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Preventing major accidents: Conditions for a functional risk ownership

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ABSTRACT

In this article, we use the concept of risk ownership to clarify the question of agency in matters that concern the prevention of major industrial accidents. We determine who may be considered as a risk owner and what functions risk owners may have, given the challenges inherent in complex systems. We argue that major accidents may be viewed as failures of risk ownership and that improving risk ownership may help resolve particular systemic issues highlighted in investigation reports. To support such improvements in practice, we propose ten conditions for the emergence of a functional risk ownership, eight of them applying to all risk owners and two concerning pivotal risk owners. They focus on the context of risk owners, on what may enable them to make sense of their task and what may help them intervene in a way that, in sum, serves the prevention of major accidents. They emphasise on the need for continuous adaptation and for disrupting oversimplifications. They advocate complementarity rather than unification of insights and judgments, and problematize the lack of critical thinking, contradictions and disagreements. They recommend to develop strong "safety advocates" with the necessary legitimacy to make the case for system safety throughout a socio-technical system.

1. Introduction

In this article, we argue that major accidents can be viewed as dysfunctions of risk ownership and we propose in that light ten conditions for functional risk ownership. We will clarify the hypothesis that functional risk ownership depends on the conjunction of functional framing, functional identities and functional interactions. We will argue that major accidents may be prevented more effectively by mobilising a wider array of agents in risk management practices, improving their contribution and the complementarity of these contributions. The role of pivotal risk owners is highlighted, focusing in particular on risk owners at board and corporate level and on "safety advocates".

The notion of risk ownership is not commonly used in current risk management practices, while there is much evidence pointing at the need to clarify the question of agency may in current practices. The purpose of this article is to make sense of this notion by using current knowledge about the prevention of major accident. The article targets high-risk companies, safety authorities and any other stakeholder involved in the assessment of current risk management practices and intending to improve their effectiveness in the prevention of major accidents. It aims at being relevant both for external and internal assessments, including self-assessments. It is meant to contribute at a practical level for increasing the awareness and self-awareness of risk owners, and understand better the premises, context and consequences of their contributions in practice. This may improve the conditions for assuming their responsibility and their impact, thereby improving the prevention of major accidents.

Our focus is on the context that allows the emergence of accidents rather than on accidents in themselves. We do not cover questions about designing installations, operations, organisations, decisions and behaviours. We examine risk management practices and eventual blind zones induced by oversimplifications. We do not address the individuals directly involved in the sequence of events in the days, hours, and minutes before an accident. We focus on entities and interactions affecting assumptions, expectations and institutional settings that create the conditions enabling the emergence of major accidents. We are concerned with the appropriate mobilisation of distributed and diverse expertise over time, in order to avoid major accidents. Although the assessments and conclusions are deemed relevant for any high-risk industry, examples from the petroleum industry are used.

The remainder of the paper is organised as follows: Section 2 exposes the premises of our assessments about risk ownership. Section 3 clarifies how those premises affect our approach to the notion of risk ownership in the context of preventing major accidents. It accords particular attention to how we frame the questions of who may be considered as a risk owner, and what functions risk owners may have in our particular context. Section 4 discusses why major accidents may be viewed as dysfunctions of risk ownership and where improvements may

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be needed for improving the prevention of major accidents. It draws on some recurrent issues highlighted in investigation reports, focusing in particular on sense-making issues, integration issues and identity issues. While Section 4 shows what dysfunctional risk ownership may look like, section 5 encompasses ten conditions for functional risk ownership that may be viewed as pertinent in that light. It presents both general conditions that apply for all risk owners, and conditions for certain pivotal risk owners. The final Section 5 provides conclusions.

2. Method

This paper is based on literature that is consistent with an understanding of major accidents as emergent phenomena in complex systems. Our assessments refer to scholars who have employed systemic accident models, in particular Turner & Pidgeon (1997), Rasmussen (1997), Perrow (2011), Weick & Sutcliffe (2011), Dekker (2012) and Hollnagel (2014). We use an understanding of the notion of risk adapted to the management of complex systems, in line with Aven (2011, 2012) and ISO (2009b). In line with ISO (2009b), the management of risks accounts for risk sources in the internal and external context, potentially giving rise to risks that may impact on objectives both positively or negatively. Accordingly, risk contributions come from the system and its environment, and from how risk is recognised, understood and managed. Risk management is therefore considered to be integrated in other management processes, and concerned with the challenges inherent to management in complex systems, such as March (1994, 1999), Power (2007) and Mintzberg (1994, 2013). That includes also challenges with sense-making when managing complex systems, as developed by Weick (2009) and discussed by Snook et al. (2012). We lean on studies of complex systems that emphasize technical aspects, as the works of Page & Miller (2007), Page (2011) or Snowden (2002), as well as studies more focused on philosophical and sociological aspects, such as the works of Ackoff (1999), Cilliers (2002) and Morin (2008).

The terminology used in this paper will reflect those references. The notions of risk owners, events, risk sources and context are used in line with ISO (2009a), and the notion of system and other associated terms will be used in line with the system of systems concepts of Ackoff (1999). We use the notion of socio-technical system, as defined by Rasmussen (1997).

ISO (2009a,b) uses the notion of “risk owner” to characterise a person or entity with the accountability and authority to manage a risk. From this definition, we infer that risk owners are agents at different levels, from individuals to entities, including institutions. These agents own particular risks, in the sense that they participate in the management of risks within a particular area of responsibility. How they actually own risks in practice will characterise their risk ownership. Risk ownership will be considered functional in our context when it supports the prevention of major accidents.

We show why risk ownership is a safety critical issue, and argue for paying attention to particular conditions and particular risk owners, by drawing especially on investigation reports from Texas City (2007a,b) and Deepwater Horizon (2011, 2016). These particular reports have been chosen because they describe recurrent issues with regard to preventing major accidents within one company, over many years and across continents. These are systemic issues, which Klinke and Renn (2002, 2006) define as “embedded in a larger context of societal, economic and political risks and opportunities”. These are not limited to one particular company (BP) or one particular country (the USA). They are part of the institutional setting of all companies engaged in a globalised industry (oil and gas), and all the authorities regulating and supervising these companies. Another reason for choosing these particular investigation reports is that they rely on systemic accident models and confirm several central arguments of the above-mentioned scholars. These reports may therefore expose systemic issues and risk ownership issues that are not confined to the oil and gas industry, but rather representative of any high-risk industry.

3. Framing risk ownership

3.1. Risk ownership and framing

Assumptions at the basis of current practices frame how risk owners understand their environment and how they navigate in that environment. Therefore, in order to distinguish functional from dysfunctional risk ownership, some framing reference is necessary. Contrasting a narrow and a wide framing is pertinent in that respect. It implies contrasting practices that recognise the complex nature of major accidents with practices that assume that complexity does not matter for system safety.

According to Kahneman (2011) or Turner & Pidgeon (1997), what differentiates a narrow from a wide framing is what is ignored, deemed irrelevant or insignificant, knowingly or not, intentionally or not. As highlighted by Dekker (2012) and Hollnagel (2014), risk management practices tend to reduce major accidents to component failures, even though such accidents are now widely recognised as being emerging phenomena. A main avenue for improving the effectiveness of major accident prevention is therefore to reduce blind zones induced by oversimplifications, moving from a narrow to a wider framing. As highlighted by Årstad & Aven (2016), this implies accepting that the complex nature of a major accident is incompressible, as formulated by Cilliers (2002). In short, that means accepting that complexity cannot be ignored and cannot be reduced to practically negligible levels. A wide framing acknowledges that complexity matters in practice and this is a fundamental condition for preventing major accidents. A functional risk ownership relies on a wide framing, recognising the need to manage the system as it is, ambiguity, uncertainty, instability and unpredictability included.

Ackoff (1999), Weick & Sutcliffe (2011), Dekker (2012) and Hollnagel (2014) agree that adopting a wide framing is not about replacing existing risk management practices, but about *expanding* them. A wide framing contains the narrower framing, allowing the perpetuation of existing practices where they are appropriate, i.e. where the machine metaphor and design thinking are appropriate and where complexity is already accounted for. It does not ostracize compliance, risk analysis, barriers or key performance indicators. However, it implies understanding safety beyond compliance, risk management beyond risk analysis, accident prevention beyond barrier management, and safety leadership beyond monitoring key performance indicators. Besides, the contrary of complex is not simple, but rather mechanical. Adopting a wide framing is not about choosing chaos, but about avoiding too many restrictions on the system because of the oversimplifications that follow a mechanical approach to systems, their management and their risk management. It is about simplifying differently in some areas to enable better adaptation to what actually happens in the system in practice.

3.2. Risk ownership concerns many agents and processes

Considering major accidents as complex phenomena emerging from a socio-technical system has many consequences, also for approaching the notion of risk ownership. It becomes obvious that avoiding such accidents depends on the contributions of many risk owners at many levels, both on the installations and beyond, both in a company and in its environment. It depends also on interactions between risk owners throughout the socio technical system. Because “the” risk of a major accident is not tractable as such, no single person or entity may be designated as “the” owner of “the” risk of a major accident. Furthermore, it is not realistic to assume that what particular individuals or entities know and do in a system does not matter for the system and is not influenced by the system. Most individuals and entities are risk owners, because they have a function in a system and cannot be exonerated from accountability and authority to manage risks, or denied the authority to manage risks within their area of