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Human and organizational biases affecting the management of safety

Teemu Reiman [a,*], Carl Rollenhagen [b]

[a] VTT, Espoo, Finland
[b] KTH, Stockholm, Sweden

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ABSTRACT

Management of safety is always based on underlying models or theories of organization, human behavior and system safety. The aim of the article is to review and describe a set of potential biases in these models and theories. We will outline human and organizational biases that have an effect on the management of safety in four thematic areas: beliefs about human behavior, beliefs about organizations, beliefs about information and safety models. At worst, biases in these areas can lead to an approach where people are treated as isolated and independent actors who make (bad) decisions in a social vacuum and who pose a threat to safety. Such an approach aims at building barriers and constraints to human behavior and neglects the measures aiming at providing prerequisites and organizational conditions for people to work effectively. This reductionist view of safety management can also lead to too drastic a strong separation of so-called human factors from technical issues, undermining the holistic view of system safety. Human behavior needs to be understood in the context of people attempting (together) to make sense of themselves and their environment, and act based on perpetually incomplete information while relying on social conventions, affordances provided by the environment and the available cognitive heuristics. In addition, a move toward a positive view of the human contribution to safety is needed. Systemic safety management requires an increased understanding of various normal organizational phenomena – in this paper discussed from the point of view of biases – coupled with a systemic safety culture that encourages and endorses a holistic view of the workings and challenges of the socio-technical system in question.

1. Introduction

Management of safety is always based on underlying models or theories of organization, human behavior and system safety. These theories are either explicit or implicit, or a combination of both. An important function of theories and models of safety management is that they create expectations and suggest potential actions. Thus, they direct attention to certain issues and away from other issues, and make certain solutions seem more relevant than others. If they lead to actions that do not contribute to safety or actually create harm, we can label these models biased. The aim of this article is to review and describe a set of potential biases in safety management approaches and their possible consequences for safety. We have tried to extract what safety management professionals and researchers generally look for—and what they might miss.

We will focus on biases that have relevance to safety management in a broad sense. The concepts of a Safety Management System (SMS) and Safety Management (as an activity within a SMS) have various definitions in the literature and no consensus exists about the precise content and scope of these terms [9,50]. However, a tentative view of these terms suggests that SMS is associated with policies, objectives, procedures, methods, roles and functions that aim at controlling hazards and risks in socio-technical systems. Hale et al. [21, p. 121] have described SMS as "a set of problem-solving activities at different level of abstraction in all phases of the systems life cycle". In this paper we focus on a subset of important activities in SMS systems: experience feedback activities (including event investigations), risk analytic activities, continuous development, safety indicators, organizing and the content of safety policies. We discuss how various biases might influence the content and scope of these SMS activities.

1.1. The significance of beliefs and assumptions in safety management

The validity of the theories underlying safety management activities greatly contributes to the effectiveness of safety management. Major accidents have challenged the general conceptions and presumptions about safe and effective operations. The underlying models of safety were in these cases proved wrong – at least until the accident was explained in hindsight as fitting an

* Corresponding author. Tel: +358 50 3427 268; fax: +358 20 722 5888.
E-mail address: teemu.reiman@vtt.fi (T. Reiman).

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existing paradigm. Thus, not even accidents have always been sufficient to prove the safety theories wrong (cf. [65]). Some of the reasons for this have to do with the biases related to human and organizational behavior, such as hindsight bias and attribution error, which are tackled in this paper.

Erik Hollnagel [24] has used the phrase "What-You-Look-For-Is-What-You-Find" to illustrate the effect of priori assumptions and models on the findings of, e.g., accident investigations. When people formulate expectations, they assume that certain sequences of actions/events are likely to happen. Such expectations and their associated assumptions are partly embedded in organizational practices, routines, norms and management strategies [73]. Expectations create orderliness and predictability, and offer guidance for performance and interpretation. Expectations guide our attention and search for evidence, thus making it easier to confirm the accuracy of our original expectations by neglecting contradictory information. Expectations can also undermine reliable and resilient performance because they encourage confirmation seeking, reliance on existing categories, and oversimplification. Consequently, organizations should continuously work to override, e.g., the typical human tendency (a bias) to seek confirmation and avoid disconfirmation [73].

There is plenty of evidence that the underlying assumptions and theories in use among safety professionals as well as safety researchers vary a lot. For example, Korolija and Lundberg [34] have noted in their study of professional accident investigators that there was no such thing as a professional usage of the concept of "human factor" but a spectrum of meanings among the investigators (see also [35]). Steele and Pariés [62] have studied safety beliefs in the aviation industry. They point out that some of the common assumptions about aviation safety [prevalent in the field] are either false or do not apply under certain conditions. They further argue:

> "Examples of the kind of assumptions we are referring to are: 'humans are a liability (and therefore automating the human out of the system makes it categorically safer)' or 'accidents occur as a linear chain of events' or 'following the procedures guarantees safety', etc. Many of the models and methods currently in use are based on these assumptions, and, therefore, they do not meet the needs of the modern aviation industry – they may in fact prevent further progress. … Most worrying of all is the fact that these assumptions are tacit: they are assumed to be 'truths' and are taken for granted without most people even being aware of them or considering them possible points for debate. An example is the notion that 'every accident has a cause'." [62]

A recent interview study in air traffic management (ATM) and airport operations [64] illustrated that managers' conceptions regarding human factors were dominantly individual and error based. However, wider and more systemic conceptions also surfaced during the course of the interviews, but there was large variance between managers in their conceptions. According to the study [64, p. 445], uninformed, individual or error-based conceptions are "insufficient or overly simplified in the context of ATM and airport operations". The study concludes that a "human factors strategy" would be needed in the target organization to form more congruent conceptions among personnel.

Different industries seem to exhibit more or less maturity in thinking about 'human error' as a contributing factor to negative events. For example, in a study about accident investigation practices in various industries in Sweden (e.g. nuclear, transportation, patient safety, etc.) it was found [53] that investigators in some branches (e.g. rail) tended to believe on individual error as a cause of events. Investigators in some other branches were more attentive to various contextual factors that influenced human performance. An interesting question in the context of this finding is to what extent a less mature view of human error should be explained by the existence of collective biases in thinking about human performance. In addition, it is well known that too biased a view of human performance contributes to the development of an organizational culture where people are reluctant to report negative events since they are afraid of being exposed to blame as well as to attempts to decrease the role of humans in the production process by, e.g., automation. Thus, biases related to human and organizational behavior can be assumed to have wide implications in the design and overall functioning of the entire socio-technical system.

1.2. Thematic areas of safety beliefs and the aims of the study

We have selectively aggregated information from literature on human sciences (psychology, sociology, human factors) together with current safety science literature and our own studies in order to abstract important lessons for safety management. Instead of offering an additional set of definitions to the scientific debate, we aim to illustrate the various issue domains which the ambiguities reflect. Thus, we will focus on the phenomena rather than the concepts that have been used to describe them. Fig. 1 illustrates some of the questions that safety professionals need to

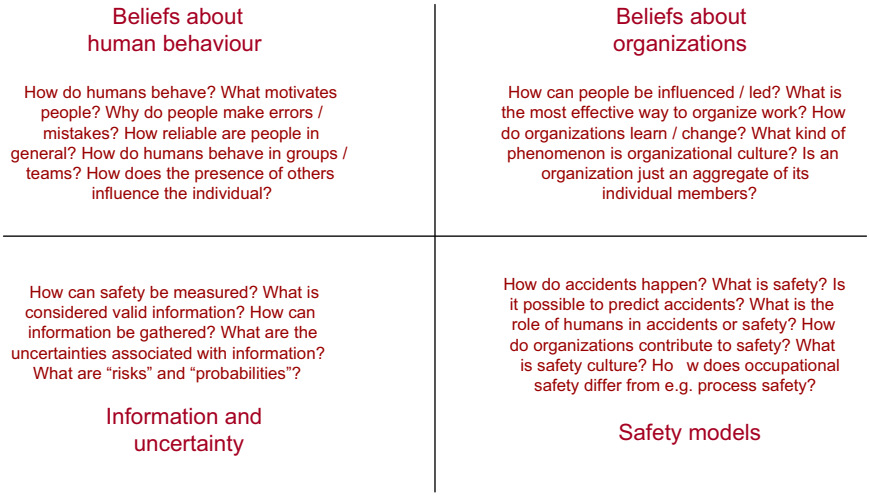

Fig. 1. An illustration of the safety management biases differentiating four interrelated thematic areas.