

How to gradually turn past failure into future success

HOW TO GRADUALLY TURN PAST FAILURE INTO FUTURE SUCCESS

Thesis submitted in partial fulfillment of the requirements
for the MSc in Human Factors and System Safety

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Date of submission: 2007

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RESEARCH QUESTION

Does the progression of stranded whale removal techniques show how conservationists can turn lessons from past failure into future success? The thesis may end up demonstrating that the gradual conversion of failure into success represents a powerful example of the creation of resilience. Resilience Engineering is a paradigm within safety research that looks at how complex systems show capability to recover the balance after a mishap, or keep the balance in the presence of continuous stress. For an accident model to handle system adaptation over time, it must consider the processes involved in accidents and not simply events and conditions: Processes control a sequence of events and describe system and human behavior over time rather than considering events and human actions individually. Rasmussen argues that accident causation must be viewed as a complex process involving the entire socio-technical system including legislators, government agencies, industry associations and insurance companies, company management, technical and engineering personnel, operations, etc. (Hollnagel, E.2003) In contrast to traditional safety thinking, which with structural means tries to prevent accidents, Resilience Engineering focuses on the ability to actively anticipate changes and threats. The thesis aims to shed light on how different organizations within the whale removal system convert lessons from past failures into a capability to better recognize and adapt to risks. The findings and lessons can then be exported to other systems. In other words, this will be a dissertation on the way stranded whale-removal agencies learn from error to be able to recognize and control error.

INTRODUCTION

Stranded whale-removal management is a complex task, which requires the contribution of many people, with different skills and responsibilities, who do their best to preserve lives and properties. Although success in dealing with stranded whale-removal is always desired, assuming a successful outcome as the result of only skills and competence produces a partial view of the situation, in the same way as presuming failure as the result of incompetence or error. The thesis will introduce the resilience engineering approach that presents a different perspective to stranded whale-removal management. This thesis on the stranded whale-removal business as a case study in resilience learning would be particularly enlightening for a number of industries.

One goal of resilience engineering is to develop explicit guidance to help people and teams in relevant managerial or other organizational positions extract meaningful lessons from past events and failures. Traditional responses to failure (doing nothing, reprimanding the person involved, writing more procedures, adding a bit more technology) are often founded in the false belief that systems are basically safe and need to be protected from erratic people. Resilience

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engineering, in contrast, means converting lessons about past failures into countermeasures that help the system in question become better able to recognize, adapt to, and absorb disruptions that would otherwise fall outside the base it was designed to handle. This requires in part a better understanding of sacrificing decisions (sacrificing safety goals against production or efficiency, or v.v.) and how these can get misconstrued in the wake of failure (Erik Hollnagel).

While case studies point to the importance of training and building personal resilience within the workplace, the thesis will take an important step further and focused on creating the right leadership attributes and culture within the organisation to support resilience. This 'organisational' resilience can be defined as the capacity of an interdependent and supportive working community to respond to change as an opportunity. The target groups are public organizations such as municipalities, regional and national authorities. The thesis will examine how safety related learning can be strengthened by measuring the safety culture and by studying processes of organizational learning. The thesis would then suggest how the authorities plan for their responses to the stress (beached whales) and advance key questions to be addressed in preparing those plans thereby managing knowledge within the organisation so as to maximise learning and effective decision-making.

The analysis of the progress the Whale-removal business has made could help with, for example:

- The value of (small) mistakes
- Gradual adaptation of strategies as expression of learning
- Evidence of a budding industry that is "learning how to learn": formalizing and organizing for learning through professional linkages and conferences
- continual exploration of alternatives in search of continuous improvement (and the importance of "thinking out of the box", seeking to become a hero at the risk of being deemed a klutz depending on how the outcome will be judged (Dekker, 2007)

METHOD

To learn the language of an occupational group i.e. to learn its ways, we need to spend time observing how they meet the routine contingencies of the work place (Bosk 2003). A qualitative case study describes the problem of the dead whales if left to decompose on the beach or while floating in the sea. The various methods of whale carcass removal are then described with their various pros and cons and what factors led to the decision to make use of that method. Data collection was through the multiple sources of information such as interviews, observations, documents, media reports and audio-visual materials. Then follows a discussion

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on the data analysis, highlighting the “out of the box” thinking/decision making that has developed the resilience of the whale removal business. Through out the research I made myself a convenient “sounding board” to allow the informants the freedom to relate stories of practice that they agreed or disagreed with.

DISCUSSION

What is a Stranding? The National Marine Fisheries Services (NMFS) defines a stranded animal as any dead marine mammal on shore, any live dolphin or whale cast ashore or unable to return to its natural habitat, or any live seal, which cannot leave shore due to injury or poor health. A mass stranding is an event where two or more dolphins or whales (other than a mother/calf pair) strand at the same time in close proximity to one another. Mass strandings sometimes involve over 100 individual animals! Every stranded animal, whether live or dead, offers a unique opportunity to learn more about the biology and ecology of that species (www.capecodstranding.net).

What constitutes an error? Was the failure the result of error? If so, was the error foreseeable and preventable? Did the error make a difference to the outcome? What constitutes an error is an extreme example of “local knowledge.” If attempts to reduce error are to be successful, they must grapple with how workers define error, understand its causes and think it maybe remedied. Policy makers also need to appreciate the constraints that workers labour under in order to formulate recommendations that workers will comply with rather than evade (Bosk 2003).

Any accident model that includes the social system and human error must account for adaptation. Systems and organizations continually change as adaptations are made in response to local pressures and short-term productivity and cost goals. Reliability engineering focuses on failures while system safety focuses on hazards. These are not equivalent. C.O.Miller, of the founders of system safety in the 1950s, cautioned that “distinguishing hazards from failures is implicit in understanding the difference between safety and reliability” (Miller, 1985).

The term Resilience Engineering represents a new way of thinking about safety. Whereas conventional risk management approaches are based on hindsight and emphasise error tabulation and calculation of failure probabilities, Resilience Engineering looks for ways to enhance the ability of organisations to create processes that are robust yet flexible, to monitor and revise risk models, and to use resources proactively in the face of disruptions or ongoing production and economic pressures. In Resilience Engineering failures do not stand for a breakdown or malfunctioning of normal system functions, but rather represent the converse of the adaptations necessary to cope with the real world complexity. Individuals and organisations must always adjust their performance to the current conditions; and because resources and time are finite it is inevitable that such adjustments are approximate. Success has been ascribed to the ability of groups,

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individuals, and organisations to anticipate the changing shape of risk before damage occurs; failure is simply the temporary or permanent absence of that.

“You don't drown by falling in the water; you drown by staying there.”
- Edwin Louis Cole

THE STARTING POINT

“Good judgment comes from experience; unfortunately, the experience usually comes from bad judgment.” – Golden Rules for Pilots, Anon.

As the following report shows, stepping outside your assigned role does not always go 100% as planned and this is what prompted this thesis. On November 12, 1970, a 14 m (45 ft), eight-ton sperm whale died as a result of beaching itself near Florence, Oregon. Since all Oregon beaches were (and still are) under the jurisdiction of the state Parks and Recreation Department, responsibility for disposing of the carcass fell upon the Oregon Highway Division, a sister agency. After consulting with officials at the United States Navy, they decided that it would be best to remove the whale in the same way they would remove a boulder and, on November 12, they used half a ton of dynamite to remove it. This decision was made because they thought burying the whale would be ineffective, as it would soon be uncovered, and they believed the use of dynamite would cause an explosion that would disintegrate the whale into pieces small enough for scavengers to clear up. The engineer in charge of the operation, George Thornton, was recorded as stating that one set of charges might not be enough and more might be needed. Thornton later explained that he was chosen to remove the whale because the district engineer, Dale Allen, had gone hunting.

The resulting explosion was caught on film by television photographer Doug Brazil for a story reported by news reporter Paul Linnman for KATU-TV in Portland, Oregon. In his voiceover, Linnman joked that "land-lubber newsmen" became "land-blubber newsmen", for "the blast blasted blubber beyond all believable bounds." The explosion caused large pieces of blubber to land quite some distance away from the beach, resulting in a smashed car. The explosion did not disintegrate most of the whale, which remained on the beach for the Oregon Highway Division workers to clear away. At the end of his news story, Paul Linnman noted that "It might be concluded that should a whale ever be washed ashore in Lane County again, those in charge will not only remember what to do, they'll certainly remember what not to do." As usual the press focused on the spectacular things that went wrong. "It seems that bad decisions have something in common, and that is that they all seem a good idea at the time" (Dekker, 2005, p. 82).

If we look at the situation through from the new view perspective of human factors, we will see the good intentions and new ideas that the people were trying out. With resilience thinking we could actually move to able to learn to change

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problems to challenges which we overcome i.e. the value of small mistakes. Resilience implies the ability to recognize, absorb, and adapt to disruptions that fall outside a system's design base (with design base encapsulating the system's physical implementation, training, procedures, instructions, previous operational history, etc.) i.e. gradual adaptation of strategies as expression of learning. To be resilient, then, may have to mean that people (and systems) go outside the role officially assigned to them i.e. continual exploration of alternatives in search of continuous improvement and the importance of "thinking out of the box" without depending on how the outcome will be judged (Dekker, 2007). It will be argued that the variability of human performance is essential, and that it is the reason for both successes and failures. The challenge therefore is how best to harness this variability and producing evidence of an industry that is "learning how to learn": formalizing and organizing for learning through professional linkages and conferences.

"Our greatest glory is not in ever falling, but in rising every time we fall."
- Confucius

DRIFT INTO SUCCESS

"Creativity requires the courage to let go of certainties."~ Erich Fromm

One of the first steps of the learning process would be to assure or prepare a frame where such extraordinary actions are possible because they are backed up by the organization. An organization which trains employees to be able to anticipate and react to extraordinary situations must always consider that failure is the opposite of succeeding

Now having learnt from other's previous experience (5/5 hindsight), today beach managers tow dead beached whales to the open sea. This is done mainly for safety reasons, as the floating rotting corpses are a danger to shipping traffic and attract sharks and so become a danger to beach users. They are learning the value of mistakes. Part of the answer involves recognizing that the 'Bad Apple' characterization of accident causation flows directly from a deterministic Cartesian view of the world. Simply replacing 'bad' apples with 'good' apples will not change the approach (to accident analysis) that is implicit in such a world view (Robert Robson 2006).

A resilient system would still try to change the procedure without the proof of really being unsafe by risking an accident because it is flexible enough to reconsider the original decision i.e. the value of (small) mistakes. It is a system in motion, floating between loosening the rules too much and adhering too exact to them i.e. gradual adaptation of strategies as expression of learning. You will never know in advance what will be the best and safest solution. Knowing about the potential to go in either this or that direction gives you more possibilities to choose from and maybe the essential time and courage to go there i.e. continual

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exploration of alternatives in search of continuous improvement and the importance of "thinking out of the box", no matter how the outcome will be judged. When everybody trusts his team-mates to behave in a similar way, these courageous actions become normal again and a potential wrong decision can be absorbed by somebody else.

“The way not to invert the bad apple theory has a big label; the culture. Organizational culture will enable that resilient people are not shown as safety disciples of Stakhanovism. The organizational culture may be "resilient" in the sense that courage is taken as a system property eventually, than being a value that belongs to the culture of an organization. The organization is responsible for providing the conditions under which the employees feel free to talk and to act in a safety sensitive way. My belief is that if the staff feels good in making steps towards safety then more and more staff will have the courage to act. In other words the employees will develop trust in the system. The finality of this is again that this behavior will be the norm rather than the exception. Here we could say that the organization could have experienced a practical drift (Dekker, 2004), but a drift into success rather than a drift into failure” (Thomas Novotny 2006).

BETTER DECISIONS

Over the years there have been further strandings where the whales have been removed with explosives. Leverage often comes from new ways of thinking i.e. i.e. gradual adaptation of strategies as expression of learning. Our tendency is to focus on our own actions and ignore how they affect others. So we must refine our scope of influence by involving/communicating with every body who shares the responsibility for the problem generated by the system. One of the biggest problems was to convince the explosive experts to use less explosive and aim rather for a concussion force from a small (7Kg) shaped cone charge to euthanize the whale, or if the whale was already dead, what was discovered is that if the decomposition process has set in the shock wave from a large charge is absorbed by the carcass and is therefore not very effective i.e. the value of (small) mistakes. Although there was communication between South Africa, Australia and the USA about the method and type of explosives to be used, South Africa discovered that the explosives used by Australia did not do the job that was required in South Africa so although the technique is similar the type of explosive is different i.e. i.e. gradual adaptation of strategies as expression of learning. It seems the Australian authorities are also attempting to soften the blow of the operation. On the carcass of a dead whale found floating just offshore – they reported a “small charge” would be used “which we hope will cause it (the carcass) to sink, or at least speed up its decomposition, allowing sharks and other marine creatures to dispose of it in the natural way. Some floating whale carcasses are towed out to sea and anchored where other conservationists are able to record shark activity i.e. continual exploration of alternatives in search of continuous improvement and the importance of "thinking out of the box". Everything in our systems is interdependent and as much as at anytime before in

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man's history, this is the age of interdependence. Senge says, "Nature loves a balance, but many times human decision makers act contrary to the balances and pay the price."

As the following report shows using explosives on dead or dying whales has become "normal operations." Six whales have stranded on the coast here in the past two months. As follows by using the new and better controlled method of whale removal it is now possible to euthanize whales if required. 'Worryingly, all have been offshore species. Inshore species more commonly strand. Last Monday another humpback had to be euthanized after it stranded near Van Staden's River mouth.' As can now be seen in the conclusion of the report this procedure is now no more stepping out the box, but has now become "normal operations", 'Kant, who is in contact with stranding networks all over the world, attended an international conference in Australia last year and the Bayworld stranding team has grown steadily in confidence and expertise.' This is evidence of a budding industry that is "learning how to learn": formalizing and organizing for learning through professional linkages and conferences.

"Being challenged in life is inevitable, being defeated is optional." - Roger Crawford

Stranded whale-removal has now taken on a number of different forms.



CARCASS REMOVAL

One may be presented with the dilemma of cleaning up a dead whale when either the carcass of one washes ashore or after a whale beaches itself and dies naturally. Once a carcass presents itself, one of two approaches involving explosives is typically used.

LAND-BASED

A land-based, explosive carcass removal or disposal usually has one of two goals: either obliterate the carcass into pieces small enough that scavengers and the natural process of decomposition will expedite removal, or break up the carcass into more manageable pieces that can be hauled away or buried. It is possible for a failed attempt at the former to result in the latter.

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Oregon's 1970 sperm whale carcass (pictured above) is a classic example. After the carcass washed up on the beach, officials hatched a plan in which they would use enough explosives to vaporize the entire whale. Needless to say, it didn't work. After the explosion, several large chunks of whale were simply buried on the beach. Other smaller chunks had to be retrieved from the surrounding area.

The Receiver of Wreck administers the Royal Prerogative on Fishes Royal on behalf of the Crown in England, Wales and Northern Ireland. Fishes Royal includes whales, dolphins, porpoises and sturgeon. The Royal Prerogative to Fishes Royal dates back to a statute of King Edward II (1307 - 1327). The Receiver of Wreck is responsible for the disposal of dead, stranded Fishes Royal on Crown or public land, and works in close conjunction with local environmental health and emergency planning officers in order to find the best solution for disposal. Once a whale has stranded, an assessment of the size, type and condition of the animal will be made, as well as its location, especially with regard to access for e.g. heavy plant equipment etc but also any special environmental or heritage issues for instance. A decision will then be taken with interested parties on the best method of disposal given the local conditions, and is usually undertaken by local contractors.



The following report demonstrates another method: 31st August 2006, Mr Fowler recalled that when a minke whale was stranded at Gibraltar Point last year, the Natural History Museum took its skeleton back to London, while its flesh went to renders. "But that whale was only three tons", he said. Mr Sollis, tackling his first whale since joining the ELDC, said that the renders, Hughes' of Skellingthorpe, would have taken the sperm whale if they had not already been dealing with one found on the Humber on February 4th.

On Friday a 64-ton caterpillar tractor slowly dragged the whale along the beach to Winthorpe, building sand ramps to go over the groynes. A pit was dug in which the carcass was sawed into sections by a Skegness slaughterhouse team. The pieces were loaded into articulate lorries and taken to a deep waste site at Slippy Gowt Lane in Boston. East Lindsey council will recover the costs of the removal operation from a national agency, the office of the Receiver of Wrecks, whose brief included whales as well as boats. The photograph was taken by Skegness News on Video.



SEA-BASED

In a sea-based explosive whale removal or disposal, the goal is almost always to break the whale up into smaller pieces that pose less of a shipping hazard and will likely sink faster. In cases where whales have beached themselves and human intervention has failed to return the whale to open water, the resulting carcass may not be easily re-floated. In other cases where a carcass simply floats into an area trafficked by humans, it is generally an easy task to tow the carcass to a suitable location for disposal.

A good example of this approach is what happened in Australia in July 2001, an explosive end to a shark ‘attraction’. The carcass of a dead Southern Right whale floating off the coast of Southern Australia (pictured above) attracted both sharks and sightseeing boaters. With boaters climbing onto the carcass above the water and great white sharks tearing at its flesh below, frustrated officials devised a plan to use explosives to blow apart the carcass, hoping it might sink or at least expedite the natural process of decomposition.

Australian police have detonated explosives in the rotting carcass of a whale that had become a dangerous tourist attraction. Television pictures last week showed great white sharks feeding on the dead southern right whale south of Adelaide - as sightseers in boats patted their snouts and even climbed onto the back of the whale. South Australia state police said they had placed three small explosive charges in the whale’s belly to blow a hole in it and speed up the decomposition process. The dead whale provoked a feeding and tourist frenzy. The whale was then towed away from shipping lanes off the coast of Adelaide and the charges detonated. “It was entirely successful,” a police spokeswoman told Reuters news agency. “It no longer presents a problem.” State government spokesman Arndrae Luks said: “It will give marine scavengers a better chance of doing what they do best, which is to clean up dead and decaying material in the ocean.”



EUTHANASIA

The need to euthanize a large cetacean has thus far typically arose when a large whale has beached itself, and attempts to return the whale to open water have failed. In such cases, the whale may suffer for a prolonged period as its internal organs are slowly crushed under its own weight. A beached whale may be subject to attack by other creatures or even abuse, injury, or mutilation by other humans. In order to end the suffering of such a creature, the decision to euthanize a stranded but living whale with explosives has been made several times in the past.

Providing a quick and relatively pain-free death for such a large creature is non-trivial. Most research attention in this area has focused on the so-called “humane killing” of whales in the context of hunting. In such cases, there is an inherent desire to preserve the corpus of the whale (i.e., for meat, blubber, etc.). However, even in this context, explosive harpoons are a leading method, though they rarely result in an instantaneous death.

Other methods of euthanizing such a large creature all have significant drawbacks. A shot from a large caliber weapon must be aimed precisely in order to be effective. Multiple shots — clearly resulting in unnecessary suffering — have been necessary in past attempts of this technique. Drugs are often proposed as a humane and less violent method. However, huge quantities would be required in order to be effective on such a large creature, and locating a major blood vessel through which to deliver drugs may entail cutting open the still-living whale. While it may seem excessively violent, a carefully placed explosive charge can minimize unnecessary suffering and provide rapid death.

The best known examples of this practice have all happened in South Africa. The detonation pictured above occurred in August 2001 when 33-foot Humpback whale beached itself near Van Staden’s River mouth. Other South African whale euthanizations happened in September 2003 (a Southern Right whale near Sundays River) and September 2005 (a Southern Right whale on Mnandi Beach).

JOHANNESBURG, South Africa (Reuters) - A stranded humpback whale was blown up on a South African beach after failed attempts to pull it back out to sea, conservation officials said Tuesday. “We put the animal down yesterday (Monday) with an explosive device placed very close to the head area,” Sandy Thackeray, spokeswoman at the Bayworld oceanarium in the coastal city of Port Elizabeth, told Reuters by telephone. She said an initial plan to place an explosive device inside the whale was shelved as conservationists did not want to cause the animal any more stress. When it was being planned Monday, she said that while the method seemed harsh, the object was to put the animal out of its misery.

Local TV footage showed the front half of the 33-foot whale exploding. Gulls swooped in for the unexpected feast and Thackeray said sharks were sure to

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follow as the mangled carcass slowly drifted out with the tides. “Nature will take its course,” she said. Efforts to free the animal Sunday ended in failure after attempts to tow it with a boat were thwarted by rough seas. Conservationists said the only thing left to do was put the animal down, but its size — it weighed 20 tons — ruled out shooting or a fatal injection. They said blowing it up was the humane alternative.



The remains of a 10-metre long humpback whale (which can weigh up to 40 tons) lie on the beach after it was blown up with explosives by conservation officials to put it out of its misery after repeated attempts to rescue it failed August 6, 2001. (E.P Herald, Port Elizabeth via Reuters)

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Players in our systems-all of us- look for heroes and when things go wrong, culprits-someone to blame. It's a "knee jerk" reaction-we should look for someone to fault....and we become upset! Instead we should look to understand the way the structure of human systems influences our behavior. Some conservationists say the incident highlights South Africa's inability to deal effectively with whale strandings. As can be seen in this comment old view of human error, the failure to acknowledge that the finding of causes of an event or an outcome is a case of reconstruction rather than identification, hence a social judgment made in hindsight. This is then followed but a statement which says exactly what the authorities are busy doing. "One of the issues that need to be resolved in South Africa is how to react to strandings. There are some very sophisticated stranding networks in the U.S. and elsewhere," said Jason Bell, the director of the South African branch of the International Fund for Animal Welfare. "We need to develop a system whereby we can respond quickly to a stranding and get a whale back into its natural environment... but if that fails, the only humane alternative is to kill it quickly," he said (© 2001 Reuters) 9/26/2003.

The following report demonstrates the results of the improved techniques. The Southern Right whale, which beached on Tuesday afternoon, was put down on Wednesday after attempts to refloat it failed. Mike Meyer from MCM, in consultation with whale specialist Peter Best, local authorities and Nan Rice of the Dolphin Action and Protection Group, decided that the most humane option would be to use explosives. Police from the explosives unit used a cone-pack explosive device, designed to force the charge in one direction only. It was detonated over the whale's brain, causing immediate death. Claire McKinnon, head of the city's cleansing department, said all animal carcasses had to be disposed of at the Vissershok hazardous waste site. She said the council would use three front-end loaders on Thursday to roll the carcass along the beach to a spot where a flatbed truck was waiting. The 11-ton animal would be hoisted onto it by crane and taken to the dump. She said the beach would not be closed to the public as the carcass did not pose a health risk at this stage. "Using explosives is an internationally recognised humane way of killing stranded animals. You can't leave the thing baking in the sun for days, dying slowly" (Cape Times / Independent Online © 2005)



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Police officers position an explosive charge on the whale. The cone-pack explosive is strapped in place behind the whale's blowhole and covered with a sandbag.



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Immediately following detonation, smoke rises from the blast area. The targeted explosion left an immense crater in the whale's head, but death was said to have been almost instantaneous. It is sad when it becomes necessary to euthanize a large, graceful, and inspiring creature like a whale. And it is made all the more difficult when it happens in such a violent and sensational manner. This is motivating the people to learn from these situations. Australia and New Zealand are leaders in now what is called whale rescue to prevent the whales from stranding in the first place or returning the whales to the sea before they die or have to be put down. Many countries are now involved in formalizing and organizing for learning through professional linkages and conferences. Perhaps science will one day offer a better understanding of why whales beach themselves in the first place so that such actions become unnecessary.



PUTREFACTION

When a whale carcass is left to its own devices, an amazing process can occur. Putrefaction is the decomposition of organic matter that causes the formation of certain gases, including ammonia, hydrogen sulfide, and methane. As tissues and cells break down, fluids are released into body cavities where they may anaerobically respire and produce gaseous by-products. These gases, while extremely offensive to humans, attract additional bacteria-laden insects. As bacteria multiply the rate of decay increases dramatically and gases begin building up within the body cavity, also known as bloat. The increased pressure forces additional fluids out of the body's cells and vessels and into the swelling body cavity. It is through this natural process of bodily decomposition that a

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giant whale carcass can violently explode. A whale's durable outer skin, thick blubber walls, and huge size may allow a longer-than-usual build up of gases to occur with fewer opportunities for the gases to escape. Such conditions may be more prone to explosion in the latter stages of putrefaction.

The well-publicized example of a self-exploding whale happened in Taiwan, Taiwan in January 2004. The carcass of a gigantic sperm whale was being transported through the city when it suddenly erupted. The pressure from the fluids and gases of decomposition — undoubtedly exacerbated by being under transport — finally burst through the whale's rotting corpse, sending a river of blood, organs, and entrails across the street.



The image above hardly resembles a whale, but when this carcass of a young humpback whale was found in Alaska, the whale's gut had inflated and was protruding from the creature's mouth. While this whale did not explode, it is a very visible indicator of how dynamic the process of decomposition can be. A similar event happened in California in August 2005.

From the first story through to these various categories of whale removal demonstrate the evidence of a budding industry that is "learning how to learn": formalizing and organizing for learning through professional linkages and conferences. What are further demonstrated are the continual improvement of alternatives in search of continuous improvement and the importance of thinking out of the box.

LEARNING HOW TO LEARN

The value of small mistakes. A Lund University project is based on theories of learning at work, looks at communities of practice and of social constructivism in order to study learning processes in rescue services and other crisis management organizations. The project began with ethnographically inspired studies of the learning climate of a few rescue services and has moved on to include additional crisis management organizations. It will eventually examine other help organizations. Effective performance in difficult situations; such as those faced by emergency services, demands in part those lessons from earlier situations are integrated meaningfully. Many organizations do invest in trying to learn from previous experiences, particularly bad ones, but do not consciously monitor their own learning. In other words, they do not consider how to learn from their own efforts at learning. This project, "learning how to learn", helps rescue services

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find ways to learn how to learn. Through a study of different rescue services across the country, it reveals how local constraints affect what can be learned and how, and suggests strategies for helping organizations learn how to learn from their own experiences. (Project Sponsor: National Center for learning from Accidents)

In my opinion it is a question of changing the safety culture in the organization concerned. Reason (1997) suggests that a just culture is an important part of a safety culture. People should be encouraged and even rewarded for providing essential safety-related information. One interesting example of such a culture is High Reliability Organizations. Rochlin et al. found, when studying aircraft carrier flight operations at sea, that “even the lowest rating on the deck has not only the authority, but the obligation to suspend flight operations immediately, under the proper circumstances and without clearing it with superiors. Although his judgement may later be reviewed or even criticized, he will not be penalized for being wrong and will often be publicly congratulated if he is right”. This implies that a strong safety culture is needed for resilience to be learned. An organization can have many mindful employees with a high degree of safety awareness. But their contribution to the safety record is highly dependent on support from the organization (Lafour 2006).

TO KNOW WHAT IS NOT KNOWN

“Knowledge is an unending adventure at the edge of uncertainty.”- Jacob Bronowski

Safety is something or an organization does rather than something a system or an organization has (Hollnagel & Woods 2006, p 347), this entails that a resilient system is viewed as a quality of how the system performs. In this view people add safety to the system as long as their action serves the function of the system i.e. making the system adapt and absorb unexpected events. (Bjørn Erik Besserudhagen. 2006)

The gradual adaptations of strategies as an expression of learning leads to a suggested plan of how to manage a safety critical project follows:

1. Manage a safety-critical project. Plan, staff, direct and control all life cycle activities associated with a safety-related project.
2. Evaluate a safety program. Confirm the existence of an operational safety management system in a developing organisation and evaluate its effectiveness.

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3. Identify hazards. Identify hazardous situations that could lead to an accident.
4. Analyse incidents. Perform causal analysis of safety incidents using modelling techniques such as fault trees.
5. Evaluate risks. Evaluate the possible negative outcomes of hazards and compute the probability of occurrence. Determine if perceived risks are acceptable to the organisation.
6. Devise risk reduction strategies. Identify system requirements, design solutions and manual procedures to reduce risk. Justify risk reduction strategies through quantitative or qualitative means. Determine required safety integrity levels.
7. Document safety requirements. Develop unambiguous, complete, correct, consistent and testable statements of safety requirements.
8. Construct safety-related systems. Design and build safety-related systems in compliance with safety requirements, using semi formal models such as state engines and Petri nets.
9. Analyse design reliability. Determine that a safety related system will meet its required reliability goals using techniques such failure modes effects and criticality analysis.
10. Procure safety-related systems. Plan, solicit, select and administer the purchase of safety-related systems and services.
11. Validate safety-related systems. Validate safety related systems against safety requirements.
12. Justify the safety management approach. Develop safety cases that present clear, comprehensive and defensible arguments that safety-related systems, as delivered, will be acceptably safe throughout their operational life.

It is accepted that complex systems are pushed beyond their design base because accidents are emergent phenomena (Hollnagel et al, 2006). Accidents are emergent in the sense that the system behavior is not explainable by the acting of its different components. An accident is not (always) the resultant from the individual behavior of its different systemic parts. It takes teamwork to succeed, just like it takes teamwork, or an entire organisation, to fail. What makes systems safe is the realisation that it is the entire system that succeeds. Failure, as well as success, is a system property, it is the emergent result of the system, not of individual components in it.

HOW DOES ONE LEARN TO BECOME A RESILIENT PERSON?

Resilient performers aren't bound by conventional thinking. They readily step beyond traditional systems to explore a realm of possibility. At the same time, resilient performers have the emotional intelligence to invite others into their creative process. They aren't out to overthrow the established culture, but, as Gandz writes, "They use the culture to change the culture; they know how to use channels effectively, and when there are no channels they create new, legitimate ones rather than acting as revolutionaries and mavericks." They think outside of the box while acting inside the box.

Bev du Toit is a consultant and motivational speaker on wellness at work who knows a great deal about resilience. Du Toit says that resilience is defined as the ability to withstand or recover from difficult situations but adds that it requires new definition. "I believe that resilience should be re-defined as the ability to cope well under any circumstance." Du Toit says that resilience is tempered by what we've been taught. "Each person's resilience is defined by the beliefs and attitudes learned from role models and integrated into their behaviour. Our learned coping skills are not only integrated into our behaviour but by neural pathways developed in our brain. As situations arise, we no longer think about how to handle them; we simply access the neural pathway and behave according to the information stored there," she says.

The good news is if you're not resilient, you can learn to flex this mental muscle. There are two key components required for this – belief and attitude. "Resilient people believe in their ability to cope, to find solutions and to manage problems," says du Toit. "They generate thought, feeling and behaviour (attitude) from this belief that centres on attaining the outcome they want."

"Develop success from failures. Discouragement and failure are two of the surest stepping stones to success."~ Dale Carnegie

SAFETY MANAGEMENT

To lead to the inversion of the bad apple theory, management should blur the boundaries of the roles by seeing an organisation more as a living system with informal networks of communications, relationships, interactions and interdependencies, and not so much as its formal structures, the rules, procedures, prescribed channels of communication, and roles that are assigned to the different persons. Further more, an essential property which is needed to encourage people to speak up at all is the valuation of subjective data. That kind of qualitative data needs to be acknowledged as equally important as quantitative data. Only then employees will see that their personal opinions and feelings are considered as relevant or at least as pointing into a direction worth looking at by management.

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The emphasis would then shift to the community of the members of the organisation that are working towards a common goal and have a strong feeling of cultural belonging to the organisation, so that everyone is considered equally responsible. The style of management that is needed for that kind of organisational thinking changes from “domination and control to cooperation and partnership” (Capra, 2002, p.113). Even though that “evidently amounts to significant changes of power relations” (Capra, 2002, p113), what probably seems scary to every traditionally thinking manager, the effects are that the official roles blur in a way that makes it easier for everybody to act in favour for more resiliency within the organisation, since everyone gets the feeling that his opinion is valued and considered important for the survival of the system. The shift from hierarchies to networks integrates the “stepping outside officially assigned roles“ by making it a system property which is expected from every member and eases that process at the same time, because the boundaries of official roles blur under the common goal to strive for the organisation’s survival.

HOW TO PROFIT FROM FAILURE

Change Your Vocabulary. “Every good leader I’ve ever met has had the amazing ability to turn a setback into a springboard for greater effectiveness.” In his book, *Leaders on Leadership: Interviews with Top Executives*, Warren Bennis interviewed 70 of our nation’s top performers in numerous fields. None of them used the word “failure” to describe their mistakes. Instead they referred to “learning experiences,” “tuition paid,” “detours” or “opportunities for growth.”

Make Failure a Learning Experience. We should never walk away from failure empty-handed. Each failure comes with lessons attached, and we can learn invaluable principles from them.

We need only resilient seasoned professionals who by virtue of their training and experience are encouraged to recognize and develop solutions to system-weakening gaps and the value of (small) mistakes between written procedures, software applications and enshrined processes. This insider attempt at improving systems is more than mere patchwork it is a gradual adaptation of strategies as expression of learning. In an ideal setting, operators would address these gaps with an approach borne from their expertise and apply homemade solutions learning during the continual exploration of alternatives in search of continuous improvement (and the importance of "thinking out of the box", without depending on how the outcome will be judged (Dekker, 2007).

Here is the basic conceptual requirement; take locally developed problem solving attempts, vet them for completeness and suitability against the organization’s

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goals, and should they withstand the rigorous analysis, modify the system by official integration into everyday tasks; this is evidence of a budding industry that is "learning how to learn": formalizing and organizing for learning through professional linkages and conferences.

SUMMARY

Through a careful study of a number of domains (ranging from healthcare through aviation to stranded whale removal), this thesis intends to concretize Resilience Engineering through:

1. Identifying problems associated with learning from failure and how these can corrode organizational investments in safety i.e. the value of (small) mistakes.
2. The proposal and refinement of possible new ways to integrate lessons from the past in countermeasures for the future i.e. Gradual adaptation of strategies as expression of learning.
3. Continual exploration of alternatives in search of continuous improvement and the importance of "thinking out of the box", seeking to become a hero at the risk of being deemed a klutz depending on how the outcome will be judged (Dekker, 2007).
4. Presenting evidence of a budding industry that is "learning how to learn": formalizing and organizing for learning through professional linkages and conferences.

Attention must be given to developing ways through which relevant decision and policy makers can gauge how much a system has learned, or is able to learn, from past failure. These indicators are not about something a system HAS, but rather about what it DOES. How, for example, does it express its beliefs in the sources of safety and risk through its responses to failure? Does the system critically monitor itself, to become able to see that it is operating closer to the margins than it would like? Does it invest in recognizing and adapting to harmful influences that threaten its resilience? Training is the least we can do to enhance safety, and we should use every single possibility to do so (Gisel 2006).

CONCLUSION

This last point leads me to make a concluding recommendation. I feel that improved performance is desirable, necessary and possible in the social control of stranded whale removal by converting past lessons into a resilient future. Such performance rests on the profession's developing a corporate sense equal to its individual sense. While it is impossible to specify, in a step-by-step fashion, my account makes clear what elements contribute to an effective control system.

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Firstly there must be some hierarchy, or functional equivalent, that permits question-answer sequences about the appropriateness of different methods of whale removal (The value of (small) mistakes). Second, some face-to-face interaction is necessary (Gradual adaptation of strategies as expression of learning). Third, there must be public forums for discussing problems and solutions (Presenting evidence of a budding industry that is "learning how to learn": formalizing and organizing for learning through professional linkages and conferences). Fourth, the community needs some control of sanctions so that it is able to control malefactors within its own ranks (Continual exploration of alternatives in search of continuous improvement and the importance of "thinking out of the box"(Dekker, 2007). Important concepts have been identified but much work still has to be done.

“What we do not see, what most of us never suspect of existing, is the silent but irresistible power which comes to the rescue of those who fight on in the face of discouragement.” ~ Napoleon

ACKNOWLEDGEMENTS

This project is sponsored by Denel Aviation by allowing me to spend part of my time as Senior Maintenance Test Pilot on a masters study at the School of Aviation, Lund University with Prof. S. Dekker.

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