



# Economic recession and a crisis of regulation in safety-critical industries



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## ABSTRACT

Some states have knowledgeable and competent regulators. Others are less fortunate. The operation and management of safety industries depends upon individuals who are often poorly paid compared to their colleagues in the private sector. In consequence, some regulators lack the experience, motivation and insight needed to guide safety-critical industries. Further problems are created by the increasing use of performance-based regulation. Many countries rely on teams who are specialists in the management of regulatory processes rather than the detailed engineering of complex systems. We argue that these problems have been exacerbated by the recent financial crisis in Europe and North America. Governments have been forced to make additional cuts on spending as their fiscal revenues have declined. This has further limited the scope for regulatory intervention and many of the best engineers have now left state employment. This paper describes the crisis that arises when companies cannot obtain guidance from national agencies. Resource limitations have increased regulatory lag; companies are often unsure of the legal frameworks that apply to new generations of safety-critical industries, ranging from hydraulic fracturing ('fracking') to the regulation of commercial space operations. In other areas, the decline in regulatory resources has only been corrected in the aftermath of major accidents, such as Fukushima Dai-ichi and Montara. We conclude that competency criteria are urgently needed to ensure regulators have the technical background necessary to protect safety across a range of different industries.

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## 1. Introduction

Europe and North America have come to rely on regulatory regimes that govern the design, development, operation and decommissioning of safety-critical systems. These state-funded agencies promote standards that encourage 'best practice' (Hale et al., 2002a,b). They also have a role in auditing and in assessing conformance to ensure that commercial and government agencies abide by their statutory requirements. However, the last decade has seen a regulatory crisis across many countries (Tung and Henderson, 2011). In particular, we have seen the violation of Smith's (1997) criteria for regulatory autonomy based on "earmarked funding and exemption from restrictive civil service salary rules—necessary to foster the requisite expertise and to underpin arm's-length relationships". For instance, Lia et al.'s (2010) analysis of food safety in China illustrates the problems they face in meeting OECD requirements for independent regulation, including the establishment of professional standards and attractive salary scales. They argue that food safety has been

compromised through a complicated reporting structure and through close links between government, industry and regulators. It is instructive that a characteristic of the future 'ideal' regulatory agency would be one in which "the economic interests between regulators and regulated firms should be expressly prohibited, such as prohibiting the regulators to hold shares of the regulated firms".

This paper argues that many regulatory agencies lack the technical expertise necessary to guide the operation of increasingly complex, safety-critical industries. This forms part of more general concerns for technical competence in government. A recent independent survey of US Federal employees found that only 28.4% had a Science, Technology, Engineering or Mathematics background. 41.3% had a healthcare background (PPS, 2013).

The economic recession has left many regulators with insufficient resources to meet the technical demands that are placed on them. In consequence, highly motivated and highly skilled staff rejoin commercial organisations rather than work for state agencies with limited career prospects. The impact of this 'brain drain' have been identified in the financial service industries and linked to the causes of the recession (The Guardian, 2012). More relevant to this paper, is the impact that a lack of regulatory leadership has had upon industries that supply products and services that could

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affect the safety of their consumers; and upon the occupational health and safety of employees in a wider class of enterprises. Inadequate regulatory support has been identified as a potential cause of a host of recent safety concerns; “Only about two dozen FAA officials were assigned to oversee certification of the 787. FAA manager Steve Boyd told the NTSB last month that the team started with scant knowledge of the plane’s advanced battery technology. Then it allowed FAA-designated industry experts from Boeing and its suppliers to run all tests and conduct final safety reviews ‘with confidence that they would make the right call,’ (it has been argued) industry should receive a bigger role in vetting new planes because the gap between the technical expertise of regulators and manufacturers has widened over the past decade” (Pasztor, 2013).

Financial constraints, staff shortages and technical limitations have also exacerbated the delays that arise before regulators respond to changes in safety-critical systems (Brezis and Weiss, 1997). For instance, Spence (2013) argues that delays in developing clear regulatory guidance have dissuaded many companies from exploiting shale gas reserves. The lack of national regulations has led to inconsistent decisions being taken by local planners. The regulatory delays have, in part, arisen because state agencies lack the detailed scientific and engineering expertise required to assess the potential risks. This has been exacerbated by the funding cuts to regulatory agencies as governments respond to the fiscal crisis. For instance, the proposed Interior and Environmental Protection Agency bill going through the House of Representatives provides for a FY2014 budget, which is one third the amount for FY2013. The Acting Administrator responded; “EPA’s FY 2014 budget reflects our firm commitment to keeping American communities across our country healthy and clean, while also taking into consideration the difficult fiscal situation and the declining resources of state, local and tribal programs” (EPA, 2014).

The fiscal pressures have been mitigated by a number of high-profile accidents; public concern has led to increasing support for regulatory agencies in some industries. For instance, Dahle et al. (2012) analyse the impact of the Piper Alpha accident (UK shelf), the Texas City refinery accident (USA), the Montara-accident (Australia) and the Deepwater Horizon-accident (Macondo) on their regulatory regimes; to show that “the influence of major accidents on risk regulation will depend on a combined effect of attention from important stakeholders and the social amplification of risk”. They concluded that “at an institutional or regulatory level, the three offshore accidents resulted in a more independent and stronger regulatory regime”.

Fukasawa and Okusaki (2012) study changes to regulatory bodies in Japan following the Fukushima Dai-ichi accident. They describe how the new Agency for Nuclear Regulation (ANR) has been created with the explicit aim to improve the quality of personnel to aid recovery from this incident. It was recognised that the “job ratio of the safety administration had been decreasing”; measured as the number of regulators to regulated employees. They describe how “It goes without saying that one of the reasons of the occurrence and spread of the Fukushima Accident is a lack of competence and a sense of responsibility from personnel of regulators, such as a lack of proactive attitudes to tsunami and severe accident measures, insufficient efforts to collect the scientific/technical knowledge in and outside Japan and apply it to nuclear safety, inefficient response in the accident and so on”. The Act establishing the ANR is specifically intended to attract individuals with the expertise and competence necessary to rejuvenate nuclear safety regulation following the accident; it includes generous salary provisions and other benefits; “if nuclear regulations are to be ceaselessly upgraded and steadily implemented in order to avoid a repeat of the Fukushima Accident, it is necessary not only to establish ideal regulatory organizations and systems from the viewpoint

of the legislative framework, but also to secure and train capable experts in the regulator’s organization on the premise that such a framework is founded” (Fukasawa and Okusaki (2012)).

## 2. Achieving safety through the market

There are three primary mechanisms for promoting safety across most industries. *Market forces* can be used to exclude unsafe products and practices through the mechanisms of supply and demand (Badrinath and Bolster, 1996). Unfortunately, it can be difficult to provide consumers, managers and employees with the information that is required to inform the ‘rational’ decisions that might drive a perfect market (Karels, 1989). In consequence, *tort law* provides means of redress, especially from third party risks that do not directly arise from the normal mechanisms of supply and demand (Pierce, 1980). However, legal intervention is extremely inefficient. Legal costs dissuade many from pursuing justified claims. *Regulation* provides alternative mechanisms for promoting safety, for instance, through the development of standards that encourage good practice.

The following sections expand this argument by comparing market forces, tort and regulation as alternate means of protecting safety. It is argued that the recent financial crisis has undermined these mechanisms across Europe and North America. In particular, there has been a shift in regulatory focus from the detailed technical analysis of safety-critical systems to focus on auditing and assessment of compliance with standards that in many cases lack any empirical validation (Hale et al., 2011). One consequence of this is that many regulators lack the technical competence to understand the detailed engineering of the industries that they support.

In a perfect market, there would be little need for regulation. The public would act rationally using perfect information to avoid those products and services that pose undue risk. Falling demand would lead to unsafe products being excluded from the market place. Unfortunately, we live in a world where few people understand the hazards that they face (Nichols et al., 2004). Individuals systematically over-estimate some risks, for example, the likelihood of fatal injury from commercial aviation. Other risks are under-estimated, including the probability of suffering a stroke associated with a sedentary life style (Sjoberg, 2000). There are theoretical questions about whether or not the public behave in a ‘rational’ way. In many cases, deep-seated heuristics guide decision making. These may include a preference for the familiar over innovation (Beck, 1992).

Some of these *information problems* can be addressed by public education campaigns that correct misconceptions created by mis-advertising. For instance, some low tar cigarettes are promoted as healthier alternatives to regular brands. However, commercials often fail to stress the residual risks from these products. Market forces also fail to preserve safety because many systems are so complex that people cannot understand the associated risks. It is hard for public education campaigns to provide an accurate view of potential risks without resorting to simplification (Savage, 2006). Most people will not read many pages of safety-related information.

*Risk ambiguity* creates further problems. Some products and services reduce particular risks but increase others. For example, medical drugs often reduce the symptoms of certain illnesses but increase the probability of side-effects. Clinicians must ensure that patients can provide informed consent for any subsequent treatment (Viscusi and Chesson, 1999). In other situations, it is impossible to find clear advice on the effect that particular products might have across the risk landscape. It is also difficult for market mechanisms to address *third party hazards*. These arise when risks

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