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Safety work versus the safety of work

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ABSTRACT

'Safety work' consists of activities, conducted within organisations, that have the primary purpose of managing safety. Safety work is distinct from operational work, which directly achieves the primary objectives of the organisation. Safety work is also distinct from the 'safety of work', which is the prevention of injury.

In this paper, we argue that safety work is primarily a performance rather than goal-directed behavior. It may contribute to the safety of work, but this is only part of its purpose. Our argument is presented in the form of a model for organisational safety activity that represents safety as a special case of 'institutional work'. Evidence of the 'safety work' takes the place of evidence of the 'safety of work', which is extremely difficult to measure or demonstrate in its own right.

Even where it does not contribute to the safety of work, safety work may be necessary for organisations to make sense of safety in an uncertain world. If organisations did not perform safety work, they would be unable to convince stakeholders that they were doing enough for safety, which would in turn prevent them from pursuing their core business.

1. Introduction

Managers and workers in modern organisations are asked to participate in many safety activities. They take part in "safety moments" and "toolbox talks". They prepare or sign "Safe Work Method Statements" and "Job Safety Analysis". They complete pre-task risk assessments such as "Take-5", "STAR" or "HYDRA". They perform observations, audits and "safety conversations". They may also be asked to co-ordinate or contribute to larger scale analysis activities such as "HAZOP", "Fault Tree Analysis" or accident and incident investigation.

Why do people participate in, or ask others to perform, these activities? The simple yet manifestly inadequate answer is "to keep people safe". Gilbert (2018) describes activities that can be separated from everyday work as 'extraordinary safety', distinguished from the 'ordinary safety' that the activities ultimately try to create. Yet 'extraordinary safety' is at best two steps removed from the safety of work. Even in an ideal world, managers and safety professionals perform safety work that controls and directs frontline staff in the performance of safety work, that in turn shapes the way operational work is performed. This raises serious doubts about whether safety work is necessary or helpful for the safety of operational work.

The practice of safety is a complex social phenomenon, where actions within organisations serve both instrumental functions (achieving goals) and expressive functions (revealing attitudes) (Islam and Zyphur, 2009). This dual purpose might be called "ensurance" and "assurance" (Rae and Alexander, 2017), "being safe" and "feeling safe" (How to shift from reactive to proactive OHS, 2015), or, as in the title of this paper, "the safety of work" and "safety work."

People who perform safety activities describe their own actions as instrumental – they are trying to improve safety outcomes, and are selecting actions that they think will meet that goal (Provan et al., 2017). The academic study of safety also usually interprets actions as instruments; even sub-disciplines such as safety culture, which recognise the importance of symbolism and expression, seek legitimacy through their ability to drive or predict safer outcomes (Cooper, 2000).

As Hollnagel puts it ("How to shift from reactive to proactive OHS," 2015):

"The efforts to prevent future accidents actually serve a dual purpose - to be safe and to feel safe. But sometimes the latter stands in the way of the former"

Hollnagel's words reflect a common understanding that safety research is primarily about improving safety outcomes, and that the expressive functions of safety action are uninteresting except as a driver or distraction from "actual" safety. We disagree.

Very few organisational "safety" activities – ranging from personal take-5 risk assessments to safety programs costing hundreds of thousands of dollars – have proven capability to measure or reduce the likelihood of accidents (Rae et al., 2010; Shannon et al., 1999). And yet there is constant growth in the number, size, and complexity of safety activities, safety programs, safety departments, and safety regulations. It is often hard to believe that this activity is competent, goal-directed behavior by benevolent actors. We suggest that in order to explain the activities it is necessary to expand our understanding of the purposes they fulfil.

In this paper, our central argument is that safety management is a form of 'institutional work' and that safety activity is as much ritual,

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routine, and dramatic performance as it is goal-directed. Actions are socially legitimised through their purported positive effects on safety outcomes, but cannot be explained as strategic or tactical choices in pursuit of well-articulated goals. Safety performances are intentional, but their value comes primarily from the structures they maintain, and the beliefs and feelings that they reinforce, rather than from their ability to prevent accidents.

To understand this better, we divide safety work into four aspects, without suggesting that any one of these is automatically more "legitimate" or "real" than the others.

1. Social safety – affirming that safety is valued and achieved
2. Demonstrated safety – proving safety to external stakeholders
3. Administrative safety – establishing and following clear rules and requirements for safety
4. Physical safety – changing the work environment for safety

This safety work may contribute to, but is not the same as, the 'safety of work'. The safety of work relates to the likelihood and consequences of accidents arising from the way operational work is performed. For readability, we will from here on refer to the 'safety of work' as 'operational safety'

Of course, most organisations and most safety practitioners profess operational safety to be their primary concern (Provan et al., 2017). We do not doubt this claim. In fact, we think the preponderance of evidence supports an even stronger claim, that when organisations seek to address uncertainties due to shortfalls in safety work, they believe that they are actually addressing operational safety.

This confusion is similar to what Rae and Alexander refer to as "probative blindness" - safety activities that improve confidence in safety without revealing or changing the underlying operational safety (Rae and Alexander, 2017). However, in this paper we suggest that it is unhelpful to consider demonstrated, social and administrative safety as distractions from "actual" or "real" operational safety. All types of safety work are important, but for different reasons. In order to understand demonstrated, social, administrative and physical safety performances, it is important for researchers to understand why the practices have legitimacy for those who perform them, and refrain from assuming that operational safety is the only legitimate purpose of safety activity.

The different aspects of safety are interrelated in several ways. Firstly, they are not perceived as different within the organisation that performs them. Events that challenge faith in one of the performances will create a response across the other types of safety work. Secondly, the performances compete for attention and resources within the organisation. Thirdly, demonstrated, social and administrative performances derive legitimacy from purported causal connections with the other performances, in particular with operational safety. This legitimacy is reinforced through academic discourse that encourages readers to focus on the 'organisational causes' of accidents instead of the proximate physical causes - see in particular the 'Swiss Cheese' model (Reason, 2000) and Hopkins' analysis of the accidents such as the Esso Gas Explosion at Longford (Hopkins, 2000). The lack of differentiation between types of safety creates defensive responses when the legitimacy of any safety activity is challenged. "Why are you saying take-5 s are a waste of time. Don't you care about safety?"

It is possible to argue about whether organisations should or should not be concerned with demonstrated, social and administrative safety. As researcher-practitioners, we are ourselves frustrated that within most organisations safety work has importance disproportionate to its proven influence on operational safety. However, it is necessary to understand why safety is managed the way it is if we are to improve it.

Our paper is structured as the presentation of a new model that extends existing organizational theory. The model represents how and why safety activities are conducted. It is not intended to analyse or explain the causes of accidents – it complements other models that focus on how organisational structures and behaviors contribute to accidents. In the final section of the paper we discuss the broader implications of our ideas, and provide some avenues to test and refine the model.

2. Bureaucracy, institutions, and work

The term "bureaucracy" has a rhetorical repugnance in safety literature. Representative titles include: "Safety learning and imagination versus safety bureaucracy in design of the traffic sector" (Jagtman and Hale, 2007); "The safety anarchist: relying on human expertise and innovation, reducing bureaucracy and compliance" (Dekker, 2017); and "Bureaucracy, safety and software: a potentially lethal cocktail" (Hatton, 2010). In each case, bureaucracy in opposition to a positive attribute such as learning, expertise, or adaptability.

The text is often less provocative than the titles, but still describes bureaucracy as at best a necessary evil, or as an initially positive phenomenon that has grown beyond control. In both the rhetoric and the content, safety theorists draw heavily on the work of Max Weber (2015). Writing in post-Bismarck Germany, Weber viewed bureaucracy as necessary for the efficient exercise of power in a modern democracy. He also cautioned that once power was acquired by a democracy, it was virtually impossible to remove. Weber saw bureaucracy as secretive, impersonal, indispensable and indestructible.

Weber's bureaucracy was inflexible. It changed only by growing and by consolidating power. Even a military conquest only replaced who was at the head of the bureaucracy – not the nature or power of the bureaucracy itself. It is understandable that safety theorists – particularly those who place emphasis on transparency and local autonomy as sources of resilience – would be skeptical of this type of bureaucracy.

There is, however, an under-appreciated and under-studied relationship between "bureaucratic" safety work and "real" operational safety. A promising direction to explore this relationship is to consider safety work as a type of "institutional work" (Lawrence et al., 2011). Institutional work theory suggests that institutions are grown, sustained, and transformed by the continuing work of those who operate within the institution (Lawrence et al., 2011). An 'institution' is "those (more or less) enduring elements of social life that affect the behavior and beliefs of individuals by providing templates for action, cognition, and emotion". 'Work' is intentional activity. Transforming the institution, responding to day-to-day demands, or even just working by habit are all considered 'work'.

Lawrence et al. (2011) write:

> "The study of institutional work takes as its point of departure an interest in work—the efforts of individuals and collective actors to cope with, keep up with, shore up, tear down, tinker with, transform, or create anew the institutional structures within which they live, work, and play, and which give them their roles, relation-ships, resources, and routines."

Similar passages could be lifted straight from texts on Safety-II (Hollnagel, 2014), Safety Differently (Dekker, 2014) or resilience engineering (Woods and Branlat, 2011). Institutional work brings the same curious respect to the investigation of management work that modern safety science brings to the study of front-line work.

Cloutier (2016) represents institutional work in four categories. 'Conceptual work' creates, maintains or disrupts the normative ideals of the institution – it provides the collective understanding of what needs to be done, and why it is important. 'Structural work' organises roles, rules, systems and resources – it provides certainty and predictability. 'Operational work' is made up of concrete actions that influence the day-to-day lives of frontline workers. 'Relationship work' is the building of inter-personal trust, alliance, and collaboration – it allows individuals to co-operate in performing the other types of institutional work.

3. Performing safety work

3.1. Outline of the model

Our model is based on the Cloutier's representation of 'institutional work' (Cloutier et al., 2016). We adapt the model by adding four types of safety work.

1. **Social safety** is a type of conceptual work aimed specifically at maintaining safety as a value, and the organisation's belief in itself as a champion of safety.
2. **Demonstrated safety** is structural work oriented towards stakeholders outside of the organisation, showing that the organisation is meeting its safety obligations.
3. **Administrative safety** is structural work oriented inwards, providing a mechanism for safety concerns to influence operational work
4. **Physical safety** is work that directly transforms the work environment in the interest of safety.

In our model 'administrative safety' includes some elements of Cloutier's 'Operational Work'. We reserve the category 'Operational Work' for non-institutional activity – typically carrying out the primary business of the organisation. Operational work would occur even in an organisation that had no regard for safety. Managers and workers perform both 'Safety Work' and 'Operational Work' – they co-create the institution that governs their day-to-day lives.

We also define a fifth aspect of safety, 'Operational Safety', as the absence of harm arising from operational work. Operational safety is not itself a type of work – it is an emergent property of work.

Our adapted model is shown in Fig. 1. For clarity, this model does not show relationship work, which connects and facilitates the other institutional work, but is not bespoke to safety.

The different types of safety work can be hard to tell apart. In fact, people inside organisations often see all safety activity as part of supporting operational safety. They may be offended or become anxious if the amount of safety work is reduced, because this is perceived as a reduction in operational safety. Breaking the causal link to operational safety, by suggesting that an activity doesn't contriubte to the prevention of accidents, de-legitimises administrative, social, and demonstrated safety work. This can be seen in language such as "Focussing on compliance" (performing administrative safety), "paying lip service to safety" (performing social safety), or "just trying to cover their backsides" (performing demonstrated safety).

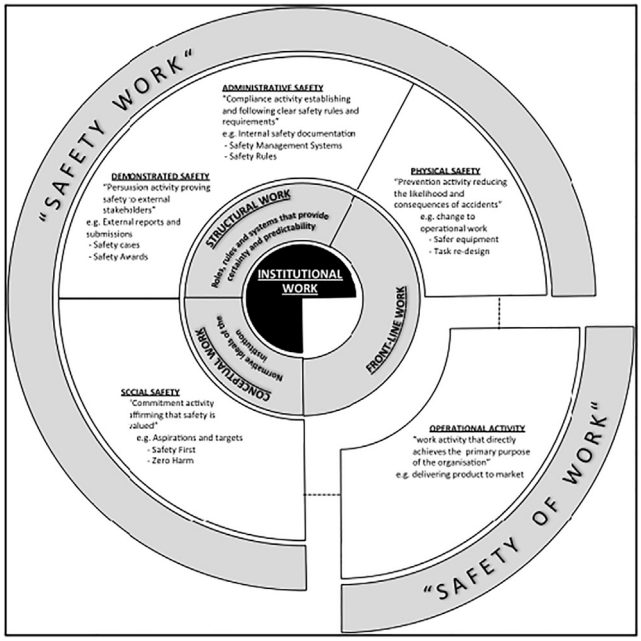

Fig. 1. Safety work and operational work.

From outside the organisation, dividing lines between the aspects can be more obvious, particularly in hindsight. In the aftermath of an accident, for example, an organisation may be accused of focussing too much on demonstrated safety, social safety, and adminstrative safety activities at the expense of paying attention to operational safety. Until such accussations are made explicitly though, questioning institutional safety actions is likely to be viewed as denying the importance of operational safety.

In the following sections, we provide more detail for each aspect of the model, and then discuss the dynamic relationship between the aspects.

3.2. Social safety

Social safety is the creation of an internal organizational narrative that puts safety in a special position. The organisation displays a collective commitment to the wellbeing of everyone involved with the company's operations.

Unless an organisation ceases business altogether, safety cannot actually be the constant top priority. Safety is constantly in a state of tension and trade-off with other values and goals of the organisation (Amalberti, 2013). Social safety is therefore continuously challenged by the operational work of the organisation, and requires reinforcement by communal acts of affirmation. Organisations have an acute need to reinforce social safety when they must justify actions inconsistent with their safety narrative, or for example, when they set safety targets and fail to achieve them.

A typical example of social safety performance is a "safety share". A safety share (also referred to as a "safety moment" or "safety start") is an item at the start of every meeting where one participant describes an experience, tells a story, or relates an item of information relating to safety. Safety shares are sometimes mandated by custom, and sometimes formally included as a standardised agenda item.

Hugh Heclo, in his book "On thinking institutionally", refers to "respect-in-depth" or "to honor something through your own participation in its practice" (Heclo, 2011). Thoughts and feelings become habits of action, which reinforce and sustain the thoughts and feelings.

Social safety is discussed in terms of values and progress: "Safety first", "Zero harm", Safety is our number one priority", "Safety journey", and "Next Gear". The enactment of social safety meets Islam and Zyphur's definition of ritual within organisations. Ritual is "a form of social action in which a group's values and identity are publicly demonstrated or enacted in a stylized manner, within the context of a specific occasion or event" (Islam and Zyphur, 2009). The symbolic and stylized nature of social safety can be seen in:

- safety slogans ("everyone goes home safe every day", "every accident is preventable", "safety is no accident")
- branded safety programs (Safety First, Zero Harm, Next Gear)
- safety logos distinct from company logos
- specific times and places for safety (safety shares, safety moments, safety as a prescribed first agenda item in meetings)
- "safety" as an adjective to mark objects and occasions as special (safety conversations, safety requirements)

To say that social safety is symbolic and ritualistic does not diminish the importance of social safety. Rituals are an important type of work, necessary for individuals to reconcile their individuality with a greater purpose – to "think institutionally". Organisational rituals, amongst other functions: signal commitment, communicate important values, exemplify and reinforce the social order, and manage anxiety (Smith and Stewart, 2011).

Social safety is a challenging topic for organisations, because the causal connection between social and operational outcomes of rituals is an empirically open question. Most constructions of "safety culture" assume that there is a link between strong cultures and positive outcomes. The validity of this assumption is probably dependent on the the nature of the rituals and the nature of the operations, and should not be assumed to hold in every case.

3.3. Demonstrated safety

Demonstrated safety work consists of activities that 'assures' safety to stakeholders outside of the organization. To flourish, a business needs regulators, communities, and customers who believe in the safety of the company's products and activities. Without such approval, an organisation cannot sustain business.

Stakeholders pose a threat to demonstrated safety when they create alliances and institutions that demand safety assurance from the organisation. The primary institutions by which communities and customers exert influence over the activities of hazardous industries are safety regulators (Walker and Wellock, 2010). Workers may also organise to undertake industrial action, or create unions to exert influence on their behalf. The organisation must respond to demands for assurance with a performance of safety activities that is even sometimes described in theatrical terms. They must "jump through hoops" or "put on a dog and pony show". Depending on the history of the particular industry, safety demonstration may be improvised, or tightly scripted by regulations. This demonstration usually involves producing and presenting 'evidence' that confirms the activities and products of the organisation are safe.

Negotiation is a type of institutional work (Helfen and Sydow, 2013). Institutions form part of larger ecosystems, containing other institutions with their own normative ideals, rules, systems and practices. When institutions interact, this creates pressure for change towards greater alignment. We chose the term "demonstrated safety" rather than "negotiated safety" because for most organisations there is an unequal relationship with stakeholders such as regulators. Managers and staff perform work to protect existing beliefs and practices, by demonstrating that they meet external expectations, or they perform work to change beliefs and practices to better align with external expectations.

Demonstrated safety deals in absolutes – an organisation must demonstrate safety to an acceptable standard, or face an external conclusion that they are unsafe. Demonstrated safety uses language hybridised from legal processes and mathematical proofs – "evidence", "demonstrate", "assurance", "reasonably practicable" and "acceptable" (Menon et al., 2009)

A representative example of demonstrated safety is preparation of a "Safety Case", common in railway, defence, and major hazard facilities. A safety case is "a structured argument, supported by evidence, intended to justify that a system is acceptably safe for a specific application in a specific operating environment" (Kelly, 1998). Safety Cases are prepared during the design of a system or facility. Operation of the system or facility in these hazardous industries is contingent on approval of the safety case by a regulator or a third-party assessor.

Safety case production involves the conduct of many "assurance" activities - including hazard analysis, design modelling, risk assessment, software testing, and human error prediction. These activities are ostensibly dual purpose - they are intended to increase the operational safety of the design and to provide evidence that demonstrates safety - but the language of the activities is directed at their demonstration rather than their operational purpose, and "success" is commonly framed as achieving approval rather than finding and resolving operational safety problems (Rae and Alexander, 2017).

Demonstrating safety through producing safety evidence is a form of structural institutional work. Professional and government standards are embedded in company processes, forms, and templates. Organisations may voluntarily adopt these standards even where they are not demanded by external stakeholders, and may create internal stakeholder approval systems that mirror the external bodies (Gunningham and Johnstone, 1999).

Because approval is usually an all-or-nothing event, demonstrated safety is measured by the achievement and maintenance of regulatory approvals and third-party certifications.

3.4. Administrative safety

Administrative safety is the enactment of controllable, repeatable and measurable safety routines. As with demonstrated safety, administrative safety activities are a form of structural institutional work. To manage day-to-day activities, organisations needs to translate goals and objectives into concrete plans, with clear expectations for what is required of everyone within the organisation (Katz, 1964).

Academic and theoretical discourse creates nebulous boundaries of time, space and category that must be considered in order to understand the causes of accidents (Dekker et al., 2011). The more we understand about how accidents come about, the less claim we have to definitive knowledge and solutions. Administrative safety, in contrast, creates a finite border around what should and should not be considered, and establishes well-defined categories and relationships within that border (Bahr, 2014). The language of administrative safety reflects this: definitions, standards, rules, accountabilities, system boundaries, and role requirements. Goals and values are translated into practices that can be performed in a standardised way, and that are objectively checkable. Administrative safety is measured through internal compliance and external accreditation audits.

A typical example of administrative safety is a personal risk assessment, or "take-5", process. It is considered good practice, before starting a hazardous task, to identify threats to operational safety and manage those threats before starting the main task (Rozenfeld et al., 2010). This routine does not intrinsically require documentation – or indeed any physical artefact. In order to support reliable and consistent performance of the routines, some organisations introduced take-5 reminder cards with lists of things to consider. To reinforce the process, records were kept and audited, and ultimately the take-5 itself became a form to be filled out, handed-in, and counted. The evolution from anxiety to practice to method to artefact is described by Wastell in his discussion of transitional objects – "the means to an end becomes the end in itself" (Wastell, 1996).

Administrative safety grows by documenting and reinforcing the ostensive aspects of routines in progressively greater detail. Eventually the processes for documenting and reinforcing routines themselves become institutionalised as "Safety Management Systems". Organisations were performing social safety, demonstrated safety and physical safety work long before the practice of documenting processes was widespread (Ingham et al., 1843). Administrative safety provides repeatability and certainty. It makes clear who is expected to do what, when. This is important for organisations to function effectively, and to manage their own performance. It is an important and open question, though, whether and when administrative safety work supports or hinders operational safety.

3.5. Physical safety

Most operational work, even when it is performed with non-safety goals, has a bearing on the likelihood of an accident. There is some front-line work, though, that would not occur were it not for safety concerns. This work includes:

- Fitting and maintaining protective barriers, such as machine guards;
- Placing markers and signs, such as traffic cones or wet floor signs;
- Supplying and managing personal protective equipment such as gloves and glasses;

- Installing, testing and monitoring safety-specific alarms; and
- Conducting safety-specific tests, such as measuring atmosphere in a confined space.

Because physical safety directly changes the work task or environment, it has the potential for a more direct causal link to operational safety. All other types of safety work must first influence physical safety or operational work in order to change operational safety. This does not necessarily mean that any specific physical safety activity improves operational safety.

Physical safety is usually discussed using physical terms and metaphors – hazards, barriers, and controls. Physical safety is often intended to operate by reducing variability in operational work – i.e. by preventing unsafe actions, but can also be thought of as providing extra capacity for workers to perform their work safely.

3.6. Operational safety

Operational safety is an emergent property of work. It is sometimes described as 'freedom from unacceptable risk of harm', but that definition poses serious problems for recognising safety. "Acceptable risk" is conceptualised through social safety, measured through administrative safety, and declared through demonstrated safety.

Except when a fatal or catastrophic accident occurs, operational safety can only be measured by performing administrative safety, social safety or demonstrated safety work. Even an apparently objective measure of safety, such as the number of injuries, requires administrative rules for identifying, screening, classifying, counting and reporting. In practice, it is hard to draw a clear line between safety work and operational safety.

One way to separate the two is to think about the mechanisms by which safety work could improve or degrade operational safety. Operational safety can really only be changed by altering the conditions or methods by which operational work is performed. This means either performing physical safety work, or changing what workers think and believe in a way that influences the conduct of operational work.

Ultimately, operational safety can only be changed by eliciting a change in matter or energy at the point where an accident could happen.

The following examples illustrate the distinction:

- Preparation of safety case documents for a regulator, by external consultants who have no influence over design or operations. This is safety work – specifically demonstrated safety – in pursuit of an organisational need. It has no mechanism to change the operational safety.
- Safety audits that check the presence of documents but not the quality of their contents. This is administrative safety work. Because the checks can be satisfied regardless of the operational reality, it does not change operational safety.
- Risk assessments prepared in support of decisions that have already been made. This is social safety work because the assessments can change how people feel about the decisions, but not the operational impacts of the decisions.

Another way to clearly distinguish safety work from operational work is to consider the effect of not performing the work. Whilst safety work activities (social, demonstrated, administrative and physical safety) have a purported mechanism by which they could affect operational safety, safety work is always discretionary. Even in the absence of the safety work, operational work could still continue. There is also always some empirical uncertainty about whether safety work causes operational safety – the weaker the evidence that a causal relationship exists, the clearer the distinction can be made between safety work and operational safety.

An example of a strong link is a workplace rule (administrative work) about wearing safety helmets whilst performing operational work in areas where objects might fall from heights. There is strong evidence for the efficacy of helmets (Long et al., 2015) and it is very obvious whether or not the rule is actually being followed. This is safety work that materially influences operational safety.

4. Interaction between social, demonstrated, administrative, physical and operational safety

4.1. Mutual reinforcement

Each type of safety intersects, and has a recursive relationship with each of the other aspects.

Social safety intersects with administrative safety when formal programs are created aimed at increasing the level of care for safety within an organisation. Examples of this include DuPont's 'Felt Leadership' program (Mottell et al., 1995) and Shell's 'Hearts and Minds' program (Hudson, 2007). The emergence and popularisation of 'safety climate' and 'safety culture' in the 1990s provided an administrative way to measure social safety (Zohar, 2010).

Social safety intersects with demonstrated safety when, even in the absence of explicit stakeholder demands, organisations seek external recognition for their internal safety narratives. A key example is nominating for safety awards. Safety awards require the deliberate crafting of a narrative of successful operational safety. Within a single industry, safety awards can be entirely a social safety performance – external to each individual organisation, but for the industry as a whole, a ritual of celebration that reinforces norms and values. Social safety has the potential to motivate physical safety work, and to motivate operational work to be performed in safer ways.

Administrative safety and demonstrated safety are both forms of structural institutional work, but are directed at different audiences. This results in hybrid roles, systems, and processes. The same document, for example a Safe Work Method Statement, may serve a demonstration purpose (to show that the work is being done safely) and an administration purpose (to explain how to do the work safely). Administrative safety maintains an organisation-wide ostensive (mental) model of other types of work. This can reinforce social safety through the promulgation of language and symbols, and support demonstrated and physical safety through established, repeatable and measurable patterns of work. Administrative safety can reduce the variability of operational work. To a certain extent, this is positive for operational safety.

Safety demonstration, being outward facing, does not intersect with operational work. However, external safety regulation is ultimately supposed to inform, guide, and enforce physical safety and operational work. To the extent that this is true, demonstrated safety activities first require social and administrative activities. If regulatory pressure results in the right administrative and social practices – i.e. activities that have instrumental functions (e.g. prohibited use of asbestos in building products), not just performative functions (e.g. perform risk assessment) – these practices will drive improved operational safety.

There is a trend in regulation away from instrumental 'prescriptive' requirements, towards performative 'goal based' requirements (McDermid and Rae, 2012). This trend can be argued to be positive or negative for operational safety. On the one hand, goal based requirements explicitly require more sophisticated demonstration performances, to the point where there is a sub-specialty of the safety profession dedicated to safety "assurance" (demonstrated safety work). This may create distance between safety demonstration and operational work. On the other hand, the flexibility of goal based regulation may allow organisations to choose administrative and physical safety practices that are more effective in achieving operational safety.

4.2. Multi-aspect response to threats

If something threatens or creates uncertainty in any aspect of safety work, it demands an organisational response. Unless people can make an astute distinction between different types of safety work, the organisation will respond to the 'safety risk' with 'safety activity'. This is likely to include social, demonstrated, administrative and physical safety activity, but will not necessarily change operational work.

A serious accident is an operational work event, that reveals a lack of operational safety, but the organisational response to accidents goes well beyond the physical workplace. Demonstrated safety activity increases as regulators and other external stakeholders need to be convinced that the company can continue to operate safety. The safety case - the argument and evidence that the system is safe - must be "repaired" by the production of new safety evidence to answer the concerns raised by the accident (Kelly and McDermid, 2001). Social safety activity increases as the organisation tries to restore belief in its own goodness through rituals of exclusion, restoration, and value reinforcement (Smith and Stewart, 2011). The sentence that appears in many accident reports "This accident was preventable" reveals that organisational actors believe they must reconcile their claim to put safety first with an accident that was not prevented. Administrative safety responds to accidents by creating new rules or by reinforcing existing rules through increased compliance activity (Amalberti, 2001).

These demonstrated, social and administrative safety activities are all generalised responses to potentially a much narrower event or risk. In fact, it is possible that the threat to operational safety increases safety activity in the other dimensions of safety work, but leads to no new physical safety work and no change to operational work.

In similar fashion, the creation of a fresh "school of thought" is a threat to social safety. Theorising is a type of disruptive conceptual work (Cloutier et al., 2016) at odds with the norm-maintaining rituals of social safety. A new school reinterprets concepts and symbols, and establishes its own legitimacy by delegitimizing existing beliefs and rituals. If the institution is sufficiently disrupted, it must demonstrate that it is still committed to safety, by publicly embracing the new school and championing it to external stakeholders. It will search to find performance measures and standardised practices consistent with the new way of thinking. Examples of these disruptive 'new' schools of thought have included: behavioural safety, safety culture, and most recently, safety differently. Operational work may benefit from the new perspectives and renewed attention to safety work, although not necessarily in proportion to the level of social and administrative safety activity.

Changes to legislation and regulation are structural threats, encompassing both demonstrated and administrative safety. They cause existing safety management systems to become non-compliant. Becoming compliant may change physical safety performance through a change to the workplace - for example mandatory roll-over protection on mobile plant.

4.3. Structural safety as a social and legal defence

As the social and legal expectations of safety have expanded, management and workers have developed an increased fear of the social and regulatory consequences of operational safety incidents. The social and legal consequences of accidents, for some, are seen to be as severe as the human consequences.

Organisations and individuals fear "not doing everything they should have done." This is a very rational fear, because if an accident occurs the organisation will, by definition, not have done enough to prevent the accident. The best they can hope for is to have done everything that they could reasonably be expected to do.

The concern can be addressed by an appeal to methodology. The administrative construction of rules and responsibilities provides a way to be doing 'the safe thing' even if those actions did not prevent an accident. Wastell (1996) suggests that in complex organisational environments, methodology acts as a "social defense". Individual decision making – with all of its attendant uncertainty and anxiety – becomes subordinate to structured methods and processes. The attractiveness of formally defined methods creates a strong feedback loop between administrative, social, and demonstrated safety. Rituals and values become metrics. Compliance evidence and cultural measurements are used in safety cases and public relations activities. Administrative procedures are given symbolic social value as "golden rules" and "safety essentials". When there is a strong feedback loop between administrative activity and symbolic representations, it becomes socially and politically risky for an organization to remove any of their administrative activity, even when provided with concrete evidence that the activity has no identified link to operational safety.

This feedback loop also goes in the other direction, for example when safety culture, as a representation of social safety work becomes administratively measured and audited (Reiman et al., 2014). This administrative 'evidence' of safety culture may then be used as part of demonstrating safety to external parties. Stakeholders such as regulators start to expect, or even to demand such evidence. Regulators make this demand explicit by providing information, tools, workshops, recommendations and even compliance activity (e.g. enforceable undertakings), and regulation (e.g. International Nuclear Industry), all aimed at reinforcing safety culture activity (Kerhoas and International Atomic Energy Agency, 2013).

The use of structural safety as a social and legal defence mechanism allows safety work to become self-reinforcing and self-preserving institutional work irrespective of any link to operational safety.

4.4. Competition for attention

Woods (Woods et al., 2015) introduced the term "safety energy" to discuss the way finite time, attention and expertise interacts with competing demands from different types of safety work. Woods was concerned with the difference between "reactive" and "proactive" activity, but the concept also applies to our four types of safety work. Whilst each type of safety work can drive improvements in other safety performances, and operational safety, it can also consume energy at the expense of other safety work.

This is not a strictly zero-sum trade-off, because the proportion of overall company resource devoted to safety can grow or shrink. Extra safety work does not have to come at the expense of operational safety. There are even authors who argue that safety bureaucracy is a net gain to both safety and productivity (Targoutzidis et al., 2014). Our model does not exclude this possibility. It is certainly the case, though, that organisations and individuals have limited attention.

Where there is a limited amount of safety energy, the different types of safety work cannot expand other than by competing for energy with the other types of safety work.

4.5. Negotiation of power

The four safety performances draw on and reinforce different sources of authority.

Demonstrated safety performance provides authority by proxy; a manager or safety practitioner who is the source of information on what the customer, regulator or legislation requires can shape social, administrative and operational performance (Daudigeos 2013). Typical examples of this are a safety engineer who demands that a risk assessment is performed in a particular way to comply with a standard, or a manager who demands that an injury is not reported to avoid upsetting a site owner or principal contractor.

Social safety performance uses rituals to channel group authority into particular symbols or words, calls upon the power of those symbols or words to demand particular actions. "We have to investigate the stubbed toe, because Every Accident Is Preventable and we are

committed to Zero Harm".

Administrative safety provides positional or "formal" authority. In heavily institutionalised organisations, written procedures can acquire formal authority that transcends traditional hierarchical authority. Power rests in the hands of those who write the rulebooks (Almklov et al., 2014; Amalberti, 2001).

Operational work is performed by the people with the least formal authority in an organisation. Physical safety improvements usually occur when authority can be drawn from elsewhere – unions, or legislation. A typical example is the introduction of a machine guard or personal protective equipment to meet regulatory standards.

The different sources of power provide some explanation for which safety activity gets priority when they compete for resources. Whilst all safety practice relies on a link to operational safety for legitimacy, anyone can call upon this link so it does not help resolve resource contests.

5. Discussion

5.1. Why distinguish between safety work and the safety of work?

When the same term is used for multiple concepts, it becomes hard to talk about the relationships between those concepts. "Safety" is a deceptively simple term that obscures a variety of purposes, activities, and outcomes. The main contribution of our model is to provide a way of distinguishing between the different institutional purposes of safety activities. This in turn allows for the framing of better questions about when and how those purposes are achieved.

The bureaucratisation of safety is one topic that can benefit from a clear differentiation between the safety work and the safety of work (operational safety). Bureaucratization refers to a growth in the breadth and depth of administrative safety activities. It is work performed to provide the organisation with confidence that it is taking the right actions to meet both external obligations and a value-based social commitment to safety. Popularly, safety bureaucracy expansion is seen as a way for organizations to limit their legal liability risk resulting from a safety incident or non-compliance (Dekker et al., 2011). However, when administrative safety activities are viewed as a form of structural institutional work, it can be seen that they perform a general purpose in maintaining the institution regardless of the threat. Yes, legal liability is a threat to demonstrated safety, and does elicit an administrative safety response, but this is just one specific case.

Any threat to safety will often generate activity across all aspects of safety work, regardless of whether it is:

- a threat to social safety, such accusations of having a 'poor safety culture';
- a threat to demonstrated safety such as failing to obtain a regulatory safety approval;
- a threat to administrative safety such as failing a safety audit; or
- a threat to physical safety such as a 'near miss' incident.

An organisation manages, co-ordinates and measures this activity through administrative work. Structural work is a precondition for other types of institutional work, including operational improvements, but is unhelpful if it requires so much time and attention that the organisation never gets around to the other work (Cloutier et al., 2016).

The complex relationship between structural work and operational work has been extensively examined in other fields (Katz, 1964) but in safety is usually represented as a binary choice between structure (Safety I) and agency (Safety II). This is unhelpful, as it leads to ontological debates about whether different types of safety work count as safety, instead of empirical investigation of which safety work activities best support operational safety. Institutional reform such as safety improvement is not a choice between conceptual, structural and operational work, but requires work of all three types.

Distinguishing between the different aspects of safety also assists in discussing the relationship between safety and assurance. Confusion between safety work and operational safety leads to false alarm (where someone holds undue concern about non-existent or insignificant risks) and "false assurance", where there is misplaced confidence in the management of safety risk (Rae and Alexander, 2017).

False alarm and false assurance are not automatically dangerous, but they interfere with the ability of organisations to concentrate on the possibility that they might not be safe, and to guard against overconfidence and misdirected attention (La Porte, 1996; Snook, 2000; Turner, 1976; Vaughan, 1997).

Our model suggests that unless organisations can differentiate between demonstrated safety, administrative safety, social safety, physical safety and operational safety, they may be performing institutional safety work without achieving operational safety. Although the different aspects of safety are usually correlated, they are capable of moving independently. If an organisation perceives the total safety performance rather than each aspect separately, a strong performance in one aspect can conceal poor performances in the other aspects.

In the absence of serious adverse events, operational safety is only measured through the other dimensions. Organisations measure operational safety through:

- risk assessments, which are usually demonstrated and administrative safety;
- compliance, which is usually physical and administrative safety;
- leading indicators, which are usually measures of administrative and social safety;
- lagging indicators, which are operational safety interpreted through administrative safety work; or
- Safety culture surveys, which are a measure of social safety

Organisations can hold a collective belief that safety is important, demonstrate safety to external stakeholders, and function in accordance with their safety systems - and this may give little insight into whether or not they are likely to experience a major accident. On the night before the Deepwater Horizon accident, a ceremony was held to celebrate exemplary safety performance (Deepwater Horizon Study Group, 2011). In hindsight, it will be obvious that there was a disconnect between safety work and operational safety – a myriad of "missed opportunities", an accident "just waiting for its release" (Rasmussen, 1997) – but it doesn't currently appear that way from within the organisation before an accident.

A third discussion where it is important to distinguish between the different types of safety is 'psychological safety'. The term originates from outside engineering or safety science, and so 'safety' means something different, but psychological safety is still relevant for achieving operational safety. Prevention of accidents relies on individuals who share ideas, express opinions, raise concerns, and provide warning of where there may be safety problems (Kewell, 2006). This depends on an environment of psychological safety. Psychological safety is a shared belief that the team is safe for interpersonal risk taking (Edmonston, 1999); it allows the boss to hear bad news (Dekker, 2007).

It is an open question whether psychological safety is created or harmed by a strong safety climate. This question is difficult to even investigate unless operational safety is differentiated from social safety work. It is certainly plausible that some performances of social safety, such as commitment rituals, make it hard to challenge the way safety is achieved and conceived. It is also plausible that some types of social safety work encourage an environment where divergent views on safety can be openly discussed.

5.2. Questions arising from the model

A good model explains currently observed phenomena, but also

suggests avenues for further exploration. Our model explains existing safety practice in organisations, and some problems observed with that practice. It should be possible to test the model via targeted ethnographic investigation. There is also opportunity for comparative case studies between organisations.

Our discussion in this paper is primarily about different types of institutional safety work, rather than who performs the work. A key area for further investigation is the role of safety practitioners in the performance of different types of institutional work In particular, how do safety practitioners and non-safety practitioners explain how and why they perform safety work? Does legitimacy come primarily from the link to operational safety, or from other external and internal drivers of safety work?

Our model also leaves untouched the status of particular safety activities. For example, what type of work is a risk assessment? Is it primarily directed towards demonstrated, social, administrative, or physical safety? Most likely risk assessment is a different type of institutional work under different circumstances, but it is important to understand how and when it plays different roles. What type of work is a safety plan? The word “plan” suggests that it is administrative work directed towards operational work, but then why are safety plans more often prepared, viewed and discussed by outsiders than by personnel performing the operational work described in the plan?

6. Conclusion

Our model presents each of the four types of safety work as legitimate activities for organisations. Other contemporary safety theories have attempted to de-legitimise non-physical safety work in order to reduce bureaucracy and increase organisational efforts on ‘actual’ (operational) safety. These approaches have had limited success due to their failure (perhaps ironic, given their complaints about the reductionist nature of bureaucracy) to acknowledge the social complexity of modern organisations. In contrast, our model explains how safety as a complex organizational performance gets enacted and reinforced. The model provides a way to talk about how and why types of safety work are legitimised and performed separately from discussions about their efficacy in creating operational safety.

Understanding that safety work is institutional work, that serves purposes beyond achieving operational safety, is important both for those who seek to understand why safety practice is the way it is today, and for those who seek to change safety practice to create a stronger link between safety work and the safety of work.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.ssci.2018.07.001.

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