



An enhanced data-analytic framework for integrating risk management and performance management



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ABSTRACT

There is increasing interest for agencies and industries to develop risk management processes for a wide variety of applications. Traditional risk management processes are motivated by controlling risk and avoiding losses. In contrast, other organizational processes focus on managing performance and value generation. In this paper we argue that risk management also adds an important contribution to these processes. However, this requires “proper” risk management extending beyond narrow safety oriented perspectives built on quantitative risk analysis and tolerability/acceptance criteria. There is need for a broad risk-performance framework with uncertainty being a main component of risk, and where knowledge and surprises are adequately reflected. In the paper we present and discuss such a framework. The framework is developed on the basis of an analysis of combinations of different risk management and performance management practices/policies. We show how the risk and performance management processes can be improved by proper risk conceptualization and a holistic thinking on how to develop and use goals in the organization, how to balance different concerns, and consider the need for agility – “sensitivity to operations”, as well as how to give weight to vulnerabilities, resilience, and antifragility.

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1. Introduction

Consider a profit maximizing enterprise, like an oil company. Its principal objectives are to create value and at the same time to avoid HSE (Health, Safety and Environment) and integrity incidents (e.g Statoil [22]). Performance management is conducted to run the business activities effectively and meet the value objective. In addition, risk and HSE management are implemented to avoid such incidents and ensure that the risks related to them are acceptably low. These two sets of management processes are often separated, run by different organizational sectors and built on different scientific and professional schools and ways of thinking. They are commonly considered incompatible and in conflict: a value focus easily leads to an increase of the HSE risks, or vice versa, an improved HSE level could hamper value generation processes. On the other hand, it is also common to associate good HSE management with improving business efficiencies and productivity [6].

This paper looks closer into these issues for industry and also public sector organizations. More specifically the paper discusses

the thesis that good risk management leads to good performance management. We aim to bring new insights to the topic by clarifying how “good” is to be understood for this thesis to be valid. We do this by relating good risk management to:

- 1) reduced risk (risk reduction shown by risk assessments or understood as perceived risk reduction)
- 2) improved HSE level (understood analogously to reduced risk)
- 3) meeting the requirements set by current practice (for example using quantitative risk analysis and risk acceptance criteria/tolerability limits)
- 4) meeting the ISO 31000 standard [17]
- 5) meeting the ideas of other “broader” risk frameworks, such as the IRGC framework [12,4] and the one studied by Aven and Krohn [3]

We relate these “good risk management” interpretations to corresponding “good performance management” interpretations:

- a) increased performance (shown through metrics/indicators or interpreted as judged increased performance)
- b) meeting economic objectives/targets/requirements
- c) meeting economic and socio economic objectives/targets/requirements

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- d) meeting economic and sustainability objectives/targets/requirements
- e) being in line with a management by objectives (MBOs) regime
- f) being in line with a total quality management perspective

The result is an analysis which reveals how the different risk management interpretations 1)–5) meet the various performance standards a)–f). We argue the thesis that performance management and risk management exhibit common principles that can be integrated in a combined framework. We argue that the thesis – that good risk management leads to good performance management – only holds for some combinations of this set of interpretations. This discussion is the topic of [Section 4](#). From this analysis we present in [Section 5](#) an enhanced framework which allows for a unified thinking of performance and risk, using the best pillars from both of these two traditions, performance management and risk management. The proposed framework is generalized to be applicable to a variety of applications, such as corporate governance, public sector, and public-private partnerships. Firstly, in [Sections 2](#) and [3](#) we provide a brief review of the meanings of the two sets of interpretations 1)–5) and a)–f) of the risk management and the performance management, respectively. [Section 6](#) introduces a case study – transportation infrastructure managed through a public-private partnership, which is used as a basis for the discussion of the unified performance-risk framework in [Section 7](#). The final [Section 8](#) of the paper gives some conclusions.

2. Risk management

This section will describe key concepts, strengths and limitations to the risk management strategies described above.

2.1. Interpretation 1) reduced risk (risk reduction shown by risk assessments or understood as perceived risk reduction)

The first interpretation relates to the achievement of reduced risk as shown by risk assessments or understood as perceived risk reduction. Think about the operation of a nuclear plant. Clearly, being able to reduce the risk related to a major accident could be considered good risk management. A risk assessment could show that a specific measure reduces the computed accident probability by say 1%. This would not be an objective characterization of the risk, yet it could represent a rather strong evidence for the measure having a positive effect on risk. However, it is easy to problematize the example. Say that the measure costs 100 million euros. Would it still be good risk management to implement the measure? No, proper risk management is really a balancing act, between protection on the one hand and development on the other. One cannot see the benefit side of the measure isolated from the cost.

Of course if the investment costs are small, the risk reduction effect could be a demonstration of good risk management. For many operational measures, the costs are indeed small – and the key is to find those measures that really give the desired effect. A training course may cost little, but it could be seen as an effective measure for risk reduction in many cases. Quantifying this effect with some rationale is however difficult.

Risk reduction can also indirectly be demonstrated through observable indicators, like injury frequency rates in a specific industry. This presumes however that the activities or systems we study are in operation and there is a considerable amount of relevant data. For rare type of events such data is not available and we have to use indicators, for example the number of gas leakages as an indicator for the risk related to serious hydrocarbon fire and explosion scenarios.

2.2. Interpretation 2) improved HSE level (understood analogously to reduced risk)

This interpretation can be seen as a special case of the first one – focusing on risk related to HSE.

2.3. Interpretation 3) meeting the requirements set by current practice (for example using quantitative risk analysis and risk acceptance criteria/tolerability limits)

The third interpretation concludes about good risk management to the degree that one is able to meet the requirements set by current practice (for example using quantitative risk analysis and risk acceptance criteria/tolerability limits). This means for example that the risk management of the oil and gas industry is good as long as it is in compliance with the current practice with its standards and guidelines. Hence if all audits carried out by the authorities and company internal systems, find the risk management tasks to be in line with this practice, the risk management is judged as good. However, also this perspective can obviously be discussed. How are improvements and developments in the risk field incorporated? The current practice can have strong weaknesses seen in relation to the “best principles” of the risk field, yet scores high on this interpretation as the requirements set by current practice are met. This illustrates the importance of focusing efforts on building resilience as protection against a wider variety of events.

2.4. Interpretation 4) meeting the ISO 31000 standard [13]

The fourth interpretation relates good risk management to the degree that the ISO 31000 standard on risk management is met. This standard covers many basic concepts, principles and methods of risk management, most broadly accepted, and was established through an extensive process involving many parties. Hence adherence to risk management processes described in this standard should ensure good risk management. However, this standard does not provide detail on how to perform the risk management. Take as an example the use of the risk management principles: ALARP (As Low As Reasonably Practicable). How should we implement the ALARP principle in the risk management? The ISO standard does not cover it. Many other examples could be mentioned. The standard just covers the basic structures and processes, and these are to large extent broadly accepted. For some discussions on the suitability of the ISO standard, see for example Leitch [17] and Aven [1].

2.5. Interpretation 5) meeting the ideas of other “broader” risk frameworks

The fifth interpretation relates good risk management to meeting the ideas of other “broader” risk frameworks, such as the IRGC framework. The discussion above concerning the ISO standard also applies to this interpretation, but here more details are provided on how to carry out the risk management. There is a foundation for each framework, and the degree that one sees a specific framework for providing good risk management depends on how one judges this foundation. The present authors consider the foundation for the two frameworks to be strong and useful, but there could of course be different views on what type of framework that is most adequate in practice. There is no space for detailed review of these two frameworks here, but some key points are highlighted in the following.

The Aven and Krohn [3] framework builds on a broad risk understanding capturing uncertainty, knowledge and consequences of the activity. The framework captures associated

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