Decremental and incremental safety: Introduction and overview

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Is incremental safety a new type of safety? It is not, of course, for there can be only one (as the Highlander wisely said). The only sensible definition of safety is ***"a state where there are as few unexpected and unacceptable outcomes as possible"***. The word safety is predictably derived from Latin where the word *salvus* means, uninjured, unharmed and in good health (Raheemy, Sherratt & Hallowell, 2025), to be safe therefore means to be free from or protected against harm and injury, either actual (occurring here and now), or potential (possibly occurring at some time in the foreseeable future) Every sentient organism tries to avoid situations where they can suffer injury or be harmed, either by making the threat disappear (which is why bears roar and dogs bark at strangers,and peacocks spread their tail feathers), or by trying to get away from such situations if they happen nevertheless, typically by hiding, by seeking cover, by crawling or by fleeing (as all birds and winged insects do when we approach them). The "*fight or flight*" response is universal (Cannon, 1915). Humans, as animals with cognitive abilities, especially the use of symbolic representation and memories of the past (history), as well as the ability to select some memories rather than all (corresponding to consciousness and also the ability to imagine what may happen in the future are naturally motivated to ensure a state of safety for whatever they do, individually and collectively. This explains the importance both of feeling safe and of being safe (which, although often confused are quite different, we sometimes feel safe even though we are not, and *vice versa*.

Alternative ways to become safe

According to Safety-I and the safety legacy (Hollnagel, 2025), a state of safety can be achieved by reducing the number of acts and/or events that result in unacceptable outcomes -- ***hence a decremental approach*** (Hollnagel, 2026), with the popular but completely unrealistic *Zero Accident Vision* (**ZAV**). (Zwetsloot et al., 2013; Sharman 2016; Björnberg, et al., 2019). According to Safety-II, a state of safety can be achieved by increasing the number of acts and/or events that result in acceptable outcomes, ***hence an incremental approach***, corresponding to an incremental safety culture. Incremental safety implies the equally unattainable ideal that everything goes well (*Visio centum*).

If safety is defined as a state where there are as few unexpected and unacceptable outcomes as possible, then the focus is clearly on those, and efforts are consequently aimed at making their number as small as possible, ideally zero. If safety instead is defined as a state where there are as many expected and acceptable acceptable outcome as possible, then the focus is on those, and efforts are in consequence aimed at making their number as large as possible, ideally 100%, hence an incremental approach.

Coin Flipping

Incremental and decremental safety refer to two different approaches to become safe, rather than to two different types of safety. The difference can be illustrated by flipping a coin. Unless the person who flips the coin is incredibly skilled any physical coin will land either heads up or tails up (only a quantum coin could, like *Schrödinger's cat*, remain in a quantum superposition. But it would be terrible for safety, and for daily life, if it was not possible to determine whether the outcomes of an act were acceptable or unacceptable. Yet even though the outcomes of flipping a coin themselves are binary, the values need not be. If the coin was flipped to make a decision the value of the outcome will be positive for one part and at the same time negative for the other (except for: heads, I win; tails you lose), but such complementarity of value is unlikely to be the case where the issue is industrial safety. There are few, if any, cases in which an accident, resulting in harm, loss or injury will be seen as having a positive value – the only exception is perhaps the actions of a terrorist, an assassin or an arsonist. Decremental safety also (I sincerely hope) exclude the possibility that someone concludes that there is a third way to achieve a state of safety, such as Safety-III. (Although human folly seems to have no upper limit.) If you neither try to reduce or decrement the number of cases where work goes wrong, nor try to increase or increment the number of cases where work goes well, the only option

left isto do nothing or *laissez-faire,* which for few companies is an attractive safety management strategy since it means that nothing will change with regard to safety and few companies dare publicly declare they are financially or ethically satisfied with their current occupational accident rate and want to keep that as their *status quo*. Using the analogy of coin flipping. The coin will land either tails up (corresponding to an unacceptable outcome) or heads up (corresponding to an acceptable outcome). So the two types of outcomes are clearly mutually exclusive, if there are more of one type of outcomes, there will be fewer of the other type of outcomes, and *vice versa*. The intention with this analogy is not to suggest that the outcome of work activities are random. On the contrary, we do all we can to bias the coin so it does not land tails up, corresponding to unacceptable outcomes or a decremental safety culture. The analogy rather suggests that we might as well bias the coin in the opposite direction so that it is more likely to land heads up corresponding to acceptable outcomes or an incremental safety culture, because that is after all what we would like, and need to happen in everyday work.

Safety-III RIP

In hindsight, the terms Safety-I and Safety-II created some confusion about whether there was more than one type of safety. **There is not, since there can be only one!** The confusion even tempted some (Leveson, 2020), (Aven, 2022), and (Cooper, 2022) wrongly to infer that there could also be a Safety-III. Others foolishly latched onto this. (Flinterman, 2024), and (Samost-Williams & Brook, 2025). Being a psychologist I had anticipated that this false inference might tempt some, and had therefore explicitly **warned against it** in my 2014 book:

> "Since Safety-II represents a logical extension of Safety-I, it may well be asked whether there will not some day be a Safety-III? In order to answer that, it is necessary to keep in mind that Safety-I and Safety-II differ in their focus and therefore ultimately in their **ontology**. The focus of Safety-I is on work acts that go wrong or fail, and the corresponding efforts are to reduce their number. The focus of Safety-II is on work acts that go well, and the corresponding efforts are to make sure that more go well." (Hollnagel, 2014, p. 178).

A more detailed argument why Safety-III is impossible can be found here.

In hindsight, I neglected to point out that Safety-I and Safety-II represent two different ways to achieve a state of safety, rather than two different definitions of safety. (But this was not clear to me, nor to others, at the time). Safety-II is actually akin to safety differently (Dekker, 2015), where the adverbial form of different makes clear that it does not refer to a different type of safety, but to a different way of achieving and/or managing safety – understood as the state of being safe. (a similar argument for safety is made in (Hollnagel, 2025).)

Safe and Safer

We are fooled by the language we use when we think, and talk about safety. As pointed out by ptofessor James Reason (RIP) the first paradox of safety "Safety is defined and measured more by its absence than its presence". Yet we commonly and habitually use the comparative form safer of the adjective safe, wrongly meaning more than safe. Yet practically all formal definitions of safety emphasise the absence of something.

According to the conventional interpretation of safety, now often called Safety-I (Hollnagel, 2014b), safety refers to a condition where as little as possible goes wrong. The American Society of Safety Engineers and the American National Standards Institute, for instance, define safety as "the freedom from unacceptable risk" (ASSE, 2011, p. 13). The Agency for Healthcare Research and Quality (AHRQ), likewise defines safety as "freedom from accidental injury, (Emanuel et al., 2009) which can be achieved by "avoiding injuries or harm to patients from care that is intended to help them". Finally the International Civil Aviation Organization (ICAO), defines safety as "the state in which the risk of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management" (ICAO, 2013, pp. 1–2).When we say that something is safer, sas in One Percent Safer (Sharman, 2020) we actually, and paradoxically mean it is one percent less unsafe, so there are fewer *(by 1%) unexpected and unacceptable outcomes. It therefore represents a decremental approach. The opposite is a true incremental approach, formerly called Safety-II, where the meaning of safer is the there are an increased number of expected and acceptable outcomes, even if it is

just by one percent. Returning to language, safer actually means less unsafe, hence less of somerthing, rasther than more of something. The only thing there will be more of is cost, since it is far from inexpensive to become safer by reducing the number of unacceptable outcomes. But there is little to show as a result of the investment, except hopefully fewer accidents and unwanted outcomes, which means that something is saved or avoided. In contrast to thast incremental safety means that something is gained because more work will go well, leading to increased productivity and revenue. And since we live in a macroscopic (non-quantum world), where an act cannot go well and fail at the same time, an increase in the number of acceptable outcomes also means a decrease or reduction in the number of unacceptable outcomes. An incremental safety approach therefore fulfills the aim of a decremental safety approach at the same time.

The Demise of Safety Culture

But what about the commonplace safety culture that is so widely used, and misused. Is this still needed to complement decremental and incremental safety cultures?

To answer that it is necessary to take a closer look at the commonplace safety culture, its origin as well as its meaning.

Safety culture was first suggested as an explanation after the Bhopal disaster in 1982 (Bloch & Vaughen, 2024) and was revived as a cause or explanation when the International Safety Advisory Group (INSAG) from the International Atomic Energy Agency (IAEA) released its report on the causes of the accident at Chernobyl on April 26, 1986. (INSAG-4, 1991), although (Reason, 1988) had attributed the accident to a combination of an inadequate test plan and group think. This accident, together with the Challenger explosion on January, 28 1986 had a significant impact on the thinking about safety, because none of the generally accepted types of causes at the time (technical failures or human error, cf. Table 1, would suffice In terms of the ages of safety (Hale & Hovden, 1998) the two disasters heralded the third age of safety, the age of safety management, where organisational failure (but strangely not safety culture, even though the concept was known at the time) became the default explanation for accidents. The transition from one age of safety to the next typically happens when it becomes clear that the default explanations and solutions no longer work in practice. (human error was itself a partly a consequence of the Three Mile Island (TMI) nuclear accident in 1979 but had possibly been anticipated by “fault of person” as the second piece of the original domino model (Heinrich, 1959) the human error construct has as such probably done more harm than any radiation release would. In 1986 human ingenuity again came to the rescue, and a new type of cause was proposed, namely safety culture, initially defined analytically as:

> “that assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority (nuclear plant) safety issues receive the attention warranted by their Significance” (INSAG-4, 1986, p.5). The purpose of safety as safety-I (Hollnagel, (2014a) is generally defined as having no or zero accidents and this leads to considerable efforts being spent on determining the causes of accidents in the firm, but mistaken belief that the elimination of these causes will prevent future accidents. This is unfortunately what in philosophy is known as an analytic proposition, which is true solely by virtue of its meaning.

The Heinrich Dogma

The belief that the elimination of the causes will prevent future accidents is due to Heinrich who many years ago wrote that:

> ”It is widely accepted as true that the cure of a given troublesome condition depends primarily upon knowledge of its cause and the elimination, or at least the mitigation, of that cause”(Heinrich, 1931, p. 31).

This assumption, has by now achieved the status of a dogma, and therefore rightly must be called the ***Heinrich Dogma*** (Hollnagel, 2025) depends on three crucial assumptions, which unfortunately never are clearly stated:

- **firstly** that an outcome always can be attributed to a specific cause, (this is actually the inverse law of causality.)
- **secondly**, that it is possible to find or determine what that cause was or is (provided enough data is gathered and enough time and efforts are spent.

- and **thirdly**, that the elimination of the cause effectively will prevent the outcome from occurring again (the law of causality in a stable world one more time).

Safety culture is furthermore an example of a counterfactual conditional, or simply a ***counterfactual condition***, as explained below.

In their introduction of the concept of different ages of safety (Hale & Hovden, 1998) described how the transition from one age to the following was accompanied by the introduction of new default causes and explanations, as summarised by Table 1. (Hollnagel, 2026) provides an extended description of seven stages of safety thinking.

Table 1: Characteristics of the three ages of safety (from Hale & Hovden, 1998).

Age of safety thinking	Typical (default) cause	Typical (default) response	Assumed mode of causality	Initiating event
I:Technology	Failure of technology	Replace, repair and improve	Linear, Monocausal	Watt's steam engine 1769
II: Human factors	Human factors human error	Blame, train, design, automate	Linear, Monocausal	Multiple accidents during World War II
III: safety management	Organisational failure (safety culture)	Audits, standardisation regulation	Linear, Multicausal	Challenger & Chernobyl (1986)

(Hale & Hovden, 1998) described three ages of safety, listed in Table 1. In each case a transition happened because new technology changed the nature of work and societies, leading to unfamiliar forms of unexpected and unacceptable outcomes that could not be explained in the habitual manner. The age of technology coincided with the second industrial revolution, marked by the increasing use of machines at work. At first these machines were primarily high-pressure steam engines which often exploded and caused considerable damage, (Leveson, 1992). In this case there was clearly a novel component or element that could be used as the cause of accidents. But that was not so for the two other ages (although the changes that marked them with some justification be seen as due to the increasing use of computing technology. Computers have radically changed the nature of work and the fabric of our societies. Computers, however, do not fail in the same way that a steam engine can explode or a tank or pipe can rupture. Computer errors are usually mistakes in programming that have been there from the start, and therefore due to the programmers rather than to a degradation of computer hardware or software. A common estimate is that there are 1 - 25 errors per 1000 lines of code, and that number has been stable since the early 1960s. It is also known that there are about 92 million lines of code in the Android software on a smartphone. You can try to calculate the number of possible software errors yourself. That these devices nevertheless work is not due to a miracle but to the existence of error correcting codes, that were studied already in the 1940s. Unlike the beginning of the age of technology, later transitions cannot be associated with a concrete physical cause, but when something unfamiliar happens humans, individually and collectively crave a named cause, as another great philosopher, Friedrich Nietzsche, astutely observed:

> "to trace something unfamiliar back to something familiar is at once a relief, a comfort and a satisfaction, while it also produces a feeling of power. The unfamiliar involves danger, anxiety and care – the fundamental instinct is to get rid of these painful circumstances. First principle – any explanation is better than none at all." (Nietzsche(1997, org. 1887, Chapter 5, emphasis added)

But human ingenuity usually comes to the rescue, and new types of cause are proposed, namely human error or the human factor in the case of the age of human factors and, eventually, safety culture in the case of the age of safety management (Table 1.) These novel default causes are essentially convenient social constructs, taken out of thin air with little, if any theoretical foundation, and therefore difficult to apply practically. We can easily improve technology, an build better, e.g., low pressure steam engines, or improve the material and construction of tanks and pipes, but there are no similar simple solutions to improve the human factor or a company's culture, at least none that are known to work. Human error and safety culture both demonstrate that in abundance. (This has regrettably never stopped some companies and consultants from promising and promoting such solutions (none mentioned, none forgotten).

If safety culture is indispensable, which seems so from the way we talk, and therefore also think about safety at present, that immediately defines two requirements. **The first requirement** is that it must be possible unequivocally to determine whether or not a company has a safety culture (and whether it is present in sufficient quantity or quality). **The second requirement** is that unless safety culture either exists naturally or develops spontaneously, there must be known ways to get it, if and when it is needed. In order to meet either requirement it is necessary to know more precisely what safety culture is. One of the first extensive treatments of safety culture was the INSAG-4 report quoted above.

But since this definition depends on knowing what "safety issues" are it is necessary to go one step further and consider what safety as such is. The best description of that is in my opinion provided by the definition of the four paradoxes of safety (Reason, 2000, p. 1), the first of which is "that safety is defined and measured more by its absence than its presence". If we accept that, then safety culture is a culture about something that is **not** there, which makes it rather difficult to meet the two requirements described above. Reason's paradox is corroborated by the common definitions of safety. The Agency for Healthcare Research and Quality (AHRQ), for instance,defines safety as "freedom from accidental injury, (Emanuel et al., 2009) which can be achieved by "avoiding injuries or harm to patients from care that is intended to help them". While the International Civil Aviation Organization (ICAO), defines safety as "the state in which the risk of harm to persons or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management" (ICAO, 2013, pp. 1–2).

The two requirements mentioned above can actually be made more concrete since they comprise three necessary types of knowledge.

Three types of knowledge

In order to establish and maintain an incremental safety culture, three types of knowledge are required (this requirement actually applies to any form of management, cf. Hollnagel (2025). (The requirements are based on the analogy between making a voyage in physical space, such as driving from Manchester to Blackpool on the M6 or making a metaphysical voyage, such as changing or managing a culture, which, for lack of better, often is likened to making a voyage in a non-physical or abstract space.

- You first of all need Knowledge about your current **position:** Where you are at any point of time, Knowledge about your position at two consecutive points in time is also necessary to measure change or rate of progress, hence to determine the effectiveness and adequacy of responses.
- secondly, you need knowledge about the target, destination, or **goal:** where you want to be when the voyage comes to the end, and thirdly, you need
- Knowledge about the **means**: about how you effectively can change your position in a desired direction and control the rate of progress.

The first and the second types of knowledge unfortunately, but necessarily require some kind of measurement, which raises the thorny question of whether and how safety can be measured? As (Reason, 2000) pointed out safety is measured by the consequences of its absence, and therefore not actually measured as such.

Safety, like risk, is a social construct (Searle, 1992). This means that it represents a set of ideas shared by a number of people: safety, truth, trust and resilience are other common examples of social constructs, since they have no obvious physical reality , unlike the Eiffel tower , which is there for all to see, touch, and ascend. A social construct cannot be measured and counted. **There is simply no unit for measuring safety, or safety culture and no meaningful scales conceivable**. For that reason alone measuring safety is a non-sense concept, it is not nonsense(see Chapter 5), but it does not make much or any sense. But there is also another reason. Namely the paradox that safety is defined by its absence rather than its presence by what happens when it is absent as pointed out by professor James Reason (Reason, 2000, p. 1). Thus, when an accident happens people are quick to conclude that it was due to the absence of safety or a lack of safety culture. *And it is obviously impossible to measure something that is not there*.

The word manage is, as so many other words in English derived from a Latin word (*manus)*, which means hand, and in everyday language having something in hand means being in charge of it and being able to control it, managing an incremental safety culture, therefore comprises what needs to be done to reach the defined goal state and to ensure it is sustained, once achieved so that the system is able to function as intended under expected and unexpected conditions alike and thereby fulfil its intended purpose, managing

an incremental safety culture also means ensuring there are as many acceptable outcomes as possible, and hopefully an increasing number as time goes by.

The third kind of knowledge is the most difficult, for physical voyages, such as driving a car along the M6, it is well known how to control the speed and direction of a car, because the necessary means have been designed for ease of use. But nothing comparable exists for a metaphysical safety culture voyage.

If we consider the two popular renderings of safety culture maturity (the HSE Culture Ladder in Figure 1 , and the DuPont Bradley curve in Figure 2) none of them supports all three types of knowledge. The HSE Culture Ladder, provides no way of determining which level you are at, which is obvious from the "definitions" of the five levels (Table 2). Their characteristics represent social judgements rather than operational criteria. Precisely the same goes for the DuPont Bradley curve (as described in Table 3.)Note that the contents of Table 3, modtly is a repetion of the contens of Table 2. The HSE culture ladder represents some original work, the DuPont Bradley curve is littkle more than a polularisation of that, and not even a good one.

The safety culture voyage

When safety culture is invoked as an essential part of explaining the presence of safety. The immediate question becomes, how it is possible to change or improve a safety culture, If safety as Reason pointed out is defined and measured more by its ***absence*** than its ***presence*** (Reason, 2000, p. 1.), and if safety culture is the basis for the presence of safety, the first question then becomes, how safety culture can be measured, and the second question how safety culture can be changed or improved.

Safety culture is commonly characterised by its level or degree of maturity, and improvements in maturity are described as a safety culture journey. The HSE Culture Ladder(Figure 1) depicts five discrete levels of safety culture named (pathological, reactive, calculative, proactive, and generative, respectively). Another and equally popular version is the DuPont Bradley curve (Figure 2), which depicts the improvement of safety culture through four stages called (Reactive, Dependent, Independent and Interdependent. The levels an dthe stages do not even have any names in common. Unlike the HSE Culture Ladder there are no recognised scientific publications to describe the theory behind the DuPont Bradley curve, and therefore no way of providing the three types of knowledge defined above. And neither describes how a company can determine at which level or stage it is, or how it can progress to the one following, which presumably is the intention in both cases.

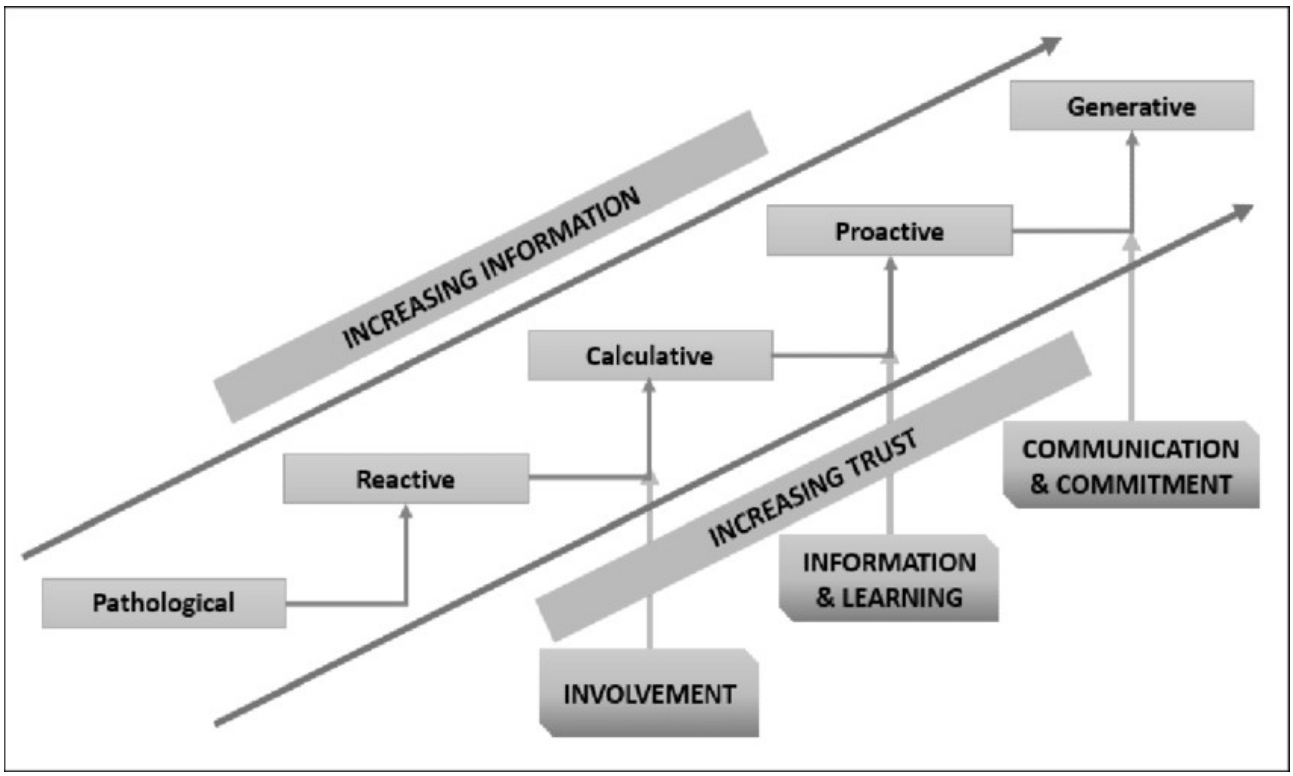

Figure 1: The HSE culture ladder (Hudson, 2007)

Table 2: The five levels of safety culture (Lawrie, Parker &Hudson, 2006)

Level of safety culture	Characteristic	Typical response to incidents/accidents
Generative	Safe behaviour is fully integrated in everything the organisations does.	Thorough reappraisal of safety management policies and practices.
Proactive	We work on the problems that we still find.	Joint incident investigation.
Calculative	All necessary steps are followed blindly.	Regular incident follow-up.
Reactive	Safety is important, we do much every time we have an accident.	Perfunctory investigation.
Pathological	The organisation cares more about not being caught than about safety.	No investigation.

Table 3: Characterisation of the DuPont Bradley curve stages for safety culture maturity.

	Safety culture strength			
	Stage 1	Stage 2	Stage 3	Stage 4
Safety culture facet	Reactive	Dependent	Independent	Interdependent
Attitude to accidents	Accidents are normal	zero accidents is unrealistic	Zero accidents is possible	Zero accidents is the goal
Safety Motivation	Absent:Laissez-faire	Comply with the rules	Look out for yourself	We need each other and we help each other
Motto	There is little we can do	Comply with the rules	Look out for yourself	
Responsibility	I am not responsible	Management is responsible	We are all responsible	We are responsible together
Activities /Measures	Up to the safety officer	Actions taken by management	What I do	What we do
Espoused values	Nobody wants safety	Management wants safety	I want to be safe	Safety matters for us all

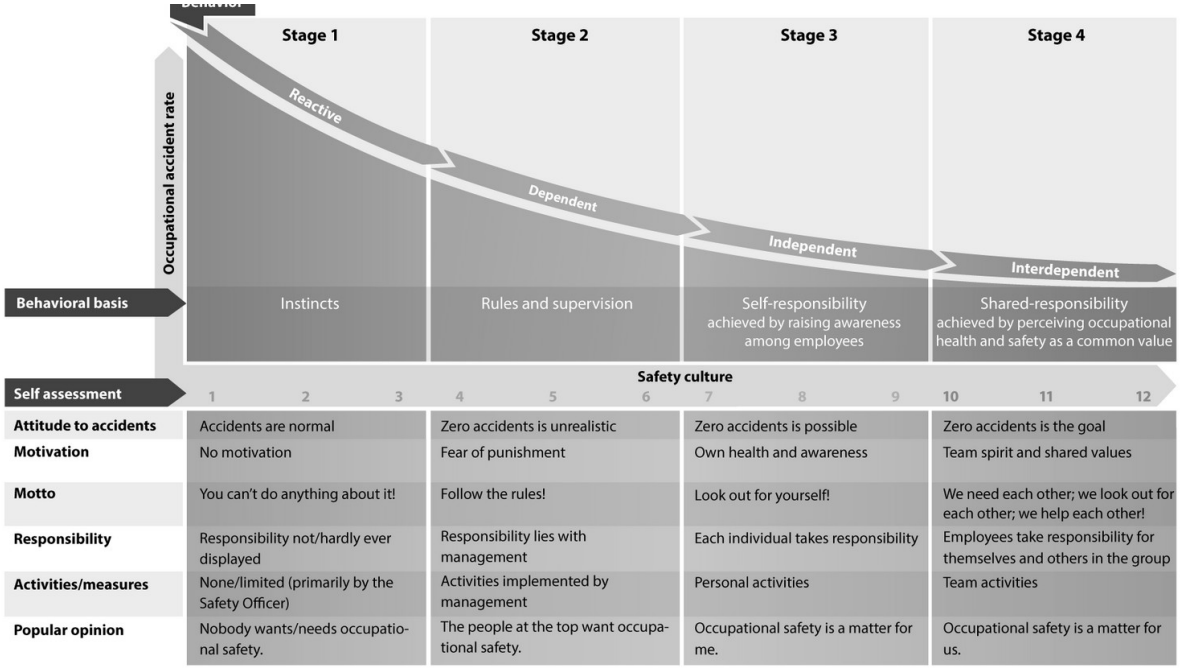

Figure 2: The DuPont Bradley curve

HSE Culture Ladder Myths

(Busch, 2017) published an article called "A Ladder on Quick Sand - A Critical View at the Safety Culture Ladder". In this he described five myths about the Safety Culture Ladder, although he failed to define what a myth is. A myth is basically "... an assumption is something that is taken for granted rather than verified." (Besnard & Hollnagel, 2014, p. 13).

The five myths were:

- **Myth 1**: Safety Culture is measurable. This myth is false. Neither safety nor safety culture are measurable
- **Myth 2**: Safety Culture is makeable. This myth is also false. Safety culture is a social construct as defined by (Searle, 1995), and as such it cannot intentionally be made. The five myths themselves are ironically made or constructed with nefarious purposes.
- **Myth 3**: There is ONE best Safety Culture. This is also false. Since safety culture is a social construct, each social collective or group within a company, and indeed each organizational silo (Hollnagel, 2020) will obviously have its own myths developed to correspond to the typical local working conditions.
- **Myth 4**: Safety Culture is homogenous. False again. No form of organizational culture can ever be complertely homogenous, with the possible exception of the legendary *esprit de corps* of the Napoleonic Grande armée or similar military units
- **Myth 5**: Certification is a Good Thing to do. False again. Certification provides a false sense of confidence. Certification is an efficiency-thoroughness trade-off (Hollnagel, 2009), where the certificate by being taken at face value makes a proper understanding superfluous and therefore reduces the amount of work.

(Busch, 2017) also mentioned yet another assumption about the Safety Culture Ladder, which effectively is a sixth myth in the same way as the five others, although it was not classified as one. Namely that the Safety Culture Ladder is a model. But a model is

> "... the representation of some aspects of the world by a more abstract system. In applying a model, the investigator identifies objects and relations in the world with some elements and relations in the formal system."
>
> (Coombs, Dawes & Tversky,1970, p. 2).

And the Safety Culture Ladder clearly does not meet these criteria. It is uncertain which aspects of the world the Safety Culture Ladder represents, and there are no defined relations, except the vague concept of maturity. Worst of all the Safety Culture Ladder does not allow predictions to be made as suggested already by Myth 2. ***If the model assumption had been proposed as a sixth Myth, it would therefore also be false.***

Figure 2 of the DuPont Bradley curvedoes show a curve of continuous reductions in the occupational accident rate as safety culture progresses through the four stages, but the curve itself is totally fictitious, simply because no company makes the continuous measurements of the occupational accident rate that the curve purports to represent. Neither are there any lower or upper threshold values or limits for the four stages. A company therefore has now practical way of knowing at which stage it is. The five myths mentioned above therefore apply to the DuPont Bradley curve inequal measure Neither the HSE Safety Culture Ladder (Figure 2), nor the DuPont Bradley curve (Figure 3) are actually models in a scientific sense (Coombs, Dawes & Tversky,1970, p. 2). They are both just attractive / seductive graphical renderings of the popular idea, that safety culture gradually can be made to mature through a number of distinct phases, either five levels or four stages but neither of them supports all three types of knowledge. In the HSE Culture Ladder, there is no way of knowing which level you are at, which is clear from the "definition" of the five levels (Table 1). The definitions represent social judgements rather than operational criteria. the same problem exists for the DuPont Bradley curve. Both renderings indirectly indicate a goal, which by default is either the fifth level (generative) or the fourth stage (interdependent) both of which sound plausible but neither of which are defined in any way. Being the last depicted element in both cases, they must therefore be assumed to be equivalent in some sense, even though they remain undefined and their names have quite different connotations. But just as they do not provide any way in which the current position can be determined, they also fail in accounting for **how** safety culture maturity can be improved. Figure 1 does include increasing information and increasing trust, but does not make clear whether these are the consequences of increasing safety culture maturity, or the causes. Neither "maturity model" therefore provides a practical approach to improve the maturity of safety culture. The DuPont Bradley "curve" does include the occupational accident rate, but that must surely be an effect of safety culture maturity. Otherwise it the raises the thorny question of how the occupational accident rate effectively can be reduced. Ninety years of intensive R&D has so far been unable to provide a solution to that. Whatever safety culture maturity is, it seems clear that it is not a simple function of something else, but a multifaceted phenomenon that cannot be brought about and managed by simple means, for instance, by leadership. Trivial or simple problems may possibly have trivial or simple solutions, but non-trivial or complex problems, such as safety culture maturity, invariably require non-trivial or complex solutions. Offering a simple solution, such as, leadership to a complex problem, such as safety culture maturity does not magically make the problem simpler, the only thing it does is practically guarantee that the solution will not work.

Two different safety cultures

While decremental and incremental safety are the names for the different approaches to achieve a state of safety "where there are as few unexpected and unacceptable outcomes as possible", decremental and incremental safety cultures are the names for the corresponding set of artefacts, assumptions, and espoused values which according to Schein (1992) constitute an organisational culture. Each of the two cultures can be characterised by some bullet points: For a decremental safety culture it is important to:

- **Maintain a steady focus on unacceptable outcome**s, count the number of failures and unsuccessful outcomes and publish them widely.
- **Be concerned with what could go wrong in the future. Investigate events in the simplest possible manner**, always trade-off thoroughness for efficiency, and do not try to communicate or confirm the lessons learned.
- **When something goes wrong, blame the people involved**, always those at the sharp end and, if possible, also those at the blunt end (designers, regulators, procedure writers, and responsible politicians).

The problem is, however not how to develop or sustain a decremental safty culture, but rather how to avoid it and instead develop an incremental safety culture, for which it is important to:

- **Ensure and support** a *visio centum* (or a 100%) mindset -- meaning the attitude that with diligence every act can in principle lead to acceptable outcomes
- **Work that goes well should be noted and repeated**: People should try to remember what they did, and share it with colleagues. Learning is about **what should be done**, rather than about what should **not be done.**
- Management must use **clear messages** and **encourage a common can-do spirit**.
- d**o not be afraid of trying new solutions**, *but remember to tell others about them so they know what to expect*. Be thorough and always act according to the conditions, and try to make the best use of resources and opportunities.

And further

- Encourage interpersonal discussions and feedback, for instance by using the Resilient Performance Enhancement (RPET),(Wahl, Stenmarker & Ros, 2022) (Martins et al.(2022) (Khattabi, et al., 2025).

Improving safety

As the safety paradox suggests there are no proven ways to increase the ***presence*** of safety – but there are several to increase the ***absence*** of safety. This is in no small measure due to the fact that there are few, if any, operational definitions of what safety is, just as there are many *accident models* but few if any *safety models*. This problem is conventionally solved by focusing on safety culture rather than safety, based on the unproven assumption that a better (meaning a more mature safety culture) means improved safety, fewer unexpected and unacceptable outcomes. This substitution, however, does not solve the problem because it disregards that safety culture is a **counterfactual condition**, and that safety culture maturity despite several elegant models cannot be operationalised (Hollnagel & Slater, 2025).

The absurdity of Zero Accident Vision (ZAV)

The zero injury targets is an expression of the current safety legacy and of, meaning the ideas and attitudes that shape the understanding of safety and especially of the Western salvation narrative (Dekker, Long & Wybo, 2014). According to the safety legacy Safety is paradoxically defined and measured more by its absence than its presence." (Reason, 2000, p. 1,) hence by acts that lead to unacceptable outcomes rather than by acts that lead to acceptable outcomes. Since accidents are unexpected events with unacceptable outcomes (losses, destruction, injuries), it is perfectly understandable that we, as individuals and societies would rather that threy never happrned. And the ideal is, of course that they never happen in an absolute sense. This will unfortunately only br possible if the world we live in is perfectly predictable, as assumed by the Bible (eccleciastes 1:9) or the eminent French mathematician Pierre Simon, marquis de Laplace. But the world we live in today is not perfectly predictable, if for no other reason than because of the vagaries of the human mind, amply illustrated by the 47th president of the US.. Even people who are less capricious still fall prey to The Law Of Unanticipated Consequences described by (Merton, 1936). So while it on the one hand is understansable that people and companies covet a Zero Accident Vision, it is on the other hand utterly absurd, and involves a Freudian denial of the self-created reality in which we currently are forced to live

The inevitability of Zero Accident Vision (ZAV)

Even though we may not want or desire the ZAV it is an inevitable consequence of the safety legacy, not least the Heinrich Dogma described below.The ZAV represent an absolute position. But even if you adopt a relativistic position, such as ***One Percent Safer*** (Sharman, 2020) (see also my comments about ”Safe And Safer”, below) you inevitably end by a Zero Accident position. The reason is simply that any approach that in accordance witj the Heinrich Dogma relies on steadily reducing the number of unexpected and unacceptable outcomes (a.k.a. accidents) will have zero accidents as the final goal regardless of whether the sought for decrement is in one percent steps or more ambitious. Regardless of what you do, and how you quantify the position from where you start will by derfinition represent 100%, and every step you take serves to reduce that. And it is inevitable that a repeated systematic reduction will lead to a state where there no longer is any chance, or risk, of unexpected and unacceptable outcomes. This is an inescapable logical conclusion, even if you pretend to disagree with the ZAV. *The only way to avoid that is to abandon the safety legacy and adopt an incremental safety position where you try steadily to increase the occurrence of expected and acceptable outcomes*. The underlying problem is that ***we are fooled by the language we use***: because the comparative term *safer* in practice means **less** unsafe rather than **more** safe, and that the efforts therefore serve to reduce the absence of safety rather than increase the presence of safety fully in line with the first safety paradox that ”Safety is defined and measured more by its absence than its presence.” (Reason, 2000, p. 1)

Counterfactual conditions

A counterfactual condition, is something, a factor or a condition (call it X), whose presence presumably might have prevented an accident from happening. (It is counterfactual because the accident that it hypothetically could have prevented **already did happen**. The reasoning goes like this ”if only X had been present or if only there had been more of X, or if only X had been better, then the accident would not have happened, commonly used examples in addition to safety culture are communication, trust, leadership, and

situation awareness. Counterfactual conditions are the favourite of self-anointed experts who in the aftermath of major calamities find it irresistible not to share their wisdom and insights with others.

Resilience to the rescue

At present the only viable alternative to the concept of safety maturity is resilience defined not as a quality in itself but as a characteristic type of performance, described below. Accepting that, the obvious next questions are: (1) how can the resilient performance of a system or an organisation be improved and (2) how can the level of resilient performance reliably be assessed. Both questions fortunately have concrete and practical answers. Resilience was initially defined as the antidote to brittleness. But it does not make sense to define anything by its opposite. It is more useful to define something by **what it is**, than by what it isn't. after some years of practical experience with resilience engineering and many futile attempts of relying on brittleness, the definition became:

"a resilient system is defined by its ability effectively to adjust its functioning prior to or following changes and disturbances so that it can continue its functioning after a disruption or a major mishap, and in the presence of continuous stresses." (Hollnagel, 2008, p. *x*). Resilience in this way becomes far more than overcoming brittleness and more than having the capacity for graceful extensibility. In the real world the ability to continue to perform as required under diverse conditions has more practical value than the ability not to collapse or break under pressure. This, immediately leads to the question of how the presence of this ability can be brought about and sustained. The answer to that was given already in (Hollnagel, 2008, p *x-xi*) It was then called four essential abilities these were later renamed the four cornerstones of resilience engineering (Hollnagel, 2009) and, to make the confusion complete, renamed again to become the four systemic potentials (Hollnagel, Licu & Leonhardt, 2021 & (Hollnagel, 2025)). The four abilities / cornerstones / potentials are:

- **The potential to respond**. In order to manage anything,or even just to exist it is necessary to be able to respond to whatever happens and to know both **what** to do and **when** to do it. This either requires that a set of responses already exists (and that the necessary resources are available) – or that a response can be developed before it is too late. An inability to respond can be fatal, whether it concerns two moving vehicles, two business initiatives on a potential collision course, or a rapidly spreading wildfire. A good example was the evacuations due to Greek forest fires in on the Island of Rhodes in the summer of 2023), to say nothing of the wildfires in Los Angeles at the beginning of 2025 another example is a new pandemic (such as Covid-19), or an outbreak of measles in an unvaccinated population all of which will eventually lead to a loss of control. Quite apart from that, no person or company likes to be in a situation where they cannot respond to what happens.
- **The potential to monitor.** In order to be able to keep an eye on what happens and be ready to respond quickly and effectively it is necessary to know what to look for (signals, signs, and symbols), (Rasmussen, 1983) to know **where** to look, and to know **how frequently to loo**k– which means knowing how to monitor (looking too often may be a waste of resources, not looking often enough may miss an important event or change). Although it sometimes may be possible to respond to unexpected events just as they happen, this strategy, known as "fire-fighting" is not viable in the long run.
- **The potential to learn**. Neither responding, nor monitoring can or should always happen in the same way. In most systems prepared or built-in responses are based on Work-as-Imagined embedded in a World-as-Imagined. Actual demands and conditions will always be different from what was imagined or experienced previously, mainly because internal or external conditions never are perfectly stable, it is therefore inadequate always to respond in the same way, and to rely on the same signals, signs, and symbols. It is a gain in efficiency paid by a loss of thoroughness. The only way to avoid this is by learning. Learning enables a system (or a company) to change how it responds to whatever happens or is required, by strengthening effective responses, by learning new responses, and by suppressing or eliminating ineffective responses. The purpose of learning is not the acquisition or accumulation of knowledge (or data or information, but the effects on performance, on the potential to respond – as well as the potential to monitor, and ultimately also on the potential to learn. Without the potential to learn, responses will be limited to a fixed and pre-defined set as in a standard procedure or set of instructions. Yet, always responding in the same way is only feasible if conditions **never**

change, if the world is fixed and perfectly stable. But that is impossible, as we all know. The same argument, of course, goes for monitoring. It is unwise to always rely on the same signs, indicators and measurements. Learning can furthermore not be limited to what **not** to do (avoidance learning). It is equally important, if not more so, to learn from what works well (reinforcement learning), in order to strengthen effective responses. Learning is necessary to make performance more efficient, as in the progression from knowledge via rules to skills (Anderson, 1980; Vicente & Rasmussen, 1988). The gradual automation of responses, the development of patterns, habits, and routines, and the recognition of important weak signals (Hollnagel, 2025) are essential parts of how performance becomes attuned to the prevailing conditions – with all the risks that such increased effectiveness and reduced thoroughness involve. Learning is a *sine qua non* for both monitoring and responding, *and ultimately also for learning itself*. A strategy for learning cannot be stable,but it must be heuristic and not algorithmic. Life is experienced backwards, but must be lived forwards, as the famous Danish philosopher Søren Kierkegaard pointed out.

- **The potential to anticipate**. Since the environments and surroundings in which work takes place and where companies exist never are perfectly stable, it is necessary to acknowledge both that they **can** change and also to imagine or think about **how** they may change, which means the potential to anticipate. Where monitoring focuses on the current situation and the near term developments, anticipation looks beyond the near term to the more distant future. It is, of course, difficult to predict what may happen in the future. ("It is difficult to make predictions -— especially about the future" because it is nearly impossible to know how other people think, and to predict what they may do and also because the rate of changes, even of physical phenomena may be too rapid to follow, and sometimes paradoxically also so slow that it is difficult for us to notice them, climate change illustrates that well. It is also necessary to consider which resources, skills, and competences a company will need in the future? This is necessary in order to ensure that responses remain possible also in the future. A simple example is that fires in Electrical Vehicles (EV), for instance, cannot be extinguished in the same ways as fires in fossil fuel vehicles, since both water and foam conduct electricity, that may possibly hurt the fire fighters. New extinguishing equipment and new working procedures are therefore required.

A different kind of journey

Safety culture maturity aside, it makes practical and ethical sense for most companies make to improve their safety, defined as *"a state where there are as few unexpected and unacceptable outcomes as possible"*. The solution should not repeat the mistake of safety culture and develop a corresponding resilient culture, although this unimaginative solution has been aired (human folly once again). The solution is to take a closer look at the four systemic potentials described above, and to develop ways to develop them, not individually but as a whole.The practical ways to do that have been described in Hollnagel, 2025 and (hollnagel, 2026) and need therefore not be repeated here. The Basic principles have also been described in (Hollnagel, Licu & Leonhardt, 2021) which is freely available from the skybrary (https://skybrary.aero/bookshelf/systemic-potentials-management-building-basis-resilient-performance.
Taken together the approach based on the four systemic potentials, hence an incremental safety culture, provides all three kinds of knowledge described above.

- Knowledge about the current **position** is obtained by a method of systematic assessment of eaxh of the four potentials.The outcome of these assessments can be described as a profile for each potential shown graphically by a radar chart. Figure 3.
- The **goal** can be defined as the desirable, if not ideal outcome of an assessment. It can also be illustrated by a radar chart showing the desired assessment outcomes
- And the **means** are provided by ensuring that the assessment questions are **formative**, in the sense that the answers directly or indirectly can be used to make decisions about how best to improve a potential, hence about how best to respond.

The questions that are used to assess the potentials, hence to gage the current level or stage of incremental safety culture must meet three conditions.They must be **specific** in the sense that they address issues that are important for a concrete company or organisation.

They must also be **diagnostic** and point to details of a potential that are meaningful to assess. And they must finally be **formative** – meaning that the answers directly or indirectly can be used to make decisions about how best to improve a potential, hence about how best to respond. Questions that only evoke binary answers or degrees of acceptability are therefore of limited operational value, and such questions must therefore be avoided. Change management cannot be based on opinion polls, except perhaps in politics.

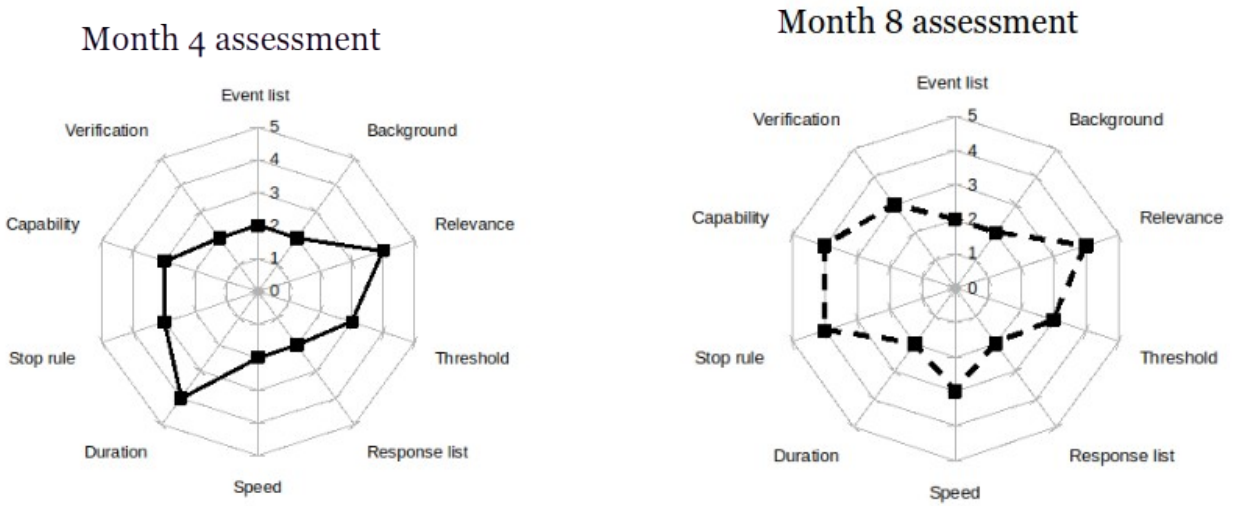

Figure 3: Radar chart profile for the assessment of a systemic potential (rerspond)

The four potentials also make it possible to define a systematic progression (or journey from a decremental safety culture to an incremental safety culture, where the former is defined by the four potentials being weak or absent while the latter is defined by the four potentials being strong or present (this progression is shown in Figure 4.

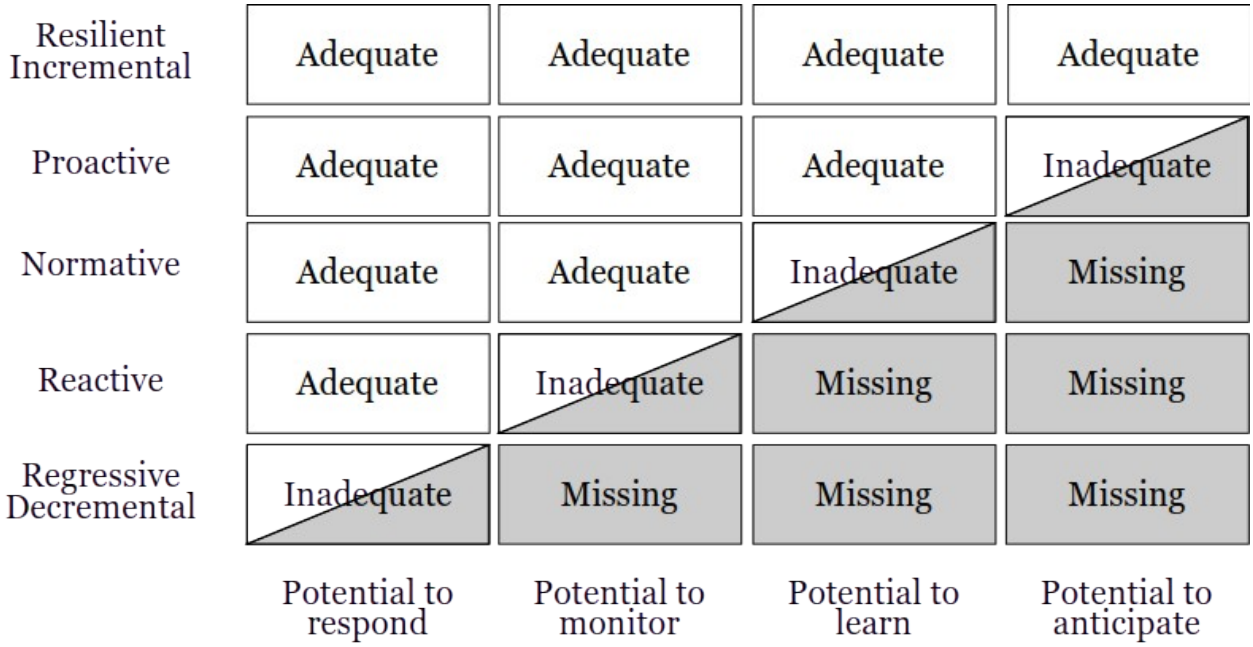

Figure 4: An incremental safety culture journey

Safety culture RIP

The arguments presented here have, hopefully, made it clear that safety culture and the safety culture journey, the attractiveness of these concepts notwithstanding have little, if any, practical value. They do fullfil an obvious psychological need and provide the illusion of practicality. Here the following quote may be appropriate:

"The anticipated utility of the safety culture concept can possibly be judged by its apparent popularity and its relatively rapid adoption by managers, regulators and academics. *This popularity, however, may be more a reflection of effective marketing than of scientific development.*" (Cox & Flin, 1998, p. 197, emphasis added).

There is undoubtedly a need of practical ways to achieve a state of safety, in public and private enterprises alike. The assumption that safety culture as a monolithic solution can do that is so far unproven, although not for the lack of trying. To the extent evidence is needed it is amply provided in the special issue about safety culture by the journal Safety Science (Hale, 2000, p. 1-14). The popularity of safety culture may, as Cox & Flin, 1998) concluded be due more to effective marketing than to proven effectivenes. Incremental safety culture differs from the commonplace safety culture by having a firm theoretical foundation in resilience engineering, hence not being a counterfactual condition and will therefore (hopefully) fare better when it meets real world practical problems. *Qui vivra, vera.* The experiences so far (Hollnagel & Slater, 2026) indicate that.

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