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Discussion

The case for research into the zero accident vision

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ABSTRACT

This discussion paper is written out of a concern. We noticed that many companies with a good safety reputation have adopted a zero accident vision, yet there is very little scientific research in this field. The zero accident vision addresses the accidents causing deaths and severe injuries among company staff. In Finland, where more than 280 companies are currently a member of the Finnish 'Zero Accident Forum', we see that this has supported the member companies to realize significant safety improvements over time, even though their safety performance was already much better than the national average when they joined the Forum (Virta et al., 2009). We therefore make a call to the safety research community to undertake research to better understand and support safety strategies based on ZAV.

1. Introduction

Improving safety of complex industrial systems and preventing deaths and severe injuries is one of the most difficult tasks for company managers. To help facing this challenge, researchers developed a number of concepts and methods. In this paper we briefly present four of them: accounting for complex contexts; setting up norms, rules and performance indicators; identifying the role of safety climate and safety culture; studying human behavior.

In the meantime, a number of companies developed policies and methods that allowed them to reach excellent levels of safety and very low rates of severe accidents. The Zero Accident Vision (ZAV) appears as one of the most popular. In Finland, where more than 280 companies are currently a member of the Finnish 'Zero Accident Forum', we see that this has supported the member companies to realize significant safety improvements over time, even though their safety performance was already much better than the national average when they joined the Forum (Virta et al., 2009). Therefore, an expert group on safety culture was established within the PEROSH Network (The Partnership for European Research in Occupational Safety and Health), which aims at promoting ZAV, identifying and analyzing outstanding practices in accident prevention and safety culture (EZAV, 2011). We regard the zero accident approach as a very important innovation that deserves the full attention of safety researchers. The aim of this discussion paper is therefore to bridge the ZAV principles and methods with the current trends of safety research and to plea for dedicated research efforts to further investigate the qualities, limitations, do's and don'ts relevant for ZAV.

There are two main parts in this discussion paper. In the first part we discuss on dilemmas and limitations that affect progress in safety performance to day. We will thereby focus on the complex context, the role of performance indicators, safety norms and rules, safety culture and human behavior as factors that to some extent all contribute to safety, and at the same time imply limitations in the improvements possible through the risk control strategy. In the second part of the paper we focus on the Zero Accident Vision and discuss the opportunities implied by ZAV and the commitment strategy for safety.

2. Why are safety improvements difficult?

Improvements in safety are usually expected from sound technology and a process of continual improvement resulting from systematic management of safety risks. It is thereby presupposed that safety management systems imply a process of regular adaptation and updating: a constant search for the best solutions and the need to regularly reflect and review existing safety practices. We will argue that approaches based on ZAV imply a great potential for further safety progress.

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The growing complexity of systems and organizations, however, increasingly requires an approach to safety which goes beyond the simple rational analysis of technical systems, organizational patterns and procedures, to account for the dynamics of processes and actions that influence or are directly involved in safety. Weick (1987) even characterizes the management of safety as managing a ‘dynamic non-event’. This implies several challenges for the functioning of safety management systems, organizational culture and the awareness and behavior of the agents involved.

In practice, focusing on specific risks or practices leads to the neglect of other relevant issues. This means that risk management in its present forms faces its limitations, both from a practical and a theoretical perspective. As a consequence, safety management can be less effective than intended and generate unexpected and undesirable side-effects:

> “*There is some evidence that making subsystems safer could make the overall system less safe because of the propensity of humans to take less care personally when a system takes more care*” (French et al., 2011, p. 761).

To address these limitations, Reniers et al. (2011) propose a holistic model “IDEAL S&S” that aims at optimizing an organization’s safety and security performance by integrating safety and security culture and climate with performance management. This dynamic model addresses three dimensions: People, Procedures and Technology; it identifies two fields of tensions: optimal resources vs. deployed resources, and short-term vs. long-term goals. Although the IDEAL model is an interesting innovation for supporting implementation and development of a safety culture in a company, it globally addresses safety and not precisely the prevention of accidents causing deaths or permanent injuries, which is our concern in this paper.

3. Complex contexts

Generally, the environmental conditions and the external and internal contexts are regarded as important factors influencing complexity and safety (Rosness et al., 2012). Rasmussen (1997) for example, points out the importance of on-going cost reduction pressure on safety, and introduced the term ‘drift to danger’ for such contextual vicious processes.

Snowden (2000) and Snowden and Boone (2007) proposed the CYNEFIN framework to “see things from new viewpoints, assimilate complex concepts and address real-world problems and opportunities”. Snowden distinguishes four different decision contexts for risk management:

- Known (scientific knowledge): causes and consequences are understood and can be anticipated; decision-making consists of identifying the risk, understanding the context and applying known responses.
- Knowable (scientific approach): causes and consequences can be determined if enough data are available. Data must be collected to decide which procedure to apply.
- Complex (social systems): causes and consequences can be determined after the event. Decision is made by situation analyzing, exploration of alternatives, problem formalizing and setting implementing flexible strategies.
- Chaotic: causes and consequences cannot be identified. Decision makers must test actions and observe results until they can make sense of the situation.

Snowden’s main conclusion is that human reliability analysis models are representative of known and knowable contexts, and that the majority of managerial practices are not appropriate when managers face complex or chaotic contexts, for which a more systemic approach is needed. This is also highlighted by French et al. (2011).

> “*It is not currently possible to perform summative risk and reliability analyses for any system in which human behaviour and activity can enter the complex or chaotic spaces. Governments and regulators should be concerned because this accounts for the majority of the technological systems currently being operated and commissioned. This does not mean that they are unreliable or unsafe; only that we cannot assure their reliability or safety to within some negligibly small probability. Modern perspectives on risk demand a systemic rather than an atomized perspective of the technical, human an organizational features of systems*” (French et al., 2011, p. 761).

Renn (2008a,b) initially studying the precautionary principle, followed similar paths and developed the concept of risk governance, arguing that traditional risk management models are not working in uncertain, complex or ambiguous situations. To some extend this was also clarified by Perrow’s ‘normal accident theory’ (Perrow, 1984), stating that hazardous industries with processes that are complex and tightly coupled will always be confronted with (low probability) ‘normal’ accidents.

There are two important avenues to deal with ‘normal accidents’ in complex settings. The first avenue is to search systematically for alternative production processes that are inherently safer as an integrated part of the safety management process (Zwetsloot and Ashford, 2003). The second avenue is the route of ‘*high reliability theory*’ and ’*resilience engineering*’. These closely related approaches provide a new vision on risk management, by addressing the capacities of organizations to face risky situations while maintaining their essential missions. In High Reliability Theory five characteristics of organisations are regarded as essential: preoccupation with failure, reluctance to simplify, sensitivity to operations, commitment to resilience, and deference to expertise (Roberts, 1990; Weick and Sutcliffe, 2007). As part of the resilience engineering approach Hollnagel (2011) and Steen and Aven (2011) characterize a resilient system by four abilities: (1) responding to usual and unusual threats in robust and flexible ways; (2) monitoring what is happening, including its own performance; (3) anticipate risks and opportunities; and (4) learn from experience.

4. Performance indicators

Hopkins (2011) argues that for each risky situation, the decision maker must establish where the risk stands in a continuous scale from insignificant to extreme, and where the acceptable limit stands. That is why managers need rules, which often seem inappropriate to operators.

> “*Generally speaking decision-makers need rules, not numerical risk acceptance criteria, to guide their decisions. Given that decision rules serve to dichotomize the risk continuum, they are inherently arbitrary to some degree. What this means is that for cases that fall immediately on one side or the other of the cutting point, the rule may seem unnecessarily strict or alternatively unreasonably weak*” (Hopkins, 2011, p. 111).

Oien et al. (2011) argue that performance measurements may be divided into reactive monitoring and active monitoring. The former means identifying and reporting on incidents (near-miss and actual incidents), and learning from mistakes, whereas the latter provides feedback on performance before an accident or incident occurs. Lagging indicators are related to reactive monitoring and show when a desired safety outcome has failed, or when it has not been achieved. The leading indicators are a form of active monitoring used as inputs that are essential to achieve the desired safety outcome.