

Conceptualizing and communicating organizational risk dynamics in the thoroughness–efficiency space

K.B. Marais^{a,*}, J.H. Saleh^b

^a*Department of Industrial Engineering, Stellenbosch University, Room M406, Private Bag X1, Matieland 7602, South Africa*

^b*School of Aerospace Engineering, Georgia Institute of Technology, 270 Ferst Drive, Atlanta, Georgia, USA*

Received 6 September 2007; received in revised form 13 November 2007; accepted 6 January 2008

Available online 20 January 2008

Abstract

Organizations that design and/or operate complex systems have to make trade-offs between multiple, interacting, and sometimes conflicting goals at both the individual and organizational levels. Identifying, communicating, and resolving the conflict or tension between multiple organizational goals is challenging. Furthermore, maintaining an appropriate level of safety in such complex environments is difficult for a number of reasons discussed in this paper. The objective of this paper is to propose a set of related concepts that can help conceptualize organizational risk and help managers to understand the implications of various performance and resource pressures and make appropriate trade-offs between efficiency and thoroughness that maintain system safety. The concepts here introduced include (1) the thoroughness–efficiency space for classifying organizational behavior, and the various resource/performance and regulatory pressures that can displace organizations from one quadrant to another within this space, (2) the thoroughness–efficiency barrier and safety threshold, and (3) the efficiency penalty that organizations should accept, and not trade against organizational thoroughness, in order to maintain safety. Unfortunately, many accidents share a conceptual sameness in the way they occur. That sameness can be related to the dynamics conceptualized in this paper and the violation of the safety threshold. This sameness is the sad story of the Bhopal accident, the Piper Alpha accident, and score of others. Finally, we highlight the importance of a positive safety culture as an essential complement to regulatory pressure in maintaining safety. We illustrate the “slippery slope of thoroughness” along which organizational behavior slides under the influence of performance pressure, and suggest that a positive safety culture can be conceived of as “pulling this slippery slope” up and preventing the violation of the safety threshold.

© 2008 Elsevier Ltd. All rights reserved.

Keywords: Risk; Organizational behavior; Safety threshold; Efficiency penalty; Accidents

1. Introduction

One of the worst industrial accidents in history occurred in December 1984 at the Union Carbide chemical plant in Bhopal, India.¹ The accidental release of methyl isocyanate resulted in at least 2000 fatalities, 10,000 permanent disabilities, and 200,000 injuries [2]. The Indian government blamed the accident on human error in the form of improperly performed maintenance activities. Many additional factors involved in the accident can be identified.

Careful analysis of events prior to the accident shows that the plant had been drifting over a period of many years toward a state of high risk [3]. Investigations of other accidents also reveal similar behavior, which suggests a possible underlying pattern of migration toward high risk.

A better understanding of safety requires understanding how systems and organizations migrate toward states of increased risk. This paper examines the dynamics of risk in organizations by developing a conceptual framework to analyze and illustrate the strategic trade-off between short- and long-term goals and to understand why organizations tend to migrate to states of increasing risk.

Organizations that operate complex systems have to make trade-offs between multiple, interacting, sometimes conflicting, and often changing goals, such as production

*Corresponding author. Tel.: +2721 808 3733; fax: +2721 808 4245.

E-mail address: karen.marais@alum.mit.edu (K.B. Marais).

¹This paper builds on and extends a work presented by the authors at ESREL 2007. See Marais et al. [1].

levels, preventative maintenance, and safety programs. Resolving the conflict between such goals is difficult because the potential outcomes of opting for different goals are often ill understood, uncertain, or ambiguous. Resource pressures limit the ability to clarify the situation or reduce uncertainty, further complicating the trade-off process. In some cases, goals may directly oppose one another. For example, operators may be required to work faster to increase throughput. However, they may also be required to perform delicate tasks that require high precision, which is enhanced by working more slowly.

The accident at Three Mile Island is often blamed on operator error because it could have been limited to an incident if operators had kept the emergency cooling systems on through the early stages of the accident. However, the presidential investigation into the accident found that the training of the TMI operators was inadequate [4]:

While training may have been adequate for the operation of a plant under normal circumstances, insufficient attention was paid to possible serious accidents. And the depth of understanding, even of senior reactor operators, left them unprepared to deal with something as confusing as the circumstances in which they found themselves [...] The specific operating procedures, which were applicable to this accident, are at least very confusing and could be read in such a way as to lead the operators to take the incorrect actions they did.

Maintaining an acceptable level of risk in complex goal environments can be challenging for a number of reasons. In particular, safety goals are often poorly articulated (i.e., what is an acceptable level of risk and how should it be achieved) and the long-term effects of performance-related decisions on safety are often not obvious. Understanding how goal conflicts arise and how they can be resolved is the first step toward formulating a robust strategy to successfully resolve the apparent conflict between performance and safety.

The objective of this paper is to propose a set of related concepts that can help conceptualize organizational risk, and help organizations to understand the implications of various performance and resource pressures and make appropriate trade-offs between efficiency and thoroughness that maintain system safety. This paper is organized as follows. In Section 2, we introduce the concepts of organizational efficiency, organizational thoroughness, and the relationship between thoroughness and safety. In Section 3, we classify organizational behavior in the thoroughness–efficiency space, and then discuss the various pressures that contrive to displace organizations from one quadrant to another within this space. We also address in Section 3 the unfortunate observation that resource and performance pressures often induce a compromise of organizational thoroughness, and result in a downward movement in the thoroughness–efficiency space. In Section 4,

we introduce and illustrate the concepts of thoroughness–efficiency barrier, safety threshold, and efficiency penalty in organizational behavior. Section 5 concludes the paper.

2. Organizational efficiency and thoroughness

The individual's approach to coping with complex goal environments has often been described as a trade-off between efficiency and thoroughness. Hollnagel [5,6], for example, in his noted work on human reliability, observes:

On the one hand, people genuinely try to do what they are supposed to do—or at least what they intend to do—and to be as thorough as they believe is necessary. On the other hand, they try to do this as efficiently as possible, which means that they try to do it without spending unnecessary efforts or wasting time.

Hollnagel's discussion focuses on human reliability and deals with one individual's behavior and decision-making. Hollnagel also discusses the application of his work to thoroughness and efficiency trade-offs at the organizational level [6,7]. In this section and the following, we formally extend the discussion from the individual to the organizational level by replacing individual efficiency and thoroughness with their organizational analogs. The resulting two concepts, organizational efficiency and organizational thoroughness, are defined below.

Organizational efficiency refers to the aspects of organizational behavior that expedite task completion and promote meeting performance goals² such as production and on-time delivery, per unit resource expended. Organizations often strive to improve efficiency by adopting any combination of the following measures: increasing production speed, increasing capacity utilization, reducing slack in the system, cutting back on personnel, and trimming costs [8]. Or they can change the design and operational procedures of the systems they operate to obtain better performance (e.g., faster, more fuel-efficient aircraft). In short, organizational efficiency is increased by either increasing production for the same amount of resources expended, or by maintaining production levels while decreasing the corresponding resources.

Thoroughness is a characteristic of the manner in which work is performed or operations are conducted. In particular, thoroughness refers to a high level of care and attention given to every detail of the task or operations. Thoroughness as an attribute is closely related to *exhaustiveness* and *vigilance*. In the safety context, organizational thoroughness contributes to creating a sound safety culture [9,10], and includes behaviors and activities that enhance the safety of the system the organization designs or operates. Roberts and Bea [11] argue that thoroughness requires “constant attention to processes such as intra-group behavior, inter-group behavior, and communica-

²At least in the short term.

Download English Version:

<https://daneshyari.com/en/article/806047>

Download Persian Version:

<https://daneshyari.com/article/806047>

[Daneshyari.com](https://daneshyari.com)