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Safety as strategy

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Safety as strategy: mistakes, failures and fiascos in high-risk systems

The aim of this article is to explore the contribution of powerful actors of organisations to the construction of safety in high-risk systems. Accident investigation reports and empirical research of daily operations of high-risk systems have targeted organisational issues since the 1990s. However, although one observes in safety research a group of disciplines contributing to advance knowledge in this direction, such as sociology, management or political science, nothing much is available in the field of strategy. Yet, the argument of this article is that it is useful to also frame the study of safety and accident from a strategic angle of analysis. In a first section, safety research is briefly introduced, then in a second section the field of strategy is explored, including studies of strategic failures. Reasons for the relative absence of an interest in the relation between strategy and safety are advanced and argued. It is believed that there is a need to advance our knowledge on the topic of safety from the point of view of the psychology and sociology of executives and top managers, particularly in relation to strategy. In a last section, illustrations of how strategic decision making matters tremendously for our understanding of safety are introduced and discussed. Outlines of a research agenda are described. Overall, this article proposes to reformulate the notion of 'latent causes' of disasters as various degrees of strategic breakdown.

Introduction

Although much has been produced on the organisational side of accidents in the past decades and a discourse well established (e.g. the risk of organisational accidents, Reason, 2016), very little has been written about the strategy of companies in relation to safety, be it empirically or theoretically. We nevertheless know that organisations are designed through strategic choices, something that was argued early by Child in the 1970s, the heyday of the contingency school of organisation (Child, 1972). But when one reads the literature on strategy, little is available on industrial safety, apart from a few studies (even if an exhaustive review is probably impossible). But the reverse is also true: there is little research in the field of safety on the topic of strategy.

Yet, we are quite familiar with the topic of strategy through the general media. We know that a product's successful development (as well as its decline) has much to do with strategy. We are also quite familiar with the topic of strategy in the context of companies whose products once dominated their markets but have since disappeared because they were unable to match the technological innovations of other companies. Apple and Samsung's smartphones are examples of successful strategies, whereas the cell phones of Nokia, Ericsson and Blackberry could be considered strategic failures. The basic but central idea that strategies can shape the fate of organisations and their employees, as the losers or winners of today's global market competitions, is quite familiar.

The successes and failures of companies are indeed believed to be in the hands of their CEO, and the names Steve Jobs, Elon Musk and Bill Gates are revered worldwide (Guthey et al, 2009). Because of their positions of power at the top of organisations, they ultimately determine a great number of orientations which indeed directly constrain the conditions of operations, and therefore their results. With their power comes the possibility of taking decisions and shaping organisational features with far-reaching consequences for the fate of their companies, their employees, but also their customers (Kaiser, Hogan, Craig, 2008).

In the past thirty to forty years, a research field concerned with the key decisions made by executives in a wide range of organisations has been flourishing, the domain of "strategy". As Hamel, one prominent writer in this domain asserts in 2011, *"In 1966, when I first began to study business strategy, there were only three books on the subject and no articles. Today my personal library shelves are fat with books about strategy, PhDs are granted in strategy, and there are countless articles on the subject"* (Hamel, 2011, 5).

And yet, despite this large and consensual appreciation that such a powerful level of decision-making processes is key to our understanding of the success or failure of companies, safety has never been described analytically and empirically as a product of top management's strategy, and for that matter, accidents have never, or barely, been included in or described as strategic failures. The aim of this article is to connect safety and strategy research and show the relevance of doing so.

In a first section, a short history of safety research grounds the assertion that there has been a lack of interest in the topic of strategy in this field, although there are a few

exceptions. In a second section, an overview of major schools, debates and authors in the field of strategy is introduced, along with studies of strategic failures, combined with a discussion on the outcome of studies of bad leadership. With this in mind, I try to answer the question of why strategy has never been part of the methodological, conceptual and empirical development of safety research. Finally, I illustrate how to complement the existing research traditions in safety with an alternative approach that would consider strategy to be a core topic for both understanding and preventing major accidents. I use three case studies for this purpose and imagine the contours of a research agenda.

Safety research and strategy

Several research traditions in safety

There is no standard presentation of the history of safety research (see Swuste, 2016, for an example based on models, theories and metaphors). The field does not have a precise date of origin, but dedicated journals began to be published in the 1970s (Hale, 2014). One possibility is to consider the different disciplinary contributions in the field, from engineering and psychology to ergonomics, through management, sociology and political sciences. When one does so, it becomes possible to identify a certain number of stabilised research traditions which provide the resources to both think and offer practical solutions to improve safety. They also take interest in **the activity of a range of professionals** populating safety-critical systems (operators, managers, engineers, inspectors, etc), whether studied in the context of daily operations or following disasters. A very short overview will serve the purpose of this article with an emphasis on the kind of actors of sociotechnical systems that these traditions target more specifically (Le Coze, 2016).

Process operators, pilots, nurses, surgeons ...

Psychology, ergonomics and cognitive engineering have had a considerable impact in practice and research with themes as diverse as human error, crew resource management, situation awareness, naturalistic decision making, resilience, teamwork and safety leadership, as well as interface design and information infrastructures (e.g. Flin, O'Connor, Crichton, 2013, Bennett, Flach, 2011, Haavik, 2013). These traditions help us understand the strengths and limitations of cognition in the context of complex

work situations. Different kinds of actors are concerned - pilots, surgeons, doctors, nurses, process operators, firemen or any individual whose expertise in front-line contexts is at the heart of the safe performance of high-risk systems. These findings on cognition have been highly influential in the understanding of safety and especially in helping design the conditions of reliable operations. Yet, while addressing the complexity of cognition in real-life situations, it has also been shown that accidents or disasters in sociotechnical systems cannot be reduced to a level of explanation centred on front-line individuals.

Technicians, supervisors, engineers, managers

In this respect, other research traditions have brought different styles and angles of analysis with a focus on alternative topics and actors involved in activities other than front-line ones. Psychology or sociology of organisation, science and technology studies and management research have developed concepts such as organisational reliability or collective mindfulness, incubation or normalisation of deviance and migration/drift, as well as notions of learning and (safety) cultures (e.g. Rasmussen, 1997, Snook, 2000, Weick, Sutcliffe, 2007, Hopkins, 2009, Downer, 2011, Macrae, 2014). When developing these ideas, concepts and themes based on a range of case studies, actors such as operators, but also managers and engineers, have been the primary subjects of these research traditions. These disciplines bring insights to some of the issues and uncertainties associated with the practice of designing technologies and managing complex sociotechnological systems. They offer a better understanding of the kinds of difficulties and problems encountered, resources available and skills needed to safely produce goods or services for society.

Regulators, inspectors, unions, lawyers, judges, citizens

Complementing these studies, research on regulatory regimes and principles, inspection practices, health and safety laws, the political economy of health and safety, as well as post-accident political issues (e.g., Haines, 2011, Parker, Lehmann Nielsen, 2011) has addressed the contribution of other actors. Produced by established disciplines such as law, political sociology, sociology or political science, this line of research indicates how the activities of safety critical systems are concretely embedded in policies, governments, lobbying, political systems, justice and social activism. The actors

populating different kinds of organisations at this level of analysis shape a background of the operating constraints of high-risk systems through the production of laws, the activity of agencies and inspectorate, the outcome of investigations but also trials and criminal charges following disasters. Robust regulation or regulatory capture are examples of concepts addressing these levels of description (Coglienesse, 2012, Lindoe et al, 2014). These studies reveal again the tremendous complexities of how the law is produced, translated, inspected and enforced but also the high number of actors involved in the dynamic and structuring of these processes, whether government officials, agency managers or inspectors, lawyers, judges and citizens.

What about executives or senior management?

Considering the wide scope covered by this diversity of angles which have evolved into specific traditions over the past three to four decades, one is entitled to assert that safety as a field is quite broad, and is quite mature. One can see clearly (as briefly sketched above), on a historical level, a recurring pattern of existing disciplines (e.g. psychology, ergonomics, sociology, management, etc) bringing their own distinctive lens and thus creating a multidimensional view of safety. Figure 1 indicates concepts or notions available for a diversity of actors, whether for prospective (safety) or retrospective (accident) contexts, the two being complementary (figure 1). Yet, there is one area that has not, so far, been the subject of focused attention, as indicated in figure 1.

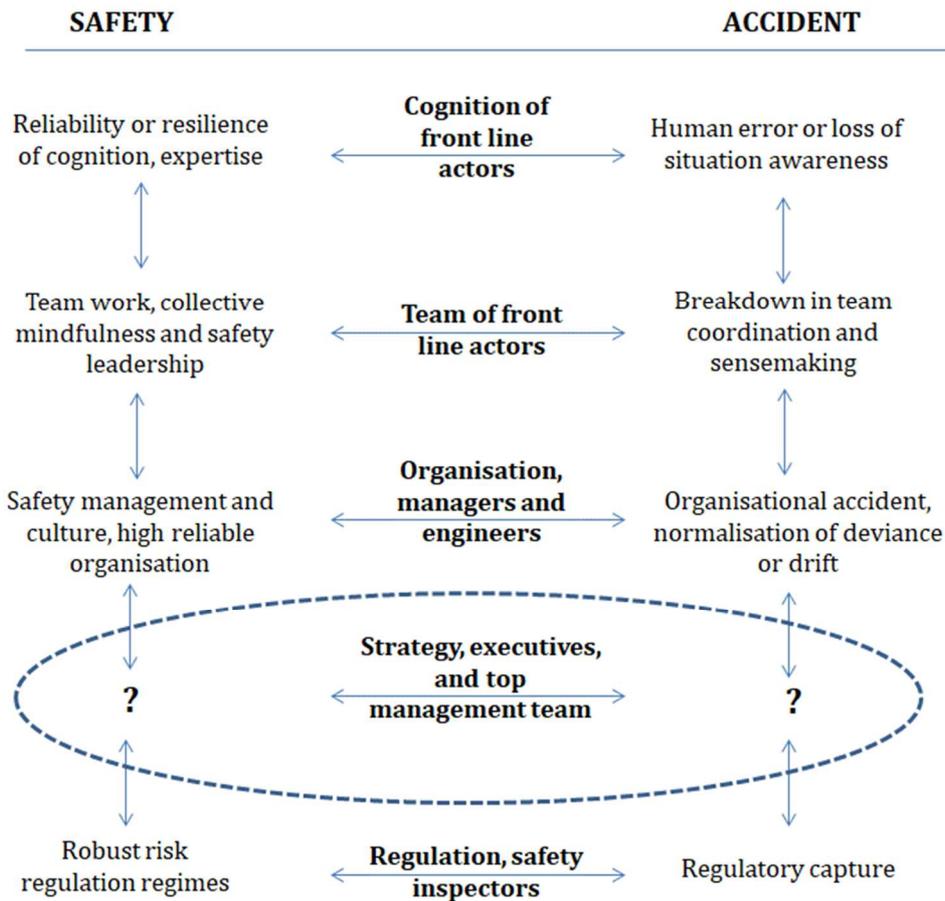


Figure 1. Safety studies and concepts for different actors

The area that has not yet received significant attention is the domain of strategy in relation to powerful actors of high-risk systems, such as executives and managers in top management teams. What is missing and needed is a conceptualisation one can rely on for interacting with top management when addressing safety, with concepts that can be applied to their psychological and sociological realities as specific actors of complex, high-risk systems. The contention is that inspiration to do so should be found in strategic literature, and this article would like to open up this possibility and constitutes a first contribution to the research agenda described at the end of this article.

However, although not as established as other research traditions in safety, there are nevertheless authors who have explicitly acknowledged the importance of this area. They have never built a theoretical or empirical agenda for this very specific aspect for the field of safety that would explicitly connect them, which is one of the purposes of this article. These authors are Perrow, Hopkins and Starbuck. They express different

intellectual sensitivities which will prove very useful for some of the issues associated with a study of strategy in relation to safety.

Failing executives and corporate malfeasance

Perrow has a radical and critical approach to organisation (Perrow, 1970, 1986, 1991, 2002), and despite the reception of his book *Normal Accident* (Perrow, 1984), a reception which mostly considered its technological argument (e.g. Hopkins, 2001), Perrow in fact developed a systemic analysis of safety and disasters (Le Coze, 2015a). By combining dimensions such as technology, structure, goal and environment which derived from his sociological approach to organisations, this author considered strategy to be key to safety performance. Perrow locates the production of safety at the top of organisations. Based on a critical angle, his approach consists in seeing the “root causes” of accidents as consequences of “*executives not trying very hard*” in a mild version, and of “*executive malfeasance*” in a more radical version devised to “*emphasise that more than a failure of proper executive behaviour is involved*” (Perrow, 2011, viii). This interpretation is quite consistent with the underlying principle that safety is almost antithetical to profit-driven capitalistic systems, a position shared by other critical safety sociologists (e.g. Woolfson, 2013). There is therefore an imperative for the presence of strong states, laws favouring alternative sources of power inside companies (e.g. unions) and adequate regulations in order to counterbalance production imperatives.

Hopkins is close to Perrow. Although more nuanced or at least not as explicitly judgmental, Hopkins shares with Perrow a background in critical sociology (Hopkins, 1981, 1984), but relies more on detailed analysis of disasters than Perrow does (e.g., Hopkins, 2012). Analysing events retrospectively on the basis of investigation reports and hearings, Hopkins has referred prominently over the years to issues such as inadequate incentives favouring profits over safety, organisational structure (in particular in relation to the position of safety departments in decision-making processes) and the absence of relevant process-safety indicators as underlying causes of disasters. These interpretations are connected to strategic levels of companies, but not formulated directly as such in Hopkins’s writings.

Yet, Hopkins’s emphasis on features such as incentives, organisational structures and indicators of high-risk systems is an explicit consideration of some aspects of strategy

because these features are shaped by top managers who have as their core attributes the ability to make choices of organisational design. Refraining from formulating moral judgement (Hopkins, 2008, 82), he, moreover, acknowledges the multifaceted aspect of complex organisations, including their environment and, particularly, regulations. His goal is primarily to design adequate principles of mindful leadership (Hopkins, 2007a) and regulatory regimes that can curb the intrinsic search for profit through mechanisms favouring compliance, playing on the pluralistic range of economic, moral, legal and reputational motives which should compel senior executives of companies to do as much as possible to remain within the boundaries of safe practices (Hopkins, 2007b).¹

Organisations at and beyond the limits

Whereas for Perrow or Hopkins (with the nuances indicated) the interpretation of accidents and safety derives from a critical view that the capitalist search for profit is linked intrinsically and ultimately to executives' sacrifice of safety over production, the interpretation of Starbuck, an organisation, decision and strategy scholar, derives more from a psycho-cognitive interest in the activity of top managers (Starbuck, Greve, Hedberg, 1978, Starbuck, Milliken, 1988, for an overview, Starbuck, 2005). The underlying assumption is different than that of Perrow or Hopkins, as for Starbuck *"good and bad results may arise from similar processes (...) the processes which produce crises are substantially identical to the processes which produces successes"* (Starbuck, Milliken, 1988, 39, 40).

Following this principle, Starbuck warns in the 1980s against the hindsight bias *"retrospection wrongly implies that errors should have been anticipated"* (Starbuck, Milliken, 1988, 40), a position still advocated more than 20 years later. *"Analysts have to surmount their tendencies to know more than they could have known, and they must formulate prescriptions that help decision makers to operate effectively amid complexity, uncertainty and ambiguity"* (Hodgkinson, Starbuck, 2012). Starbuck conceptualises executives filtering the world in relation to complexity, ambiguity and uncertainty, quoting as an illustration the chairman of IBM who declared, in the period following World War II, *"I think there is a world market for about five computers"* (Starbuck,

¹ Although more referenced for his perspective on a normalisation of deviance by NASA engineers about behaviour of technical artefacts (Vaughan, 1996, 2005), Vaughan also introduced the idea of "trickle down" to conceptualise how choices made by powerful actors of the agency (politicians in Congress, top administrators) translated into problematic safety contexts and constraints (Vaughan, 1997).

Milliken, 1988a, 39). The future is not determined and executives, top managers and leaders should be granted a more cautious retrospective appraisal in the light of failures (depending, of course, on their extent and nature; more about this below). Introducing with Meyer the interplay between ideology, business strategy and power, Starbuck also describes the socio-political nature of top decision making beyond its cognitive dimension (Meyer, Starbuck, 1993).

Once translated with Farjoun into the concept of “*organisations at the limits*” (Farjoun, Starbuck, 2007), executive failures are understood in the light of a core tension in companies between “*exploration of new possibilities and exploitation or protection of current assets*”. They add that “*one comes usually at the expense of the other*” (Farjoun, Starbuck, 2007, 558), which entails a degree of risk taking as an intrinsic aspect of strategy. Farjoun and Starbuck reassert the complexity of the issue because “*people and organizations do not always know how far they are from the true limits or the extent to which limits are elastic, relative, or arbitrary. Therefore, progress in general, and exceeding limits in particular, entails ambiguity, risk and uncertainty*” (Farjoun, Starbuck, 2007, 543).

But, they also leave no doubt to the reader about the roots of problems when it comes to technology and environment “*of course, since organizations choose their environments and technologies, the issue is partly one of business strategy*” (Farjoun, Starbuck, 2007, 553). In this respect, they formulate the following interrogation. “*If an organization is striving to exceed some of its limits, some people are pushing for very extreme performances. Who is exerting such pressure, and for what reasons?*” (Farjoun, Starbuck, 2007, 562). Although not explicitly stated as such in their article, one can infer that they pursue two lines of interpretation, a more critical one in which “*organizations may be driven to try to exceed their capabilities by senior executives who pursue unrealistic goals because of insecurity, ambition, greed, hubris, jealousy or competitive zeal*” (Farjoun, Starbuck, 2007, 554) and another, milder form of interpretation, in which “*organizations may promise too much and overstep their capabilities, not so much as a result of conscious design but as response to cumulative flows of events or as unintended by-products of decisions and actions*” (Farjoun, Starbuck, 2007, 545). These two possibilities will be used in a later section to interpret three case studies of safety impacted by strategy (table 2). In regards to safety and the operation of high-risk systems, Starbuck has

mostly published on Challenger and Columbia (Starbuck, Milliken, 1988b, Farjoun, 2005a, b, Starbuck, Farjoun, 2005)².

Safety and strategy

This brief presentation of three authors offers an overview of the current state of understanding of how strategy contributes to safety. These authors start from different assumptions but all agree on the centrality of this aspect. If they recognise that disasters must be understood as a combination of the characteristics described by Perrow (e.g. technology, structure, goal and environment), strategy plays a very important part. Yet, they are cautious. Safety and disasters are multidimensional phenomena, they result from a complex interaction between technology, human, organisation, environment and regulatory processes, so singling out strategy from this complexity is difficult. Perrow is all too aware of this issue and contends that *“classifying something as an executive failure rather than a mistaken executive strategy or a poorly performing executive, or even a failure by management or workers, is controversial. Observers can disagree, and since it is easy to have a mistaken strategy or a poorly performing organization, it takes a great deal of evidence to make the case for executive failure”* (Perrow, 2007, 293).

It is now argued, however, that this line of work should be pursued to help characterise safety (and disasters) from the point of view of strategy and powerful actors of high-risk systems by exploring the cognitive, psychological and sociological side of top management decision-making processes. Indeed, none of these authors has developed a specific agenda that would connect the insights of the field of strategy to the existing research traditions in safety. Yet, it seems important to do so for at least two reasons.

First, empirical studies of daily operations in high-risk systems carried out with a multilevel research design must consider the influence of powerful decision makers. These can be site managers or corporate executives. The work situations and practices of a myriad of individuals in organisations are constrained by design choices made by top management at site, branch or corporate levels. These design choices include, but

² Note that this idea of pushing beyond the limits was described by many authors back in the 1980s (if not earlier) with Perrow and more graphically by Rasmussen with the notion of migration, something also translated later in the 2000s in the concept of drift by Snook, then picked up and developed further by Dekker and Hollnagel (Le Coze, 2015a, 2015b). It is a well-established idea in safety research. The interest of Farjoun and Starbuck in the context of this article is that they are strategy writers, targeting specifically top management decision-making processes. **This article also contributes by refining the analysis provided so far by the concepts of migration or drift by explicitly introducing strategy concepts.**

are not limited to, the composition and number of operators in production teams, the choice of organisation structure, the appointment of key managers at various positions in board of directors or management committee but also, of course, and of great significance in the context of safety, cost-cutting policies or downsizing in relation to strategic moves such as merger and acquisition or business reorientation.

It is therefore difficult not to associate safety with these choices, and it is critical to understand how they are made, by whom, under which circumstances, and most importantly how and why they resist to signals that the consequences of these choices are potentially detrimental to safety. This of course is a very important issue for the study of daily operations that is currently poorly investigated, as the focus today is predominantly on shop-floor or organisational analysis, without explicitly introducing analysis of the strategic level. The lack of conceptualisation of top management in relation to safety can lead to a neglect of this dimension as a basic ingredient of safety, and as an expected and primary item in safety auditing or assessments.

Second, most retrospective investigations have a tendency to abstract decisions from their contexts, something that the human-factor literature has successfully argued against when considering the front-line situations of pilots, surgeons, firemen or process operators. Because of the complexity of many work situations in sociotechnical systems, individuals rely on elaborate and expert mental processes to cope with dynamic contexts, developing sophisticated trade-off capabilities which sometimes prove wrong in hindsight (and simplistically, from a sociotechnical point of view, qualified and morally charged, as “human error”). As advocated by Starbuck, a similar posture could also be granted to top managers because they too deal with the complex task of balancing multiple dimensions, constraints and resources.

Starting with the assumption that no CEO, executive or top manager ever wants to create the conditions to harm an employee (much less many), there is much to gain from understanding how their actions can lead to such outcomes. Without a better knowledge of what is happening from the point of view of these powerful actors, we lack the ability to help top managers better understand the trap they can fall into, the possibility of grasping how best to design regulatory practices for inspecting high-risk systems, but also the ability to obtain fair retrospective judgement to appraise their degree of failure, in the context of a search for legal responsibility.

And, apart from Starbuck, and even there not explicitly (and limited to NASA cases), there is no connection between safety research and the conceptual, empirical and methodological inputs of the field of strategy. Because of the lack of empirical description in safety research at this level of analysis, there is a bias toward retrospective accounts of events, which are moreover unspecified from the point of view of complex strategic decision-making processes. Before hypothesising why and then illustrating and extending our appreciation of the relationship between strategy and safety with three case studies, the next section introduces briefly the field of strategy and its reflection on the topic of strategic (and leadership) failures.

One more comment. I voluntarily leave aside in the following sections of this article the established white collar - corporate crime or organisational deviance literature which is based on socio-legal investigations (Gobert, Punch, 2003, Geis, Pontell, 2007). I believe the study of strategy offers an angle on the issue of powerful actors which favours operational realities of businesses and their complexities. The idea is that this strategic angle might help show the implications of executives and top managers' activities from another angle than the legal one found in white-collar crime or corporate deviance literature following scandals or disasters. This proposition replicates for different actors the problem of studying in retrospect versus the study of daily operations. I will come back to this idea further at the end of the article.

A very short overview of the field of strategy

A recent discipline, an array of different schools

Whereas "*there is no straightforward linear history of accumulated and progressive building of a coherent body of knowledge*" (Carter, Clegg, Kornberger, 2013, 2), strategy became a topic of its own in the 1980s through the constitution of conferences, journals, professional associations, key authors and university positions, although the first contributions to the field are slightly older. As for many other fields, strategy is now represented by an array of schools rooted in different disciplines such as cognitive psychology, economics, management and sociology.

Presentations of these schools or research traditions are available in overviews (e.g., Whittington, 2001, Mintzberg et al., 2008), sometimes with a critical angle (Carter et al,

2013), but also through an introduction to main authors (e.g., Loilier, Tellier, 2007). Key journals in which conceptual, methodological and empirical findings are introduced and debated on a regular basis in articles are *Academy of Management Journal*, *Academy of Management Review*, *Administrative Science Quarterly*, *Journal of Management*, *Journal of Management Studies*, *Strategic Management Studies* as well as *Long Range Planning* and the *Harvard Business Review*.

Out of this wealth of articles, handbooks, manuals, introductions or biographies of leaders, a relatively stabilised number of traditions can be identified, and one proposition to organise this diversity is Mintzberg et al's (2008) description of ten more or less parallel or successive, overlapping and partly competing schools of strategy. The interest of Mintzberg et al's classification is that it reveals the diversity and complexity of the topic. But the aim of this section is not to provide a full account of the wealth of perspectives and research traditions available, it is instead to select an option of presentation which will support the purpose of this article within its space constraints.

Linear, adaptive and interpretive views of strategy

With this in mind, one might prefer a more simple and enduring distinction of the 1980s which differentiates linear, adaptive and interpretive approaches to strategy (e.g., Mintzberg, 1973, Chaffee, 1985, Johnson, 1986). The first one is grounded in the idea that executives can objectively describe the opportunities, resources and constraints of their business (inside and outside the firm). Strategy derives from this analysis, which is then implemented following instructions from the top. This is the linear view of strategy, a sort of translation at the executive level of the Taylorist ideal.

The second one is the adaptive version, stressing instead the experimental and incremental nature of strategy: companies evolve on a regular basis by introducing variations which keep them in line with markets, consumers and technological changes. *“Employees might know much more about customer needs, business operations and inimitable practices, how to improve them, than a detached management”* (Carter et al, 2013). These variations are produced by the companies through small moves which can be initiated, tested, then adopted in several corners of the organisation, without necessarily involving top management at first. This is also described as the emergent view of strategy.

The third is the interpretive perspective. It relies on careful attention to the cognitive processes, mental representations or constructs that top people in organisations use to make sense of their environment, companies' capabilities and causal relations between strategy and (opportunity of) success. It argues that strategy is often a question of competing visions within a firm which are shaped by power struggles as well as cognitive and cultural framing. Bold rather than incremental moves, or even disruptions in company strategies, might result, sometimes too late for the survival of a company and reflecting tensions, power struggles and coalitions behind strategic options.

Table 1 summarises this classification and associates it with some of the research traditions introduced above. The first two interpretations have a stronger normative flavour than the last one. The interest of this classification is to highlight important and structuring debates in this field about the way strategy is created, produced and realised. Is strategy a product of top managers who decide through rational means of analysis about the strength and weaknesses of their organisation in relation to product developments and market potential? Do they decide then transfer the implementation to employees? Does structure follow strategy? The answer is yes for the authors belonging to the linear (and normative) view above, less so for the two others.

Table 1. Linear, adaptive and interpretive views of strategy

Interpretation	Short description	Relation to traditions (indicative)
Linear	Executives establish the strengths and weaknesses of the company in order to elaborate a strategy, then design the path to reach the desired outcomes, implemented by employees who follow this plan.	Strategy planning, five forces, entrepreneurship
Adaptive	Strategy is the product of experimental and incremental changes (not necessarily planned) adapting the organisation to its environment; as a result, companies manage to remain successful businesses. These moves can be initiated at different places, not exclusively by top management.	Process strategy, resources-based view, dynamic capabilities, organisation and strategy
Interpretive	Strategy is the product of complex cognitive processes trying to make sense of the world, creating power games about which interpretations within the cultural background of business leaders should prevail, considering the uncertainties of the market, consumers and technology developments.	Strategy as practice, strategic decision making, strategic agility

Power of executives and top managers

Executives interact with a variety of actors inside and outside the organisation, from top management teams to the board of directors, within complex governance structures and networks (Dumez, 2018). Process strategy, strategy as practice and strategic decision-making research traditions have greatly contributed to untangling these complexities (e.g., Eisenhardt et al, 2010, Johnson et al, 2003, Vaara, Whittington, 2012, Rouleau, 2013) and have also put into question the taken for granted idea in the field of strategy that executives possess power.

Contrary to this idea, executives are in many ways constrained in what they can and cannot do. Boards of directors, regulators, shareholders, auditors, non-governmental organisations and unions are examples of key negotiating partners which limit and constrain them in the exercise of power. Moreover, power is not an individual attribute but a relational one, structured by specific social contexts. Circumstances can bring more or less power to individuals and an important part of an executives' job is in fact dedicated to manoeuvring to get as much power as possible to implement their ideas. Carter, Clegg and Kornberger consider for instance Machiavelli's view of power to be the most appropriate lens to conceptualise the field of strategy (Carter et al, 2013).

But other approaches see strategic success from an evolutionary perspective which also challenges executives' power or influence. According to this view, executives are only successful when selection processes favour their business. A successful strategy is not a result of how lucid and prescient top managers have been but of external forces which they do not really control. No one can foresee the future and the complex relationships between customers' evolving preferences and competitors' moves. This evolutionary perspective undermines notions crediting top management and their power because luck is involved through this unpredictable selection process.

Another view is that executives' actions are only one aspect of why organisations succeed. As described above, ideas which turn into successes can derive from initiatives from different corners of the organisation and not exclusively from executives and top managers. Strategy is more distributed. Moreover, implementation of strategic orientations requires a level of implication, adaptation and improvisation by employees that powerful company actors do not necessarily anticipate but are key to meet expectations. So, to attribute success solely to executives is a reductionist account of a more collective achievement, *"the strategy we assume we observe is a result of an*

assemblage of practices. It is only the process of objectifying and reifying these practices that leads to what we think as objects” (Carter et al, 2013).

So, power should not be overestimated, but the reverse is also very clear: executive power should not be underestimated. As Perrow contends, *“organizations are imperfect tools, but the powerful ones appear to do well enough for their masters”* (Perrow, 1986, 172). Jackall writes, *“because of the interlocking character of the commitment system, a CEO carries enormous influence in his corporation. (...) His word is law; even the CEO’s wishes and whims are taken as commands by close subordinates on the corporate staff, who turn them into policies and directives”* (Jackall, 2010, 23).

So, despite limitations in the power of executives and top managers, this article recognises that they remain in many cases the most powerful actors of organisations. Most of the time, their power is much greater than that of any other actor of their organisation even if there are restrictions. Indeed, their strategic choices constitute and remain the daily constraints that many other actors have to deal with in order to perform their tasks: *“bureaucracy expands the freedom of those on top precisely by giving them the power to restrict the power of those beneath”* (Jackall, 2010, 93).

Framing strategy

So, a full understanding of strategy requires use of the lenses of the linear, adaptive and interpretive schools, one of which may be called upon more than the others depending on the specific cases under investigation as well as our personal intellectual sensitivities and purpose (it is the interpretive one which is favoured in this article). This classification provides an interesting first approach because a central concern for organisations and their top managers is indeed to opt for the adaptations and orientations which will bring success to their organisation in its environment, whether these adaptations are incremental or top down. These adaptations include the ability to successfully align position, choices and action (Johnson et al, 2013). Strategic choices include product and service developments, their price, diversification and geographical implementation. These can be promoted through internal innovation, merger and acquisition, alliances or joint ventures. These choices are always in relation to a picture of the position of a company by its top actors, and issues related to implementation are, of course, paramount to any success.

Indeed, these strategic moves must be in line with the capabilities of an organisation, which are anchored in its history, people, culture and assets and turned into choices of organisational structure (e.g. centralisation vs decentralisation) and employees, along with symbolic (e.g. discursive, cultural) and motivational (e.g. incentives, career evolution, workplace and job satisfaction) aspects, while satisfying a diversity of shareholders and stakeholders. In this context, a synthetic approach presented as an embryo of a general theory of strategic management is provided in the framework of dynamic capabilities, which can be decomposed into three main properties: sensing, seizing and transforming (Teece, 2007).

Of course, not all business domains face similar complexities, but in the context of globalised markets with their fast pace of innovation, competition and evolving financial environments combined with social change, translated in a range of varying expectations and consumer trends, orienting organisations successfully is without a doubt a very complex task (Eisenhardt, 2002, Teece et al, 2016). It reveals the full complexity of social realities for which a diversity of actors participates in shaping top decision-making processes. In this respect, books and articles on strategic failures are quite useful for providing relevant insights, and particularly so for the purpose of this article.

The study of strategic failures

Analysing strategic failures

Although the strategic literature favours recipes for success and stories of success over those of failure (Denrell, 2003, Pfeffer and Sutton, 2006), a certain number of books and articles have nevertheless been published in the past 15 years on this subject, offering systematic treatment grounded in case studies (e.g. Finkelstein, 2003, Sayles, Smith, 2006, Hamilton, Micklewaith, 2006, Carroll, Chunka, 2008, Kerdellant, 2016). Although there is no theory of strategic mistakes, error or failure, as Kerdellant asserts (Kerdellant, 2016, see also Shimizu, Hitt, 2011), books are organised along similar lines. They are based on examples grouped into categories of strategic failures, followed by psychological, cognitive, organisational and sociological explanations of these failures, targeting both individual (CEO) and group levels (top management team, TMT), sometimes from an institutional or political economy viewpoint (e.g. Sayles, Smith,

2006). The selected categories are consistent with the description found in the literature as indicated above.

They thus describe strategic orientations which turned badly, as for instance in the case of a merger, acquisition or product launch. There are plenty of case studies available. One example of a product launch disaster that is often analysed because of the billions of dollars lost is the failed innovation 'Iridium' by Motorola in the phone industry. In general, these failures are grouped into a recurring pattern of executives and top management teams' inability to perceive the problem associated with their strategy. This idea is highly consistent with the interpretive view described above (table 1). Indeed, a business strategy can turn into a sort of paradigm or mindset shared by executives and top management which then becomes a deeply held ideology, resisting against warnings of problems.

The underlying cognitive, psychological and sociological reasons for these failures include the classical biases than one finds in the literature such as optimistic but also confirmation biases, and from a group perspective, the issue of a lack of a devil's advocate position to counteract the phenomenon of groupthink. As Finkelstein writes "*in a world of check and balances, when there is no real countervailing force to a CEO, individual preferences can dominate*" (Finkelstein, 2003, 42). This point indicates the importance of how top management teams (TMT) are structured and able to decide on the basis of potentially conflicting views, considering uncertainties involved in any strategic moves, but also importantly, the necessity of a sufficient balance of power to divert from wrong paths when the CEO has his or her mind set on something.

Although not found in these fairly recent books on strategic failure, there are concepts available in the strategic literature which would provide appropriate analytical lenses for understanding these events. Let's mention, without being exhaustive, three such notions derived from a process perspective of strategy included in the interpretive view (table 1): '*strategic drift*' (Johnson, 1987), '*strategic dissonance*' (Burgelman, Grove, 1996) and '*escalation of commitment*' (Staw, 1997). The table below offers a short description of each concept and its relevance (table 2).

Table 2. Relevant concepts for understanding strategic failure

Concept	Short description	Relevance for strategic failure
Strategic drift (Johnson, 1987)	Incremental loss of fit, despite strategic adaptations, between the company's products (or services) and consumers' choices	Degree of strategic failure depends on the extent of uncoupling between products (or services) and consumption of these products by customers
Strategic dissonance (Burgelman, Grove, 1996)	Process triggered by leaders' appreciation that products (or services) need to be questioned in relation to market changes	Absence of dissonance potentially leads to failure because need for change is not perceived or happens too late
Escalation of commitment (Staw, 1997)	Situation of strategic uncertainty over existing problems and whether or not (and to what extent) to maintain a course of action in relation to these problems	Strategic failure consists in choosing to maintain a course of action instead of diverting it

Escalation of commitment is highly relevant here and defined as situations “*where losses have been suffered, where there is an opportunity to persist or withdraw, and where the consequences of these actions are uncertain*” (Staw, 1997, 192). This definition fits quite well with the view of Finkelstein, who argues through his analysis of numerous strategic failures that “*the real causes of nearly every major business breakdown are the things that put a company on the wrong course and keep it there*” (Finkelstein, 2003, 138).

Reasons for keeping the wrong course in the case of escalating commitment are diverse, individual and collective, ranging from the nature of the project involved (e.g. size, expected payoff or availability of possible alternatives) to psychological (e.g. illusion of control, optimism, self-justification) and sociological (e.g. social justification, leadership norms) dimensions (table 3). One strong message from this literature is that strategic failure is not to be too simplified retrospectively. “*Decision makers must accept that the tendency toward errors is deeply ingrained and adopt explicit mechanisms to counter those tendencies*” and that “*the really aware executives realize the limitations they face. So they redouble their efforts, insisting on greater vigilance and deeper analysis*” (Carroll, Chunka Mui, 2008, 197).³

³ Authors conceptualising successful strategic decision-making processes specify the kind of interactions within top management teams along these lines (Doz, Kosonen, 2010, Eisenhardt, 2013). It covers

Table 3. Escalation of commitment (based on Staw, 1997)

Escalation of commitment	Nature of project involved	Size
		Expected pay off
		Availability of possible alternatives
	Psychological dimensions	Illusion of control
		Optimism
		Self-justification
	Sociological dimensions	Leadership norm
		Social justification

Therefore, following his investigation of strategic failures based on retrospective interviews with executives, Finkelstein warns against the simplistic explanations commonly formulated in hindsight. Reflections such as *'the executives were stupid'* or its opposite *'executives couldn't have seen what was coming'* can be heard. Interpretations that *'it was a failure to execute'* or that *'the executives weren't trying hard enough'* can be found too. But there is more. *'They lacked leadership ability'*, *'company lacked the necessary resources'* or *'executives were simply a bunch of crooks'* are explanations to be expected after strategic failures. As indicated earlier, Starbuck suggested a very similar cautious attitude about any retrospective appraisal. But Finkelstein goes further, adding and contending that *"the personal qualities that make this awesome scale of destruction possible are all the more fascinating because they are regularly found in conjunction with truly admirable qualities (...) most of the great destroyers of value are people of unusual intelligence and remarkable talent"* (Finkelstein, 2003, 213).

Leadership & strategic failure

It is interesting in the context of this article to complement and develop further this last argument with the help of critical studies of leadership. As indicated above, one quick interpretation of strategic failure is that *'executives lacked leadership ability'*. There exists indeed a very large literature (and a business) on leadership, for instance on transactional or transformational leadership. The former would be based on a more supervisory style while the latter on a more inspirational one. But critical views of the industry of leadership show that much of what is said about leadership does not

dimensions of conflict resolution, data sharing and updating among executives who are used to working together and also knowledgeable in their industry.

correspond to reality (Alvesson, Spicer, 2014, Pfeffer, 2015). Of course, very often in organisations, as much as in leadership or in safety research, *“describing reality as it is, rather than as we wish it to be, is particularly challenging”* (Pfeffer, 2015, 33). And, when one does, leadership appears in another light. *“Like many popular management fashions, much of the discussion about leadership is based on shaky foundations”* (Alvesson, Spicer, 2014, 41). In theory and as advertised, promoted and sold through books and consultancy, leadership should be about modesty, authenticity, trustworthiness or truthfulness.

But reality is very different. *“Many of the most powerful and economically successful leaders in organizations of all types demonstrate little to no correspondence with the prescriptions for what leaders are supposed to do”* (Pfeffer, 2015, 196). More than that, rather than corresponding to the expectations of the literature, situations of less than virtuous leadership in fact exist more commonly than the positive descriptions available in the leadership industry. In recent years, studies have for this reason been published about what has been identified, defined, investigated and conceptualised as bad (Kellerman, 2004), toxic (Lipman-Blumen, 2006) or destructive (Kaiser, Craig, 2014) leadership. Kellerman has for instance compiled a series of profiles of leaders from a variety of organisations (not only for-profit ones) and ranked them from ineffective to unethical through a 7-type scale: incompetent, rigid, intemperate, callous, corrupt, insulate, evil. She adds that *“effective behaviour and ethical behaviour are not joined; nor is the distinction between them always crisp”* (Kellerman, 2004, 220). Kaiser and Craig list the following ingredients of destructive leadership: abusive supervision, unethical leadership, dark side of charisma or personality and negligent leadership, and also indicate that *“it has been argued and empirically shown that most leaders display some combination of constructive and destructive behaviour”* (Kaiser, Graig, 2014, 264).

Providing an alternative discourse to the dominant, more positive vision, the notion of bad (toxic or destructive) leadership bears a closer feel to reality than the usual view because *“many leadership studies contain an important normative bias that leadership is something inherently good, desirable, and necessary, thus covering up the ambiguity, messiness, and imperfections of organizations and people’s aims and acts”* (Alvesson, 2014, 52). This darker than usual view of leadership and organisational life is well

supported by Jackall's ethnographic study of bureaucracy and morality of managers in organisations (Jackall, 2010).

Considering the outcomes of these critical approaches, one should not necessarily expect to find virtuous leadership qualities to be exhibited at the top of companies, even in admired and successful companies. *"Many of the most well-known and well-regarded CEOs, including Bill Gates of Microsoft, Steve Jobs of Apple, and Jack Welch of General Electric, exhibited narcissistic traits and behaviour (...)"* (Pfeffer, 2015, 70). How is this possible? One explanation is that leadership is not strategy. Strategy determines how organisations are successful at what they are doing, regardless of the style of leadership. Strategy is about succeeding in business, not about complying with supposedly good standards of leadership as promoted by the consultants of the leadership industry. Critical studies of leadership are therefore important for research in strategic failure in safety because to find in retrospect traits such as, for instance, being reluctant to consider or even being dismissive towards employees' opinions to be a reason for a strategic failure in safety is revealing for it is this very psychological trait that has often proved useful to the success of some executives.

While one might wish for respectable leaders, this is not always (often?) the case and does not determine success (which questions the kind of environment that acclaims successful businesses that clearly step outside the boundaries of what is defined as tolerable in retrospect, in the case of scandal). *"Many losers were once winners, many executives whose businesses figure prominently in this book were not only arrogant, they were proud of it"* (Finkelstein, 2006, 169).

Degree of strategic failure

Following this summary and in generic terms, strategic failures can be described as the inability to provide a suitable orientation and operating mode for a company in evolving (and very often tough) business environments. This definition creates the fundamental tension for any executive in a complex world as indicated by Starbuck, which is found as a recurring theme in the literature intrinsically associating strategy with risk. *"Risk is inherent in business. If you never took risks, you'd never chart new ground. You would never revolutionize a market or a product or an industry"* (Finkelstein, 2006, 271). One could add, with Kerdellant, however, that there are degrees of risk taking and strategic

failures. This author distinguishes between a broad range of cases and implies a kind of scale in the structure of the book, although without conceptualising it further. Based on this structure, I suggest a distinction between strategic mistake (or error), strategic failure and strategic fiasco.

Examples of strategic mistakes abound when products or services fail to meet their customers' expectations, when top managers miss an important trend in markets, when mergers or acquisitions do not lead to the expected gains, or also, when geographic implantation of products or services in new countries misses the local cultural scripts which would allow their local success. These remain mistakes when the survival of the company is not involved. These mistakes can or should be part of expected business complexities, but also the learning processes of managers and top managers.

But, when executives and top managers make highly risky moves threatening the entire assets of the company, the notion of strategic failure becomes more appropriate (note that the reverse is true too: when executives fail to anticipate and adapt to major changes in markets, they also threaten the survival of the company). And, when large scale fraud produced by executive hubris turned into unethical practices and maintained in specific favourable institutional contexts ends in scandal, we move into the next stage of strategic breakdown, something that could be called strategic fiasco. Perrow suggested in this situation to use the qualification of executive malfeasance. The notion of "*rogue executive*" has also been proposed for this form of behaviour (Sayles, Smith, 2006), following a series of scandals including Enron in 2001, and a bit later, the subprime crisis in 2007/2008 in the poorly regulated financial capitalism (also described as predatory capitalism).

Defining and summarising strategy in the context of this article

To summarise the above, one can retain that to approach and understand strategy, its complexity, ambiguity and uncertainty, one needs to describe and consider (see table 4 below) the main tasks and activities associated with strategic decision making (e.g. product diversification, acquisitions, organisational design, etc), the complex social business environment populated by a diversity of actors (e.g. boards of directors, top management team members, regulators, media, consultants, etc) and the different concepts (e.g. strategic dissonance, strategic drift, escalation of commitment) shaped by

cognitive, psychological and social realities which help explain the mechanism of strategic breakdowns of various scales (i.e. mistake, failure or fiasco). A definition of strategy could be the “*choices made by top managers over the main orientation of a business in its market and the ability of these orientations to be successful considering the human and technical capabilities involved*”.

Table 4. Key aspects of strategy in the context of this article

Strategic tasks and activities	Choices of geographic or product (services) diversification, acquisitions and ventures, budget allocations, organisational structure, choice of top personnel, design of work methods, motivation and rewards systems, management and conflicts resolution style.
Complex social business environment	Boards of directors, top management team members, regulators, shareholders, auditors, non-governmental organisations, unions, medias, consultants, competitors.
Analytical perspectives on strategy	Linear (decision then implementation), adaptive (incremental and emergent) or interpretive (cognitive, cultural and power view of strategic decision making)
Strategic decision-making failure concepts	Strategic drift, strategic dissonance, escalation of commitment (in relation to cognitive, psychological and sociological phenomena featuring structural, cultural, power and historical aspects of strategic decision-making processes).

Connecting strategy and safety research

A missing link

To this day, safety research and strategy research have not really met explicitly, apart from in the work of the three authors introduced above. Why is this so? I suggest four hypotheses. First, as introduced, safety and strategic research have developed in parallel historically with a process of institutionalisation of their domains of investigation in the 1970s or 1980s and onwards. Their dynamics have consisted in strengthening their own conceptual, methodological and empirical autonomy, and therefore they have not really interacted much so far. Second, in relation to the first point, safety research has been centred on showing the limits of a focus on human error in the past three decades while establishing safety as an organisational and regulatory problem. Third, it is easier to

study human error of precise end actors than top managers and executives for obvious methodological reasons, including access to these powerful actors, but also the difficulty of linking strategy and safety given the complexity of sociotechnical systems (see Perrow's quote above on this issue). Fourth, strategy writers have been focused on the obvious question of how to create and design successful businesses in the context of globalisation and the new economy, and safety is only a peripheral issue to these concerns for most businesses. But, they are not for safety critical systems!

Nevertheless, these reasons can and should be surmounted. The connection between strategy and safety can be an area of investigation which comes quite naturally as a complementary notion to existing topics in both safety and strategy research. Now that there is an established body of scientific knowledge on cognition, organisation and regulation in safety, it is probably easier to combine it with a strategic angle. It becomes, in this perspective, a refinement to an established body of work. Conversely, now that there is a body of established literature on strategy and strategic failures, it becomes justified to adapt and translate it in safety research, as for instance understanding events in relation to company strategy, and therefore, to the activity of executives and top management teams. How to proceed with a stronger connection between the two domains? What sort of strategic failure is an incident, an accident or a disaster?

Safety as strategy

Two combined options are suggested in this article, then illustrated. The first one is to conceptualise safety in the context of company strategy. As introduced above, top management decides key moves such as acquisitions, products and geographic diversification, but also organisational structure, management style and key personnel, all of this strongly contributing to specific relations and interactions between the diversity of actors in a company. A proposition is therefore to consider, as a prerequisite, that safety is produced in the context of specific strategies. Considering safety this way provides a dynamic approach, something which is missing in many research traditions, as recently contended by Griffin et al with the help of the dynamic capabilities framework of Teece (2007). "*There is currently no conceptual framework for describing qualitatively different kinds of change in safety systems (...)*" (Griffin et al, 2015, 2). As

discussed, companies evolve constantly, and changes are strongly correlated to strategic moves (Child, 1972).

As analysed in the literature on strategic failure, key moments in the life of an organisation such as a merger, the launch of a new product, internationalisation, new projects or organisational change are always critical. These moves can succeed or fail, in isolation or all together. These moments also include changes in the structure of companies or the placement of key managers in new positions as a result of these changes, creating new kinds of interactions between the diversity of actors of organisations. From a safety point of view, these analyses are important because they reveal a quite central feature of organisational life. These are moments when top management is deeply involved in the process of making sense of the uncertainties of how well their strategic decisions do.

This leads to the second option to be combined with the first. Strategy, and strategic failures, are cognitive, psychological and sociological realities as discussed above. They are a product of executives and top managers' decision-making processes in their complex work, social and business environments, as well as wider institutional context. This second option refers to this aspect of strategy which points to the type of relationships and interactions within top management teams and known phenomena ranging from biases to group think, which can contribute to missed signals. These phenomena profoundly influence what has been described as strategic dissonance, strategic drift or escalation of commitment (table 2). From a safety point of view, this level of analysis is likely to bring complementary insights to existing works already available for other actors populating high-risk systems.

Illustrating safety as strategy

Let us illustrate safety as strategy with three different cases. This is a stepping stone towards a better appreciation of this approach, which intends to generate new interest for this level of description and conceptualisation. These cases can be differentiated along two dimensions: company size and magnitude of event. The first case (called *silo case*) concerns a relatively small, national company in the business of food grain storage and distribution (250 employees) and a fire without any casualties but with product (grain) loss and infrastructure damages. The second one (called *pyro case*, for

pyrotechnic) involves a bigger company (1400 employees) producing and selling dynamite, operating in several countries and an explosion causing the death of four employees. Finally, the last one is about a multinational present around the world (100,000 employees) and a series of disasters causing environmental damages and many casualties between 2005 and 2010 (called *petro case*).

These three cases involve successively larger organisations and a greater magnitude of impacts of the associated events. They provide enough material to address the question of strategy as framed in this article. The aim is to show that the three cases can be described as strategic breakdowns of various degrees, from mistakes to fiasco. The first two are first-hand personal empirical studies with access to top managers and executives of the companies (Le Coze, 2010, 2012b); the third one is the BP case which relies on secondary data from extensive reports and books published over the past ten years (e.g. Hopkins, 2008, 2012, Bergin, 2012, Lustgarten, 2012, Le Coze, 2016, 2017).

These cases are each in turn presented briefly to highlight the specific aspects of importance for this article. I will not go into detail about the technical aspects or human factors, but rather focus on the relationships between events, organisation and strategy. Note that descriptions of engineering or human factors (and to a certain extent organisation) are not missing because this information is not available. In fact, these illustrations depend on in-depth ethnographic types of investigations which are necessary to provide the level of detail needed to judge a specific situation from a strategic angle. These details slip however into the background here because the focus is on a strategic level of understanding and interpretation. But it is clear that methodologically, this type of analysis and appreciation can only be inferred when a rich empirical material of a diversity of artefacts and activities of operators, engineers and managers from shop floor to top management is available.

One word about the main differences between these three empirical studies, beyond technology, in relation to their size. It stands to reason that one cannot address the strategy of a small, local company in the same way as that of a multinational. Because of their complexity, multinationals face specific challenges unmet in smaller scale organisations (Morgan, 2006). However, despite this obvious difference, an approach of safety as strategy can apply equally well. And there is a heuristic value in comparing them even if, from the point of view of the design of a research agenda and its

methodological implications, studying safety from a strategic angle in a small to medium-size company and a multinational entails very different prerequisites and complexities.

Silo case

In the silo case, a fire occurs in one of a company's silos without resulting in casualties but with costly damages. The investigation reveals that the silo was not well managed by a young recruit. This young employee should have monitored heat parameters but was not in a position to perform his work properly because of a lack of training, experience, adequate working conditions and supervision. Risks associated with silos, from a major hazard point of view, are fires or explosions. It is imperative to check storage temperatures. His failure to do so constituted a real drift from expected practices. The executive manager declared that this event had resulted from "*a faulty employee badly supervised*". The situation could be framed in a different way.

In fact, the context of the event was embedded in a change of structure, key managers, and relationships and interactions between managers created by this new executive manager as part of his strategy for the company. This new executive manager replaced two previous executive managers who both had operational experience. The industrial activities of this organisation include about 70 silos which, depending on their size and complexity, are operated by one or several operators. These units are spread over a geographic area and grouped into supervised entities managed by appointed people. Without operational experience, this newly appointed executive manager wished to distribute the operational side of his activity to operational managers who would report directly to him.

The idea was for him to concentrate on key moves for the future of the organisation, such as the prospect of merging with other companies, and on the administrative dimension of his position. The company had no specific economic difficulties and had a good position in its market, based on the storage and distribution of crops in this area of the country. However, one trend for this type of business was to grow through combining resources with neighbouring organisations, basically extending geographic coverage and mutualising activities. The associated change of principles of organisation and managers was directly linked to this strategy.

He recruited, with the help of his human resources manager and an external consultant, three profiles inside the company to take on the new positions of operational managers reporting directly to him. These new positions presented a challenge as a greater number of silos and people had to be supervised (with a younger workforce because of demographic dynamics), hence the need to also create new positions at an intermediary level between operators and these operational managers. This new structure was reinforced by a formal reporting system designed to regularly provide updates on the operational status of activities in a homogeneous way by the three appointed operational managers. Audits by the quality, health, safety and environment (QHSE) department were also to be performed on top of this.

One problem was that one of the new employees in the position of operational manager reporting directly to the new executive came from the base of the organisation and had no previous experience managing several silos and employees. Without knowledge at this level of management, he had much to learn, but no specific training support was provided. The new executive and human resource manager thought highly of him, and when a certain number of problems cumulated because the new manager struggled in his new position, they were ignored by the executive. Moreover, this new operational manager hid rather than openly discussed the difficulties he was having due to his lack of experience. The other two newly appointed managers noticed the attitude of their colleague and did not necessarily appreciate his management style, but they did not intervene because they lacked knowledge of how exactly the situation was from an operational point of view of his area.

The QHSE manager complained about problems in the way safety was handled under the supervision of this new manager, but the executive did not respond positively and left the situation as it was. Indeed, the change of executive, organisation and managers had changed the level of authority of the QHSE manager. Theoretically, her position was the same in the organisational structure, but the new executive favoured the opinions of the new operational managers, who had evolved under his management and who the new executive wished to support in this challenge.

Following the investigation of the fire from a human and organisational angle, the new executive finally realised that a certain number of problems existed in relation to the difficulties met by the new manager, and that changes had to be made to his own style of

management, choice of managers, or in other words, his own approach to dealing with his strategy. Instead of “*a faulty employee badly supervised*”, it was therefore more appropriate to speak of “*a new strategy with unanticipated and unmanaged weaknesses*”. These two different levels of explanation were not exclusive, the latter constituting the context of the former.

Pyro case

In the pyro case, an explosion of one of the production cells of a plant manufacturing dynamite, killing four people, including three who should not have been there at the time of the explosion, led one to question the management of the site that morning, in particular circulating paths and co-activity in the plant. As for the silo case, the context of this event was a series of transformations in the way the plant was managed and handled from the top over the years. But the complexity of this organisation is greater than in the silo case: it consists of multiple plants (including some abroad) with many more employees, including a high number of employees abroad, with a greater differentiation of expertise, roles and positions within the group.

A leader on its national market and one of the top four worldwide, the company had decided to extend its activity to include an engineering service on the use of dynamite along with its core business of producing dynamite cartridges. Family-owned and debt free, the financial background of the company was favourable to many investments in design, which were made over the years in order to simultaneously improve safety, health and productivity in the plants. However, as part of the evolution of the company under its strategy, some changes were made to the organisation in terms of technology, key managers and their activities. These constituted the background of the accident and its casualties.

A certain number of these strategic changes were decided at the level of both plant and corporate management. Overall, these organisational decisions created operational problems. First, a new plant manager without operational experience was appointed. Second, this new manager, after a short period of time, divided his time between two plants in order to optimise their management, in particular when it came to dealing with social climate and capitalising the expertise needed to deal with complex environmental and safety regulatory requirements. One consequence in this particular case was that

power shifted to the production manager of the plant where the accident happened. Without much experience, the newly appointed manager relied on the more experienced production manager, which created a new trade-off situation in the factory, at the expense of the HSQE manager.

Third, and combined with the previous strategic changes just described, was the appointment of a new technical expert at the corporate level. This modification (which was just one of employee and not of function) contributed nevertheless to altering further the power of the safety department in the same plant. The QHSE manager had relied on the person who had previously filled this position at the corporate level, who he knew well, to get his message across about safety issues at this level of decision making. In his absence, the QHSE manager lost his influence. Combined, these strategic choices of the organisation (e.g. appointing an inexperienced manager, dividing his activity between two factories, replacing the technical expert at the top level) created new social interactions, removed the site manager from daily operations in the factory, increased the power of the production manager and weakened the ability of the QHSE manager to play his operational role.

For instance, days before the accident, it was decided to reopen some production lines in the plant in order to deal with an excess of product to be processed coming from one of the company's factories abroad. This had the effect of causing problems of circulation in the plant and contributed to the number of casualties following the explosion because it increased co activities and their associated complexities, without establishing a rigorous management of change process as would have been expected. This was an example of failing to provide a favourable balance between safety and production in the absence of a site manager permanently in the factory. Without the possibility to confront and oppose to this option at the top-management level, it was not possible for the QHSE manager to play his role.

These new social configurations of relationships between managers and the information flow they created throughout the organisation from plant to top management following this strategic move in the organisation and employees' appointments remained invisible to top management until the accident revealed the many associated operational problems. The event shook their beliefs that the technological investments made over the years for designing a safer plant were sufficient to determine how safe the factory

practices were and revealed that this social dimension of safety counted as much as its technological side.

Petro case

The petro case (BP) cumulates, in a period of five years between 2005 and 2010, three disasters in three different branches of this company's activities (pipeline oil transport, refining, offshore exploration), challenging the management of process safety across the company. In the first disaster, a poorly maintained refinery (Texas City, 2005) caused an explosion and the death of 15 subcontractors. In the second, an oil spill (in Prudhoe Bay, 2006) was created by corrosion due to a lack of inspection and maintenance programs. And in the last case, a deep water well (Macondo) failed to be secured and leaked gas on the platform (Deepwater Horizon, 2006) which exploded, creating an environmental disaster and 15 casualties.

With this case, another layer of complexity is added in comparison to the silo and pyro cases due to the much larger scale of the multinational involved. However, because of the wealth of material available (investigation reports, books, articles), it is possible to also approach this example from a strategic angle as done for the two previous examples. Indeed, what can be inferred from the number of analyses and interpretations on this case study is that the firm suffered this series of disasters as a result of strategic moves.

The story of this multinational is one of organisational transformations in line with a strategy from the middle of the 1990s onwards which had clear detrimental consequences for process safety, creating the conditions for these three major events to occur. And these transformations are closely linked to the strategic orientations developed by the executive and his team throughout a decade, including several important orientations in terms of diversification, acquisition and structural changes of the organisation.

One key initiative consisted in finding new petrol fields for the company, requiring an expertise in dealing with multiple political, social and technological challenges. The strategy also implied buying and merging with other petroleum companies in order to grow in size and prevent the risk of aggressive takeovers by other petroleum

multinationals at a time when the company was smaller in size (Bergin, 2011, Browne, 2010).

From an organisational point of view, the old vertical structure was progressively transformed into a networked configuration in which internal engineering expertise was decentralised and business units (BU) were created with a higher degree of autonomy across the branches, from exploration to refining. This was intended to increase decision-making speed and flexibility at the regional/branch levels. Along with these strategic orientations, a cost-cutting policy was activated, expecting financial targets to be met by BU managers.

Diversification, acquisition, restructuring and cost cutting in a period of low petrol prices characterised this financially and commercially successful strategy. However, the disasters demonstrated the inability of the multinational to maintain safe operations in this framework. The networked configuration had created an unfavourable context for safety trade-offs under cost-cutting pressures, at least in some parts of the multinational. Favouring a decentralised mode of operating for more autonomy and fast decision-making processes at the level of branches and BU altered, in a context of strong cost-cutting imperatives, the checks and balance principle expected of high-risk systems, considering their hazardous potentials (Bergin, 2011).

Discussion

Linking top management decisions to (safety) events

In all three cases, it is highly relevant to understand the events as products of strategic choices which materialised in specific operational constraints affecting the organisation's reliability, flow of information and learning, decision making and sometimes integrity of engineered systems or their design. What is clear is that analysis of strategic changes is key to contextualise unsafe practices (what has been conceptualised as migration, drift or beyond boundaries but without a clear connection to strategic decision-making processes, see note 1), whether when operating a silo, a pyrotechnic plant or an offshore platform and whether in a multinational or a national company. Despite differences in both the organisation size and magnitude of events

involved, each can be translated as strategic flaws of varying degrees, something implying the psychological and sociological realities of top decision makers (as introduced above when analysing studies of strategic failure).

Because safety is one parameter among others in companies, an adequate strategy is one which establishes a complex balance between other goals, including productivity, return on investments, social climate, human resources and any other legal or regulatory expectations in relation to work, environment or commercial contracts. This potentially implies that executives or top managers can be reluctant to change courses of action that are the product of their strategies until problems are so obvious or visible that they have no choice but to accept altering and modifying the mindsets associated with these strategies.

Indeed, in these three examples we see how an executive or top management team's strategy turned into a mindset associated with a structure with positions allocated to managers who created safety flaws. One interpretation is indeed that strategic orientations, as shown above, provide a background in which the treatment of signals of safety problems is framed. The literature on strategic mistake or failure as introduced in the previous section, combined with conceptual insights (strategic drift, escalation of commitment), provides much support to legitimise such a psycho cognitive explanation. Because of the strategic cognitive mindset of the powerful actors in these organisations, it took an event (or several) of sufficient proportion to modify their perception of the problems.

Therefore, with regards to Farjoun and Starbuck's question "*if an organization is striving to exceed some of its limits, some people are pushing for very extreme performances. Who is exerting such pressure, and for what reasons?*" (Farjoun, Starbuck, 2007, 562), the three cases provide some clues. It is pretty obvious in the first case, the silo case, that the executive transformed the organisation to implement his strategy, which remained unquestioned until there was a serious event because the dynamics within the management committee were such that it failed to alert him of the potential consequences of this new strategy. This executive's gap of interpretation, as expressed in personal interviews before and after the event, showed that what he thought to be an adequate approach proved to be quite weak in some areas.

The second case is very similar, but this time it was the misconception that the design investments of the past years were sufficient to ensure the plant's safety when indeed the new organisational arrangements and relationship between managers had created new weaknesses and flaws in the plant's safe management. For these two cases, silo and pyro, there was no deliberate cost-cutting strategy or deliberate trade-offs between safety and production but rather an incremental series of changes of the organisation consistent with the strategy which in turn created unexpected patterns from the point of view of executives and top managers.

The third case is more radical because of the extent to which the strategy clearly relied on strong cost-cutting policies across the company in the context of mergers associated with a new commercial philosophy emphasising the financial achievements of autonomous business units, at the expense of the strong centralised organisational configuration of the past. Pushing the logic of networks, this strategy was a much more ambitious, innovative and aggressive approach than the two previous cases, maintained by a powerful and charismatic leader who designed his top committee so as to remain unchallenged. The strategy's consequences were not immediately obvious, and it took some years before the conditions were created for the highly visible events which followed.

Thus, as for any strategic mistake or failure involving for instance a new product or a merger, *“the real causes of nearly every major business breakdown are the things that put a company on the wrong course and kept it there”* (Finkelstein, 2003, 138). In all three cases, changes resulting from top managers' strategies created new configurations adversely affecting safety but kept in place until problems could not possibly be seen as peripheral but instead as core weaknesses. The events revealed the inadequacy of some key aspects of what the strategy consisted of. As described in the literature, processes such as these have strong affinities with notions such as *“escalation of commitment”* (Staw, 1997), *“strategic dissonance”* (Burgelman, Grove, 1996) or *“strategic drift”* (Johnson, 1987). These are useful concepts for safety as understood through a strategic angle of analysis (table 5).

Table 5. Strategic concepts applied to safety

Concept	Short description	Relevance when translated to safety
Strategic drift	Incremental loss of match, despite strategic adaptations, between a company's products (or services) and consumers' choices because core strategic paradigm resists	Incremental moves can make the company drift away from safe practices without being an explicit enough part of the picture of top leaders
Strategic dissonance	Process triggered by leaders' appreciation that products (or services) need to be questioned in relation to market changes	The absence of dissonance between safety problems and strategy create the possibility that a course of action remains unchanged despite its potential consequences
Escalation of commitment	Situation of strategic uncertainty over existing problems and whether or not to maintain a course of action in relation to these problems	Incidents and accidents can be considered as problems in need of a reappraisal of strategic orientations, but the actions taken fail to tackle the problem adequately

Strategic mistake, failure or fiasco?

Should strategic mistake be discriminated from failure or fiasco in regards to safety as implied in the strategic literature? Are there degrees of strategic breakdown when safety is concerned? One intuitive option is that strategic "mistakes" could be associated with process safety events without casualties. These strategic mistakes would sound as warnings that something is wrong with a strategy. Strategic "failures" could be linked to high consequence events. This would indicate that a strategy has gone too far without realising its safety implications. But is this so simple? Is the degree of strategic breakdown linked with its consequences? This hypothesis certainly needs cautious treatment based on empirical data, but it seems indeed to make sense that the more a strategy challenges the ability to remain within the envelope of safe performances, the more likely it is to provoke large consequence events.

Out of the three cases, the petro case clearly looks the most like a strategic failure, or perhaps even a fiasco. The extent of safety problems in the three events were quite critical, with strong warnings, for instance, from a refinery manager that resources were needed to improve the integrity of installations. Stuck in their strategic mindset of

delegating autonomy to business units, top management would not relieve the refinery of its cost-cutting objectives and constraints despite pleas to do otherwise by the site manager of the refinery where the disaster occurred. Why change the course of action of a winning strategy? In this case, the view of Carter, Clegg and Kronenberg seems particularly relevant. *“Strategy writes scripts for adulation today which can easily be rescripted as shaming and deceitful tomorrow. (...) the very thing that makes a company rich, powerful and successful, can make the same organization poor, its executive criminals, and its investor’s debtors, as we have seen in countless corporate scandals. It is easy to get caught up in the success of a winning strategy and be blind to the corners it cuts”*.

Can the same be said about the other two cases? Although exhibiting similar patterns of powerful actors shaping the conditions under which trade-offs were operated across the company, the strategic analysis creates a different feel. A deliberate aggressive cost-cutting approach was not visible and changes in the organisation were not as radical or innovative even if new principles of decision making were clearly established and power was redistributed within the organisation. Still, the consequences of the pyro case with its four casualties make it more of a strategic failure than the silo case, which could be classified as a strategic mistake. The pyro case's strategic failure would not so much be an aggressive cost-cutting approach combined with a radical innovation to business structure as with the petro case, but rather the inability to perceive in time that safety is as much the product of its social aspect as its technological one. In relation to Starbuck’s quotes above which distinguished two types of explanations of organisation at and beyond the limits, the following table can be suggested (table 6).

Table 6. safety strategic mistake, failure or fiasco

Strategic fiasco	<i>“Organizations may be driven to try to exceed their capabilities by senior executives who pursue unrealistic goals because of insecurity, ambition, greed, hubris, jealousy or competitive zeal”</i>	Petro case
Strategic failure	----	Pyro case
Strategic mistake	<i>“organizations may promise too much and overstep their capabilities, not so much as a result of conscious design but as response to cumulative flows of events or as unintended by-products of decisions and actions”</i>	Silo case

These principles and table contain a strong assumption which is an inductive outcome of several years of empirical study of organisations. This distinction between mistakes, failures and fiasco implies indeed that a certain degree of safety achievement is correlated to strategy. As argued in this article, this distinction creates the possibility of reframing safety as a product of strategic decision-making processes, a possibility which has so far been left unexplored or insufficiently specified in existing research traditions (e.g. migration, drift, see note 1). And, these considerations lead to the important topic of learning at executive and top management levels.

'Nearly error free' and 'latent causes' revisited

As any individual and as much studied at the shop-floor level, executives learn from their mistakes. But what do they actually learn? Looking at these safety events in this way leads to an important area of development for the framing of the operational challenges of high-risk system. With a more explicit focus on the powerful actors of organisations in relation to their strategy, top management teams and how they affect decision making, the notion of “nearly error free” operations of the high reliability research agenda (La Porte, 1982) could be turned into a “nearly strategic error-free” issue.

What and how do executives and top management teams learn from their mistakes before they turn into a strategic failure such as a disaster? Is a disaster a series of strategic mistakes by executives and top management teams who did not learn from them? Is the incremental nature of patterns leading to disasters based on inadequate learning by executives from previous mistakes? Figure 1 offers a graphical version of these loops between mistake, failure and fiasco, and is commented below.

general, and exceeding limits in particular entails ambiguity, risk and uncertainty" (Farjoun, Starbuck, 2007, 543).

Second, and as often commented in the literature, executives and top management teams are happy to get credit for their successes but not for their failures, which they tend to attribute to others or to external circumstances (Baumard, Starbuck, 2005, Starbuck, 2009, Quinlan, 2015). There are indeed plenty of opportunities to shift the blame to other actors of the company, technology or market constraints. When shown retrospectively that managers below top management teams did not meet expectations, it is indeed tempting for executives and top managers to consider that lower management should have performed better, in order to shift the blame to them. This situation was best expressed by the executive in the silo case who described the fire as a result of "*a poorly performing operator badly supervised*", thus excluding the possibility that his strategy had created the specific contextual conditions of the event. The same could be said about the other two cases, pyro and petro, even more so that they are bigger organisations with many more possibilities for challenging managers and middle managers on what they were supposed or expected to do, namely finding ways of not sacrificing safety over production. These cases are not exceptional; there are many such cases: "*managers at the middle and upper middle levels are often left to sort out extremely complicated questions about technology, investment, and their bosses' desires and intentions*" (Jackall, 2010, 85).

Executives certainly never explicitly ask anyone to make decisions that would be detrimental to process safety, but the context that they create and the associated rewards can implicitly encourage such decisions as much as explicit oral statements would, indeed "*pushing details down to protect the privilege of authority to declare that a mistake has been made*" (Jackall, 2010, 21). It is always possible in the absence of such statements for executives to pretend that they had no such intentions and that such a rationale for decision making was never implied. An example is provided by Hopkins in his analysis of the BP Texas City accident (2008). "*BP's cost challenges had this characteristic: senior executives demanded cost cuts and left it to others further down the hierarchy to ensure that these cuts were not at the expense of safety. Lower managers responded as best they could to these conflicting requirements, but, inevitably, safety was compromised*" (Hopkins, 2008, 81).

Conceptualising strategy in relation to safety is also a way of reformulating the very influential idea of latent causes of incident and accident (Reason, 1990). Reason introduced this idea in the 1990s using a medical analogy, perhaps inspired by Turner and his incubation period metaphor (Turner, 1978). Specified more analytically as organisational then cultural by Reason (Reason, 1997), these latent causes could now also be understood as strategic as suggested in this article. Latent causes can be strategic mistake, failure or fiasco and a definition of strategy in the context of safety could be the *“choices made by top managers over the main orientation of a business in its market and the ability of these orientations to be successful without compromising safety, considering the human and technical capabilities involved”*.

Thus, the conditions of learning at strategic levels and the way latent causes find their origins at strategic levels are important questions to be explored and included in a research agenda. But before turning to scientific topics to be investigated, I would like to make two additional points, first about the strategic approach in comparison with the legal one, and second, on the absence in this article of the larger institutional contexts within which strategies are deployed.

Legal considerations

I have deliberately left aside the legal and socio legal perspectives of these case studies, although issues of compliance with safety regulations are always involved to a certain extent. The emphasis in this article has been on trying to understand from an operational point of view what patterns at powerful levels of decision making could contribute to safety problems without any intention to harm employees or to create conditions of environmental disasters. These two options, the legal or the operational ones, are quite different although complementary.

The option described as operational here offers the best understanding of how safety is produced in light of the complexities of managing high-risk systems, and considers a certain level of non-compliance to be almost inevitable. First, the number of regulations and prescriptions is quite high and evolves, and second, sometimes there are ambiguities or difficulties in effective translation of the law into practice (Huising, Silbey, 2011). Moreover, the legal option is also often associated with the search for blame and/or restorative justice, which may or not address the complexities of

managing businesses. In principle, a better grasp of reality offers invaluable material to judge retrospectively events which caused harm. The legal and operational perspectives can meet there, but their logic remains different. Finally, if, as suggested by Hopkins (2007), the law could be designed on a reinforced philosophy of accountability through the principle of “outcome responsibility” (Hopkins, 2007), the study of safety as strategy could supply empirical material to further elaborate this possibility and its rationale, or any other rationale which questions the responsibility of corporations (Gobert, 1994, Gobert, Punch, 2003).

Institutional considerations

I have also omitted to describe larger institutional contexts in this article. One core question in this respect is *“How can failing courses of action in high-risk systems be maintained when oversights are designed to operate against such dynamics?”*. A first answer is that all high-risk systems are not regulated equally and that some are clearly not as likely to create problems as others. The aviation, nuclear, railway, maritime and chemical industries depend on differing legal and regulatory controls across the world (despite sometimes international and shared frameworks, e.g. aviation), as argued by Perrow (1994, 1999). In theory, the likelihood of strategic failure is higher in underregulated industries than in highly regulated ones. However, the power, resources and expertise of multinationals might sometimes be strong enough to capture the regulator even in the most regulated industry. The Fukushima case comes to mind.

A second answer is that some of the patterns operating behind rare but high consequence events are not visible to regulatory agencies because of a lack of relevant inspection practices. This happens of course for under resourced agencies with a lack of competent inspectors in poorly regulated industries, but it can also happen in highly regulated areas when complex patterns escape the scrutiny of companies themselves because of the complexity of their operations (e.g. Engen, 2014). In fact, to my knowledge, no regulatory agency has so far promoted a strategic approach to safety as exposed in this article and does not therefore explicitly address the relationship between safety and strategy.

A wider political economy view provides a third answer, as globalisation is now at the heart of contemporary financial capitalism, creating specific constraints on the

operating landscape of safety critical systems. Without describing how executives evolve in these specific financial contexts, it is difficult to understand how their logic is now framed by shareholders' expectations of companies' financial performance (and as argued to be directly at the source of the rise of "rogue executives" by Sayles and Smith, 2006). Much has been written on this topic in the past two decades, however only little in relation to the safety of high-risk systems (Le Coze, 2017).

A research agenda for safety as strategy

What research agenda can be designed on the basis of the above sections? I suggest three main avenues. First, there is a clear need to provide a better description of how executives and top management teams in high-risk systems are organised and work on a daily basis with regards to process safety in relation to strategy. How do executives within these teams interact with such issues in their complex business social environment? How do they balance the need to change and adapt their organisations to their markets with the necessity of remaining within safe envelopes of operation? What is the dynamic of debates regarding strategic orientations and safety, **not only process safety but also occupational safety**? How do these debates contribute to strategic drift or escalation of commitments despite signals of safety problems? What sort of debates and dispositions are triggered in the aftermath of an event of minor or major proportions?

Second, there is a need to refine the analytical categories associated with strategy between several levels of decision-making processes such as corporate and business unit or site, depending on company size. In particular, in multinationals, one can find a very high number of these levels, with possibly different implementations of strategic orientations of senior managers. There exists a possibility of decoupling between corporate activities and operational ones, as some studies of multinationals have shown (Kristensen, Zeiltn, 2005). What degree of autonomy is left at the site level? How much of what is happening at individual sites informs top management levels about problems reflecting on strategic constraints? How much is kept at BU or site levels?

Third, although initially based on inductive empirical studies, more research is needed to ground the contention that one can elaborate a scale of strategic mistake, failure and fiasco in relation to safety. These three research orientations and studies would need to combine empirical analysis of executives and top management teams with what is

happening in reality at the level of on-site work activities. This is a very demanding research design, but to focus solely on executives and top management teams would restrict the relevance of the research, although of course not uninteresting. One strong obstacle remains access to data at the highest levels of decision making on such a sensitive topic.

Conclusion

This article went through a number of steps to introduce the role of powerful actors of organisations in the daily construction of safety. Strategy offers a highly relevant focus for this purpose. Starting with the very much shared idea that strategy matters for the fate of any business, it is shown that neither the fields of strategy nor safety have developed an agenda for understanding strategy's contribution to the ability of high-risk systems to remain within the boundaries of safe performance. After introducing some authors who have made first approaches to this topic, the article moves on towards a more explicit articulation of the conceptual background of strategy's relation to safety.

A synthesis of some of the most visible research traditions in the domain of strategy are introduced, relying on the three distinctions of linear, adaptive and interpretive views of the subject. Core debates, which question both the vision and power of executives and top management teams without challenging the fact that they remain without a doubt the most powerful actors in organisations, despite the presence of limits to the exercise of this power, are discussed. It is precisely their power to orient organisations which sometimes locks them into patterns of strategic failure, as studied by several authors and also conceptualised as 'escalation commitment' or 'strategic drift'. Distinctions between strategic mistake, failure and fiasco are suggested, and the status of leadership in relation to strategy is discussed as well.

Applied to safety with the help of three case studies ranging from local to multinational companies and from an incident, an accident to a series of disasters, it is shown that strategy offers a much-needed refinement to the existing body of safety research. If safety is indeed an organisational product as convincingly argued in the past 30 years with a notion such as "latent cause" and change is one part of this key organisational aspect, then strategy plays a determining role in this, linking any events to actions of the powerful actors of companies and shaping the fates of the latter.

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