

Minimising risk technologies/inventions

Patrick:

Most Engineers are risk-averse to some extent. Minimising risk, however, is often a good way to maximise the chances of stagnation, boredom and uncompetitiveness. Humans tend to be very bad at assessing the **actual** probability of coming to grief under any given set of circumstances. We also get confused between the probability of an event and its seriousness.

Mark:

I am not sure I agree with you. Most Engineers would like the opportunity to push the boundaries, but are constrained by the risk-averse people who control the purse strings in their company. This is a common scenario which can stifle innovation and, if unchecked, be the ruin of a business (as well as apathy, of course). We need more engineers in the board room to fight their corner, but that's another story.

It is hard to assess whether something is safe, or not, particularly where humans are involved, because we are all so different. If you tell people not to do something, because it is not safe, you can bet your bottom dollar some will. Of course there is a much higher risk of accidents, when you change something, particularly, if people have been used to performing a task in a given way - so, in effect, you are fighting history. It's that transitional period where you need to de-program and re-educate, where the risks of accidents are greatest.

Patrick:

So are there any inventions which can help manage risk better; help us take 'calculated risks'? Maybe if we look at the main things people want to protect themselves against...

Illness: The link between behaviours such as smoking and longterm health damage is proven and yet still many people don't take it seriously. It's too hard to visualise and too impersonal. Now that Hollywood can inject the faces of actors into video, I'd suggest making use of that technology by designing a cigarette vending machine with a camera which captures a short movie of an individual's face and pastes it seamlessly into one of a patient on eg a cancer ward. This would be shown briefly before the product was dispensed.

Mark:

I have never smoked nor will I (although, I had considered it, only to increase my circle of friends. Joining the many smoker clubs meetings in door-ways, outside of business buildings), but I think the campaign to stop smokers smoking, has gone far enough. You would have to live on a different planet, or be in-denial (bad joke), to be in any doubt that the habit was bad for you. If I must give an opinion, your video vending technology might hit home harder, using a camera with aging and manipulating software to show two, side by side, face pictures of what the person, using the machine, will look like in 20 years time, one, if continuing to smoke and the other, if not. Vanity is just as powerful a deterrent as health and the pictures would not scare the horses, well not quite so much!

Patrick:

Misinvestment: Competitive, high-creativity industry is what allows us to limit the risk of going out of business. Open Innovation is one way to get so close to customers that the chance of product-launching a major 'lemon' is greatly reduced. I'd suggest creating a website for earliest adopters. In return for commenting on and contributing to design decisions via the site, they would get a discount on the final product...They would also have a photo, micro-CV and contact details embedded in a file on any such

devices, so that their contribution could gain them access to more potential employers/clients who become users of the product.

Mark:

Knowing your customer is very important, but it is difficult to extract and interpret 'open innovation' web site data. I would also be concerned about ownership aspects to the Intellectual property and of giving my competitors knowledge to my future plans - plus access, to submit ambiguous data - or am I being a little paranoid?

Patrick:

Well, paranoia is one way to limit risk.

Incidents/Accidents:

All engineering catastrophes seem to result from a combination of bad initial design, poor instrumentation (that concealed the problem) and inadequate /procedures. ¹

It's often very difficult to spot this kind of **combination**. We need meta instrumentation that independently monitors the other monitors. The Space Shuttle does (did?) this with computers to check on computers but it's harder to automatically check on inadequate training. My suggestion here is a modification of e-learning technology. People already get local, immediate access to training material eg in the Royal Navy via handhelds etc. I'd suggest using this technology to undertake spot checks. Asking safety-critical, location-specific questions, without warning, via a mobile device, would tighten up on errors and help monitor performance.

Mark:

This idea may sound very plausible, but so did the compartment modelling on the hull of the unsinkable 'Titanic'. Having to answer, or read, a mobile device could distract the engineer whilst he or she is working, possibly causing an accident, rather than prevent them.

Patrick:

Complexity is a real problem. The Challenger disaster, Bhopal, Chernobyl and the BP debacle might have been avoided by system-wide simplification. Pilots and surgeons are now turning to the humble checklist to ensure that even the most complex procedures are redesigned to be clearer and then adhered to.

Redundancy in design is a costly but often effective approach to limiting risk. The original designer of the 747 once said that he only ever flew in four-engine jets because they didn't build airliners with more engines. Imagine therefore airliners flying in formation in which each machine is capable of 'donating' some support to the others. The group allows some sharing of specialised resources so that one plane would carry extra fuel for the group, one would be capable of undertaking advanced diagnostics for the others and one would have an on-board doctor. Coordinated fleets would also limit daily airport noise problems to a particular time window.

Mark:

Again, I can see your reasoning and that planes are getting steadily bigger and bigger but, future transportation is much more likely, in my opinion, to be made via large high-speed magnetically levitated trains, in neutrally buoyant vacuum tunnels, geared for long range and capable of speeds of 4,000 miles per hour. This makes sense on so many fronts - commercially, safety and for the environment, but needs the political will and deep pockets, to make happen.

Patrick:

4,000 MPH sounds like an accident waiting to happen...speaking of accidents, insurance in future needs to be more personalised. I'd propose that every time the

ignition key is about to be turned in a car, for example, the driver could press a touchscreen to advise an on-board computer about their identity and their planned route. This would be combined with the statistics about the time of day and known road conditions to generate an optimised quote for the individual trip.

Mark:

We live in an ever increasing fast moving world, where time management and convenience are paramount just to keep up, so I am not so keen on becoming a 'data-in-putter' for an insurance company. I find paying my car insurance yearly a chore enough, let alone each journey.

Patrick:

Well on the theme of form-filling, a secondary school teacher I know tells me that he has to fill in a risk assessment form covering all possible accidents before children in his class can cross the pavement and board a bus. Partly as a reaction to this approach, there is now a small industry which centres on telling us we have been protecting our kids too much and that we should let them play with fire and chainsaws (There's even a book entitled something like "30 Dangerous things to let your child do"). There is evidence too that teen brains are wired to take risks.

If you never take any chances, you will be less good at assessing danger, the argument goes. So mountaineering, cave diving, parachuting and motorsport may actually be processes for helping us respond better to risk or even to reduce our need for adrenaline-generating, risky behaviour. I once helped build a firefighting simulator for the Royal Navy whose job it was to help train people to make decisions when genuinely scared but in the absence of any real danger. Other such reactive, physical environments could be developed for different activities...how about running courses for air travellers in how to get out of a crashed aircraft...or even react during a bomb scare?

Cars are by far the biggest source of risk to young people, whether as passengers or pedestrians. My suggestion here is a novel overtaking technology. Rather than have cars pull out into the oncoming traffic, to see if overtaking was appropriate, the small vehicles of the future could be equipped with a bridge from the front to the back. This would allow a faster vehicle to drive over the top of another (without any need for mirror use or signalling).

Mark:

Not too keen on your 'running courses for air travellers in how to get out of a crashed aircraft...or even react during a bomb scare'- very alarmist - and, on your crazy overtaking technology, I think you have been driven-over, not by a car, but by activity in your mesolimbic dopamine system - in other words it's 'a bridge too far'. Your symptoms may be useful though, for understanding the psyche of the 'boy racers' who cause hundreds of deaths on our roads each year, often by misjudging an overtaking manoeuvre. My guess, this is caused by a deadly combination of impatience, arrogance and lack of experience, plus little or no fear, by the driver. Other contributing factors may be the driving conditions and other driver's actions.

How can we minimise this risk, rather than add to it - much like your 'drive over car-bridge' idea would? On-going education may be the key, and not just for the 'boy racer's'. We already use technology, in electronic signage, to tell car drivers to slow down and to warn them of oncoming dangers or problems. Why not expand upon this system, in periods of non-use, by publishing small snippets of the Green Cross Code. For example, show a symbol on one and then, a mile or two down the road, the meaning (answer) on another. People can have very short memories, and need to be reminded. On overtaking accident black spots, messages, such as 'slow down if being

overtaken' and/or 'leave a gap between you and the car in front for over-takers' or even 'watch out there are 'boy racers' about'.

Patrick:

Or maybe one saying '**Stop reading distracting roadsigns**' ?

<http://www.sciencedaily.com/releases/2010/06/100603132458.htm>

<http://dotearth.blogs.nytimes.com/2010/06/01/can-we-do-better-at-managing-rare-big-risks/?src=twit&twit=nytimesscience>

http://www.steelguru.com/article/details/OTO%3D/RMS_Titanic_-_Did_a_metallurgical_failure_caused_a_night_to_remember.html

<http://www.impactlab.com/2008/06/27/trans-atlantic-supersonic-maglev-vacuum-tube-train/>

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