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Review

What have we learned about learning from accidents? Post-disasters reflections

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ABSTRACT

The disasters of the past years in different high risk industries (e.g. aviation, offshore, nuclear) push for a moment of reflexivity about learning from accidents. In the aftermath of these events, one wonders whether learning from accidents remains a viable endeavour for companies and states or whether recurring technological disasters such as these seriously and definitely undermine any attempt to prove the feasibility of learning. Progress has certainly been made in the past, but apparently not enough so to be able to reach the highest safety levels, even in systems with dedicated resources. As a result of the current situation, some have been able to argue that '*we don't learn about disasters*'. Although appealing and right, this is a very generic statement. There are many studies addressing aspects of learning from accidents which are in a position to bring insights about the drawbacks of learning. But this wealth of research is also part of the problem. When one wants to step back and to look broadly at the topic, to understand the reason why '*we don't learn*', one is left with a fragmented scientific literature covering a very large spectrum of interests and views on the subject. This paper tackles this problem by first designing a framework to organise the diversity of studies and second, by extracting four lessons on learning from accidents, putting together for this purpose works in psychology, sociology and political science.

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1. Introduction

In these times of post technological disasters in different high-risk industries, including the Fukushima (2011) nuclear power plant and Deepwater Horizon oil rig (2010) explosions, or the AF447 flight crash (2009) and, a little earlier, the BP Texas City (2005) and the Columbia shuttle (2003) explosions, one has to reflect. In a wave that clearly recalls the series of the eighties, i.e. Bhopal (1984), Chernobyl (1986), Challenger (1986) and Piper Alpha (1988), that created the impulse for increased research and efforts in the field of safety (e.g. Rasmussen and Batstone, 1989), one wonders about 'learning from accidents'. This paper is thus triggered in the aftermath of this wave of disasters, and by the reactions that one could find in the media from researchers with voices in the field because of their broad philosophical or sociological perspectives on the issues of modernity, risk, science, technology and democracy. Two examples are Beck and Stengers (Beck, 2011; Stengers, 2011). Beck is a sociologist, known for his input in the 1980s on 'risk society' (Beck, 1992). This author will be discussed in more detail below. Stengers is a philosopher, known for a contribution in association with Prigogine about changing times in the scientific realm, based on the principles of self-organisation (Prigogine and Stengers, 1978). She has been exploring the relationship between science and society since (Stengers, 1993), and the place of catastrophes in (post)modern times (Stengers, 2009).

What is striking in these reactions is the level of discussion that remains at what could be described as a 'macro-level', not very informed by empirical studies on learning from accidents in different high risk industries. This 'macro-level' views lend themselves to critics. Let us illustrate with Fressoz (2011). This author, a historian, in a stimulating article published in the months to follow Fukushima, challenges Beck's 'risk society'. Fressoz, based on his more general historical thesis of technological disasters in relation to modernity (Fressoz, 2012), argues that Beck's theory remains part of a teleological discourse of progress. The reflexive modernity of Beck would somehow lead to a heightened consciousness of the limits and risks of society's own techno-scientific developments. '*Since the 1980s, social theory has treated technological disasters as symbols or precursors of an immense historical break: a break with the project of technical mastery of the world, with the idea of progress, with the disregard of nature, with consumerism – in short, a break with everything characteristic of modernity*'.

For Fressoz, quite the contrary, Fukushima's nuclear accident demonstrates once again that we are far from this expected next stage of 'reflexive modernity'. We 'do not learn' from the past because technological disasters continue to reoccur. '*The more disasters there are, the less we seem able to learn from them. Our faith in progress and our concern for economic efficiency make it clear that, contrary to postmodernist claims, we have not escaped from the illusions of modernity*.' (Fressoz, 2011). The '*We*' in Fressoz's thesis is clearly very broad, and includes regulators, industry and civil society all together. But one could argue that Fressoz's statement about reflexive modernity, although appealing, lends itself to criticism. Not only for its content, but because of its nature: it is also a macro statement. Of course, it must be seen within the wider debates about 'postmodernity' and the implications for a notion as important as the notion of 'progress'. Although the claim that *'we don't learn'* sounds right, it is not based on in-depth empirical studies about some of the real limits and constraints of learning as described in high-risk systems.

What should one think about this? What do these recent disasters demonstrate in terms of learning from accidents? What do we know today about the limits of this activity that could help to shed light on these recent disasters? One of Sagan's main conclusions, following Perrow's normal accident (Perrow, 1984), was not to expect too much from learning (Sagan, 1993). A lot has been written since on the topic. One problem is nevertheless that asking such a question requires different strands of work to be put together. One is faced indeed with a wide range of approaches, interests and outcomes on this topic. No tentative overview of this diversity can be found, with the exception of a few, so far limited, attempts (Lindberg et al., 2010) that this article wishes to pursue.

It definitely seems to be a problem, as for any scientific field, not to take a step back from time to time.[1] This is especially true when a topic is very active and has been growing steadily in the past years. Learning from accidents in high-risk industries is indeed still a young field. Although a pillar of safety management, it is rather scattered, and, as noted by Lindberg et al. (2010), p. 714 '*the scientific literature on experience feedback from accidents has grown significantly in the last few decades. However, this literature is still rather fragmented, and much remains to be done to develop a unified and integrated approach to learning from accident that integrates knowledge and experience from different disciplines and fields of application*.' This paper subscribes to this statement and acknowledges that when one wants to look broadly at the topic, there is currently no framework or synthesis available to do so.

Three points must be made in this introduction of the paper before going further. One pertains to the definition of learning, the second about the relative youth of the field and the third is about the constructivist view of learning that the paper rests on.

1.1. Learning

When one introduces the question of learning, the question of the definition of 'learning' immediately arises. There is obviously no easy answer to such a question, as it is approached from many different disciplinary angles, and this is a very broad field of investigation. Learning about learning is as old as the first treatise about how humans produce (reliable) knowledge of the world around them. The Greek philosophers are probably the place to start. Plato and Aristotle (if one leaves aside the pre-Socratic philosophers and thinkers of other parts of the world) are philosophers formulating questions and developing answers to the question what is 'learning'.

By questioning how humans could know nature beyond the myths explanations, these philosophers provided a first literature for a definition of learning. Taking a giant leap forward into history centuries later with the advent of 'modern' science, the names of Popper (1936), Khun (1962) or Latour (1987), come to mind for the twentieth century. Questioning induction and deduction, the experimental and mathematical side of scientific theories or their paradigmatic dimensions, is an excellent approach for defining and providing examples of learning about (scientific) learning that extend the contributions of ancient philosophers. Studying science through a philosophical, historical or sociological mode of investigation provides a perfect field of research to refer to for a definition of learning.

However, the field of learning is obviously not limited to the study of science(s). Although the scientific way of learning has very often been seen as the normative reference to compare other types of learning with, learning is approached in many different fields. Learning has also been explored in the last decades for different objects/subjects from biological, ethological, psychological, organisational, anthropo-social and political viewpoints and even from an engineering perspective with the attempts to design 'intelligent' systems, e.g. 'self'-autonomous robots.

[1] See for example, among others, Miller's comments on the fragmented approach to cognition, a problem that he associates with many other scientific fields 'This favoritism for analytic theories is not peculiar to experimental psychologists. All scientists share it. Analysis is the scientific reflex: when you want to understand something, take it apart.' (Miller, 1986).