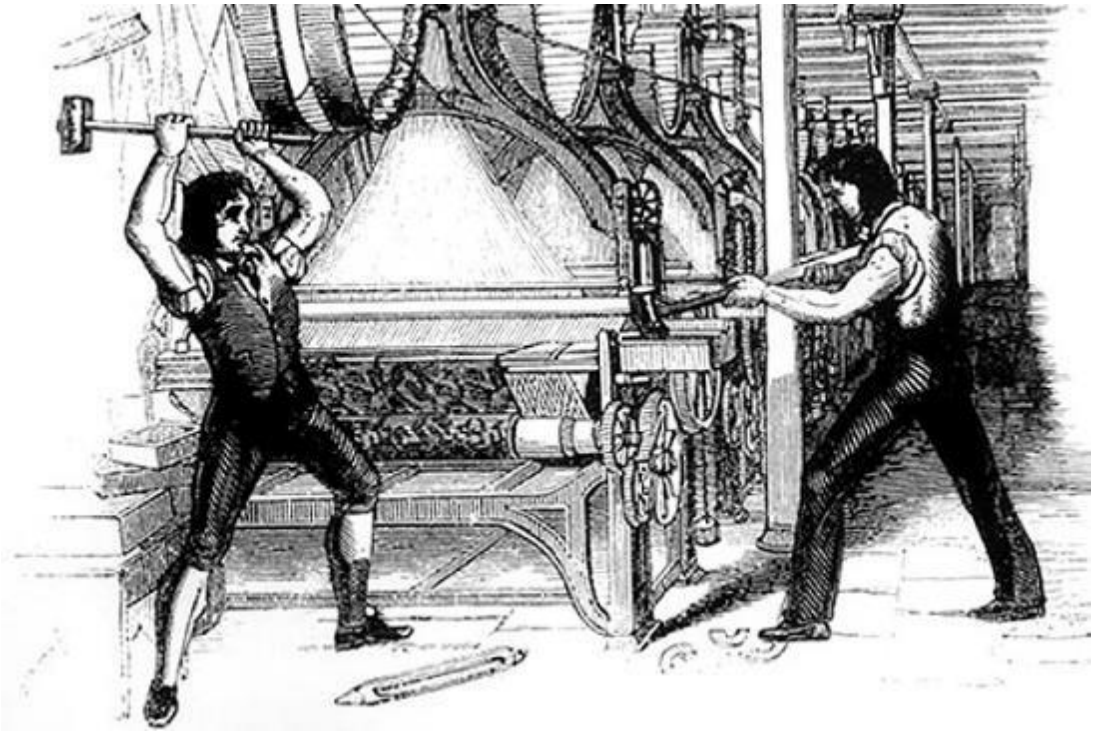
Job loss & psychosocial impacts





Credit: Jeannie McMillan Banham

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Job loss or worse jobs?

The first thing people fear from any new technology is job loss, with the result that those still with jobs are more likely to work alone, in isolation with all the attendant physical and psychosocial impacts that can have.

On the one hand, some previous technologies did lead to loss of jobs, or to worse jobs.

The Luddites had a point about the looms, and although factories led to a huge growth in the British economy, the factories were notorious for the injuries and fatalities to workers, from adults down to the children running under the mechanised looms.

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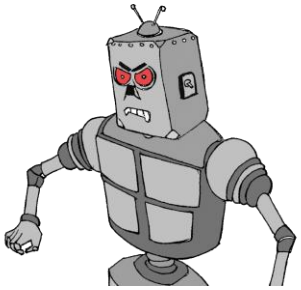
Job loss & psychosocial impacts



Credit: Jeannie McMillan Banham

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Job loss or worse jobs?

The production line made it cheaper to produce cars, but by forcing people into unnatural working postures and repetitive movements, led to MS problems that many people at this event have talked about over the last two days.

However, not all technology has resulted in the things people feared.

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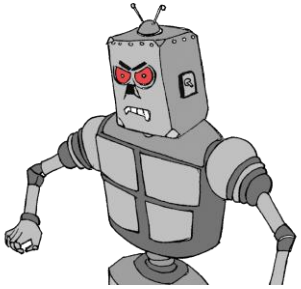
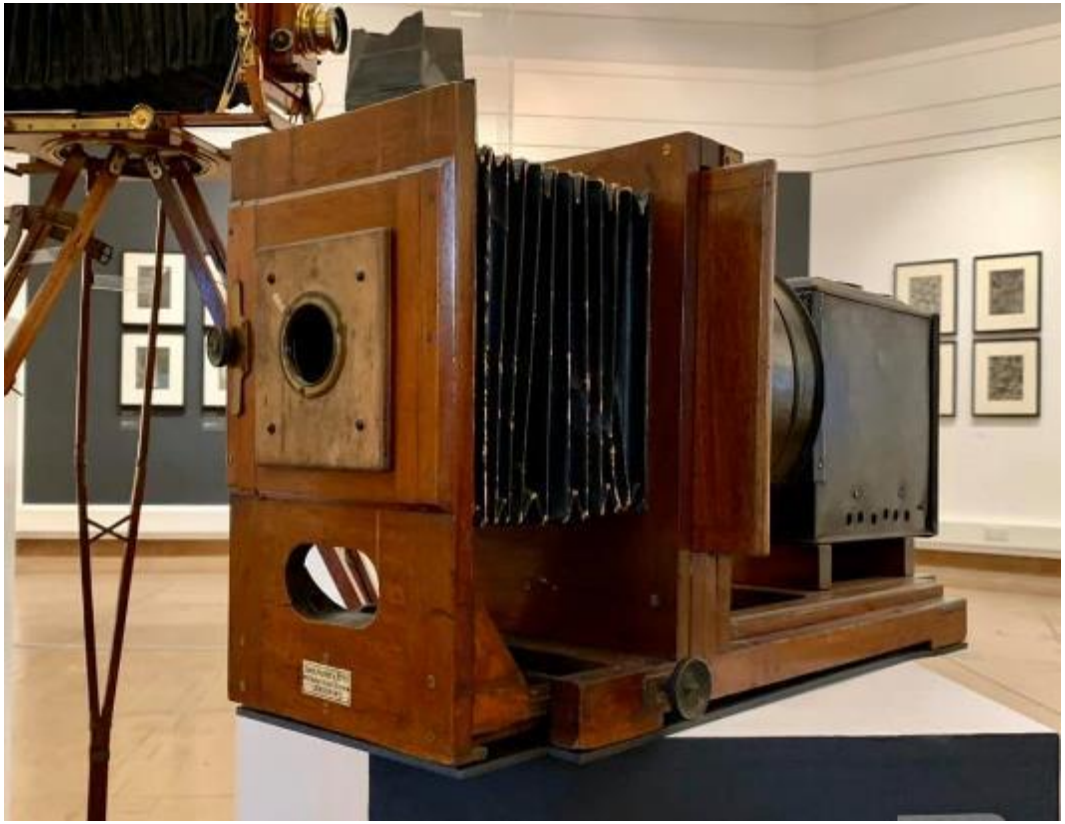
Job loss & psychosocial impacts





Cameras didn’t steal our souls, or artists’ jobs

Camera: along with the belief that cameras might steal your soul along with your image, there was the belief that artists would no longer have a role. Actually, it changed the nature of art. There was less need for artists who could create an exact image of something, and more scope to use art to show something about a place or person or object. Artists who could do no more than reproduce an image probably did lose their jobs, and models didn’t need to pose for as long for a photo as for a painting, reducing their MSK issues. But art has flourished, in all its forms.

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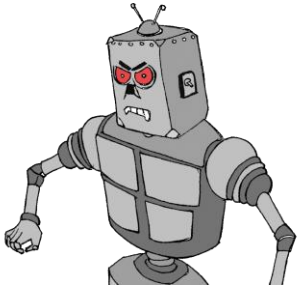
Job loss & psychosocial impacts



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Video didn’t kill the film star

Video tapes threaten to kill the radio star, the theatre star, the film star and the BBC itself

But videos actually led a resurgence in film-making. Video would subsequently save the US film industry, creating a massive global market for video cassette, and later DVD sales and rentals. Amazon Prime and Netflix have continue this trend, increasing the overall market for films and tv programmes for the seemingly unlimited appetite we have to sit and do nothing while staring at a screen

So will robots be like the looms and the production lines, taking jobs, and making the jobs left worse? Or will they be like the camera and the video tape – the start of more innovation, enrichment and growth? I certainly believe they have the potential to be more like the camera and the video tape, provided we make sure we have the right skills in place

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What’s so great about these jobs?

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What's so great about work?

Manual handling causes over 1/3 of all workplace injuries, including pain and damage to arms, legs, back and shoulders; 2nd largest cause for days off work in the UK, largest in Republic of Ireland, and a significant cause of pain, much of which can become life-long and activity-limiting beyond retirement.

Even the mundane **desk job**, so familiar to most of us, has its hazards. Stress; MSD; Sedentary lifestyles; Eyesight, head aches.
What is so great about jobs like this that we want to preserve them?

What is so great about these jobs that we want to preserve this work for humans, if robots could do it?

Work in **confined space** doesn't cause as many injuries as MH. When there are problems in confined space, the result is more likely to be fatalities, and often multiple fatalities, as one person goes to rescue another. People dies as a result of suffocation, collapsing structures, explosions. Even without tragedy, the work is exhausting because of low oxygen levels, uncomfortable because of constrained postures, and often dirty and dark.

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Ocado warehouse: Lost jobs?

Google “Ocado warehouse robots” or see

www.youtube.com/watch?v=4DKrcpa8Z_E

You can see the robots moving along, selecting groceries and placing them in the correct crate, all ready to be loaded onto vehicles for delivery to customers. The crates are still taken out of the system and delivered to customers by people, but it doesn’t take much imagination to see how the whole process could be automated once autonomous vehicles gain wide use.

If warehouses are like this, then jobs will be lost

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Amazon: robots and humans

In this Amazon warehouse I visited in Tilbury last year, the robots bring the goods to the packers, who stand in one place to stow items, and then to select and pack items.

Rather than destroying jobs, Amazon have created lots of jobs, opening new fulfilment centres where people and robots work alongside each other.

Using the robots reduces manual handling injuries, and keeps vehicle movements away from people. Makes the use of the ability of humans to distinguish between a shampoo bottle and a printer cartridge, and the speed, agility and strength of the robot.

However, it does has an impact on the way people work. In a traditional warehouse, workers would meet each other walking up and down the aisles to collect products, but now, they stand alone at their picking stations, isolated from each other by robots and conveyors. Are these the jobs we want to create?

Challenge is how to make these new jobs better, not isolated. We mustn't replace one set of punishing tasks with another set. We should learn from the problems created by production lines, where varied jobs were replaced with monotonous and repetitive jobs.

Amazon images removed for copyright reasons. See article at www.saferchoice.co.uk/resources

http://thesaferchoice.co.uk/resources/17-resources/25-robots-at-amazon-uk

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Reduce ‘bad’ jobs

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Reduce ‘bad’ jobs

Using a robot reduces exposure of people to *disease and pests*, *cuts and grazes*, as well as *repetitive movements.*

Using AI vision, the robot can quickly identify different waste streams – plastic, glass, tin, paper – pick it up, and deposit it in the correct hopper.

You can see the speed with which it senses and “thinks”, makes a decision and acts. Although traditional safety methods have been applied in this case – a physical barrier between people and the moving parts – its AI does mean there is an additional layer of safety. When there is a need for human intervention, the robot can sense the presence of a human hand, and will stop.

- Article at www.bulkhandlingsystems.com/viridor-invests-max-ai-robotic-sorting
- Full video at https://youtu.be/Q7tE_vNYzzU

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Reduce vibration & noise

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Robot moles

Confined space working could in the future be replaced with Robot ‘moles’. Read about these moles at

www.gov.uk/government/news/robots-to-fix-underground-pipes-and-help-cut-roadworks

They could reduce:

- vibration and noise

- confined space working

- traffic hazards to the workers, cyclists, pedestrians, drivers.

Flying and underwater versions of the robots are also being developed, to inspect and maintain oil and gas pressure vessels and offshore wind turbines. Work at height, another major cause of accidents, could be reduced by this technology.

Some jobs will go, and people will need to be reskilled to operate the robots. With plenty of pot holes to fix in the roads in the Chiltern Hills where I live, I think there will be plenty of work above ground for people if we leave the moles to go underground.

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More ‘good’ jobs

Photo taken 1960s, Suffolk

Agriculture

Agriculture has seen rapid changes during the 20th and 21st centuries, employing fewer people, in more sedentary jobs. Those sitting in large vehicles to spread *pesticides* or to harvest crops are exposed to *noise*, whole body *vibration* and *long hours of lone working*, as well as *static postures*.

Farm machinery has also got a lot larger – this one is a family photo from 1960s. Heavier machinery compacts the soil, making it less able to cope with flooding, less able to absorb water, to the cost of towns downstream.

I'm not repeating my notes on Tom, Dick and Harry here – please go and read about these great little robots at www.smallrobotcompany.com

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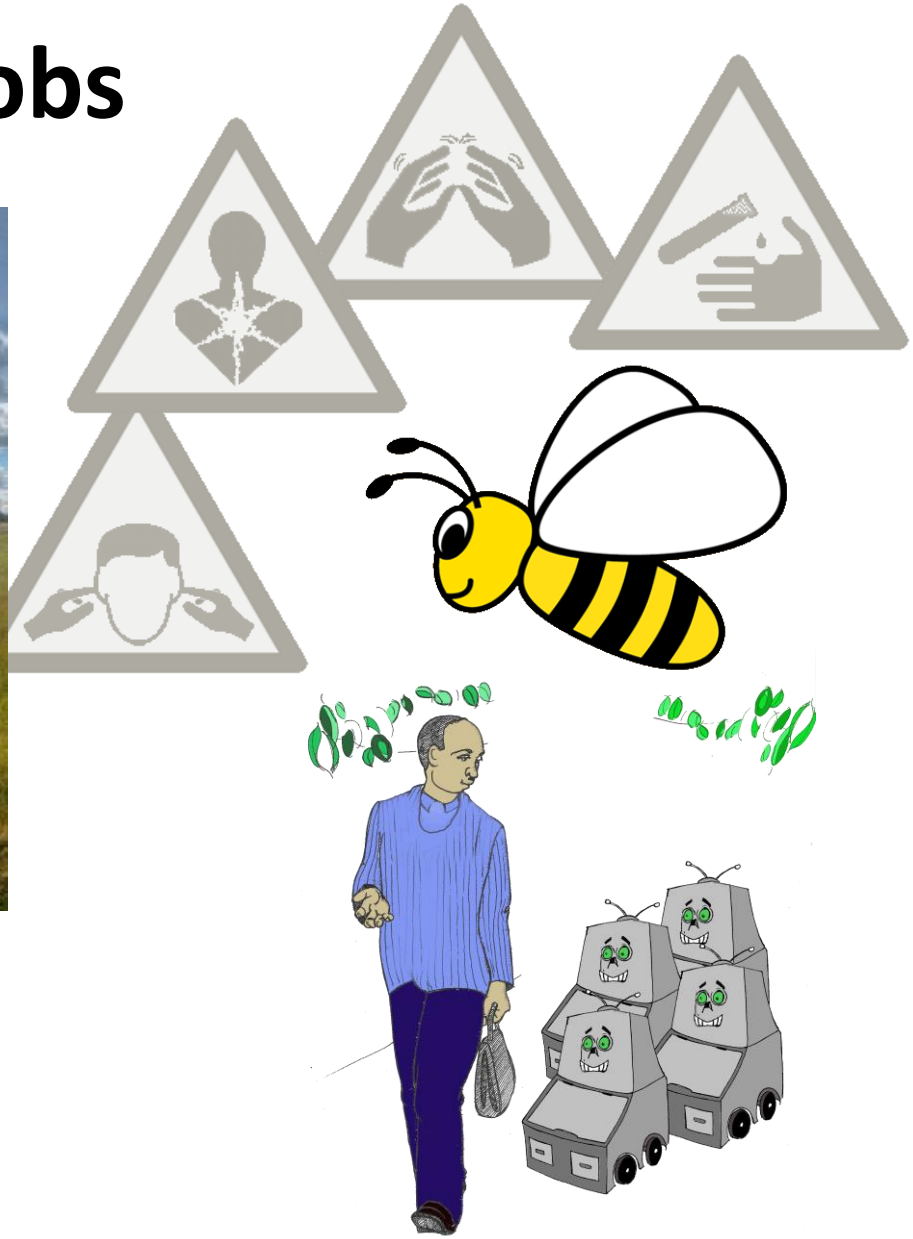
More ‘good’ jobs

Credit: The Small Robot Company, Wiltshire



Credit: Jeannie McMillan Banham © Safer Choice Ltd 2020

Fewer hazards, smaller robots, nicer work, better for bees!

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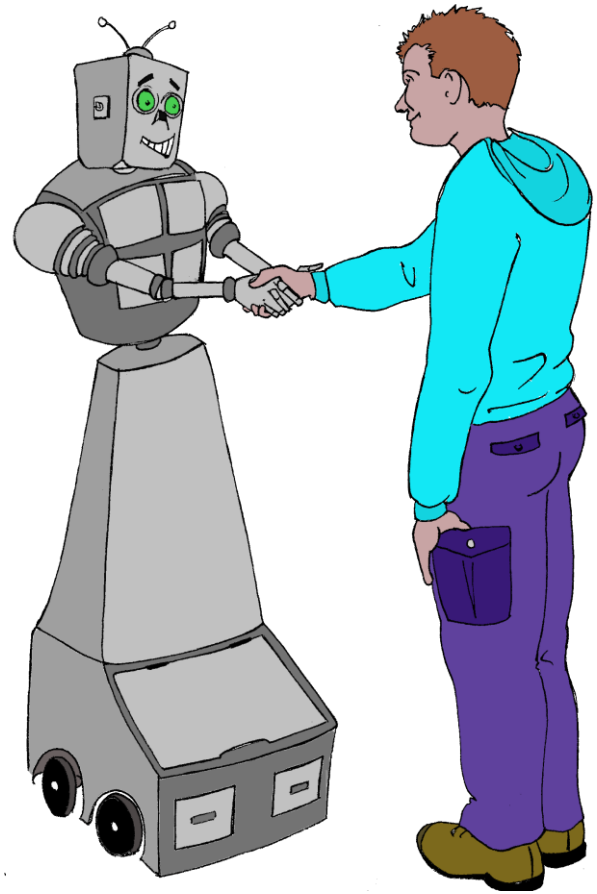
What is a good job?



Good jobs involve working out how robots and humans can work together – to keep the work interesting for people, but to reduce the hazards – the heavy or repetitive work, the vibration, noise, exposure to hazardous substances etc.

Conclusion: automation creates jobs, and it is our job to make sure that those new jobs are good ones, not ones that expose people to physical or psychological risk

Credit: Jeannie McMillan Banham

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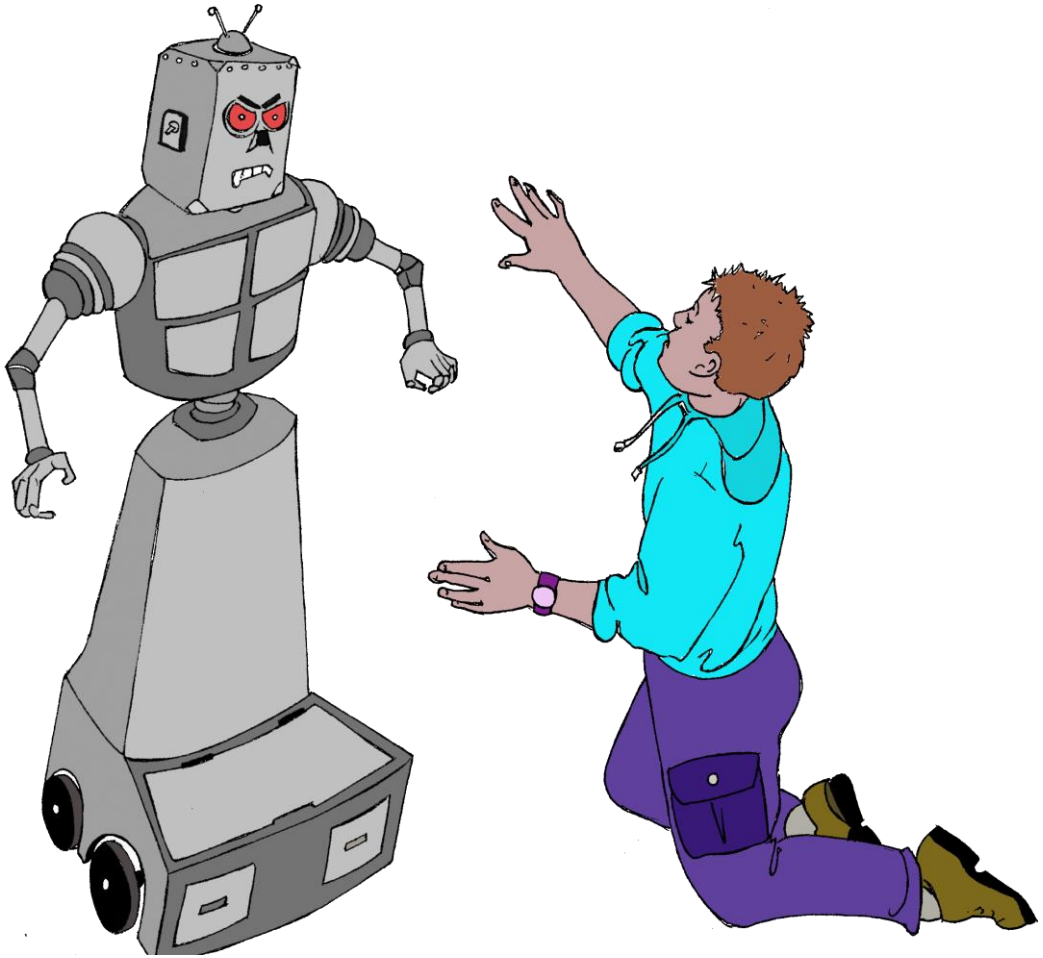
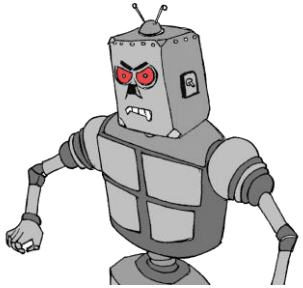
Injuries





Credit: Jeannie McMillan Banham

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Are robots dangerous?

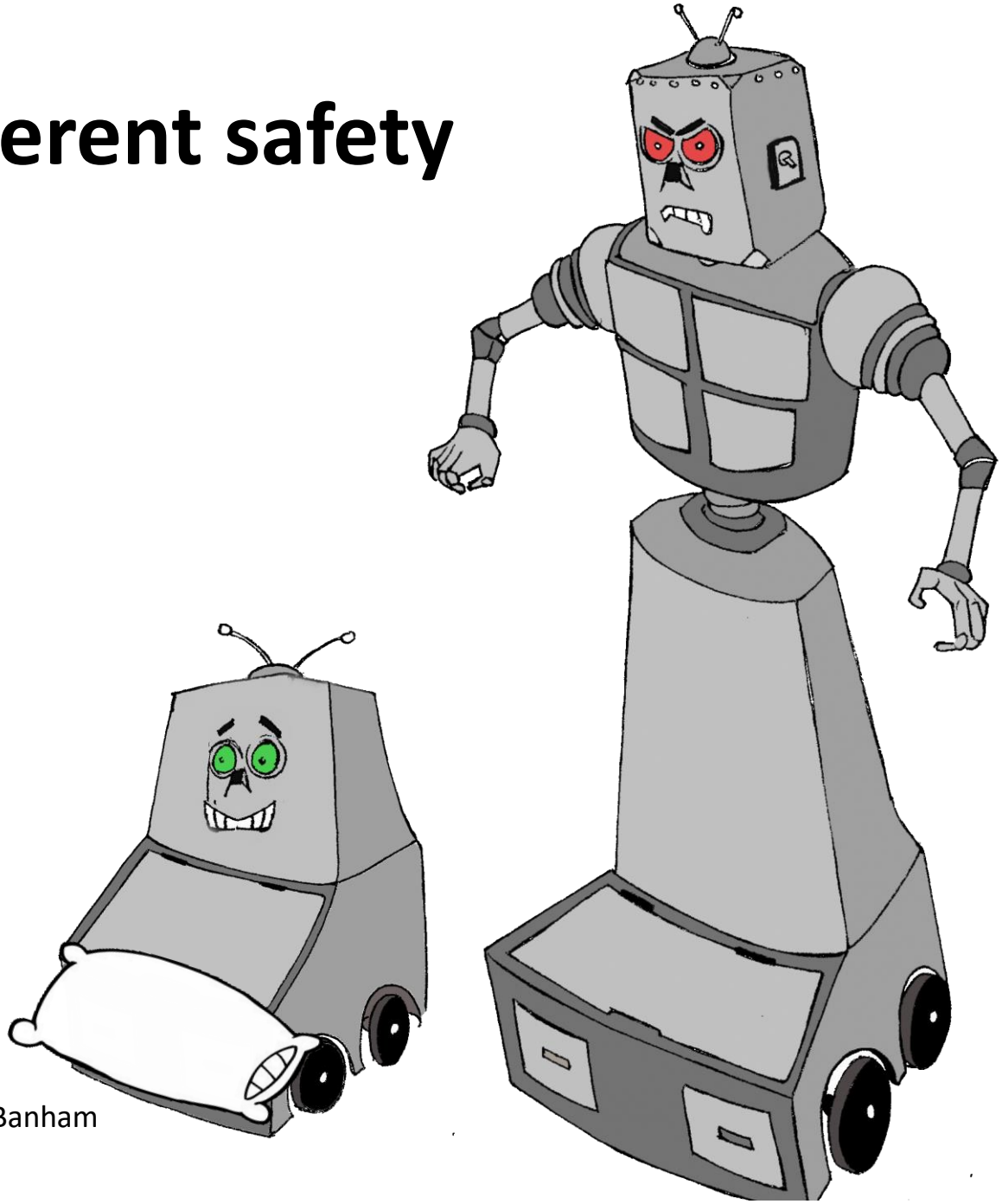
I'm not repeating my presentation notes here, but please compare these two news sources for yourself:

www.washingtonpost.com/news/morning-mix/wp/2015/07/02/robot-grabs-man-kills-him-in-german-car-factory/

www.themanufacturer.com/articles/media-sensationalises-vw-worker-killed-in-robot-accident/

Inherent safety

Compare these rules with the Amazon robot



Credit: Jeannie McMillan Banham

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How to avoid injuries

1. Make it smaller and lighter. This will be inherently safer, because if it does come into contact with a person, the damage will be less.

2. Get rid of sharp edges and pinch points, and make it softer

3. Make it slower. just as we know that driving slower reduces the impact of a vehicle on a pedestrian or cyclist, so if they move slower less impact on those working around.

However, moving more slowly all the time can be less productive, so for robots who share a space with people, but are not working directly with them all the time, the usual approach is to use sensors

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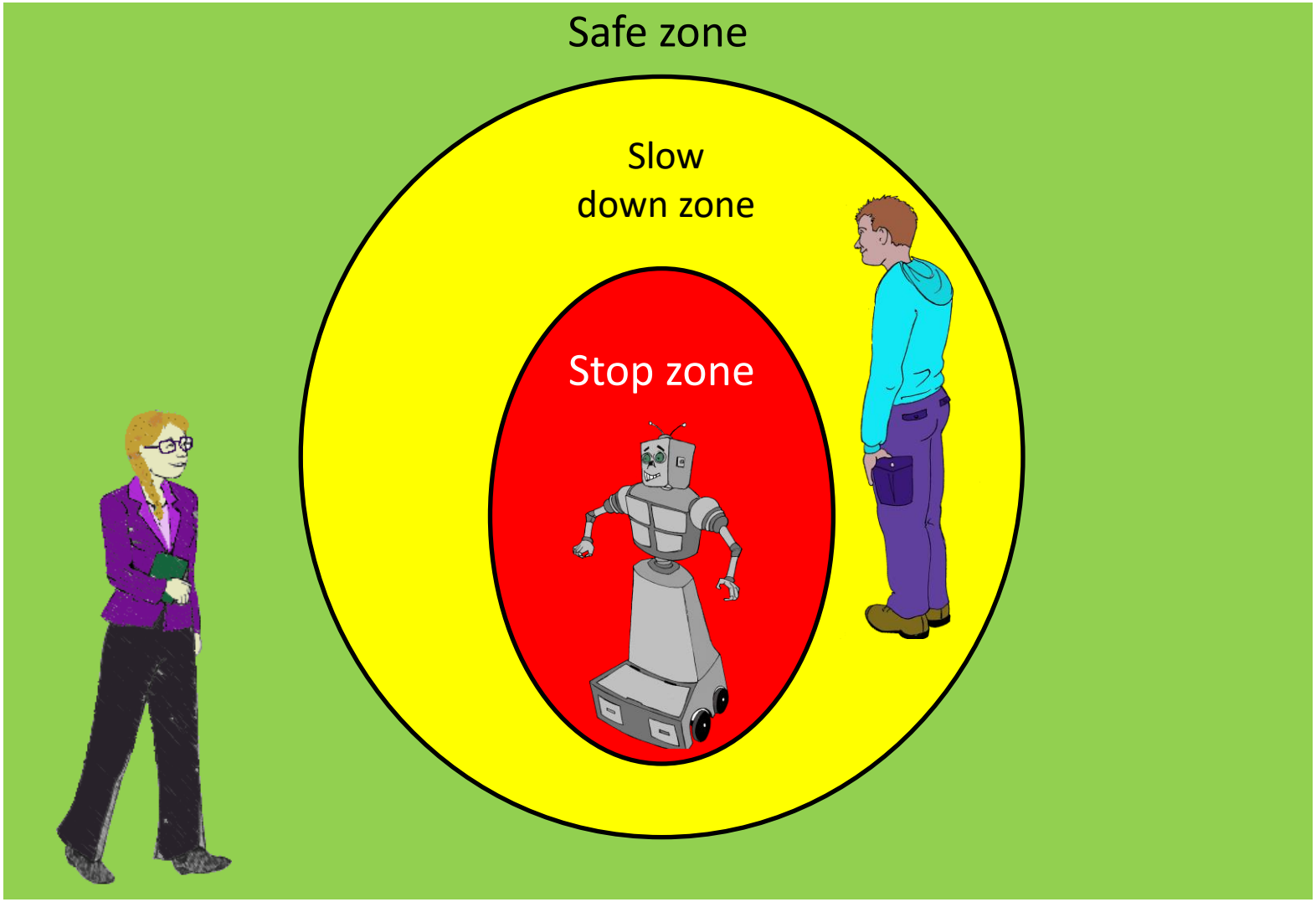
Injuries - avoidance



Avoiding injuries, maintaining efficiency

Slow it down and or stop it when it sees people

This is one area where new, better jobs come from. Technicians will need new skills to define these zones accurately

You need to take account of the full range of the robots arm, for example, and of any tools being used. If you change the tools, you need to change the zones.

Ask yourself:

What if the stop zone is too big? Too small?

What is the purpose of the slow down zone?

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Risk assessment

Hazard	Control	Risk
Robot arm…	Maintain separation…	
Robot wheels…	Speed controls…	
Robot tools…	Selection of tools….	

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Risk assessments

As with any other hazard, we need to carry out risk assessments – identify the hazards, establish the controls, estimate the residual risk and monitor success of the control measures.

For those of us for whom risk assessment is an everyday task already for traditional work tasks, we have to learn how to assess new systems, taking account of both the physical aspects of robots, and the possibility for incorrect decision making of AI. If you think the latter is difficult, you're right, but on the other hand AI can't be any less predictable that human decision making, and it doesn't take much to think about accidents that have been caused by, or made worse by, inadequate decision making

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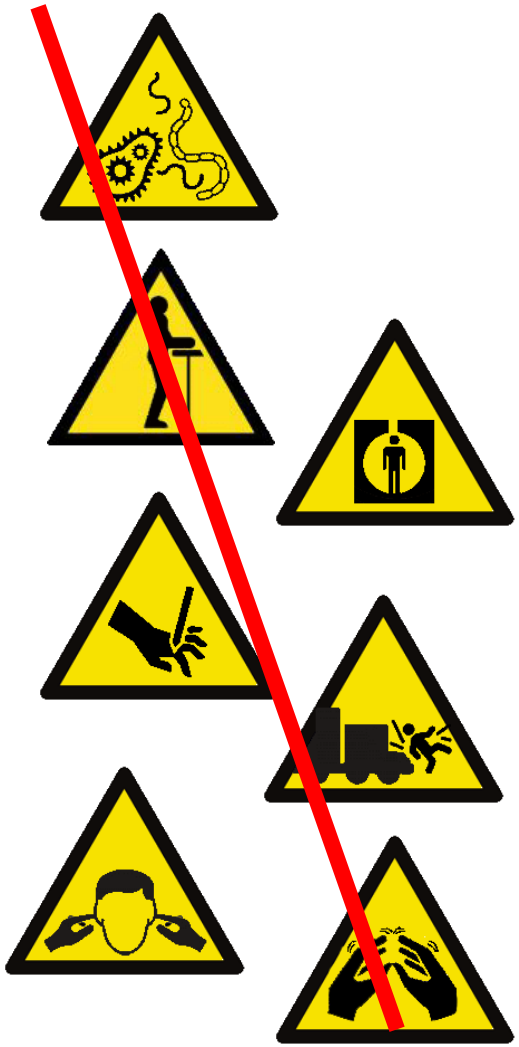
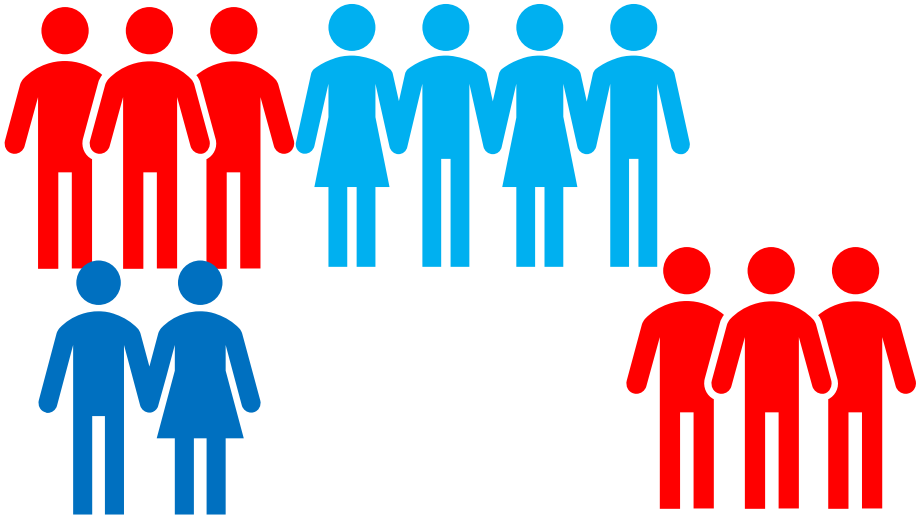
Opportunities v Challenges





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Job loss v Job creation

On the positive side then, robots present the opportunity to get rid of some ‘bad’ jobs. Those involving dangerous, dirty, exposure to disease, MSD, confined space, machinery and vehicles. Noise and vibration.

On the other hand, this will lead to some jobs disappearing.

But as old, bad jobs disappear, we need to make sure that new, interesting and healthier jobs appear.

An estimate from previous waves of technology is that for every 1 job that disappears, 2 – 3 new jobs are created.

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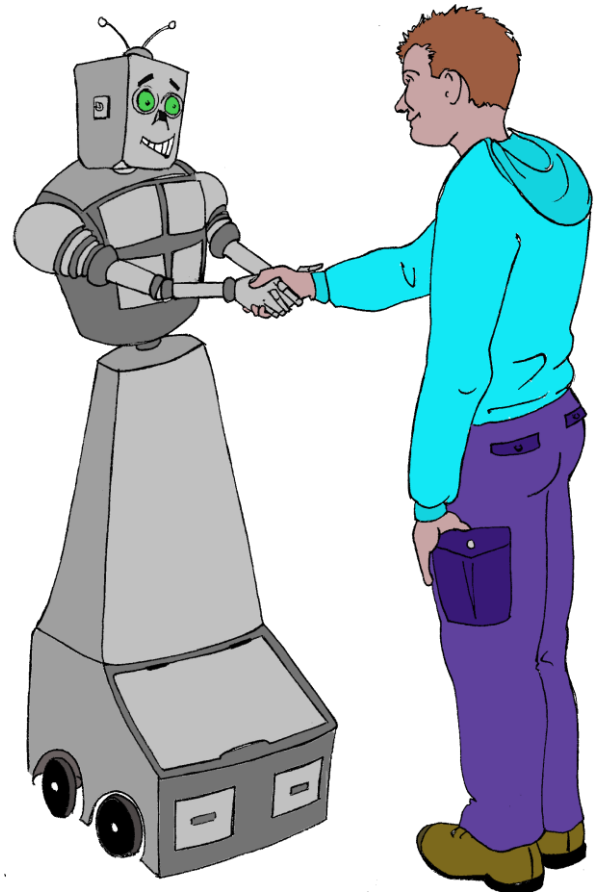
Opportunities

Healthcare

Space



Nuclear

Energy

Underwater

Credit: Jeannie McMillan Banham

Calll to action

Didn't have time to talk about other applications reducing WAH, remote environments such as wind turbines, nuclear decommissioning, undersea and even in space.

To make sure we get the opportunities, and manage the challenges will need investment from government, commercial and training organisations. Investment will be needed in:

Job design – human factors skills for 21st Century, to make sure new jobs avoid the psychosocial hazards, are not driven by the pace of the robot, and do not end up with people working in isolated cells.

Robot design – engineering and safety critical, to reduce likelihood and nature of injuries.

Retraining and reskilling – of those developing, installing, using, and in particular, those modifying robots from one task to the next

If we do all this, robots really can be part of overcoming the existing challenges of poor work, to create a healthier working environment in the future.

Educate yourself about robots

Exhibitions in your sector

'Open labs' eg MTC www.the-mtc.org

Articles

Saferchoice.co.uk 'Resources'

Websites:

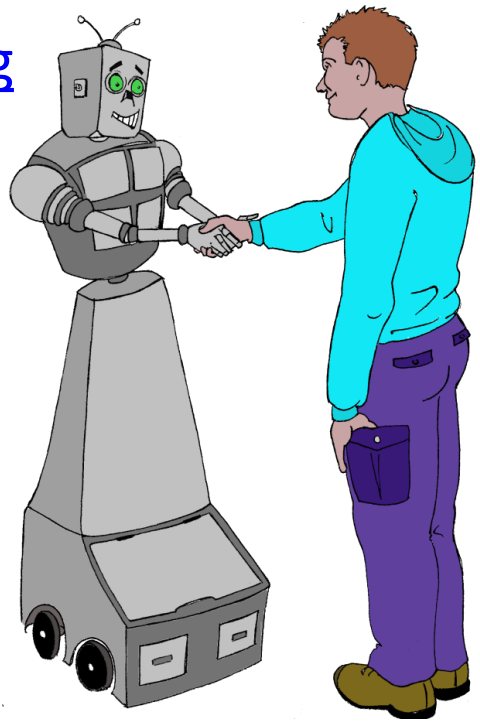
robots.ieee.org

robott-net.eu

innovateuk.blog.gov.uk

edo.cloud

YouTube – search 'robot



Credit: Jeannie McMillan Banham

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Social robots (for interest)

Milo www.robots4autism.com

Toyota's Human Support Robot

www.toyota-global.com/innovation/partner_robot