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How safety culture can make us think

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How safety culture can make us think

Safety Culture has now been for almost three decades a highly promoted, advocated and debated but contentious notion. This article argues first that one needs to differentiate between two waves of studies, debates, controversies and positions. A first one roughly from the late 1980s/early 1990s to mid-2000s which brought an important distinction between interpretive and functionalist views of safety culture, then a second wave, from mid-2000s to nowadays which brings additional and alternative positions among authors. Four views, some more radical and critical, some more neutral and some more enthusiastic about safety culture are differentiated in this article. It is contended that this evolution of the debate, this second wave of studies, should be understood within a broader historical and social context. It is characterised, borrowing insights from management studies, by patterns of interactions between academics, publishers, consultants, regulators and industries. In this context, safety culture appears in a new light, as a product among other (albeit a central one) of a safety field (and market) which is socially structured by this diversity of actors. This helps sensitise, first, the second wave of studies, debates, controversies and positions on safety culture of the past 15 years as identified in this article. Second, approaching safety culture through this angle is an opportunity to questions safety research more globally and, third, an occasion to pinpoint some of the currently unproblematised network properties of high-risk sociotechnical systems.

1. Introduction

Safety culture is now an important and pervasive notion which made its way over the years in different high-risk systems (e.g. nuclear, rail, oil & gas) to frame the problem of safety from an organisational perspective. It is discussed by academics, is widely available in books and advocated by consultants and is even sometimes regulated (more about this below). The topic has been discussed for more than three decades, we are accustomed to the notion, and one could conclude that much of what could be said over the years has been said considering the amount of attention granted to the topic (for a recent overview, see Gilbert et al, 2018). This article argues otherwise and offers an alternative way of using the notion to discuss about safety.

In a first section, I identify two waves of safety culture studies, debates, controversies and positions among authors, one from late 1980s/early 1990s to mid-2000s, another from mid-2000s to nowadays. In a second section, I shortly introduce management studies on the explosion of consulting, fads, fashions and gurus in management in the past 30 years to compare the situation with the safety field. It appears that a similar pattern is witnessed. In the last section, I consider some of the implications of this, discussing three points.

I start with sensitising the second wave in the light of the pattern of social interactions identified. I then discuss safety research from this perspective and finally, refer to some network properties of high-risk systems which would benefit from integrating these considerations. This article adds therefore another, qualitative but also alternative, angle of interpretation to the bibliometrics analysis of thirty years of publications on safety culture (Nunen et al., 2018). As these authors assert, "*bibliometric analysis uses quantitative methods. Hence, the content or the quality of publications cannot be interpreted.*" (Nunen et al., 2018, 258).

2. Distinguishing a first wave from a second wave of controversies and positions

2.1. A 1st wave (late 1980s-mid 2000s)

Much water has flowed under the bridge since one of the first academic writings on safety culture in the late 1980s by Turner and Pidgeon, (Turner et al, 1989, Turner, 1989, Pidgeon, 1991). Commenting on the analysis of the OECD report following Chernobyl, they wrote. "*If these social and cultural elements are as important as the Chernobyl analysis suggests, it is not enough merely to identify a safety culture. We need to be able to identify what constitutes a good safety culture, what its characteristics are and how managers responsible for risk management can change and improve existing safety cultures.*" (Turner, Pidgeon, Blockley, 1989, 2).

A few years later, at the end of the 1990s and early 2000s, special issues of journals such as *Work and Stress* and *Safety Science* made important contributions to a growing interest for the notion in the industry and regulators. Many authors, with their analysis in these special issues provided the intellectual support to frame a debate (Flin, Cox, 1998, Pidgeon, 1998, Reason, 1998, Hale, 2000, Guldenmund, 2000, Glendon, Stanton,

2000). A much influential view at the time was to distinguish the functionalist from the interpretive view (Stanton, Glendon, 2000). The former promoted a rather managerial ambition to shape and to control, the latter advocated a more neutral ambition to grasp safety culture as a social construct. This is still a quite valid first overview, which characterises well this topic, at a first level of analysis.¹

A comment is needed at this point. These waves of debates must be seen as periods during which published material or studies create new interpretations or controversies about the notion of safety culture. They suddenly open additional possibilities for thinking about the notion. These waves do not mean that they replace previous studies, positions or debates of a preceding wave. As remarked by a reviewer of a first version of this article, research based on psychometric studies of the first wave are still very popular and much practiced, as much as framing safety culture through functionalist versus interpretive lenses. Waves do not mean that one replaces another, it means instead new options for thinking the topic of safety culture, often adding wealth of interpretations, and indicating evolutions in our grasp of such a complex subject.

2.2. A 2nd wave (mid 2000s-now)

Following this first wave of debates, a second wave of studies have been produced and new positions advocated in the late 2000s and during the 2010s, to bring a more nuanced and diverse range of appreciations (table 1). In the next section, I differentiate four positions produced in this 2nd wave by scholars in relation to safety culture, a first one of rejection, a second one of interest for the notion as an object worthy of detached scientific study, a third one open-minded about its value but under conditions and the fourth one of promotion of a maturity view of safety culture. These positions constitute a sort of continuum from highly critical to highly favourable perspectives on safety culture.

Table 1. 1st and 2nd waves of safety culture studies and debates

| |
|---------------------------------------------------------------------|
| Safety culture studies, controversies, positions and debates |
|---------------------------------------------------------------------|

¹ Another issue was the difference between safety climate and safety culture (Guldenmund, 2000), the latter targeting deeper level of analysis (based on anthropology) than the former (based on organisational psychology, psycho sociology and psychometric measurements), but this issue has become over the years a secondary one in comparison with the first.

| 1 st wave, 1990-2005 | 2 nd wave, 2005-2020 |
|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p style="text-align: center;">Interpretive view & functionalist view</p> | <p>Rejection or critical view of safety culture</p> <p>More neutral, detached scientific interest for safety culture as an object</p> <p>Open-minded about safety culture practical value, under certain conditions</p> <p>Promoting safety culture methods, programs and models</p> |

2.2.1. First view: rejection or critical view of safety culture

Perhaps the most recent radical perspective is Hopkins’ rejection of safety culture (Hopkins, 2016). Hopkins is a very influential and productive sociologist in the field of safety (Le Coze, 2017a). Author of multiple books and articles, engaged in industry and regulatory debates, he has come up with the belief that it would be more appropriate to abandon the association of the two words “safety” and “culture” together. Not that culture is not an important notion, but that the combination of safety and culture is not a good one because it is more confusing than enlightening. This conclusion comes at the end of a list of properties on culture developed by the sociologist (Hopkins, 2016, chapter 7).

Hopkins’ list contains seven points: culture is a group phenomenon, not an individual one; organisation culture can override national cultures; an appropriate definition of culture is “*the way we do things around here*”; Culture is descriptive more than explanatory; culture is a product of top leaders; emergent and managerialist view of culture are not opposed; safety culture is confusing and we should abandon it. It is not the purpose of this article to analyse these propositions but as the list makes it clear, Hopkins does not reject culture entirely,

He proposes to specify the conditions under which a good grasp of culture in relation to safety is possible, in particular, through adapted organisational structures (Hopkins, forthcoming). For him, talking about organisational culture which influences safety is far more appropriate than the search of something like a safety culture which would exist independently of other cultural dimensions expressed in organisations (Hopkins, 2006).

But this leads to the rejection of safety culture as an idea because it introduces too many biases, as observed in companies' practices.

One could see Hopkins' position as one among other critical views of safety culture, although it is the most radical in the sense that he explicitly suggests abandoning it. Not all critical views conclude to a rejection of safety culture. Silbey has for instance argued against the mainstream approach of safety culture (Silbey, 2009). She criticises its dominant rationale as expressed in companies and which can be seen as "*an expression of responsabilisation, this neo-liberal technique of governance*" (Silbey, 2009, 348).

To reach that conclusion, she differentiates between safety culture as causal attitude, as engineered organisations and as emergent and indeterminate. She then criticises the first two of these versions, which are the most common ones in industrial practices, because they "*reproduce individualist and reductionist epistemologies that are unable to reliably explain social or system performance.*" (Silbey, 2009, 343). One issue is that they downplay power, asymmetry of authority, controversies etc. "*One is hard pressed to find a reference to power, group interests, conflict, or inequality*" (Silbey, 2009, 361). However, and contrary to Hopkins although critical, Silbey does not go as far as rejecting it.

2.2.2. Second view: a more neutral, detached scientific interest for safety culture as an object

The second position finds the topic interesting, worthy of scientific inquiry given its importance, but without any critical (Silbey, 2009) or radical implications about its relevance (Hopkins, 2016). It looks into the topic as something that can be sensitised according to how it is conceptualised by different authors, seeing as a consequence a diversity of ways of studying and talking about it, without really taking side about which one is more valuable than the others, and often promoting complementarities rather than exclusiveness. One of these authors is Guldenmund, who slightly moved away from the binary distinctions of views of functionalist and interpretive views of safety culture of the late 1990s and early 2000s (Guldenmund, 2000) to differentiate academic, analytical and pragmatic versions of safety culture (Guldenmund, 2010a), to then explore the potential of images (following Morgan, 2006) for refining our understanding of this notion (Guldenmund, 2010b).

I describe succinctly his distinction between the academic, analytical and pragmatic views. The academic is the ethnographic one associated with anthropology and sociology and requires intensive fieldwork, the analytical is the psychometric one based on the statistical treatment of semi-quantitative data collected through questionnaires, surveys and measures (with psychological or psycho sociological roots), and the pragmatic one is the one promoted by an engineering view of the field of safety or by consultants (with a managerial orientation). Guldenmund finds no incompatibility between these three options, and consider them to be complementary instead, each being understandable as focusing on the past (academic); the present (analytical) and the future (pragmatic). *“All three approaches could be considered complementary rather than alternatives or competitors.”* (Guldenmund, 2010a, 1476).

Edwards et al (2013) have a very similar idea and suggests dividing safety culture in three different perspectives, overlapping and highly compatible with Guldenmund's: normative, anthropological and pragmatist². And, again, the rhetoric is one of compatibility rather than rejection or critics. *“In order to increase the applicability of safety culture research and practice to a wide variety of settings and problems, and to improve its predictive validity, it could be beneficial to synthesise the approaches of each conceptualisation into a single overarching conceptualisation of safety culture”.* (Edwards et al, 2013, 77). One issue is that the two authors do not go beyond their suggestions, by testing or applying them. They remain interested in the safety culture construct, don't see why they would reject it or would be too critical about it (as the examples of Hopkins or Silbey), but stop there, at least in these articles.

Henriqson et al (2014) share this posture although using different lenses, based on the work of Foucault. Mobilising the analytical categories and strategies of the philosopher, they show in two steps, the genealogical one then the archaeological one, how safety culture is, first constituted historically as a scientific object (genealogy), second how safety culture creates tangible effects in companies (archaeology). Seen this way, safety culture becomes an object likely to model behaviours, or in Foucault's term, to produce a certain type of governmentality, namely a form of power found in the ability of

² Note that the distinction of Guldenmund (academic, analytical, pragmatic), Edward et al (normative, anthropological, pragmatist) and Silbey (as causal attitude, engineered organisations, emergent and indeterminate) are not incompatible.

discourses to provide the principles against which social reality and population can be oriented, shaped and influenced.

In all of these examples of authors and studies, safety culture is presented as a very interesting topic to comprehend. Identifying its various forms, digging into its historical origins, looking for its effects, appraising compatibilities of its various forms...the main purpose is not really or at least not explicitly to criticise or to argue against the notion, but to understand, to explain and to stand back. Safety culture is an object likely to interest the scientist or researcher, in itself, detached from practical considerations or detached from the constraints of proving its relevance³.

2.2.3. Third view: open-minded about its practical value, under certain conditions

The third one is one which recognises culture as potentially an important aspect of safety, but one which needs to be studied, approached and promoted while making it compatible with social sciences' practices, insights and debates. It is probably fair to say that this posture finds its roots in the first writings on safety culture by Turner, with Pidgeon and Blockley, who tried to find ways to accommodate the notion with findings of sociological and organisational studies of culture and disasters (Turner, 1971, 1978), to turn it into a meaningful and relevant concept (Turner, Pidgeon, Blockley, 1989, Turner, 1989). It was in the early days of the notion, in the late 1980s, and Turner was well positioned to discuss this issue as a researcher at the vanguard of both topics, culture and sociotechnological risks (Le Coze, forthcoming).

First, they warned "*It needs to be recognised that culture is not a simple 'thing' that can be bolted on' to an organization, nor a simple set of practices which can be implemented on a Monday morning after a week end course (Turner, Pidgeon, Blockley, 1989, 8).* They identified the growing consulting market which was then created by the success of the notion of culture through the Mc Kinsey's gurus Peters whose *In search of excellence* (Peters, Waterman, 1982) put culture high on the agenda of corporations.

They consciously distance themselves from a simplistic view of safety culture by connecting it to its anthro-sociological roots. They turned it into a set of principles

³ A slightly earlier contribution within this category is Richter and Koch following Martin's distinction between three perspectives on organisational culture (Martin, 2).

among which the involvement of the highest level of organisations feature chiefly, including issue of power. *“What is to be avoided is the cultural pattern of behaviour which has been called group think, a precarious pattern in which those in powerful positions use influence to reinforce their own points of view even when these are mistaken, and to stifle criticism”*. (Turner, Pidgeon, Blockley, 1989, 7).

This is precisely this idea of combining power and culture that Antonsen promoted when discussing safety culture (Antonsen, 2009a). Drawing on the ethnographic tradition of safety culture exemplified by Turner and his followers (Gerhardi, 1998), Antonsen comes back to Perrow’s assertion that *“we miss a great deal when we substitute power with culture”* (Perrow, 1999, 380). Although this notion was not absent of Turner’s view of culture, risk and organisations (Turner, 1978), Antonsen’s exploration goes one step further by elaborating more about the possibility of a combination between the two concepts of culture and power, requiring for subcultures to be recognised (Antonsen, 2009a), and how it can be concretely translated in practical safety management intervention (Antonsen, 2009b).

In a study, Antonsen shows that the outcome of safety culture assessments performed by questionnaires were at odd with the findings of an inquiry following an event on an offshore platform (Antonsen, 2009c). In a nutshell, results were rather good according to the questionnaires, but this evaluation failed to predict the serious near catastrophe which occurred a few weeks-months later. Although, cautious in his article, the opposition between the survey based and qualitative based approach of safety culture is exposed, challenging the relevance of the former, and suggesting the importance of developing the latter in the future.

So, in this third view of safety culture, it is believed that the notion has potential as an alternative or complementary approach to other more traditional safety approach, but under certain conditions. The first condition is to situate the notion in relation to other notions, including the idea of subculture but also power. The second condition is to question more explicitly the relevance of certain type of operationalised version of safety culture (i.e. questionnaires) in comparison to in-depth anthropological practices (e.g. Haukelid, 2008, Naevestad, 2009), sharing here some concerns expressed by Vaughan about the limitations of using surveys (Vaughan, 2005).

2.2.4. Fourth view: promoting methods, programs and models

The fourth view embraces unconditionally the idea of safety culture and develop tools, programs and models advocated and implemented in various industrial contexts (e.g. Reason, 1997, Cooper, 2000, Hudson, 2007). It shares with the third view this belief in the practical implications of safety culture for industries, but does not discuss conceptually the notion in relation to the social sciences, or its likely limitations, as a scientific object, as a social construct. They correspond to these cases described by authors of the second view as primarily pragmatic (or pragmatist) or engineered oriented (Silbey, 2009, Guldenmund, 2010, Edwards et al, 2013).

These programs are not likely to be discussed from an academic point of view, and it is the core of Hudson's following quote. *"There is an advantage to well-grounded scientific theories and, at the same time, there is a problem with academics (...) Fine distinctions of theory, the daily fare of the fundamental scientist at the cutting edge, are too fragile to base a system on if that system is to work (...) If an approach does not work in the long run there will be a lot of problems created, including the believability of the academic world"* (Hudson, 2007, p. 719).

One current and highly successful version of this perspective is the maturity framing of safety culture, a story which has been studied (Filho, Waterson, 2018). Based on various sources, including the influential sociological study of Westrum delineating pathological, bureaucratic and generative cultures (Westrum, 1993, 2004) or the maturity scale in the field of quality (quality management maturity grid), the proposed scheme proposed for instance by Fleming (2001) or Hudson (2007), discriminate between bad and good safety cultures. Several steps, as one would walk up the stairs, allow companies to move from bad to good. Each step is broken down in dimensions to be compared with in reality to position practices of an organisation (Parker, Lawrie, Hudson, 2006, Lawrie, Parker, Hudson, 2006).

Served by an appealing visualisation which represents a progress from bottom to top as one gets higher achievements (top) in contrast to lower results (bottom), such programs which are also highly compatible with classic auditing practices, could be seen as the answer to Turner's plea introduced above to establish the criteria of a good safety culture. Of course, along the way, some of the subtleties of the ethnographic stance, or of the reflexivity on safety culture as a construct, are left aside while these cautious

considerations are core to the three other views (e.g. Hopkins, 2006, Antonsen, 2009a, Guldenmund, 2010).

3. Safety culture as an illustration of social transformations

This new classification of the different views which have studied, analysed, practiced or promoted safety culture shows the range of critical, neutral or nuanced options but also embracing and enthusiastic ones (tables 1 & 2). This new classification differs from the initial distinction between functionalist and interpretive views of the 1990s and early 2000s, which corresponded to a 1st wave of studies and debates. The 2nd wave in contrast, from mid-2000s to late 2010s, goes now beyond and refines this distinction. They all add something new to our understanding of the problem. The new views of this 2nd wave offer more nuances which resonate or not with one’s own experience and intellectual sensitivity of the topic.

Table 2. Safety culture, four views

| | |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| First view: rejection or critical view of safety culture | The dominant view of safety culture translates an individualistic (neo liberal) view by management (e.g. critical view, Silbey). The practical misuse of the notion witnessed in companies should lead to abandon safety culture (e.g. radical view, Hopkins). |
| Second view: a more neutral, scientific interest for safety culture as an object | Diverse safety culture perspectives co-exist, they are not exclusive, and perhaps even complementary |
| Third view: open-mind about safety culture practical value, under certain conditions | Safety culture is an important concept but needs to well-understood to be useful, combining it, for instance, with notions such as power |
| Fourth view: promoting methods, programs and models | Safety culture should be developed as a tool to improve safety, with, for instance, the help of maturity models |

But how is our own sensitivity of the topic forged in the first place? In which context? I argue that one missing perspective of this 2nd wave of study to stand back further is one which would appreciate the broader context in which these new views are produced. Why would authors become critical or radical about safety culture within a decade or two? Why would the maturity idea of safety culture gain such prominence in companies over that same period of time? When asking such questions, one needs to consider some

of the changes of the operating landscape of high-risk systems over the past three decades. The next section turns to the empirical, conceptual and critical studies within the history and sociology of management consulting (e.g. Clarke, Kipping, 2016), to develop this consideration.

3.1. Management studies on fads, gurus and consultant-client relationship

When doing so, it appears that safety culture development is parallel and very similar to an even broader dynamic in the past 20 to 30 years which has been studied by management researchers, targeting the explosion of management ideas in the 1980s and the development of a market served by a thriving consulting industry, business schools and business publishers (Sahlin-Andersson, Engwall, 2002; Clark, Fincham, 2002; Kipping, Engwall, 2002; Sturdy, Hangle, Clark, Fincham, 2009; Clark, Kipping, 2012; Engwall, Kipping, Üsdiken, 2016). Researchers of this topic are interested in different aspects of this evolution of management, and their work provide highly relevant insights to think about safety culture.

These writers address indeed the rise of consulting in the 1980s as part of the knowledge economy, the post-industrial, the information or the network society, which are examples designed to capture the macro mutations of the past decades in areas of work, organisations or capitalism in which the service economy has taken a central place. These writers identify and study fashions in management (Abrahamson, 1991, Jung, Kieser, 2012), the rise of management gurus (Huczynski, 2006, Collins, 2007), the relationships between publishers, consulting and academics driving these trends but also the client-consultant relationship (Clarke, 2004, Engwall, 2012). The value of these studies over more than 20 years of research in management is that they allow an interesting analogy for safety.

3.2. What about the field of safety?

These research topics associated with the study of the field of management consulting which exploded in the 1980s within the macro transformations captured in the literature as the knowledge economy should strike anyone involved in safety research and practice because the patterns described and analysed in the above literature

correspond quite well to what has happened in the field of safety over the past two to three decades too.

Increase complexity of and concern for high-risk systems, development of knowledge in safety through scientific journals and a specialised press but also presence of and need for safety professionals in accident investigation or safety management, and associated demand for training in this area to be developed by universities...are some of the ingredients mirroring those described in the field of management which led to the phenomenon of the 1980s onwards (Clarke, 2004, Engwall, 2012).

These trends (higher concerns for safety, training needs, development of safety journals, etc), in the 1970s then 1980s, propelled by a series of major events (e.g. Bhopal, 1984, Chernobyl, 1986) along with the macro changes in organisations and regulations, led to a new situation in the field of safety reminding of the one described above in management. Issues of methods, models and practices developed, advocated and supported by academics and consultants which could be seen as fashions or fads, advent of guru-like writers and speakers, problems of client-consultant relationships, are easily translated in the safety field.

3.2.1. Any fashions, fads in safety ?

Anyone with a practical or research experience in safety, especially in diverse high-risk systems, in the past 15 years would indeed be able to write a list of some of the most prominent methods, practices, concepts or ideas in safety which reminds the list indicated previously in the field of management (e.g. total quality management, lean management, liberated company). Safety Culture, Crew Resource Management, Behavioural Based Safety, High-Reliability Organisations, Swiss Cheese Model, Just Culture, Safety Check-List, Safety Leadership, Golden Rules, Vision Zero, Resilience Engineering or Safety II, etc...are examples of these methods, practices or ideas which have been produced and been around for some years, sometimes decades.

Indeed, thirty years ago, in the 1980s, Safety Culture did not exist as a concept or as consulting product to buy on the shelf for companies. Safety Culture was only starting to be mentioned explicitly in reports or journals. The program Crew Resource Management was in its infancy. The notion of Human Error was not even ten years old with major conceptualisation still to come. High Reliability Organisation was not a management

label, and was only back then just a published idea. So, it is mainly in the past two to three decades that an explosion of what could be called safety concepts and products has occurred.

3.2.2. A socially structured safety market

Sometimes but not always, these methods, practices or models are directly associated with the names of academics such as James Reason, Erik Hollnagel, Andrew Hopkins, Sidney Dekker but there are also visible consultants such as David Marx, Tim Marsh, Tony Kern or Todd Conklin. These writers promote their views through books, sometimes blogs, articles in a diversity of journals and periodicals and conferences but also online videos (or sold as DVD). For a time, and before being absorbed by Taylor and Francis, the publisher Ashgate had an important portfolio of titles including best sellers in human factors and system safety by some of these highly visible writers. Titles such as *Managing the Risk of Organizational Accident* (Reason, 1997) or *Just Culture* (Dekker, 2007) for academic writers are two of these examples.

It is therefore very tempting to copy and paste the mode of institutional analysis applied in the field of management, from a historical and sociological point of view to safety (Clarke, 2004, Engwall, 2012). Comparable actors and institutions are involved in the production of something that could be approached as a safety market for ideas, methods and practices: consultants, academics, safety publishers and press. There are no quantitative figures which would help to ground a comparison between the two fields, management and safety. One can imagine without taking too much risk that the safety field is only a tiny fraction of what represents the management field but the analogy between the two is still highly informative.

One major difference which is immediately striking is the importance and presence of active regulators. In safety, and more so in high-risk systems, regulators can become the promoters of methods and ideas, and cases of prescribed safety culture in the petroleum industry in Norway (e.g. Antonsen, Nilsen, Almklov, 2017), or of resilience or just culture in aviation (e.g. Bergström, 2018) are now available. This concretely means that such concepts have become expected and required for companies through regulations (another case is crew resource management, see below). One needs therefore to slightly expand the key actors and institutions in comparison with the field

of management, to include the regulators (figure 2). Let's illustrate it briefly with three fairly well known and studied examples, high reliability organisations, crew resource management then safety culture.

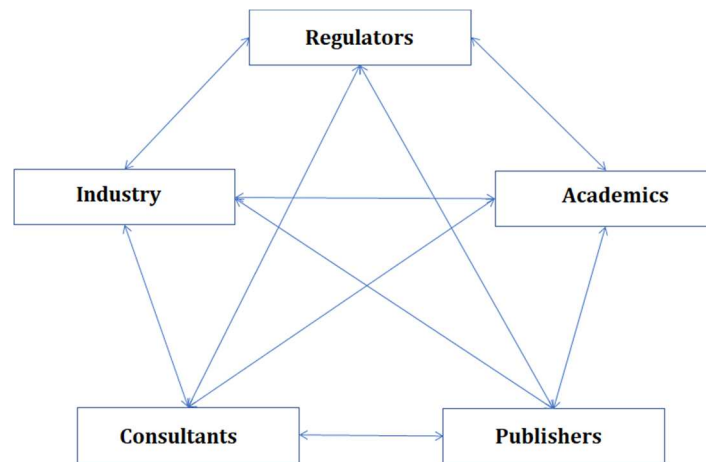


Figure 2. Core actors and institutions shaping safety

3.2.3. Examples: HRO, CRM, Safety Culture and Vision Zero

The story of high-reliability organisation has been recalled in many writings (e.g. Le Coze, 2016). A group of academics in US with various backgrounds (organisational psychology, social psychology, political science) empirically studied high-risk systems then conceptualised properties which would explain how they manage to remain successful despite the high demand and complexity of their operations (Weick, 1987, Roberts, 1989). Further conceptualisation was then developed in subsequent years into a successful academic model of collective mindfulness (Weick, Sutcliffe, Obstfeld, 1999) which gained a momentum through consulting and applications in various companies, including most visibly BP (Reid, 2007). A dedicated website to high reliability exist (www.high-reliability.org) by promoters of high-reliability organisations, and the notion has become a sort of management label, whether or not against the initial intention of the researchers.

Crew Resource Management is more closely connected to aviation and derives from slightly different disciplinary backgrounds in ergonomics, human factors and psychology than the HRO traditions (Le Coze, 2016). CRM were developed through applied research programs, in the 1980s, to become training programs for pilots and teams in order to strengthen their ability to communicate and cooperate, to avoid the likelihood of serious events by managing errors, including notions such as situation

awareness. In relation to the highly regulated context of civil aviation, CRM has become a requirement, a qualification in non-technical skills that crew members must now obtain to fly. CRM has then migrated, combining the influence of safety research and consultants in the following decades across the maritime, railways or medical domains in which such teams' coordination issues are also central and problematic (Fornette, Jollans, 2016).

In the case of safety culture, the story, as recalled above and in many publications, goes back to Chernobyl and official reports at the end of the 1980s. Mentioned as a key dimension behind the disaster, the concept picked up in several directions, some more academically oriented, some more practically oriented and some oriented towards the regulation of high-risk systems. Safety culture, high reliability organisations and crew resource management have all three been quite successful cases of methods, concepts and practices in the field of safety.

But one can see with these three illustrations several different trajectories. Started differently, high-reliability organisations as a research topic formulated by academics, crew resource management as a need to increase pilots and crew members non-technical skills interactions in teams, while safety culture started as a concept introduced in official documents without any contributions from research.

From there, they developed further through their own complex historical trajectories within the institutions represented in figure 2, translated from academic formulations to a high-risk systems management label promoted by consultants in the case of HRO, developed through applied research and regulated in aviation then exported to other safety critical domains through consulting in the case of CRM, circulating between academia and consultants then regulators in the case of safety culture.

Another very good example recently is Vision Zero (Waterson, 2017), which started as an official slogan of road safety in Sweden in the late 1990s, to then migrate in OHS management in companies (Zwetsloot et al, 2013). And one can find the range of possibilities when it comes to taking a stand in the debates between the critical (Dekker, 2017), the more neutrally interested (Sherratt, Dainty, 2017) or more enthusiastic (Zwetsloot et al, 2017), in the literature. Other cases of methods, ideas, models and concepts (e.g. behavioural based safety, just culture, resilience, etc) could have been

explored this way. They would reveal the complexity of the interactions between the different actors producing them, and the patterns associated but also the controversies that they generate.

3.2.4. The presence of safety Gurus

The topic of gurus can also be further commented. It appears that what can be described in the field of safety looks quite close to what has been observed in management in this area too (Huczynski, 2006, Collins, 2007, Clarke et al, 2012). Perhaps that one of the first safety guru is James Reason, following the success of the publication of *Human Error* (Reason, 1990) and *Managing the risk of organisational accidents* (Reason, 1997).

Although two books written for different audiences, the first for academics, the second for practitioners (in which Reason promotes an engineering view of safety culture), they have both promoted the widely acclaimed defence in-depth analysis of accident, later called the swiss cheese model, and made their author a highly visible and demanded speaker across the anglo-saxon world and industries, who also worked as a consultant with John Wreathall and Patrick Hudson (Larouzée, Le Coze, forthcoming).

Invited in hundreds of safety conferences to present and to discuss human error and the swiss cheese model, Reason can surely be said to be one of the first equivalent to management guru of the 1980s, such as Peters (Collins, 2007), but in the field of safety, during the course of the 1990s. Surely, there were safety writers before the 1980s, as identified in historical research (Swuste et al, 2010, Swuste et al, 2012). DeBlois, Heinrich or Pettersen have surely met some success in the past, but they would not fit the guru description, a phenomenon of the 1980s explained by the changes described above (knowledge economy, scientific production in safety, training needs, explosion of consulting, complexity of high-risk systems. etc).

Hopkins is another case of successful writer in safety after Reason. In the 2000s, he became a widely acclaimed analyst of major accidents and also a consultant for multinationals (Hopkins, 2016). Publishing more than 10 books on events as mediated as the explosion of the BP Texas City refinery (Hopkins, 2005) or the BP Deep Water Horizon offshore platform in the Gulf of Mexico in 2010 (Hopkins, 2012), his scientific production has become the basis for training videos marketed and distributed by a company (MediaTraining).

It would be possible to further elaborate on the similarities between the fields of safety and of management by identifying categories, as done by Huczynski (2006), of academics (e.g. Dekker, 2012, Hollnagel, 2014), consultants (e.g. Marx, 2009; Marsh, 2013) or safety practitioners (e.g. Kern, 2009, Conklin, 2015) who could endorse this kind of guru status. It would also be interesting to replicate the style of analysis applied by some researchers to conferences during which speakers capture the interest of the audience, or also to explore the reason for the success of the books of these writers.

The aim of these developments was more to situate the context in which safety culture methods, ideas and practices evolved in the past two to three decades, and how one can observe a social structuration of the safety field created by complex patterns of interactions between consultants, academics, publishers, regulators and industries. But, to follow up on the title of this article, which is about what safety culture can help us think, I now develop an answer to this in **three** points.

First, I offer with the help of the above an interpretation about the second wave of debates and studies, second, I suggest some reflections about safety science (or research) in this context and finally, I introduce a networked perspective on high-risk systems. Whether these points constitute together a fifth view of safety culture, or an invitation to move on to a third wave of studies and debates will be left at the appreciation of the readers ...

4. Discussion

4.1. Interpreting the second wave: a fifth view or a third wave of studies?

First, one should now understand better the move from the 1st to the 2nd wave of safety culture studies and debates. Questions were formulated earlier about this. Why would authors become critical or radical about safety culture within a decade or two? Why would the maturity idea of safety culture gain such prominence in companies over that same period of time? The new range of sensitivities expressed in the past 15 years can be interpreted as a result but also reactions of the evolutions described above.

As much as in management research in which one finds critical or more neutral writers, (e.g. Clark, Fincham, 2002, Kipping, Engwall, 2002) and at the opposite end of the spectrum, enthusiastic ones promoting management methods, ideas and practices (one recent example is the “liberated company”, Carney, Getz, 2009), one can also find these

different positions of writers in the safety field. They have been identified in the first section, and classified in 4 views (table 2). Let's comment this.

Seen from this angle, it appears now that critical (Silbey, 2009) or radical (Hopkins, 2016) views of safety culture reflect what they consider to be a safety culture market dominated by a thriving consulting industry which primarily sells products for business purposes, without always really promoting an organisational perspective, but often an individualistic one instead. And, when promoting an organisational view, selling the idea of safety culture as the possibility of a homogeneous entity or force able to embrace the entire spectrum of activities and actors of a company.

This of course is quite problematic as Silbey emphasised in her article referred to earlier. It downplays power, conflicts, coalitions, disagreements and heterogeneities across practices, views and mindsets of actors which could be cherished instead as the basis for the ability to cope with complexity. The unrealistic ideal that safety culture can be manufactured to create a unique template of behaviours is for these critical authors such as Silbey highly dubious as a prospect, but most of all, not necessarily to be wished either.

But the reasons behind such a success are the same than argued in the management literature (Jung, Kieser, 2012). It offers a sense of control to managers, it brings a solution to a problem (safety management), it supports management's claim that they care about the problem, it is generic enough to be applied anywhere with possibility of certifying organisations (as now advocated by certain consultants), and in the case of safety, it can also serve as a basis for regulatory requirements.

The safety culture maturity case is precisely one such example of an easily graspable, highly marketable idea, for management (Filho, Waterson, 2018). It is graphically represented as a scale or ladder that one can make sense of very easily (the power of visualising is thoroughly exploited), and intuitively conveys the idea for a company that it is situated somewhere on the scale, with a possibility of improvement when situated at the bottom or in the middle. Of course, one can also consider that safety culture is approached in different ways as more neutral writers see it (Guldenmund, 2010, Edwards et al, 2013), ways which would not necessarily be incompatible according to these authors.

One problem is when one mode, the consulting mode, prevails over other modes, such as ethnographic approaches of safety culture which are more demanding because time consuming and more complex in their rationale, when, for instance, they argue that safety culture needs to be combined with issue of power (Antonsen, 2016). It follows that critical or radical views are quite understandable in this context because these writers observe a disproportion in the influence of one way of approaching safety culture over other ones. One can read Busch's book on *safety myths* also as a critique of a thriving consulting industry structuring safety professionals' mindsets and practices (Busch, 2016).

This could be a fifth view of safety culture. The fifth view argues that safety culture has to be understood as one illustration among other, albeit an important one indeed, of how the safety field is socially structured, with competing interests about the definition of safety culture, and safety objects or topics more generally, which can become safety product as part of a market (Laroche, 2018). This leads to a second point this time about safety science (or safety research).

4.2. Safety science or research

Because the four views of this second wave (table 2) are advocated by different academics, it shows the various ways of conceiving safety science, and the increasing relevance and need to reflect about this (e.g. Le Coze, Pettersen, Reiman, 2014). On the one hand, safety is an object that researchers and scientists are supposed to observe, describe, explain and predict as objectively as possible (although objectivity is a highly complex notion) and, on the other hand, safety is also a highly value laden object which immediately conveys a sense of need for action, often conveyed by the researchers themselves who see safety science as an engineering endeavour (Hale, 2014), but certainly expected by companies. And any scientific writing about safety has some potential concrete implications.

In the safety market context introduced in this article, the need for solutions to safety problems (whether technical, behavioural or organisational), will always imply that ideas produced by research can potentially enter this market to become products designed by consultants who see opportunity to both help but also develop businesses. Examples are for instance found in the case of high-reliability organisations which

moved from a research topic to a marketed product or, in the case of safety culture, from a typology of pathologic, bureaucratic and generative cultures to an assessment and improvement scale. And regulators can also use safety concepts, as introduced.

Safety science or research is perhaps intrinsically ambiguous in this respect, and this view complements or expands the classic opposition between researchers (who must publish) and practitioners (who must find quick and easy fixes to their problem). For instance, one opponent to safety culture, Hopkins, has also developed a consulting side to his research which became intrinsic to his activity (Hopkins, 2016). As a sociologist, his posture is at the crossroads of professional, public, policy and critical sociology (Burrawoy, 2004).

Such ambiguity could come from the fact this kind of experience is needed to get to formulate reasonable or convincing recommendations to industry or regulator. To be too much of an outsider, as a detached scientist, is not necessarily a good thing if one wants to have impact. And the issue of funding research might also push researchers to produce actionable type of knowledge, sometimes competing with consultants in this respect.

In fact, one could probably argue that a very strong and prominent stream of safety science production in the past 20 years is based on such a practically or engineered oriented research attested by the successful authors described as gurus earlier.

Consistently with the findings of the literature on management, success is obtained when writers can connect with the world of practitioners while providing answers to problems that they encounter in their daily activities. In the 1980s, major and popular safety books had an ethnographic and sociological angle of analysis (e.g. Turner, 1978, Perrow, 1984, Vaughan, 1996), whereas 20 years later, popular books in safety exhibit an engineering oriented rational (starting with Reason, 1997), or a stronger combination of descriptive and normative intent (Hollnagel, 2009, 2014, Dekker, 2001, 2007, Hopkins, 1999, 2000).

4.3. Networked high-risk systems

This leads to a last point to mention, a third point that safety culture can help us think. The proliferations of methods, ideas and practices in the past twenty years whether or not seen as fashions or fads, but also the increase of knowledge available through safety

science, developed and sometimes popularised by researchers (but also consultants or reflective practitioners) through popular books characterise some of these new networked features of high-risks systems, for which little empirical description is available so far. Let's develop this observation.

In the past thirty years, the operating landscape of high-risk systems has evolved towards networked configurations of interacting entities linked in chains of commodities across oceans and continents. Globalisation, as a multifaceted phenomenon of scales, flows and trends propelled by privatisation, liberalisation of finance and trades combined with the IT and transport revolution in the 1980s (Sassen, 2007) has transformed the conditions under which safety is produced (Le Coze, 2017).

Multinationals operate across the world, smaller companies are part of globalised commodity chains, regulations combine national and international levels of authority and rules production which entails a diversity of organisations interacting in a complex mix of vertical and horizontal networks (see for instance Almklov et al, 2018 in the maritime sector). We have yet to conceptualise better these transformations, and knowledge producers (including consultants) are part of the picture, considering the extent to which companies import and translate ideas, methods and practices introduced by outsiders (Almklov et al, 2014).

For instance, the original empirical high reliability organisations studies in the 1980/1990 were not so much concerned about such networked configurations for historical reasons but authors within this tradition have now explicitly started to address what they describe as "*virtual organizations*" (Grabowsky, Roberts, 2016). Stressing the challenge of coordinating, cooperating and communicating across time, space, professional expertise, legal arrangements and digital processes created by globalised activities, the focus is on subcontracting schemes which correspond to the outsourcing (and offshoring) of activities and their safety implications. Other studies have now started to investigate these aspects of work in relation to safety (Haavik, 2017, Quinlan et al, 2013, McDermott, Hayes, 2017).

What has been described in this section about the social structuration of the safety field also contributes to an appreciation of the contours of networked high-risk systems, but from a different angle. This angle is the contracting of safety expertise to consulting

firms which differs from the focus on blue-collar type of subcontracting such as maintenance or inspections. It is about the role played by these actors of the knowledge society, who introduce methods, ideas and practices in high-risk systems, sometimes at the highest level of organisations.

For instance, the role of consultants has been highlighted from a quite critical angle in accounts of the BP story of failures (Bergin, 2011, Hopkins, 2012). By following consultant recipes based on the idea of decentralised organisations applied in the car industry to petroleum industry, Browne, BP's CEO, would have followed a bad advice. *"McKinsey again suggested ditching the 'matrix' structure – which the consultancy had itself devised for Shell in the 1950s – in favour of the decentralised business model"* (Bergin, 2011, 17). Hopkins adds that *"the change was a commercial success, but the seeds were sown for both the Texas City and the Macondo disasters"* (Hopkins, 2012, 101).

Such appreciation is quite a common view of consultants who are often targeted for their lack of positive contribution to companies despite their highly valued status (Sennett, 2006, Sturdy, 2009). However, without ethnographic empirical material about how these methods, ideas and practices conveyed by outsiders, whether researchers or more often consultants are concretely translated in companies, but also inferred from practices, as for instance illustrated in the client consultant relationship literature (Clark, Fincham, 2002, Alvesson et al, 2009), this remains a blind spot in safety science (Almklov et al, 2014). Investigating this area could consist in promoting a third wave of safety culture studies, which would require providing the empirical material to explore this issue. Such studies should be part of a wider empirical and conceptual ambition to better grasp the properties of these networked high-risk systems which now populate our societies (Le Coze, 2017).

5. Conclusion

Safety culture is a contentious notion. Following a first wave of studies in the late 1980s/early 1990s to the mid-2000s which introduced the distinction between functionalist and interpretive views, a second wave of studies and debates produced stronger divergences on a continuum with rejection at one end and enthusiastic developments at the other end. An explanation for these opposite views (with some options in between) can be found in the social structuration of the safety field. This field

is socially structured by the interactions between academics, consultants, publishers, industries and regulators which create specific dynamics which in turn shape knowledge production, and influence practices. Such knowledge is caught in multiple and potentially competing interests.

Safety culture is in this context one example among other. High-reliability organisation, resilience or vision zero are other cases of concepts shaped by competing interests. When approached this way, safety culture can clearly make us think. First, it reveals a social structuration which explains better why one finds a diversity of sometimes opposite views identified in the second wave, second, it triggers important questions about safety science as both practice and research, and third, it addresses one overlooked aspects of what can be described as the network properties of current high-risk systems.

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