

This one will bring the house down

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First I would like to thank Jean Venables and the sponsors of this event for giving me the opportunity to come here and speak to you on a subject very close to my heart for reasons that will become apparent later this evening. The title of this talk; “this one will bring the house down,” reflects my understanding of the potential impact of systemic failure, within a company, and more broadly within industries, including the construction industry. In particular, tonight I wish to look at the role leadership plays in systemic failure by examining the behavioural drivers and what creates what I term; ‘safe leadership.’ Before going further, you may wish to note that I view safety incidents and commercial failures in the same way, both avoidable by using very similar techniques and behaviours.

Managers in larger companies may have believed, certainly prior to the current economic problems, that they fully understood the possible failure modes that could fatally impact their business. However my experience of speaking to managers around the world indicates that few understand the silent and corrosive nature of systemic failure. Like a degenerative illness, systemic failure is not a single event but usually a steady decline towards ultimate catastrophic failure. Most worrying is that systemic failure is very difficult to detect and those who may wish to point out the possibility of failure, particularly in the early stages are often dismissed as being obstructive or lacking understanding. It is not a giant leap for me to make reference to the current banking failures in the same context, so more on that later.

Before going further I should make a confession to you, whilst my business card indicates I am a Fellow of the Institution of Civil Engineers, which is true, you in fact have before you by qualification, training and experience, an electrical and electronics Engineer. My experience for some 30 years of my career has been in the railway industry, and probably the darkest fact about my background is that I trained as a signal engineer. Those who understand railway engineering will know that anyone associated with signal engineering is automatically a member of the ‘black arts’ society. But why am I telling you this? Well for two very important reasons, the first being that signal engineers are in fact particularly well trained to understand modes of failure in a system, albeit focussed principally on mechanical or electrical systems. Signal engineers consider

two modes of failure; 'wrong side failures' and 'right side failures.' Wrong side failures are failures that occur leaving a potentially dangerous situation; a simple illustration would be a signal showing a clear 'proceed' aspect to a driver, when it should be showing a danger, stop, aspect. A right side failure is one that when it occurs, whilst a wrong condition, is not dangerous. An example would be the failure of a switch on a control panel. Whilst the failure may prevent the signaller from being able to move a set of points say, the signalling interlocking system would take care of the actual safety on the ground. Understanding these two modes of failure allowed signal engineers to design appropriate mechanisms to identify those failures which could have very serious and immediate consequences, needing urgent attention, and those failures that could indeed take a lower priority in the management process. Further, as electronics were introduced into signalling systems in the 1980's the understanding of holistic system integrity then became a vital part of the signal engineer's knowledge. I find it interesting that many of my civil engineering colleagues tell me that this 'holistic system' approach is not as naturally understood in their discipline.

The second reason for confessing to you about my background in railways was my experience following the terrible Clapham Junction railway disaster of December 1988. For those who do not readily recall this event, some 35 people died and hundreds injured, 69 of them seriously, when a crowded commuter train passed a signal momentarily showing a proceed aspect. This signal should have been showing a danger, stop aspect. The driver of this train was unable to see the stationary train until only a few seconds from the collision owing to the curvature of the line. Whilst he had made an emergency brake application, his train was probably travelling at a speed of around 45mph at the point of collision. To make matters worse, the wreckage strewn across the track was struck by an empty stock train coming in the opposite direction. The prima facie cause of the accident was a wiring error in one of the old signal boxes, an error made during preparation work for new signalling. The subsequent enquiry however, far from focussing on the wiring error, unearthed a catalogue of management failures that had been going on for years. What emerged was massive systemic failure.

I was appointed in early 1989 to take charge of the Southern design and construction organisation which included the staff who had directly been involved in the lead up to the accident and the accident itself. What I found was an organisation in deep shock, having lost all confidence in how to go forward, and desperate for leadership.

Before speaking more about the events at Clapham let me tell you a little about early electronic signalling systems and provide you with some theory behind holistic system design. This thinking translates very well to understanding systemic failure. These electronic interlockings superseded the type of interlocking involved in the events at Clapham which were based on mechanical relays.

When we first started to examine the application of software to safety systems, the railways developed a standard RIA 23 which introduced the concept of the 'safety integrity level' (SIL). This publication of this specification predated a European specification IEC 61508. (European specification IEC 61508 in fact predated RIA23 but the rather ponderous process of achieving consensus across Europe delayed its publication). The SIL levels (1 to 4) defined the 'dangerous failure per hour' which allowed software systems to be designed to a level appropriate to the application. For instance a train monitoring system which provides information on where trains are located need not be a high SIL level as the integrity of safety of the overall system is not usually compromised by its failure.

To understand this further I would like to show you the 'Windows of opportunity model of causation' developed by Dr James Reason (Manchester University). As with all good models there have been a number of variations on the central theme. In this case the windows represent the layers of protection, and an open window represents an error in the system. The size of the window represents the adequacy of the protection layer. The probability that all windows will be open and aligned at any one time, providing a failure path (shown by the arrow on the diagram) represents the probability of a combination of errors causing a path of failure. The higher the SIL level the smaller the windows which reduces the possibility of alignment.

You can take this SIL thinking into organisational design. The checks and balances within an organisation represent the windows. Windows may become enlarged increasing the possibility of alignment as a result of incompetent or even deliberate acts, and reduced in size again as a result of management vigilance or more formal audit. When behaviours become so delinquent the size of the window so large, the window is to all intents and purposes not there, in other words that barrier of protection against failure is removed.

The windows representing the checks and balances in a system can include not only human interventions, but technological barriers as in the case of the signalling software, and this of course is where the 'rub' is. Signal engineers realised a long time ago that in a system, if the human elements could be replaced by technology, the system would invariably be safer. The system may

well be less 'efficient' as the human is capable of making complex judgements which do not necessarily follow a logical process - called risk taking, but systems which have the protection of even simple technology will invariably be safer than those driven by human intervention only. The recent introduction of Train Protection Warning System (TPWS) as a simple electronic system to prevent signals being passed at danger, has significantly improved the statistics of this dangerous event occurring since the widespread introduction on the UK railways in recent years. No longer do we simply rely on the driver of the train correctly observing signals to prevent a collision at a converging junction. The railway has become a safer place by the application of relatively simple technology. Of course in a management system it is not possible or indeed desirable to completely eliminate the human element.

So enough of technology, I would now like to consider further what we can now see to be the weak link in any system; the human being.

Let me list a few well known and very significant systemic failures;

- The Clapham Junction railway disaster
- The Herald of Free Enterprise sinking
- Kings Cross underground fire
- Chernobyl nuclear plant
- Enron collapse
- The current banking crisis

There are of course many more. What is interesting is that all these failures have a number of common features, failures in leadership, communication, assurance of quality, competence of staff, and supervision. Failures in leadership I believe are particularly misunderstood, usually a failure to provide what I have already referred to as 'safe leadership.'

The whole matter of the 'leadership' window should be understood in the context of both the effect of 'authority' on human behaviour, and the impact of the 'style' of leadership. Both of these factors will impact on the size of the window in our model.

So, first a few words about the effect of authority. Much work has been carried out to examine the psychology behind why humans will sometimes behave in irrational ways. Dr Stanley Milgram a twentieth century social psychologist whilst at Yale University attempted to address the issue of

'obedience to authority.' He had previously been involved in researching why under the Nazi regime during the second war, seemingly ordinary people would carry out terrible atrocities against fellow human beings. In his paper he describes an experiment he conducted which led participants to violate norms of good behaviour in a particularly dramatic fashion. His aim was to examine the conflict between obedience to authority and personal conscience. What he found was profoundly disturbing, and it is interesting to note that present day commentators have questioned the morality of conducting such an experiment.

The participants believed they were assisting in an experiment which would examine the role of punishment in learning. The participants one by one took their place in a room with an Experimenter who ordered them to deliver ever-increasing electric shocks to a victim if the victim answered questions incorrectly. The victim was hidden from the view of the participant and was not in fact receiving any electrical shocks but was part of Stanley Milgram's team. The electrical equipment used by the participant incorporated switches which indicated a range of voltages labelled from 'low voltage' to 'lethal voltage.' The victim was asked a series of questions by the participant and when the question was answered incorrectly the participant was asked to administer an electric shock, each time increasing the voltage. In some cases the participant on hearing shouting from the victim asking to be let out of the room, questioned whether the experiment should continue, yet only a very small number of subjects actually walked out of the laboratory refusing to continue with the experiment and forego their fee. Those participants who questioned the continuance of the experiment were assured by the Experimenter that full responsibility was being taken by the University and that they should continue. This authority seemed to satisfy most, in fact Milgram's results show that 60% of the participants were quite prepared to administer what they must have considered were lethal voltages to the victim of 450 volts, despite the shouting and pounding on the wall by the victim demanding to be let out. Most disturbing is that no participant stopped before reaching 300 volts, much higher than household mains voltage. In the case of one participant, on hearing so many wrong answers from the victim, commented; "he's so dumb he deserves to get shocked."

This and other experiments conducted by Milgram demonstrated a number of issues;

- Obedience to authority
- Conformance to group behaviour (peer pressure)
- How employees become 'agents' of those in authority
- Few people have the resources needed to resist authority

Now I would like to turn to the 'impact' of leadership style. If you have a daughter or son and have attended a social function with them where you have had opportunity to stand back and observe their behaviour, you may have been surprised and not always pleasantly at what you have seen. I have a teenage son, and I have done this. I have watched him speaking enthusiastically to anyone who will listen, waving his arms around just like his father, and speaking on any subject you wish to mention. Have you ever noticed how their gestures and behaviour are remarkably similar to your own? Worse still, if you have been able to overhear their conversation, you may have noticed that they use the same phrases and words as you do. I have made this observation on one or two occasions over a number of years and I do not always like what I hear. This can come as a terrible shock when you realise that it is your behaviour they are subconsciously copying, just as subordinates will do at work in a bid to both conform and to please their superiors. I would contend that in the case of your son or daughter this is not just about nature, but nurture.

Such events remind me of the influence and impact the leadership style has in an organisation. I would content that many supervisors, managers, including senior managers in a company have had little training to understand how to provide what I would call 'safe leadership,' and certainly often do not understand the potential impact they have as a leader on those working in their organisation. In recent years I have seen leadership training emphasising the aspect of self-awareness and the impact of personal behaviour on others, but I have not yet found such management training which connects behaviour to the possibility of systemic failure.

Many of you will have recently watched on television the group of senior bank executives appearing in front of the Parliamentary Committee to apologise for the crisis within the banking sector. I was particularly taken by one of those directors who declared that; 'he did not feel personally culpable for the collapse of his bank.' Such an admission strongly indicates to me that this director completely failed to understand the impact of his leadership, or lack of leadership for safe behaviour. I use the word 'safe' in a wide context here, not just relating to events that result in injury or loss of life.

Let us now take a look at some of that 'unsafe leadership' behaviour. Well first I would be as so bold to content that a very significant number of companies and public sector organisations suffer from the following characteristics;

- Top management who do not welcome questioning
- Boardroom bullying

- Senior management who do not understand the impact of their behaviour
- Senior management who do not understand the product process for which they are responsible (which may include a belief that the responsibility for that process can be in some way ‘contracted out’)

Put another way, the ‘management window’ in Dr Reason’s model is considerably increased in size by such behaviours, in effect lowering the organisational SIL rating to maybe an inappropriate and dangerous level. But the worse is to come. The influence this behaviour has on the vital defence mechanisms that exist in the organisation below. Fundamentally the behaviour of the senior management will be copied by subordinates.

Strong leaders are often characterised by a clear purpose (vision), sometimes flamboyant behaviour which can be seen as attractive in some cases, and very strong drive and determination.

The less attractive aspects of strong leadership can include;

- Arrogance
- Ruthless determination
- Misguided self-belief

Some of this may be cultural, and from my travels around the world I would note that in some societies, notably further ‘east,’ questioning of top management is simply culturally unacceptable.

What is important is that subordinates subject to ‘persuasive’ leadership will often follow and reinforce the behaviours they believe the leader is seeking to promote. Further, processes are often built up around those organisations which reinforce those behaviours. For instance, it has been reported that the banking industry rewarded risk-taking based on short term cash flow gains. Probably more dangerous is that those subordinates who attempt to copy the behaviour of the leader may often misunderstand the leadership messages and in fact behave in an even more reckless way than the leader had intended. It is quite clear that this sort of behaviour was taking place in the banks with top management apparently unaware of risks being taken in their name if the senior executive I mentioned earlier is to be believed. This is of course where that banker who declared that ‘he did not feel personally culpable for the collapse of his bank’ was failing to understand the influence he had as a senior manager. For sure, he may not have directly indulged in reckless risk taking, but quite clearly his leadership style and the authority vested in him had led the organisation to behave in a way that encouraged what we can now see as reckless risk taking.

He missed the fact that as a leader one is responsible not only for your direct actions but also for the influence you have on others.

Board room bullying has got to be one of the most significant risks to an organisation as it can negate the natural process of risk management that can occur through collective thinking. Sir Fred Goodwin, the former RBS chief is alleged to have had a senior executive in tears during one of his daily executive meetings. If this is true the current state of the Royal Bank of Scotland does not surprise me, this is a fine example of boardroom bullying. I am not suggesting there are executives in tears in companies around the world, bullying takes on far more subtle forms than outright aggression. Where bullying is taking place it is unlikely that risks facing the business will be adequately identified, carefully considered, and mitigated. Once again the 'leadership' window in Dr Reason's model increases in size through a lack of cohesive and effective Board influence.

Earlier I noted the risk of senior executives who do not understand or engage in the industry process they are managing. Two key examples come to mind, that of the BP Texas oil refinery in 2005 where a terrible explosion caused the deaths of 15 people with 170 injured, and that of the Railtrack collapse in 2001. I do not seek to directly link the terrible rail accidents which preceded the collapse of Railtrack with the boardroom style within the company, as I believe the issues surrounding those accidents to be a little more complex and beyond the control of any Board, particularly one that appeared not to have understood the risks inherent in its process. The inquiry into the Texas oil refinery disaster heard BP state that there been 'deeply disturbing internal mistakes.' It is said that at the most senior level, the CEO failed to take steps to understand the risks associated with the plant he was in charge of, and it was later discovered that those members of the Board who 'did' understand the risks, did not communicate them thoroughly to the CEO apparently due in part to personality issues. Disharmony in the Boardroom was to have devastating consequences on this occasion. During the inquiry BP admitted that; 'hazard reviews had not recognized the possibility that multiple failures by staff could have such devastating results.' This brings into focus the risk management processes within a company, which may effectively recognize individual failures; failure to obtain insurance, failure of a market, etc, but do not identify the components of systemic failure. What is most shocking about this case is the fact that the HSE report into the earlier disaster at Grangemouth in Scotland concluded that BP 'did not detect and intervene early enough on deteriorating performance.' Those who have read the Clapham Junction Inquiry report will also know that British Rail had similar 'warning incidents' prior to the major disaster.

In the case of Railtrack, we see a Board which it is said viewed their business as ‘a process of sweating assets for the benefit of shareholders’ rather than managing an exceptionally complex industry riddled with inherent dangers and risks. Indeed, in accordance with the Rail Regulator’s approach at that time, it was believed that the industry could be managed through a series of contracts and that the client Railtrack need not be particularly ‘informed.’ The Government in pursuing such a strategy indicated they had little knowledge of ‘nature of the beast.’ The result was a mass of over-complex interfaces, another red light in the systemic failure model. The ensuing rejection by Railtrack of engineering thinking which had dominated the railways for years, whilst necessary in part to achieve a more customer focussed railway, went way beyond what was required or indeed sensible. The ‘contracting out’ approach to risk management with few or no effective checks and balances in the form of supervision at Board level was probably certain to fail from day one in such a complex industry.

In many cases, a failure to understand the risks inherent in business activity results in a leadership that does not know when to ‘call time’ on bad behaviours. In the same way it is clear to me in the case of the banks that everyone was blindly copying everyone else and management failed to stop the merry-go-round. As the former head of Citigroup put it; “as long as the music kept playing, we all got up and danced.” Anyone who has travelled to the UAE and visited Dubai recently can see for themselves the results of apparent irrational management decision making in the dozens of stalled developments that never a realistic business case, and sadly never will have.

So how would I define ‘safe leadership?’ Those who have followed the American Quality guru Edwards Deming will know how he frequently spoke about ‘the job of top management.’ He said that job was to personally promote and drive quality on a daily basis. His approach being that if quality was pursued by top management, commercial success would follow. This is a brave approach and even though I believe Deming has a great deal to offer management, I am not totally convinced the sole pursuance of quality will bring success under all circumstances. However there is a strong message here, that of top and senior management actively participating in the achievement of quality. It follows that for senior managers to participate in the achievement of quality requires a thorough knowledge of the process for which they are responsible supported by appropriate ‘leading’ data (as opposed to ‘lagging’ data usually found in management reporting). All this identifies with the failings found in the BP Texas refinery disaster. So to conclude, safe leadership can only come from a thorough understanding of the particular business risks, an understanding of the achievement of quality around the business processes, adequate ‘leading

indicator' data for management, a careful and well considered Boardroom management style, and a willingness to 'call-time'.

Ensuring quality is maintained throughout the business requires effective supervision. Supervision should run from top to bottom in a company. It is not just about managing staff on the construction site. Supervision is the one of the most vital elements in the prevention of systemic failure, and in my view the importance of effective supervision is not widely appreciated or understood.

Looking at the Clapham Junction accident, one of the key failings was the complete absence of supervision of the installer who made the fatal error in his work. The supervisor's behaviour was conditioned by a number of problems and issues that existed at that time: First he had not been formally trained to be a supervisor and indeed in evidence at the Inquiry stated that he did not know what being a supervisor entailed. Secondly, he made incorrect assumptions about competence and trusted the installer. The installer was known in the depot as reliable and had 'apparently' done an excellent job for many years (not knowing that the installer's practices were in fact wholly faulty, and always had been). Thirdly, the Southern Region of British Rail was suffering from a problem of a shortage of staff in some ways due to the low wages being paid across the industry at that time. This shortage often led to the supervisors undertaking senior technician duties rather than supervising. In the case of the supervisor responsible at Clapham, he was leading work on a set of points out on site. Points are very complex items of equipment and I have no doubt that both the natural instinct to engage in activities one is familiar, combined with the issue of available competence to install this equipment, played a role in distracting the supervisor from his proper duties. It is a sobering thought that had the installers work been overseen by a trained and competent supervisor at some stage, there is absolutely no doubt in my mind that the Clapham Junction disaster would not have happened.

At company board level there are a number of recognised supervisory processes; supervisory boards required on the continent, and non-executive directors more common in the UK. How effective these mechanisms can be in the absence of a 'willing group' of executive directors is questionable. He who pays the piper usually calls the tune, and anyone who has served on a company board will understand the potential limitations of the non executive director's role in influencing risk taking. Supervisory Boards clearly have a possible wider ability to impact on risk management although as a recent legal case against a major German company has shown, entire supervisory Boards can be rendered harmless with the right strategy!

Private companies are of course to an extent free to operate without such checks and balances. Rather amusingly one newspaper columnist noted recently that; companies which bear the personal name of the Chairman or CEO, as with Madoff, and more recently Stanford, seem to be particularly susceptible to risk taking! Allegedly Stamford employed a minor accounting firm located above a hair salon in North London to sign off his accounts each year, and clearly Madoff did actually prove that you can fool quite a lot of the people for quite a lot of the time. Both clearly lacked effective supervision.

Returning to the Clapham Junction disaster, management had to an extent 'lost the plot.' They were burdened down working on continuous reorganisation and operating cost saving plans and had little time to ensure the quality processes they had specified were in fact enacted. Being in the main career 'railwaymen' and Professional Engineers, while they understood what was needed, they simply failed to ensure that when an order was given, it was carried out. The culture of actually being serious about quality and safety, as opposed to 'talking seriously' about quality and safety had not permeated much of the middle management ranks who sometimes exhibited a lack of engagement, and were in many cases guilty of latent action (failing to do what they knew needed doing). The investigation report by Anthony Hidden QC makes dismal reading in this respect.

So, the matter of achieving really effective supervision from boardroom level down to the activity on the ground is a potentially complex issue requiring careful structuring and consideration. We can conclude that failures in supervision have led to pretty catastrophic results, there is therefore little substitute for ensuring a high level of training and competence in the supervisory workforce at all levels.

So in drawing the threads of this talk together, I would like to proffer one or two recommendations for management. It is clear to me that senior managers should be continually questioning the effectiveness of their leadership window; just how effective is that window in preventing failure, and what SIL rating have you created in your organisation through your supervisory arrangements and cultural behaviour?

On leadership

- Managers should take time to understand the impact of their leadership style and development of 'safe leadership' behaviour

- Managers should be trained to understand thoroughly both systemic failure and the responsibilities which come through leadership (authority and impact of style)
- Senior executives should take great care to understand the process and risks associated with the business they are managing and indeed should personally be at the forefront of the pursuance of quality as well as financial success
- Chairmen and CEO's should recognise the need for harmony in the Board room as an essential component of 'safe leadership.' This harmony includes harmony between members of the board, and an atmosphere which allows freedom to voice dissenting opinions
- Boards should consider as part of the risk management process, systemic failure and the potential for it to occur in the organisation
- Senior management must make time to get out on site (including around the office) and ensure that what they think is happening is the reality on the ground. This not only allows management to assure themselves about the reality of their plans, but of course provides visible management commitment, as Mike Evans, the Head of Health and Safety at Heathrow Terminal 5 pointed out; 'leaders will get the level of safety they demonstrate they want.'

On supervision

- Managers should look very closely at their supervisory arrangements at each level and question the effectiveness of those arrangements
- Where risk is 'contracted out' to third parties, considerable attention should be paid to the arrangements of supervision of that risk
- Boards should invest in training for supervision at all levels, including building an understanding of the vital role of supervision into senior management training

In closing I thought it might be helpful to some if I describe the approach to risk management we have adopted in Mott MacDonald where one of my responsibilities on the Group Board is to lead the safety programme.

We realised that health and safety management can come across to many as quite a dry subject, so eighteen months ago we sought a 'platform of engagement' for our managers and staff across the business, something that would appeal to 'thinking professional.' The approach we have adopted is aimed to achieve engagement in the following way; first we see our role as managers as preventing loss (and of course creating wealth). Preventing loss is a positive concept and crosses all the boundaries of safety, finance, and commercial. Our belief is that the behaviours that will

prevent health and safety losses will also prevent commercial and financial losses. So at the top of our agenda is a thorough understanding of systemic failure by all our senior managers, and to do this we produced a training DVD which was based on my own experiences following the Clapham disaster. We have built on this with 'Remember Charlie,' a DVD I am sure many of you will be familiar with; the story of Charlie Morecraft and his personal struggle to physical recovery after sustaining terrible injuries in an accident at work. He calls it a 'motivational safety' approach, and I am sure that those of you who have seen this DVD are certainly motivated to change bad habits that may have existed. We are in the process of showing this to all 14,000 staff as it reinforces very strongly the message of personal responsibility for safety, a useful message in our current society where finding someone else to blame is often the norm. Finally, we have recently produced a further DVD called 'Circles of protection' in which we engaged Ray Mears the international survival expert, and this DVD is focussed on developing safe behaviours to manage risk. This DVD is again targeted at all staff and the structure of the programme picks up on each of the systemic failure themes; leadership, communication, supervision, assurance of quality, and staff competence.

So, I will leave you with a few questions for you take back to your workplace; just how effective are your own leadership windows, do 'you' practice safe leadership, do you have the necessary leading data to allow you to do so, and how are you supervising the risk in your business, starting at Board level?

And finally, do your managers understand that systemic failure is one mode of failure that can indeed 'bring the house down?'

Thank you.

Richard Williams