



# Managing major accident risk: Concerns about complacency and complexity in practice



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## ABSTRACT

In this paper, we are concerned with understanding safety issues presented as complacency issues in relation to major accidents. Using insights gained through accident reports as well as theoretical analysis, we seek to understand why current practices often induce a misleading overconfidence in risk management. We argue that the main challenge lies with our ability to acknowledge complexity in practice. From this basis, we propose to define what acknowledging complexity means through seven conditions of prudent practice. These concern the incompressibility of complexity, system boundaries and behaviour, contextualisation and differentiation, understanding of uncertainty, normality of ambiguity and the importance of language. These conditions of prudent practice can improve risk management related to major accidents, and ensure a prudent approach to the prevention of major accidents.

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## 1. Introduction

Major accidents, when they happen, take many by surprise. Accidents such as the Deepwater Horizon accident (DWH accident) in 2010 and the disaster at the Texas City refinery in 2005 involve experienced and competent organisations that believed they knew and controlled what was necessary in order to avoid a major accident.

In hindsight, this element of surprise is often explained by invoking a complacency issue. Such an explanation implies that major accidents are the result of an inexorable silent ripening process, where slow degradations of system safety lead inevitably to a disaster because they are not recognized and/or handled properly. It implies also that isolated shortcomings were not corrected, neither by near colleagues or managers nor by more distant stakeholders. It is therefore relevant to assume that this complacency issue is a widespread problem about risk understanding and control. These observations provide the basis for the present paper. Using insights gained through accident reports as well as theoretical analysis we argue that:

- (1) Concerns about complacency reveal concerns about our ability to relate to complexity in practice.

- (2) We need an appropriate approach and language to be able to relate to complexity in practice.

Combining (1) and (2) we see a platform for gaining new insights and improved risk management. This platform will demonstrate the relevancy and usefulness of complexity thinking to reduce major accident risk. It will also contribute to defining what complexity entails in practice, and enriching the language we use in risk management, by integrating perspectives from different areas of the risk and safety fields.

We will lean in particular on fundamental work on complexity by Morin (2005, 2008), Snowden (2005, 2011), Page and Miller (2007) and Cilliers (2002, 2007), and work on risk management in complex systems by Rasmussen (1997), Hollnagel et al. (2012), Hollnagel (2014), Dekker (2012, 2013) and Taleb (2010, 2012). The discussion will be generic and not related to a particular area of application, although we will use some illustrating examples from the petroleum industry.

The remainder of the paper is organised as follows: Section 2 discusses some of the key safety issues raised by the notion of complacency, and shows why it is necessary to reconsider assumptions about risk, uncertainty and risk management. In Section 3, we will discuss the relevancy and usefulness of the notion of complexity thinking for identifying the limits of current practices. In Section 4, we define what complexity in practice entails by proposing seven conditions of prudent practice – the building blocks for the platform referred to above – to strengthen our ability to prevent major accidents. The final Section 5 provides some conclusions.

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## 2. The issue of complacency – lessons to learn

In this section, we explore the issue of complacency and some of the questions it raises, in order to understand what lessons to learn. We argue that concerns about complacency question key assumptions at the basis of current practices aimed at preventing major accidents.

### 2.1. Complacency – primary lessons

Dictionaries, such as the Merriam-Webster, British Dictionary, or Collins English Dictionary associate the term of complacency with feelings of security and self-satisfaction with an existing situation, while, at the same time, a person is usually unaware or uninformed of actual dangers or deficiencies. Moray and Inagakit (2000) link complacency to a lack of vigilance. The notion is not used to address the absence of information, but rather the inability to see, perceive, recognise or detect information, which is key to prevent a disaster. Complacency is used to characterise an unawareness of the presence, the relevance and/or the importance of available information. Evidence of danger existed but was not recognised adequately.

Complacency is often invoked as an important reason for why a disaster can happen. It is related to the notion of disaster incubation coined by Turner and Pidgeon (1997), arguing that an organization's ability to recognise danger signals often becomes weaker over time, and its ability to prevent major accidents degrades little by little, unnoticed. The disaster is then the symptom of this degradation process, appearing after such an incubation period, like a disease breaks out after the silent colonization of an organism by pathogens.

Dekker and Pruchnicki (2013) review some of the research concerning typical safety issues that develop in such incubation periods. They point to the gradual normalization and rationalization of deviation from safe operating procedures and design criteria. They show that such tendencies are reinforced by resource scarcity, conflicting objectives and focus on performance indicators. The incubation period is therefore seen as a period of drift towards a major accident. Also Moray and Inagakit (2000) show that the notion of complacency implies a vicious cycle leading unnoticeably to a disaster.

The issue of complacency appears to address a widespread, pervasive and recurrent problem. Five years separate the Texas City and DWH accidents for example. In both cases, investigation reports (2007, 2010) conclude that the companies involved were overconfident in their overview and control of system safety. The report (2010) following the DWH accident concludes that the disaster “exhibits the costs of a culture of complacency”. This conclusion is made explicitly valid beyond the actual installation and beyond the companies involved. It points at the industry, both operators and contractors alike, questioning the choices of companies taken separately, from the highest management levels and down, as well as collective actions representing the industry as such. It also points explicitly at the government, and questioned the role of regulatory authorities and standardisation agencies.

In hindsight, it is apparent that the companies were not only overconfident about how safely the business was conducted, they were also overconfident that the basis of this overconfidence was relevant and reliable. Their practice was similar to what was current in most other companies in the industry, and this generalized overconfidence was not challenged effectively, neither internally nor externally. Thus, the issue of complacency addresses problems not only about the understanding of the system, but also about the sustainability of misunderstandings about the system. The issue of complacency is not used to refer to an isolated issue or merely a

technical issue, it concerns both the macro and micro levels of a system it is pervasive in a global industry and it is also a governance issue. It questions how the business is conducted in its environment and addresses in that respect a systemic risk, as defined by OECD (2003) and Klinke and Renn (2006), a risk in which many stakeholders have a stake. It points to the need for breaking a vicious cycle that allows the perpetuation of a generalized overconfidence. This requires a reflection upon the role and contributions of many different stakeholders, as much as self-reflection from each stakeholder. Such reflections must concern but current practices and improvement processes.

### 2.2. Complacency – why it is necessary to look beyond primary lessons

The issue of complacency raises many questions and it is relevant to consider the limitations of this problem definition in order to assess the solutions aimed at correcting this problem. Moray and Inagakit (2000) mention for example that complacency is a problem definition only possible in hindsight. They argue that such a diagnosis is weakly substantiated, and it conveys unreasonable expectations. It reinforces also the still too common reflex to point to “human error” in the sharp end of the business as the cause to look at and the problem to solve.

It is also worth noticing that concerns about complacency are not particularly novel. Dekker and Pruchnicki (2013) show that concerns about the invisibility of danger signals have been under scrutiny for some time. The proposed cures against complacency are not particularly novel either. After the Deepwater Horizon accident (DWH-accident), the Report to the President (2011) highlighted the need for “Changing business as usual”. Nevertheless, looking for example at what the oil and gas industry deems important to emphasize after 2010 (IOGP1, 2008; IOGP2, 2011; IOGP3, 2013; IOGP4, 2012), improvements still concern risk assessments, key performance indicators, barriers, safety culture and controls on oil and gas installations. There are no particular reasons to be optimistic that improving “business as usual” improves the prevention of major accidents. DNVGL (2014–2015) looks at different information sources considering the evolution of major accidents in the oil and gas industry over the last 20–30 years, and conclude that there is no clear trend of improvement. Looking beyond the boundaries of the oil and gas industry, at reports across different high risk industries, Le Coze (2013) argues that major accidents that occurred in the last decade are comparable to major accidents that occurred between 1970 and 1980, creating a disturbing sense of ‘déjà vu’.

So, while it is not reasonable to question the relevancy of improving current practices aiming at preventing major accidents, it is necessary to consider the limitations of current practices and seek to identify what is missing from current practices. It is equally necessary to questions whether current improvement processes maintain a vicious cycle.

### 2.3. Complacency and expectations

The issue of complacency does not only affect the system, it also reflects the system.

Complacency is a diagnosis only apparent in hindsight, from a distanced perspective. It is not a self-diagnosis *ex ante*. Furthermore, it is not normally a choice but rather an unintentional unawareness. There is no indication that the companies that experienced major accidents intended to push the boundaries for safe performance so far as to actually encounter such an event. There is no reason to doubt that the companies really believed that they saw, understood and did enough to keep their businesses within sufficiently safe boundaries. So, the issue of complacency is interesting because it questions auto-satisfaction with overview and

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