Review

The Emperor has no clothes: A critique of Safety-II

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ABSTRACT

Relatively new to safety, Resilience Engineering (RE) is known by various pseudonyms: Safety-II, Human & Organizational Performance (HOP) and Safety Differently. Collectively termed New-View, they have created a stir amongst OSH practitioners by challenging them to view key areas of occupational safety in a different way: [1] how safety is defined; [2] the role of people in safety; and [3] how businesses focus on safety.

When subject to critical scrutiny, New-View's major tenets are shown to be a collection of untested propositions (ideas, rules, and principles). New-view's underlying RE philosophy is predicated on repeatedly testing the boundary limitations of systems until a failure occurs, which paradoxically requires more risk controls that create the very problems New-View criticizes and attempts to address – constraints, complexity, rigidity, and bureaucracy. This continuous threat-rigidity cycle indicates New-View's *raison d'etre* is somewhat circular. New-View entirely lacks any new associated practical methodologies for improving safety performance: it uses traditional Safety-1 methodologies to tackle actual safety problems. Moreover, no published, peer-reviewed empirical evidence demonstrates whether or not any aspect of New-View's propositions are valid. Currently we don't know how, or if, New-View improves safety performance *per se*, or if it reduces or eliminates incidents/ injuries. The extant Safety-1 literature suggests that New-View's propositions lack substance. The inescapable conclusion, therefore, is 'the emperor has no clothes' and that ideology and emotion has triumphed over science and practice. It is also clear that the OSH profession has an immense crisis of ethics across its entire landscape.

1. Introduction

The OSH world is changing. Over the past decade, new theories have been proposed and marketed to OSH professionals by safety scientists. In turn, these are influencing 'real-world' safety interventions based on faith in the efficacy of safety science, and the credibility of the scholars involved, rather than on field studies providing experimental evidence of the utility of such theories. Some of the new theories colloquially known as 'New View' predicated primarily on Resilience Engineering, have caused considerable controversy around the globe within the practitioner community.

To the author's knowledge, there has never been an academic challenge to the 'New View' theories, and/or their associated propositions. This manuscript aims to fill that void, and is intended solely to stimulate an academic debate, that hitherto has been notable by its absence. As such, the manuscript is very much a 'position paper' or 'viewpoint' based on scrutiny of the propositions put forth by 'New-View' advocates when promoting it into industry (e.g. Gant, 2017; Green, 2018).

The manuscript is structured to [a] provide a relatively brief

background to 'New-View'; [b] explore it's specific propositions; [c] examine its scientific underpinnings; and [d] the motivations behind its rise; and, [e] How traditional Safety-1 and New-View might be reconciled or at least co-exist in harmony.

2. Background to new view

Scholars (Gilbert et al., 2018) often call for new safety science theories, models, and approaches to better facilitate OSH incident/injury prevention. Resilience Engineering (RE) derived from or paralleling (Cantu et al., 2021; Haavik, 2021) Normal Accident Theory (Perrow, 1999) and High Reliability Organisation (HRO) work (Roberts, 1989; LaPorte & Consolini, 1991; Bea & Roberts, 1995), was thought to offer (Hovden et al., 2010) different perspectives to supplement and improve traditional approaches to OSH incident/injury prevention (termed Safety-1) which is defined as 'ensuring freedom from danger, risk or injury' (Vaughan, 1996). Subsequently, a proliferation of published resilience papers (Cantu, et al., 2021), with associated RE approaches burst into the OSH practitioners landscape: [a] Safety-II (Hollnagel, 2014a); [b] Human and Organizational Performance (HOP) (Conklin,

Table 1
Safety-1 versus New-Views propositions.

Features	S-1	S-II	HOP	SD
How safety is defined				
Freedom from Danger, Risk and Injury (e.g. Vaughan, 1996)	X			
Ability to succeed under expected and unexpected conditions alike (Hollnagel, 2013)		X		
The presence of defences (Conklin, 2012)			X	
The presence of positives not the absence of negatives (Dekker, Cited in Provan, 2017)				X
Purpose				
Focus on injury / incident reduction (OED, 2020; MHSWR 99, Conklin, 2012; Gantt, 2017)	X		X	X
Prevention of Harm (MHSWR 99; Conklin, 2012; Proven et al. 2020)	X		X	X
Management of Risk (explicit (e.g. MHSWR 1999) and implicit (Bergström, et el., 2015))	X	X		
Understanding the impact of work systems on behaviour (e.g. MHSWR 1999; Conklin, 2012)	X		X	
Creating more resilient systems (Hollnagel, 2013; Baker, 2019; Proven et al., 2020.)		X	X	X
Focus on the presence of positive capacities (Hollnagel, 2013; Conklin, 2012; Gantt, 2017)		X	X	X
The role of people in safety				
Employee Engagement (e.g., OSHA Act 1970; Hollnagel et al., 2013; Conklin, 2016; Proven et al, 2020)	X	X	X	X
People are the Solution (e.g. MHSWR 1999; OSHA Act, 1970; Hollnagel, 2014a; Conklin, 2012; Gant, 2017)	X	X	X	X
People can be the Problem (e.g. Heinrich, 1931)	X			
Business Focus				
Safety Structures (e.g. MHSWR 1999; BS 18001; ISO 45001)	X			
Bureaucracy of safety (Laurence, 2005; Dekker 2014)	X			X
Promote relationships and not transactions (OSHA Act 1970; Green, 2017; Proven et al., 2017)	X	X	X	X
Safety Culture (IAEA, 1991; HSE, 2005; BSEE, 2013)	X			
Organisational Culture (Baker, 2019; Proven et al., 2020, pp 7)		X	X	X
Manage Complexity (Dekker, 2006; Rankin et al., 2014)		X	X	X
Decentralise decision-making power to workers (Proven et al, 2020, pp 1)		X	X	X
Lean Management Systems (Schafer et al, 2008; Conklin, 2012; Rosso & Saurin, 2018)		X	X	X

2012); and [c] Safety Differently (SD) (Dekker, 2015).

With similar underlying philosophies and an oblique safety focus, these are collectively termed 'New-View' as each believes a focus on the absence of danger, risk and injuries is insufficient (e.g. Conklin, 2012; Hollnagel, 2013; Dekker, cited in Provan, 2017). Rather, they tend to focus on the presence of positive capacities within a RE paradigm, termed Safety-II (Hollnagel, 2014a; Provan et al., 2020). Pillay (2017, p150) states '*RE is concerned with operating as close as possible to the boundaries of failure as part of normal work*' a philosophy diametrically opposed to the traditional 'defences-in-depth' principles of Safety-1 (Reason, 1990).

2.1 Hollnagel (2017, pp4) states Safety-II is concerned with ensuring that 'as many things as possible go right'. The Functional Resonance Analysis Method (FRAM) is used to identify and describe essential system functions, characterise the potential variability of the functions, define the functional resonance based on dependencies and couplings among functions, and identify ways to monitor the development of resonance either to dampen variability that may lead to unwanted outcomes or to amplify variability that may lead to wanted outcomes. Hollnagel & Poulstrup (2012) stated, "*Safety-II is not a new discipline or a new practice but rather a new perspective on what happens and how it happens. The new perspective provides another way of looking at events, how they are analysed, and how the results are interpreted*". The Oxford English Dictionary defines 'perspective' as "a particular attitude toward something; a way of thinking about something", which in Safety-IIs case is '*looking at how and why things go right, rather than go wrong*" (Hale, 2014, pp1).

2.2 Baker (2018) states "*Neither a process nor a program, HOP is a movement towards using the social sciences to better understand how to design resilient systems'*. Unpacking this statement via the Oxford English Dictionary (OED) shows 'process' is defined as "*A series of actions or steps taken in order to achieve a particular end*" and a 'program' as "*A set of related measures or activities with a particular long-term aim*". Baker (sic) is, therefore, categorically stating 'HOP has no defined steps to achieve a particular end (i.e. design resilient systems), and neither does it have a set of related measures or activities to design resilient systems". The OED definition of a 'Movement' is "*A group of people working together to advance their shared political, social, or artistic ideas*". A reasonable interpretation of Baker's statement, therefore, is that HOP is "*solely about a group of people advancing shared ideas to design resilient systems'*.

2.3 Gantt (2017, pp 5) states "*SD is not an individual process or tool that organizations can tack on to their existing organizational programs. SD is more of a mental model or a way to see the world*." In the OED psychology dictionary, a mental model is defined as "*An internal representation having—in some abstract sense—the same structure as the aspect or portion of external reality that it represents*". Such representations are, however, necessarily incomplete structural analogues of the world (Johnson-Laird, 1983). Mental models concern a *system* and they serve the purpose of *describing, explaining, and predicting the behaviour of that system* (Rouse & Morris, 1986). As such, SD should be able to provide testable hypotheses by which safety scientists can empirically scrutinise the efficacy of New-View.

2.4 It is very clear that none of the New-View proponents articulate a clearly defined set of practical processes, methods, tools, activities or combinations thereof, by which to improve safety *per se*. All appear to be solely concerned with sharing ideas and propositions based on their author's mental representations of the industrial and academic safety world. The big question, therefore, is whether or not any of New-View's *ideas* have merit for improving 'safety' or reducing incidents and injuries.

2.5 Table 1 provides a list of the common propositions put forth by New-View advocates in their published texts. These are compared to a Safety-1 perspective by the author to identify convergence and divergence between the two without regard to their merits or otherwise. Table 1 was constructed by using the headings of New-View advocates challenges (*How safety is defined, the role of people in safety, and, the business focus*), for structure. Within each of those headings, the specific propositions were gleaned from published texts by New-View advocates.

New-Views <u>common</u> propositions include, but are not limited to; [1] redefining safety (Hollnagel, 2014b; Conklin, 2012; Dekker, cited in Provan, 2017); [2] creating more resilient systems (Hollnagel, 2013; Baker, 2019); [3] focusing on the presence of positive capacities (Dekker, 2015) or what goes right (Righi et al., 2015); [4] rejecting the idea people can be a problem in safety (e.g. Conklin, 2012; Dekker, 2015, pp vi; Gantt, 2017); [5] a focus on organisational culture not safety culture (Henriqson et al, 2014; Proven et al., 2020); [6] managing complexity (Rankin et al., 2014); [7] decentralising safety decision-making power to workers (Dekker, 2020, pp3; Proven et al., 2020, pp 1); and [8] developing lean management systems (Schafer et al., 2008; Conklin, 2012; Rosso & Saurin, 2018). Collectively, these propositions help to

distinguish New-View from Safety-1 in both science and practice. It is notable, however, that Safety-1 and New-View propositions coincide on [a] employee engagement, [b] viewing people as the solution, and [c] promoting relationships between people (these tend to be features of National OSH regulations (e.g. OSHA Act, 1970; MHSWR 1999)).

2.6 Hollnagel (2016) doesn't consider Safety-II as New-View, because RE is an alternative or complement to safety *per se*. Hollnagel (2020) also states SD isn't New-View, as one of its objectives is injury reduction. HOP is avowedly New-View, while *advocates* of RE (Safety-II) and SD promote them both as New-View.

2.7 Embedding itself into organisations, including OSH regulators (Australian, British, Dutch, and New Zealand), without any supportive peer-reviewed scientific evidence that it reduces adverse events or injuries, it is uncertain whether New-View's propositions are valid for improving actual safety performance. *De facto*, therefore, the New-View debate is about the central purpose and focus of OSH research and practice: is it injury / incident reduction, or making *organisations* more resilient? Some may argue both can be done simultaneously, because injury reduction could be the result of improving resilience, but Pillay (2017, pp149) shows this has not been the case over the past decade.

3. Responses to specific New-View challenges

Gantt, (2017) and Green, (2018), both ardent New-View advocates have challenged orthodox OSH thinking in three key areas: [1] how safety is defined; [2] the role of people in safety; and [3] how businesses focus on safety. Within each challenge, Gantt, and Green have collectively put forth and promoted, four explicit New-View propositions. The author has presented their propositions in Table 2 to structure this section of the manuscript.

3.1. New-View challenge 1: How safety is defined

Definitions are important (Flowerdew, 1992) in scholarship, pedagogy, and practice as they provide the lens or framework to perceive objects or concepts, which in turn influences the methodologies and resources required for enactment and assessing progress.

3.1.1. Safety is defined as '*The condition of being safe; freedom from danger, risk, or injury*' (The American Heritage® Dictionary of the English Language). Safety-1, therefore, is concerned with ensuring freedom from precursors (danger, hazards, risks) exposing people to, or triggering, an adverse event (incident) that causes harm (injuries, fatalities, property damage), to ensure the condition of being safe (people and assets are *protected* from or not exposed to danger, risk or harm). As such,

Table 2
New-View's central challenges to the OSH profession and their rationale (Gantt, 2017; Green, 2018).

How safety is defined	The role of people in safety	How businesses focus on safety
Safety is the presence of positives not the absence of negatives. Absence of accidents does not indicate presence of safety.	People create success far more often than they are involved in failure. New-view recognises difference between work as done and work as planned.	Safety is an ethical responsibility not a bureaucratic activity. Systems should manage safety not liability.
Serious incidents are preceded by long periods of accident free operation.	New-View allows mature conversations around risk to occur.	Lean management systems enable effective risk management.
Safety must be about capacity to adapt, tolerate change, be resilient and recover.	New-View recognises people are a source of innovation and insight.	Systems should be designed to promote relationships, not transactions.

the purpose of Safety-1 is 'the prevention of harm' or 'ensuring freedom from danger, risk or injury' (Vaughan, 1996), views explicitly intended by OSH regulators to force companies during their everyday activities to try and avoid causing harm to people and/or assets.

3.1.2. Safety-II: Hollnagel & Woods (2006) *assert 'safety is not a system property'* as safety is something a system delivers or an organisation does, rather than something a system or an organisation has'. Hollnagel (2013) subsequently stated Safety-II concerns 'working safely' rather than safety, as the latter is an epiphenomenon (a secondary effect or by-product that arises from but does not causally influence a process), because it is marked by the absence of danger, risk, incidents, and injuries. Hollnagel (2014b, pp24) further asserted the use of the term 'safety' should be restricted solely to incident and injury aetiology.

Urging the entire OSH profession to focus on ensuring safe operations or safe working in expected and unexpected conditions, not just on incidents, injuries, or other negatives, Hollnagel argues RE (Safety-II) should be applied to work systems, operations, processes, and behaviours to ensure people succeed in working safely. The objective is to understand a system's performance variability, and why things go right, rather than only why they sometimes go wrong (Righi et al., 2015). A resilient system can adjust its functioning before, during, or following events (changes, disturbances, or opportunities) and thereby sustain required operations under both expected and unexpected conditions (Fairbanks et al., 2014). REs implicit raison d'être is risk management (Bergström et al., 2015). Safety-II, therefore, considers itself a form of resilient risk control shifting the OSH focus from reactive analytic techniques, to proactive adaptive and co-adaptive models & measures helping to anticipate and identify where any disturbances or sources of variability are within a process. Safety-II asserts new ways of measuring & monitoring systems, and intervening to improve safety, arise from focusing on, and building on, the presence of successes within a given process (Hollnagel et al., 2015). Logic dictates, however, that focusing on what goes right, also presupposes a corresponding understanding of what goes wrong (i.e. the what, the where, the when, the who, the how, and the why) (Haavik et al., 2019).

Originating from the Latin *resiliere* which means to bounce back, or resume a former position or structure after being stretched or compressed, 'resilience' is defined as the '*capacity to recover quickly from difficulties*'. Hollnagel (2014b) explicitly defined Safety-II as '*the ability to succeed under expected and unexpected conditions alike, so that the number of intended and acceptable outcomes (in other words, everyday activities) is as high as possible*'. However, this is more akin to defining *how* to achieve a goal (Locke & Latham, 1990), as the operative word '*ability*' is defined as '*possession of the means or skill to do something*'. Safety-II as currently defined, therefore, refers to '*the means or skill to succeed……etc.*'. Straying far from *resiliere*, no mention is made of safety systems bouncing back or returning to original positions. Hollnagel regularly changes his Safety-II definitions, although they all emphasise that resilience is the ability to adapt or absorb disturbance, disruptions, and change (Bergström et al., 2015).

Similar to the safety culture construct (Vu & De Cieri, 2014), it's apparent the entire RE concept is nebulous (Pitera & Goodchild, 2009; Bosher, 2014), and hence open to multiple interpretations (Righi et al., 2015). Partial explanations for its nebulous nature might reside in the presence of four target domains for system resilience (Hosseini et al., 2016): organisational, social, economic, and engineering, each of which contain multiple competing definitions. Where OSH sits in this RE schema hasn't yet been determined, but aspects likely reside in all four domains (Jilcha, & Kitaw, 2017). Certainly, Safety-II definitions do *not* speak directly to [a] safety management; [b] the management of safety; [c] safe working; or [d] working safely. Hollnagel seems content to entirely replace the concept of 'safety' with RE, or at least disassociate safety from RE. Safety-II appears to be a stepping stone or device for RE to become a formal discipline, leaving the baggage of the past behind (Hollnagel, 2016). Reminiscent of 1980s thinking (Wall, 1984), in 2020 Hollnagel announced the next step as 'Synesis' (http://ehscongress.com,

Apr 2020), whereby safety, quality, and production is merged into one integrated management system.

With definitional confusion reigning across multiple RE domains, Woods (2015) grouped 'resilience' around four basic concept labels: (1) as rebound from trauma and return to equilibrium (i.e. *resiliere*); (2) as a synonym for robustness; (3) as the opposite of brittleness (as graceful extensibility when surprise challenges boundaries); and (4) as network architectures that can sustain the ability to adapt to future surprises as conditions evolve. Similarly, Righi et al. (2015) highlighted constructs like robustness, capacity, ability, flexibility, adjustments, improvisation, adaptation, stability and variability needed defining: they argue a lack of well-defined constructs is a drawback for field research. RE, therefore, is still very much in its infancy where attempts to sell the ideas and legitimise the concept are underway, although some evaluation & augmentation is ongoing via critical reviews (Reichers and Schneider, 1990).

3.1.3. Human and Organisational Performance (HOP) originated in the US Nuclear industry using HRO principles, with Human Error treated as the starting point for pre-accident analyses of system factors (Conklin, 2012) to overcome any potential normalization of deviance in work activities (Vaughan, 1996). Adopting defences-in-depth principles (Reason, 1998, 2016) to manage risk by introducing multiple layers of control (Lyon & Popov, 2020), HROs work to reduce errors and keep them small: '*fail safely and often*' is the mantra. The hallmark of HROs is not they are error-free, but errors do not disable them (Nuclear Regulatory Commission, 1979; DOE, 2009). HOP defines safety as the '*presence of defences*', with more defences added in response to an adverse event.

When problems arise, HOP focuses on identifying system weaknesses, not operator errors, by looking for situational Human Error traps (Petersen, 1980; Reason, 1990; Cooper & Findley, 2013) and removing them or building defences against them before they lead to a problem or incident (Bea, 2002). Consistent with safety culture research (Cooper, 2016), HOPs focus is on optimising systems and situations to optimise behaviour. Although HOP embraces RE, it does not fully follow exhortations to focus on positives *per se*, as Conklin asserts a system must have the capacity to fail safely (after Daley, 1962), then recover (i.e. *resiliere*), then learn (Miller, 1954; Nuclear Regulatory Commission, 1979; Hale, Wilpert & Freitag, 1997). HOP parallels earlier Human and Organizational Factors (HOF) work by Robert Bea (1998; 2002) in the world-wide Oil & Gas industry, combined with standard practices contained in DOEs (2009) performance improvement handbook.

Little is written about HOP academically; most information is available from third-party *marketing* websites. Latterly, HOP has morphed, as proponents state it's explicitly based on Schein's (1990) interpretive organisational culture model, whereby '*HOP is a group of principles (or organization beliefs) that shape our programs, tools, behaviors, and language. We are looking to adjust the organization's shared beliefs around blame, error, the definition of safety, the role of the worker, complacency, risk normalization, contextual influence, failure, the importance of learning from normal work (…and the list goes on) with the end goal of creating more resilient systems*' (Baker, 2019). Critically, Schein's (1990) culture model has no empirical evidence to support its criterion-related validity in the OSH domain (Cooper, 2016; Cooper et al., 2019).

3.1.4. Safety Differently (SD) rejects the notion of Human Error as incident causation, viewing them as symptoms of system problems affecting Human Factors (Dekker, 2006). Contrasting old and recent views of Human Error, Dekker highlighted: how safe or unsafe complex systems are, the role of people operating within complex systems, and how people should be viewed as a resource instead of a problem. In 2012, specifically blaming the bureaucratisation of safety (Westrum, 1993; Dekker, 2014) and compliance requirements for the plateau of safety incidents in three organisations, Dekker coined and trademarked the term 'Safety Differently' (Dekker, 2015). Based on Hollnagel's (2014) premise 'the presence of positive capacities can help assure a system's continued functioning even under varying circumstances so

that the number of intended outcomes is maximised', Dekker defined SD as '*the presence of positives not the absence of negatives*' (cited in Provan, 2017). Dekker's explicit examples of positives: [1] the ability to say 'no' in the face of acute production pressures (the promotion of a stop-work authority (Kleinman, 1984; Pearse & Refshauge, 1987), a right underpinned by OSH regulation (EEC, 1989), and promoted in many companies); [2] the willingness of superiors to hear bad news and the acceptance & encouragement of dissenting views (Edmondson, 1999); and [3] the commitment to learning and the restoration of trust and relationships if vulnerabilities & problems have been identified (Reason, 1998).

3.1.5. New View Proposition: Safety is the presence of positives not the absence of negatives.

Traditionally, Safety-1 has evaluated the effectiveness of safety systems and/or interventions by monitoring lagging 'after the event' measurements such as injury/ incident rates (Lingard et al., 2013). This is partly due to: regulatory requirements (HSE, OSHA); monitoring the effectiveness of risk controls; providing lessons-learned to avoid future repeat events; facilitating the trending of salient issues over a number of years; and providing real-time monitoring of the safety culture (Biggs et al., 2010). Thus, incidents are used to locate and fix negative aspects of safety to improve the system.

Regardless of focusing on positive capacities or negative features of the same system to prevent adverse events, the end result is often the same, but a focus on analysing the positives (what goes right) takes longer (Vesely et al., 1981). Importantly, it is not possible to determine if things went "right" with respect to safety without defining what "going right" means with respect to hazards or accidents, i.e., "going wrong." (Leveson, 2020). It's also easier for people to agree what 'failure' is in any given context, rather than what constitutes 'success' or a positive capacity (Guillaume, 2011).

New-View advocate's emphasis on the presence of positive capacities is predicated on the assumption these predict safety performance. Positive Performance Indicators (PPIs), used in the Australian construction industry since 1994 (Shaw, 1994; Mitchell, 2000; NOHSC, 2002), measuring organisation process actions taken to manage and improve OHS performance, show these assumptions are incorrect. This is primarily due to PPIs tending to measure OHS processes, but not safety performance *per se*. This means reliable linkages between PPIs and safety outcome measures are rare (Simpson, 2006; Biggs et al., 2010).

Similarly, a focus on 99.9% of an organisation's successful activity (*the presence of positives*) still leaves a 1:1000 error rate to contend with. Leape (1994) cites Deming (Nov 1987) who stated "*If we had to live with 99.9%, we would have two unsafe plane landings per day at (Chicago) O'Hare, 16,000 pieces of lost mail every hour, and 32,000 bank cheques deducted from the wrong bank account every hour*". From a different perspective, in 2019 there were approximately 125 million American workers of which 0.000000008% of the workforce (5,333) suffered a fatal injury (bls.gov). If 99.9% of workers (i.e. *positive adaptive capacity*) remained unharmed it would mean 125,000 American workers *could* have suffered a fatality. This illustrates that a focus on the negative can pay huge dividends (i.e. potentially 119,667 less deaths than there actually was). Donchin et al. (2003) reported an 1.7 error rate per intensive care unit patient per day, one-third of which could have led to the patient's death (in the US this equates to 5 m patients annually X 1.7 = 8.5 m errors/33% = 2.85 m errors with a potential for a patient death: Society of Critical Care Medicine, 2021). Such ratios illustrate the vast scope for error residing in the remaining 0.01% from focusing on what goes right 99.9% of the time: they also illustrate a positive focus is not necessarily going to reduce incident rates, and also undermine the idea that safety is solely the presence of positives. Certainly, even when the vast majority of things are going right, it only takes a few small system features to go wrong, combined with people's ineffective behaviour (Meng et al., 2019) to destroy a facility, crash an airplane, or sink a vessel (Reason, 1990).

New-View advocates explicitly state we should expect and accept

incidents are part of the system (DOE, 2009), learn from them when they happen (Beckman, 2017), and try to stop a repeat in the future (Rasmussen, 1990). New-View proponents, therefore, appear to fully subscribe to Perrow's (1999) thesis that normal or system accidents cannot be prevented due to complex interactions (Perrow, 1994) and tight coupling (Perrow, 1984). On this basis they are urging the global OSH profession to stop monitoring and using incidents / injuries as safety metrics at all (Dekker, cited in Provan, 2017). It appears New-View advocates favour reducing a system's complexity and loosening the coupling amongst associated subsystems by building additional capacity (redundancy, organisational learning, mindfulness) into the systems using High Reliability Theory principles (Roberts, 1990) rather than assessing risks and dealing with them via the hierarchy of control (Marais et al., 2004). Hence, New-View advocates focus on the presence of adaptive capacities: the more there are, the safer the system is thought to be. Unfortunately, this tends to downplay the importance of also focusing on the presence of negatives (Simpson, 2006; Biggs et al., 2010). Balancing the presence of positives capacities and negative adverse events is an issue previously addressed via the adoption of both leading (presence of positives) and lagging (the presence of negatives) indicators (e.g. HSE, 2001).

3.1.6. New View Proposition: Absence of accidents does not indicate presence of safety.

New-View advocates emphasis on positive capacities is partly based on their proposition 'the absence of incidents and/or injuries does not indicate the presence of safety'. This implies incident/injury absence is: [1] by chance, not intention; [2] due to suppressed reporting (Clark & Robertson, 2008); [3] because, relatively speaking, they are rare events (Benner, 1978).

The absence of incidents does not automatically mean there is an absence of safety either: '*trust and verify*' approaches could be adopted to test the efficacy of any safety arrangements (Galloway, 2020). Safety-1 legislation certainly tends to promote proactive searches for hazards and risks (negatives), and the completion of corrective or preventative actions before they cause an incident/injury (Cooper, 1998). Incident/injury absence would suggest the entity is proactively doing the right things, assuming adverse events are not being hidden.

New-View advocates suggests they differ by looking at the whole task to understand: [a] where a risk comes from, [b] what pressures the risk sources exert on workers, and [c] how to manage task complexity (Dekker et al., 2011). This is equivalent to Safety-1's Risk Appraisal, Assessment and Evaluation approaches (Bea, 2002) promoted by regulators (Brazier et al., 2000; Gadd et al., 2003). Moreover, identifying and dealing with hazards & risks is positive for workers (Cooper, 2018). As such, assuming the presence of reporting, an absence of incidents / injuries by definition has to be a positive (Hickson, 1976).

Of fundamental importance to this debate, perhaps, is that New-View advocates have failed to state which measures might be used to indicate the presence of safety to replace incidents and injuries (Dekker et al., 2008). Measures derived from a FRAM (Raben et al., 2018) in healthcare showed that of 40 sources of system variations, 39 were related to staff behaviours, suggesting that FRAM views 'behaviour(s)' as a system component, and seeks to identify their influence on the wider system. Organisational Behaviour Management (OBM) is a proven process for addressing behaviours in a wide range of settings (Stajkovic & Luthans, 1997). OBM essentially seeks to determine the impact of the system on behaviour, and address both system issues and the behaviour. Numerous industrial / occupational safety OBM studies use the percent-safe score (Cooper, 2009), which is derived from direct peer-to-peer observations of safety behaviour in the workplace. However, although the 'percent-safe score' is a proactive and positive leading indicator that is used by workers to adjust their safety behaviours it is not a substitute measure for injuries, as injuries can still occur, despite such interventions. Any proxy measure that is not directly measuring incident/injuries will be exactly the same. Traditional lagging indicators focused on incidents/injuries, therefore, are still required.

3.1.7. New View Proposition: Serious incidents are preceded by long periods of accident free operation.

New-View emphasises that long periods of injury-free operation precede many serious incidents, implying there are insufficient warning signals from focusing on the presence of risks and danger. Although warning systems can never be 100 percent reliable (Sorensen, 2000) there are always signals (near-misses): it's a case of knowing what to look for from those available (Sonnemans & Körvers, 2006). Importantly, New-View advocates usually conflate the visible precursors for major process safety incidents (e.g. Texas City, Macondo) with those for personal injury incidents. As stated by Hale (2002), '*major incidents can sometimes be predicted by minor incidents, but not always; there are always precursor signals (close-calls and deviations) of major incidents; and not all minor incidents could result in major incidents. Many Serious Injuries & Fatalities /catastrophes are unique and singular events, having multiple and complex causal factors that may have organisational, technical, operational systems or cultural origins*'. All four of these factors, for example, were involved in Texas City and Macondo, indicating the multi-faceted nature of Serious Injuries & Fatalities (SIFs) and *industrial* catastrophes.

Leading indicators (visible leadership behaviour, employee involvement, behavioural percent-safe scores, corrective action rates), in conjunction with lagging indicators (near-miss reports, incident statistics) have been around since the 1970/80s (Hollister & Trauth Jr, 1979) to provide numerous signals about the presence and quality of safety (Harms-Ringdahl, 2009). To develop meaningful Performance Indicators, an entity must clearly understand: [a] what it is currently doing and why; [b] how effective those *current* efforts are at influencing the desired performance; and [c] what it is trying to achieve in terms of behaviour change at various levels. This requires a review of existing efforts that, depending on the resources available, can be a labour-intensive, time-consuming process, but quality should take precedence over quantity of indicators (Parmenter, 2010; Cooper & Findley, 2013).

3.1.8. New-View Proposition: Safety must be about capacity to adapt, tolerate change, be resilient and recover.

New-View advocates positive focus centres on their *belief* safety must have the capacity to adapt, tolerate change, be resilient and recover from failures. Every adaptation, change, and bounce back from failure is viewed as a positive. One of the stated purposes is about freeing people from bureaucracy (Dekker, 2014), while simultaneously urging the monitoring and recording of system variations (McNab et al., 2016). Monitoring is equivalent to coping with complexity (Hollnagel & Woods, 2005), and retaining control (Hollnagel & Woods, 2006). These conflicting goals point to the possibility of demanding, costly, bureaucratic exercises, with no proven value for improving safety or reducing injuries (Bromley & Powell, 2012); indeed, the Dutch Parkinson registry was abandoned simply because administrative burdens were too high and poor reporting led to outcomes that could not be used to improve the quality of care (Leistikow & Bal, 2020). Managing variation requires measurement as "you can't manage what you can't measure" (Kaplan & Norton, 1996). Importantly, many of New-View advocates variations in system performance frequently concern staff behaviours being performed (Raben et al., 2018). As such, Organizational Behavioural Management may be a useful proven strategy for New-View advocates to adopt (Cooper et al., 2005) to show the impact of RE interventions on performance. Such approaches also illustrate that organisations' already possess the ability or capacity to adapt to changing circumstances; something they do it all the time: as markets change, as new materials are invented, as new technology is introduced, or as existing problems come to the fore (Bea, 1998; 2002; Bea et al., 2009).

3.1.9 In many respects New-View advocates perspectives and philosophies about defining safety, appear to arise from a lack of recognition that traditional Safety-1 has already being doing the things they propose. For example, the widespread use of Leading & lagging indicators to monitor both the presence of positive process aspects of safety (what is being done) and the presence of unwanted outcomes (adverse incidents). While New-View advocates do not give any

indication of any alternative 'tangible' outcome measures to replace incidents and/or injuries, field research focusing on what goes *right* demonstrated a failure to positively impact OSH (Simpson, 2006; Biggs et al., 2010). In my view, that should be of major concern to everyone involved in the OSH world contemplating the adoption of New View propositions. Certainly, field experiments to test the hypothesis that "the more adaptive capacities are present, the safer the system is thought to be" are urgently required.

Importantly, apart from an analytical tool to analyses jobs or systems (FRAM), New-View writers and advocates have not defined a set of practical processes, tools, activities or combinations thereof, by which to improve safety *per se*. They rely on existing Safety-1 methodologies while persuading companies to adopt their ideas (e.g. eliminate all existing procedures and processes and start afresh (Dekker, 2018)). This makes it very difficult to make valid comparisons between the known efficacies of Safety-1 process configurations and those proposed by New-View advocates. In other words, we will never know if it is their ideas that lead to any injury reductions, or the use of known Safety-1 processes. As such, it is incumbent upon New-View academics to publish the results of their experiments or field studies to help disentangle the knots. Ideally, these would be of the quantitative science variety incorporating hypotheses, methods, interventions, and outcome results.

3.2. New-View challenge 2: The role of people in safety

Safety-1 generally starts with a company's executive leadership team deciding on strategy to fulfil the organisation's legal responsibilities (Hawksley, 1988; Hudson, 2007), including the legal duty of all employees regardless of rank and/or task to work safely and be involved in managing any risks (MHSWR, 1992). To this end, companies develop safety management systems (SMS) (De Oliveira Matias & Coelho, 2002; Robson et al., 2007), hire competent OSH personnel and resource OSH departments (Pojasek, 2005), develop policies and rules (Viscusi, 1983), train employees (Hale, 1984) and fund & monitor improvement initiatives (Leape et al., 2002) so performance can be adjusted as appropriate (Sawacha et al., 1999).

3.2.1. New-View Proposition: People create success far more often than they are involved in failure

The proposition "*People create success far more often than they are involved in failure*" is a truism, suggesting there is nothing to debate. However*,* the proposition appears to allude to ideas to rebalance the balance of power between worker and leader, and/or perhaps, stakeholders and safety professionals.

New-View advocates believe Safety-1 treats people as problems to be controlled (Dekker & Breakey, 2016), arguing people should have autonomy over their work and be viewed as essential contributors to solutions (Dekker, 2017a), as they possess adaptive capacity to cope with problems at the 'sharp-end' (Dekker et al., 2008). This requires companies to decentralise and devolve decision-power about safety to the entity's expertise residing in the 'sharp-ends' of the organisation Dekker (2018). Both Dekker and Hollnagel (2016) explicitly advocate companies cease to manage safety, and/or turn over all responsibility for safety to the workforce. Dekker (2017b) goes further by calling for anarchy: '*It is time for Safety Anarchists: people who trust people more than process, who rely on horizontally coordinating experiences and innovations, who push back against petty rules and coercive compliance, and who help recover the dignity and expertise of human work*'. Anarchy is defined as '*a state of disorder due to absence or non-recognition of authority or other controlling systems*' (OED, 2000 – 3rd Edition). In Gelfand's (2019) tight-loose culture model such an extreme results in 'anomie'.

Most OSH professionals likely reject the concept of safety anarchy, but would, and do, advocate and encourage employee engagement to involve people in the safety effort (Cooper & Findley, 2013), a practice underpinned by legislation, at least in the UK, EU, USA, Australia & New Zealand (Ochsner & Greenberg, 1998; Walters, 1998; Harris, 2004; Markey & Patmore, 2011). The extent to which participation OSH laws

translate into practice is a different debate, but, in principle, workers should already be involved in safety in a multitude of ways.

If New-View advocates wish to encourage and deliver anarchy into organisations, the central question becomes, '*can a state of disorder*' deliver a safe workplace, where people are not injured, maimed, or killed? Evidence shows that when individuals can make autonomous decisions without regulation or constraints, the risk for fatal events nears 1×10^{-2} per exposure (Amalberti et al., 2005). In the deep-sea fishing industry, one of the most dangerous, vessel-masters are sole decision-makers who won't stop fishing in ever-greater borderline conditions (Morel et al., 2008) which is pure RE philosophy in action. Conversely, when formal safety structures for the deep-sea fishing industry are in place, fatal incident rates halve (Jensen et al., 2014). This contrast provides the clearest view yet of the impact of New-View versus Safety-1 philosophies in action.

3.2.2. New-View proposition: New-View allows mature conversations around risk to occur.

What is meant by this proposition is not clear, nor expanded upon by New-View proponents. There is certainly no evidence indicating the maturity of conversations around risk is any better, more comprehensive, or advanced, under either Safety-1 or New-View conditions.

3.2.3. New-View proposition: New-View recognises difference between work as done and work as planned

This proposition implies that any gaps between work as imagined (WAI) and work as done (WAD) goes unrecognised by Safety-1 (Hollnagel, 2017). However, a recognition of the difference between WAI and WAD is shown by techniques used since the mid-1960s for work evaluation (Neff, 1966), training design (Annett & Duncan, 1967), Job Analysis (Prien & Ronan, 1971), Task Analysis (Kirwan & Ainsworth, 1992), and human reliability & system safety (Yu et al., 1999). Explorations of gaps between WAI and WAD is not new or reserved solely for safety (Ashour et al., 2021), but is a process *equivalent* to a Safety-1 risk appraisal, assessment and evaluation process promoted by the regulators (Melo & Costa, 2019; Bubbicoa et al., 2020). Thus, both Safety-1 and New-View are identical in this respect.

3.2.4. New-View Proposition: New-View recognises people are a source of innovation and insight.

Both Safety-1 and New-View subscribe to the view people are a source of innovation and insight, although it's recognised *not* all entities subscribe to employee engagement, or only allow it for certain activities. As in other areas of organisational life it sometimes comes with restraints.

Research shows engaged employees (Harter et al., 2006) are five times less likely than non-engaged employees to experience a safety incident, and seven times less likely to suffer a lost-time safety incident (Lockwood, 2007). Familiar employee engagement practices in OSH include: [1] developing and training safety leaders (Sarkus,1996); [2] encouraging the reporting of incidents (Clarke, 1998); [3] helping to investigate and review incidents (Krause & Russell, 1994); [4] identifying and reporting hazards (Painter & Smith, 1986); [5] conducting risk assessments (HSE, 1997); [6] reviewing rules and procedures (Laurence, 2005); [7] developing and delivering toolbox talks (Lane & Watkiss, 1999); [8] pro-actively involving people in behavioural safety processes (Cooper, Phillips, Sutherland & Makin, 1994); and [9] sitting on safety steering committees (Glendon & Booth, 1982).

New-View writers and advocates do not appear to offer new employee engagement practices: to the author's knowledge, they are no different than Safety-1 practices. For example, explicit HOP defences for any given task include Pre-job Briefings (Toolbox talks); Stop work for two minutes to assess any situational risks (Take 2); Job pauses by workers to check the job/task is going as planned; Random and unexpected peer observations of behaviour (behavioural safety); Procedural compliance checks (audits); Time-outs (another Take 2) to check work is still safe; & Post-job de-briefings. Clearly, these are fairly standard Safety-1 practices, albeit New-View advocates place an emphasis on minimising human error (Marinus Jr. & Nekimken, 2017; Williams &

Roberts, 2018) to help increase workers vigilance before, during and after job tasks.

3.2.5 Generally speaking, New-Views propositions surrounding the role of people in safety are in alignment with the ethos of the role of people found within Safety-1. By and large people successfully manage to create safe work environments and avoid incidents. Similarly, various job analytic techniques have been used to identify and overcome both actual and potential safety problems. However, New-View writers need to explicitly call for companies to cede all decision-making power for safety to employees (Hollnagel, 2016; Dekker, 2018) could be seen as a risky proposition: not least because it may blur boundaries between managerial and employee job roles that could cause relationship problems, and may also require much more effort be put into safety communications to ensure everyone has necessary safety information at the right time and the right place. The potential for such problems could be amplified in high-risk organisations (e.g. Nuclear, Aviation, Deep-Sea fishing, etc.). A call for a "*safety partnership*" between leadership and workforce with "*safe production*" as its central ethos may prove to be a more fruitful strategy (Cooper & Finley, 2013). This would at least recognise the reality that leadership tend to control an organisation's resources, while the workforce tends to control how safely work is actually done, and that neither group alone can bring about a safe working environment.

3.3. Challenge 3: How businesses focus on safety

New-View advocates see incidents/injuries as emergent properties of complexity which Safety-1 cannot cope with (Dekker et al., 2011). Contrary evidence (Hawkins & Woollons, 1998; Kmenta et al., 1999; Chiozza & Ponzetti, 2009), shows New-View writers and advocates have fallen into the trap of believing everything in the world of work is complex, despite explicit warnings to the contrary (Kurtz & Snowden, 2003, p5). *Complex* and *chaotic* contexts are unordered—there is no immediately apparent relationship between cause and effect, and the way forward is determined based on emerging patterns (Snowden & Boone, 2007). Organisations, by definition, are organised and ordered entities with compartmentalised management systems, meaning OSH is concerned primarily with a '*complicated*' world, where solutions to problems are generated by analysis (i.e. *Simple* and c*omplicated* contexts assume an ordered universe, where cause-and-effect relationships are perceptible, and right answers can be determined based on the facts) (*Ibid*). Undoubtedly some industries (aviation) are complex, but the entities operating within them are usually complicated, not complex. As such, one of New-View writer's central tenets (i.e. dealing with complexity) is based on a fundamental misunderstanding of Kurtz & Snowden's (2003) 'Cynefin' sense-making framework. Traditionally, Safety-1 s focus has been to prevent adverse events by installing and operating an appropriate SMS, containing risk and mitigative controls, which may be either administrative and/or technical, to provide order and structure.

3.3.1. New-View Proposition: Safety is an ethical responsibility not a bureaucratic activity.

There are various competing approaches to Safety-1 (Wachter, 2011), each with their merits: Ethical; Regulatory/Legal; Loss Prevention/Control; Risk-Based; Behavior-Based; and Safety Management System/Quality. All are encompassed by Safety-1 in various combined configurations: the presence of one does not preclude the presence of the others.

New-View advocates do not specify exactly what safety, as an ethical responsibility, actually means, but do imply Safety-1's focus on safety via a SMS is bureaucratic which often devolves into petty bureaucracy (Hale & Borys, 2013), with people held to account by their leaders and senior managers (Dekker, 2014). Dekker (2017b) asserts '*Over the past two decades, we have doubled the amount of safety bureaucracy. But we have not become any safer: in many areas we have the same number of fatal accidents as before. By insisting on compliance, we not only hollow out work, we*

rob it of precisely the innovations and insights we need to know where the next accident will happen'. Dekker does not state if it is the SMSs themselves that are the problem, the execution of the elements of the SMS by those operating under their auspices, or the non-compliance (Lawton, 2018).

An issue with perceived increases in bureaucratic safety is some regulators use one-size-fits-all action-level goals for every business, which might be suitable only for small and medium enterprises; whereas, goal-setting regulations allowing customisation and flexibility might be more suitable for larger enterprises (Hale & Bory, 2013). Bureaucracy and accountability are integral to organisational life across all domains (inclusive of academe), in all countries, even in devolved or matrix type organisations. Structure is vital for both company and safety performance (Hechanova-Alampay & Beehr, 2001; Nahm et al., 2003). For example, the Deepwater Commission (Graham et al., 2011: 251–253) observed an effective SMS was absent from BP's operations prior to the Macondo disaster. A material factor in events, SMS's were missing from the entire US offshore Oil & Gas industry in general, owing to the industry successfully lobbying against the requirement with legislators. Many other disaster enquiries also highlighted the role of a weak SMS (Waring, 2015). Bolin & Härenstam (2008) showed most workplaces were characterised by both post-bureaucratic, in principle the opposite of traditional bureaucracy (Child, 2005), and bureaucratic features. Evidence, therefore, strongly suggests an effective SMS is vital to prevent low frequency, high consequence adverse events.

New-View writers transmit the message bureaucracy is coercive as it requires compliance; they don't consider it might be enabling (Adler & Borys, 1996). In truth, some elements of an SMS are bureaucratic and coercive simply to meet regulatory requirements, while others are enabling, for example standard operating procedures (SOPs) spelling out how to do a task safely. While the introduction of numerous OSH regulations, in the UK at least, has not impacted fatality rates as intended (Cooper, 2019), New-View writers appear to overly emphasise perceptions of bureaucracy being heavy-handed, with their solution being to treat safety as an ethical or moral responsibility (Dekker & Breakey, 2016) by perhaps focusing on *substantive, procedural and restorative* justice, within a 'just' culture (Conchie & Donald, 2008). Evidence (Bourrier & Bieder, 2013) shows bureaucracy, procedures and documented activities have brought progress, avoided recurrent mistakes, and allowed for 'best practices'. Similarly, rules have positive social psychological effects for employees (Organ & Greene, 1981; Podsakoff et al., 1986; Michaels et al., 1988; Adler & Borys, 1996), but rule effectiveness depends on the combined presence of written requirements with valid means-ends relationships (linked to the desired outcomes), employing optimal control, consistently applied, and having purposes understood by stakeholders (DeHart-Davis, 2009).

3.3.2. New-View proposition: Systems should manage safety not liability.

New-View advocates propose that an SMS should solely manage safety, not liability, disregarding the fact that in many countries the two *tend* to be inextricably linked: insurers charge premiums according to how well an entity manages its incident/injury rates, by how safe, or risk averse, it is deemed to be.

At a societal level, across the globe, regulators generally hold entities legally accountable for poor safety, while insurers use the legal system to ascertain an entities liability regarding injured parties' compensation (Faure, 2014). There are some exceptions (e.g. a few European Countries) where strict legally well-defined circumstances separate fault and no-fault based liabilities (e.g. Watson, & Kottenhagen, 2018).

Organisations also have *statutory* duties to manage their exposure to legal, financial and reputational liabilities from their safety practices, and managing these is a proactive protective risk management device for business stakeholders. At task-level, however, there's no reason to stop employees developing a separate set of explicit '*liability free*' rules and/or procedures for each specific 'shop-floor' task, derived from the organisation's managerial rules/and procedures containing the liability components used to meet certification (ISO 45001) and legislative requirements. Ideally, these task-level 'rules' would meet the

requirements outlined by DeHart-Davis (2009).

3.3.3. New-View proposition: Lean management systems enable effective risk management.

New-View advocates propose that lean-management systems (Saurin et al., 2006; Saurin et al., 2013) enable effective risk management, although no co-related Risk Management, RE and Lean Engineering studies exist. Rather, there is a *simulation* study (Zarrin & Azadeh, 2017) simultaneously showing increased redundancy (layers of control / defences in depth) for manufacturing exerts the maximum impact on lean production. Actual evidence (Maslaric et al., 2013) shows a lean strategy can reduce supply chain costs and waste, but also reduces supply chain resilience. Thus, lean strategies can remove the very resilience New-View writers and advocates desire. Brazilian research (Soliman et al., 2018) showed Lean *Production* reduced complexity by eliminating jobs, reduced diversity of behaviours and beliefs, and reduced disruptions due to information and human-related problems. Conversely, it intensified the workload of remaining workers, boosted the number of social interactions, and fostered resilience by forcing people to become problem-solvers, thereby exchanging one type of complexity for another. Although these mixed impact results, both positive and negative, were the results of a commercial cost-cutting exercise, not a New-View RE implementation, they show lean-management systems may not exert their intended effects.

New-View writers (Vincent & Amalberti, 2016) recommend simplifying and decluttering bloated procedures and rules by enlisting employees to help provide the right ideas. Promoted by the author and others since the 1990s, New Zealand coal-mining research (Laurence, 2005) shows fewer, high quality procedures are much more effective than many, poorly written, bloated ones. New-View advocates have adopted this approach, alongside lean manufacturing or lean engineering principles. Depending on your perspective, 'lean …' can be seen as streamlining your processes or adopting institutional short-cuts. So long as people and assets remain unharmed, it could be a good thing, although the evidence above is already showing unanticipated consequences.

3.3.4 New-View proposition: Systems should be designed to promote relationships, not transactions.

New-View advocates state systems should be designed to promote relationships and not transactions (Green, 2017; Proven et al., 2017). They highlight risk awareness and risk management can be a messy (Forrester et al., 2018) and complex issue (Ramasesh & Browning, 2014) with the solution being to create interdisciplinary teams to overcome any issues (Pellissier, 2011). Some argue this requires a different skill set and a different view of leadership (Thude et al., 2019), although Edmondson & Nembhard (2009) assert such challenges are the benefits. Regardless, interdisciplinary team-working has been espoused and expanded upon numerous times over the past four decades or so, particularly as it is contained in legislation (e.g. OSHA Act 1970).

3.3.5 In sum, it appears the New-View movement's manifesto for an entity's safety focus is to reduce the overall amount of bureaucracy, separate safety and liability, devolve decision-making power to workers, adopt lean 'safety' practices to reduce perceived system complexity (including SMSs), increase resilience, and improve collegiate team-working to develop relationships. It is incumbent upon New-View proponents to provide an explanation of how these propositions can be proven to reduce injuries and improve safety performance, while also delivering empirical examinations of each.

New-View proponents must also give serious consideration to the notion that their manifesto and strategies could be detrimental to employees' safety: for example, there seems to be a taken-for-granted assumption (Schein, 1990) those at the sharp-end will always do what is right for safety in any given situation, even in the absence of procedures. Were this to be true, it is unlikely any entity would ever have experienced a safety incident or suffered a serious injury or fatality.

4. The science underpinning New-View

4.1. New-View <u>*practitioner*</u> advocates assert '*no-one approaches safety with more scientific rigor than the Safety Differently community*' and '*if you are relying on Heinrich, triangles or dominoes for your safety programmes then you are the ones building on sand, you are the ones in glass-houses throwing stones. The absence of scientific testing in these approaches is simply breath-taking*' (Green, 2018). In reality, the majority of scientific New-View texts, published in Safety Science and other journals, are sociological texts or position papers that magnify and emphasise problems with Safety-1, but none are scientific published experiments demonstrating '*we did this, and the results are…*'. For example, Patriarca et al. (2018) reviewed 472 RE contributions, including journal articles, conference proceedings and book chapters. They did not report a single contribution demonstrating an impact on safety performance. Similarly, Pillay (2017) conducted a review of 46 RE works specific to safety management. One of his many conclusions was '*empirical quantitative studies investigating the utility of RE as a safety management strategy are entirely missing from the literature*'. Thus, the validity of New-View proponent's ideas in OSH remains unsupported. There is literally no empirical evidence to support them in safety management. The same is found in other topic domains (Bhamra et al., 2011; Panter-Brick, 2014; Linnenluecke, 2017), revealing no peer-reviewed experimental evidence supporting New-View's RE perspective exists: it's entirely theoretical.

4.2. Conversely, although some research leaves much to be desired, Safety-1 is under-pinned by numerous studies stretching back decades. These include, but are not limited to: [1] safety culture research (Cooper et al., 2019); [2] safety climate surveys (Tear et al., 2020); [3] behaviour-based safety (Cooper, 2009); [4] safety management systems (Salguero-Caparrós et al., 2020); [5] risk assessment methods (Hrymak & de Vries, 2020); risk management (Glendon et al., 2016); risk perception (Elmoujaddidi & Bachir, 2020); [6] incident triangles (Marshall et al., 2018), incident causation (Madigan et al., 2016), and incident investigation (Tetzlaff et al., 2020); [7] root cause analysis (Corwin et al., 2017); [8] employee engagement (Sammer et al., 2020); [9] teamwork (Schmutz et al., 2019); and [10] safety leadership (Cooper, 2010; 2015). Importantly, as this manuscript has demonstrated, New-View proponents have still to develop any *new* safety methods or practices of their own: they rely entirely on proven Safety-1 methods in the field. Thus, logic dictates that methodologically, Safety-1 and the New-View approach are exactly the same. The real difference between the two approaches resides in the *propositions* (ideas, rules, and principles) and *RE philosophy* promoted by New-View writers and advocates.

4.3. Propositions are hypotheses' that usually include an explanation of how they can be proved (but do not in New-Views case). As such, the onus is clearly on New-View advocates to prove its efficacy in safety. In a simulation study making use of safety incident rates, advocates argue a highly resilient company is a safe company (Wehbe et al., 2016). Given the large number of variables in the various New-View hypotheses, numerous experimental designs are possible to prove that RE has value at improving safety in the safety domain, but this will entail the use of traditional safety measures. Recognising this, Ranasinghe et al. (2020) explored RE indicators from 11 industries. Identifying 28 RE indicators, they showed four in common use that also mirror Reason's (1998) safety culture variables: top-management commitment, awareness, learning, and flexibility. One stated aim of RE is culture change: as such, reliable & valid safety *culture* measures (Cooper et al., 2019), *not climate surveys*, could provide proof of culture change. Similarly, evaluations of the impact various aspects of RE (reduced complexity, workers decentralised decision-making, lean management systems) exert on injury/incident rates would be helpful. In the absence of experimental studies, comprehensive desktop studies of CSR reports (Sowden & Sinha, 2005) of companies implementing New-View approaches might provide independent evidence of its efficacy, recognising sample sizes > 30, and over multiple years (pre & post introduction of New-View) is necessary,

along with matched comparisons with non-New-View companies.

4.4. In sum, all safety scientists' welcome new ideas proven to help reduce injury rates, the SIF approach being one recent addition (Wachter and Ferguson, 2013). However, despite a steady proliferation of texts promoting the utility of New-View approaches to improving safety over the past decade, supporting evidence is currently non-existent. It's still attempting to sell its ideas and legitimise its constructs, with some critical reviews (Righi et al., 2015) trying to identify and define its parameters (Reichers & Schneider, 1990).

5. Understanding the rise of New-View

Motivations:

5.1. To understand the rise of New-View approaches, it is worth examining its motivations. The underlying philosophies of SD reflect Dekker's rejection of the Vison Zero premise: he states it lacks intellectual underpinning by the likes of Marx, Freud, Mill, de Tocqueville, Bonhoeffer, Nietzsche, or Kierkegaard. SD's motivations, therefore, appear to be entirely ideological (Feuer, 2011). Available evidence shows ideology doesn't determine safety performance: rather, it's the quality of implementation of safety management processes that is vital (Zwetsloot, 2017). For example, when comparing Vision Zero adopters and non-adopters in British construction companies, a marginal difference of one case in the number of SIFs over 4 years was found (Sherratt & Dainty, 2017). Interestingly, as SD pushes back against bureaucracy, it simultaneously fails to acknowledge ongoing work to rein-in safety procedure problems (Hale & Borys, 2013; Sasangohar et al., 2018).

5.2. It is also clear New-View's manifesto, particularly SD, appears born of frustration with the darker side of the OSH world, where unethical practices are apparent: [a] suppressed incident reporting (Frick, 2011); [b] manipulative injury reporting to downplay severity to create a '*looking good index*' (Dekker's term) (Ouyang et al., 2017); [c] using generic risk assessments (Russell et al., 1998) and permits-to-work (Iliffe et al., 1999), because an entity cannot or will not resource these systems properly; [d] making people sign attendance sheets at tool-box talks, inductions, or work permit processes (Kaskutas et al., 2013) without informing them they've just become legally liable if someone gets hurt, as the lawyers/attorneys will use their signature against them in court (Holdren, 2020; Senthanar et al., 2020); [e] making people take drug tests if they're injured or involved in a near-miss in attempts to shift responsibility onto workers (Macdonald, 1997); [f] outsourcing risky jobs to temporary work agencies to avoid legal liability (Ellen et al., 2012); and [g] not taking appropriate corrective actions when a hazard is identified (Cooper, 2015). The list of OSH dark arts is endless, but they're more prone to surface when companies put profit before safety and create & maintain a culture of fear (Cooper & Findley, 2013). Importantly, the dark side causes the workforce to withdraw from safety. This then provides fertile ground for many injuries, while simultaneously creating an ethical void to be exploited. Clearly, a more ethical OSH approach is required, with practitioners of the dark arts being called out by their colleagues and professional bodies (British Safety Council, American Society of Safety Professionals). Safety scientists may also wish to research ethical and unethical practices in OSH, or least offer existing insights to tackle this issue (Guntzburger et al., 2018).

5.3. Based on HRO principles (Nuclear Regulatory Commission, 1979; Weick, 1987; Roberts, 1990), HOP apparently surfaced in the US in response to US Union's concerns that Behaviour-Based Safety (BBS) blames the worker (Cooper, 2003). Although BBS is one of the most effective and successful paradigms in the history of safety science (Cooper, 2019), and behaviour is often the observable manifestation of Human Error, HOP is marketed as the 'politically correct' means to engage people in safety (Leemann, 2014), as both systematically monitor worker behaviour (Williams & Roberts, 2018). HOP also promotes the addition of mitigative layers of control to reduce the severity of impact should an incident occur, as well as preventative layers of risk control (Lyon & Popv, 2020). HOPs appeal to the Unions is it shifts the

blame for safety problems squarely on the organisation, not individuals (Pate-Cornell & Murphy, 1996), and addresses system faults not people's individual errors. HOP, therefore, exploits notions of locus of control (Christian et al., 2009), while downplaying that people may behave unsafely as a matter of choice (Choudhry & Fang, 2008).

5.4. Safety-II's stated aim is to concentrate solely on resilience and/ or entangled systems (termed *synesis*) applied to all areas of an organisation's functioning as it tries to integrate everything (Hollnagel, 2016). Meanwhile, RE has been trying to morph into a fully-fledged discipline, although reviews show a very long journey ahead (Pillay, 2017; Patriarca et al., 2018). However, in attempts 'to make resilience a full-scale paradigm or even a science,' it's explanatory power gets '*pushed to represent more than it can deliver*' (Alexander, 2013: pp 2713). Similarly, resilience is a by-product of something the system *does*, rather than being something the system *has* (Patriarca et al., 2018). As an epiphenomenon, therefore, it is subject to exactly the same criticisms Hollnagel (2014b) aimed at 'safety'. Thus, it appears RE is simply replacing one non-system property (safety) as a risk control with another (resilience). This begs the question: why? The answer might reside in '*disciplinary imperialism*' (Dupré, 2001) whereby one discipline (resilience) attempts to explain phenomena or solve problems in a domain belonging to or associated with another discipline (safety) (Olsson et al., 2015). The ever-expanding scope and scale of resilience without any supporting evidence showing it improves safety performance, gives credence to the argument that resilience is to safety science, what a blackhole is to galaxies: it draws matter inward in a continuous accretion process.

Promotion

5.5. Much rhetoric surrounding New-View marketing mirrors that for BBS in the late 1990s (Manuele, 1998). Many ask if New-View is another fad?; is it the magic bullet?; does it really reduce injuries?; is it really different?; or is it just another consultant-led culture change initiative with another name? There are no clear answers, but some of the language asserting New-View is a movement is and has been, inflammatory to say the least (Rae et al., 2020). In the practitioner arena, any questioning of New-View's orthodoxies has led to less than collegiate discourse, in what can only be described as exhibitions of ideological totalism or fundamentalism (Stark & Bainbridge, 1985) from some of its advocates. Warnings about the negativity associated with the marketing of New-View have been ignored (Busch, 2019), even though some of New-View's messaging can reasonably be viewed as somewhat extreme, (e.g. anarchy) or even deceptive (Kulik & Alarcon, 2016). For example, no New-View writer has addressed workers corresponding legal liabilities if something goes wrong in a fully devolved system adopting New-View ideology. This latter aspect alone raises questions about ethics in safety science and the OSH profession at large (Bowen, 2000).

5.6. A 2019 special issue of safety science evaluated theoretical differences between HRO and RE: many suggested that despite the close similarities, due to their different philosophical backgrounds, they are two different disciplines (Le Coze, 2019; Haavik et al., 2019; Pariès et al., 2019). In essence, the special issue legitimised RE as a discipline entirely separate from HRO, with barely any criticism (Hopkins, 2014; Pettersen & Schulman, 2019) of its fundamental principles and/or its impact on safety performance. Were the debaters conversant with Robert Bea's (2002) Oil & Gas industry work and his other research dating back to the 1980s, they may have concluded HRO & RE were, *de facto*, exactly the same thing. In my view, a better debate might have centred on what difference RE and HRO make to actual safety performance: which [a] better creates the conditions to reduce the serious injury and fatality rate; [b] better helps improve the quality of the safety management systems; [c] better helps safety professionals in their day-to-day work. The answers to these and other questions, might then have helped answer the follow-on question: [d] does it really matter if there are minute, subtle, nuanced differences between HRO and RE? As scholars, scientists, teachers, and practitioners we must never forget '*safety science is an applied subject*' whose ultimate justification must be

that it makes things in the field safer and healthier (Hale, 2014).

5.7. From the above section of the motivation and promotion of New-View approaches it is clear the OSH discipline is in the middle of an immense crisis of ethics across the practitioner and scientific landscape. It would seem safety science has an *urgent* need to work out what ethical principles should regulate conduct in the OSH scientist domain: how should scientists market their theories? What are the constraints (if any) that should be placed on marketing? Should these apply when they are building their brand in the commercial arena? If there is no supporting evidence for the theories from 'field research' should caveats be attached to every paper / communication? Should there be an expectation every theorist has to publish their 'experimental results' in the scientific arena, before commercially marketing their associated products/services? To help raise ethical standards, perhaps every manuscript should explicitly state whether it's a research or position paper, case study, review article, survey or technical paper.

5.8. Overall, this critique reflects the parable of the Emperor without any clothes. Although the Emperor (Resilience Engineering), court suitors (New-View advocates), and tailors (New-View writers and researchers) recognise that he is naked (No supporting empirical evidence in OSH), few (Pillay, 2017; Patriarca et al., 2018) explicitly acknowledge that nakedness (to do so could incur the wrath of some advocates). Until the audience proclaims the Emperors nakedness, the Emperor and his suitors will resolutely continue with their procession (which is precisely what is happening in the practitioner and academic arenas).

6. Reconciliation between Safety-1 and New View

This exploration has revealed that New-View is a collection of unproven propositions that remain to be empirically examined: there is no published evidence showing these ideas positively impact safety performance. With Resilience Engineering as a common factor, the various New-View approaches adopt different lens to look at industrial/occupational safety. Safety-II is concerned with focusing on the 99.9% of human activity that goes right. HOP is avowedly a movement advancing shared ideas to design resilient systems, while SD represents its proponent's mental models or ways to see the world [of safety]. The New-View RE lens or perspective is based on "*operating as close as possible to the boundaries of failure as part of normal work'* (Pillay, 2017), in direct contrast to the traditional Safety-1 philosophical "*defences-in-depth*" approach, which on the surface appear to be opposites.

A fundamental outstanding question is whether Safety-1 and New-View can fruitfully be reconciled. After Thomas Aquinas (1225–1275), the key to reconciling the two opposing philosophies is to find the common truths within both. In my view, this centres on 'barriers': [a] the defences-in-depth approach places risk controls in the form of barriers between the various layers of energy or energies that exist in any identified potential incident trajectory (Haddon, 1973; Reason, 1997); [b] the RE approach implies there are no barriers *per se* as determined by "*operating as close as possible to the boundaries of failure*" while HOPs HRO mantra of "*fail often and fail safely*" suggests RE is constantly pushing any boundaries to find a system's limitations.

To fail often and safely also implies more controls or defenses are subsequently put in place to prevent or mitigate the severity of any future failures. Thus it appears RE allows the boundary edge to inexorably expand outward from the center in the wake of numerous failures at the boundary edges, but *paradoxically* leaves more barriers (physical, procedural, and administrative risk controls) behind in its wake. Morel et al. (2008, pp14) addressed this threat-rigidity cycle (Staw et al., 1981), stating "*The process of making systems safer always leads to a considerable increase in constrained safety; this increase is almost always to the detriment of the resilient, adaptive ability of the system. As it becomes safe, therefore, the system also becomes rigid*". The threat-rigidity cycle, therefore, indicates New-View's *raison d'etre* is somewhat circular: The constraints, rigidity, complexity, and bureaucracy contained in the additional control barriers to facilitate the 'fail safely and fail often'

mantra are the very same aspects New-View criticizes or seeks to address.

Theoretically, reconciliation between the philosophies of Safey-1 and New-View might be possible via a focus on 'energy' barriers, but whether it will *improve* safety performance in practice (e.g. less incidents and injuries) is the unanswered question. It is certainly a very realistic prospect that each boundary failure, or a proportion of them, could result in someone being seriously hurt or worse.

This begs the question of whether Safety-1 and New–View approaches can ever be reconciled, or coexist in harmony. Gelfand et al.'s, (2017) work on fractal patterns of culture *might* provide the means to determine where the safety-1 and New-View approaches might usefully co-exist. These scholars suggest that cultures facing threats and uncertainty seek order and precision and are best described as having tight social norms. Cultures with lower perceived threat levels revel in ambiguity and risk-taking and are best described as having loose social norms (open to new ideas and more adaptable). The effects of this tight-loose culture continuum are vividly illustrated in Gelfand et al. (2021) which compared nations with high levels of cultural tightness, to those with high levels of cultural looseness. COVID-19 cases were estimated to be 5 times more (7132 per million vs 1428 per million, respectively) and 9 times the number of deaths (183 per million vs 21 per million, respectively) in looser cultures, taking into account a number of controls, which the authors attribute to tight or loose social norms. Thus, in terms of the Safety-1 versus New-View debate, tight cultures would likely be described as a defences-in-depth, traditional safety-1 approach to industrial safety, whereas looser cultures would likely reflect New-View ideas of *operating as close as possible to the boundaries of failure as part of normal work'* (Pillay, 2017). Gelfand's work does appear to show that being at either extreme of the cultural tight-loose continuum is detrimental to performance, whereas purposefully aiming for 'flexible tightness' or 'structured looseness' appear to be preferable positions. Gelfand (2019) argues an understanding of "*which behaviour(s) govern desired social norms X the degree of enforcement required*" leads to 'cultural intelligence', which help entities become 'culturally ambidextrous': i.e. determining where a tight Safety-1 culture is required (e.g. a sour gas area on an LNG Train), and where cultural looseness may be appropriate (e.g. Corporate office areas) on the same facility. Although relatively new, Gelfand's (2019) cultural tightness-looseness theory certainly deserves scrutiny and evaluation by safety science, not least for resolving issues surrounding the Safety-1 and New-View debate.

7. Conclusion

When its major tenets are subject to critical scrutiny, New-View is shown to be based on a collection of untested *propositions* (ideas, rules, and principles). New-view's underlying RE philosophy is predicated on repeatedly testing the boundary limitations of systems until a failure occurs, which *paradoxically* requires more risk controls that create the very problems New-View criticizes and attempts to address – constraints, complexity, rigidity, and bureaucracy. This indicates New-View's *raison d'etre* relies on a circular threat-rigidity cycle. New-View also lacks any new associated *practical methodologies* with which to improve safety performance, apart from FRAM. Thus, both Safety-1 and New -View use exactly the same Safety-1 *methodologies* to tackle safety problems, albeit they might be used in different configurations. Moreover, there is no published, peer-reviewed empirical evidence to demonstrate whether or not any aspect of New-View's *ideas* work in practice. Currently we don't know how, or if, New-View improves safety performance *per se*, or if it reduces or eliminates incidents/injuries. The extant Safety-1 literature contained herein suggests that New-View's *propositions* lack substance. The inescapable conclusion, therefore, is '*the emperor has no clothes'* and that ideology and emotion has triumphed over science and practice. It is also clear, that the OSH profession has an immense crisis of ethics across its entire landscape.

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