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A methodology to evaluate risk for supporting decisions involving alignment with organizational values

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A B S T R A C T

There is an increasing need for organizations to evaluate aspects that are not easily quantified, such as alignment with organizational values, within their strategic planning decisions. These aspects are often insufficiently understood and are rapidly changing, with potential to cause severe negative consequences. Because there is no accepted methodology for characterizing these aspects, this type of risk is often neglected or given inadequate attention. This paper develops a methodology to evaluate risk and uncertainty related to alignment with organizational values. The methodology builds on risk perspectives involving uncertainties and knowledge rather than probability estimates. We illustrate the methodology on an application within the energy sector. This paper is relevant for both public and private sector organizations who face the dilemma of "what you cannot measure you cannot manage", implying a struggle to include low-data and low-knowledge aspects into risk-based decisions.

1. Introduction

Throughout history, organizations have struggled to understand and manage uncertainty. As there is wide acceptance of the fact that the future is unpredictable, scientists take advantage of available information and patterns to help make planning decisions. The field of risk has evolved to help address these issues, but this research has primarily been directed towards systems with some basic level of understanding. For example, to manage risk for a transportation network requires some basic (although not perfect) understanding of subsystem elements, such as traffic or weather patterns.

Similar to related science disciplines and analytic studies, a risk study is only as credible as the available knowledge and information about the system. As the adage claims "garbage in garbage out" for any quantitative analysis, it is imperative for risk study evidence to be credible. This creates major concerns for risk practitioners who are interested in addressing recent and critical problems in industry; to manage an organization's alignment with strategic values. As many major public and private sector organizations are investing in developing strategic values to abide by, it is difficult to predict or understand the ability to make decisions that abide by the values. One major reason for this is because these organizations are making decisions to impact systems that are insufficiently understood. Aspects of reputation and social awareness can be unpredictable and rapidly changing. For example, social media allows users to rapidly spread information to the general public. This speed of information dissemination is not necessarily influenced by the information credibility, as is seen in recent controversy over "fake news" or "alternative facts". Another concern is the use of "unbalanced information" in risk models. Any model that uses multiple sources of information or knowledge should recognize that some information sources may be more credible than others. However, few methods exist to address this type of imbalance.

For example, consider recent controversy from Volkswagen. The automotive manufacturer was subject to intense media scrutiny and degraded reputation after it was revealed that they had used a "defeat device" to mislead regulators about vehicle emissions [48]. One major reason for this degraded reputation was the company's repeated claims to value sustainability within their strategic mission. One can say this controversy involved a management of risk, involving the ability of decisions to align with strategic values. In addition, this involved decisions for a system that is insufficiently understood; notably the system of public sentiment. Within the decision-making process, some information may have been highly credible, such as environmental emissions data. Other information may have been non-credible, such as current public, regulatory, judicial perspectives on aspects of decisions.

Another recent and relevant example is the Equifax credit bureau data breach that exposed the personal information of over 140 million people. While Equifax was notified of the need to patch a software vulnerability, the issue was not addressed within the mandatory 48 h time period. Days later, vulnerability scans still did not identify the software vulnerability, thereby allowing hackers to access personal identifying information over the course of almost three months [49]. While this breach was caused by some combination of human error and technology oversights, the apparent breakdown in risk-remediation processes exacerbated the issue. As this organization describes a goal of "We serve

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as a consumer advocate, steward of financial literacy, and champion of economic advancement" [17], this data breach highlights a misalignment with organizational values that has resulted in a major degradation in reputation. The externalities of this data breach have potential to degrade consumer trust in the larger financial industry, including other credit bureaus.

There is need for the risk field to adapt and advise decisions for organizations as they struggle to align behavior with their strategic values. We recognize that a misalignment with values is a direct violation to a social contract with system users, shareholders, employees, and other stakeholders. Thereby, a violation has potential to degrade an organization's reputation and cause long-term damage.

This paper presents a methodology to advance the state of the art for evaluating risk for decisions involving organizational alignment with values. We explore relevant questions to aid in the risk evaluation process, and contrast these questions with risk methodologies that are prevalent in the literature today. We include a taxonomy of relevant knowledge and uncertainty, with a goal to identify gaps and rank these elements. Finally, we build on recent advances in risk thinking by discussing how the study of uncertainty and gaps in knowledge enable organizations to evaluate risk. We apply the methodology to a recent and relevant case example involving the energy sector.

This methodology is adaptable to both foreseeable and unforeseeable risk events. Although the methodology is applied at a strategic level, it is adaptable for iteration on more detailed levels, such as within business sub-units including engineering and information technology. The methodology is designed to be adaptable to broader strategic risk management frameworks, such as enterprise risk management practices and ISO 31000 [24]. The methodology will be of interest to risk managers, executive leadership for public and private sector organizations, and other system managers.

This paper is organized as follows. Section 2 will present the proposed methodology. Section 3 will provide an illustrative case, and Section 4 will discuss the strength and challenges of the methodology and the example case. The final Section 5 will provide conclusions and point to opportunities for future research.

2. Methodology

This section will outline the general approach to evaluate risk for alignment with organizational values. The methods distinguish between foreseeable and unforeseeable events. The main difference is that foreseeable events are known by the analyst, while unforeseeable events are not known by the analyst. Foreseeable events are commonly studied in literature because they are known to be possible, allowing the analyst to assign a likelihood and expected consequences. The assignment of likelihood and consequences is also highly controversial, as these metrics can be assigned with little or no knowledge credibility. There is an emerging research literature for addressing unforeseeable events, which several scholars refer to as 'black swans'. Although few practical methods have been developed to evaluate risk related to these unforeseeable events, there is some agreement for the need for alternative risk analysis approaches that avoid event-specific analysis [5,43].

There is need to develop risk evaluation methods that are applicable to unforeseeable events and also avoid complications from assigning metrics (such as likelihood and consequence) that may be insufficiently understood, even by experts. Recent literature introduces alternative definitions of risk, that expand beyond traditional definitions requiring likelihood and consequence estimation. For example, the latest ISO certification measures risk as "the effect of uncertainty on objectives" [24]. Although this definition is disputed [8], it suggests that the study of risk involves the study of uncertainty about something for which true values exist. The uncertainty can be due to stochastic variability within the system, lack of knowledge of the system components and their interactions, future conditions, credibility of available data, accuracy of available data, trust in stakeholders, and many unknown or hidden quantities.

Risk-informed priority-setting and decision-making need to address risk and uncertainty judgments as well as other relevant factors [18,39,45]. For example, an organization's priorities may also rely on other aspects such as the mission of the most critical subsystems, the needs of key stakeholders, or scientific perspectives on how the system is organized. Consider the enduring controversy over scientific principles used in either accepting or denying the relationship between societal policies and climate change. Regardless of whether a particular stance on this issue is justified, organizations accept the fact that there may be stakeholder disagreement on this issue. Real applications also require an assessment of knowledge strength in priority-setting and decision-making. This allows analysts to recognize that knowledge is justified beliefs that are founded on data, information, argumentation, testing, and modeling [7]. It suggests that knowledge with low credibility or with diverse interpretations introduces additional uncertainty, which should be systematically considered in the risk evaluation process. In particular, this type of uncertainty not only includes aleatory uncertainty (variability), but also includes epistemic uncertainty stemming from a lack of knowledge [36]. Analysts also must be mindful of the delicate balance between the need for being accurate (using quantification) versus the tendencies to oversimplify complex qualitative aspects using purely quantitative metrics and evidence. This is compatible with measurement theory approaches that avoid assigning numbers when there is no supporting data or belief.

When integrated with broader risk approaches, the method of this paper advances risk-informed decision-making across diverse organizations within both the public and private sector. One example of an accepted and commonly implemented risk approach is the United States Coast Guard risk-based decision-making guidelines. These guidelines consider the selection of a risk assessment approach, the management of risk projects, and the study of uncertainties through scenario analysis [33]. When implemented in practice, these guidelines coordinate with multi-attribute analysis problems that involve diverse stakeholders [32]. The method of this paper is also compatible with other commonly utilized decision-making approaches, such as the analytic hierarchy process, multi-attribute utility theory, and other decision analysis tools [2], but extend beyond these when it comes to the risk and uncertainty analysis approach. The method of this paper can also be integrated with private sector enterprise risk management processes [35] that emphasize the importance of identifying threats and opportunities associated with the strategic planning process.

2.1. Proposed method to evaluate risk

The process outlined in Fig. 1 follows general principles to evaluate risk events that are both foreseeable and unforeseeable. The process first involves identifying risk metrics and supporting knowledge, then judging the strength of the knowledge. Next, surprises and unforeseen events are addressed. Then, a multi-criteria assessment of *goodness* for potential alternative investments is performed. Finally, managerial review and judgment are performed. The process is intended to be first implemented at a high level with organizational executives. This group may then choose for more detailed implementation to occur in various business sub-units, such as within the technology or engineering groups.

It is important to note that although an event is thought to be possible, it could still be insufficiently understood. For example, there may be varying levels of supporting knowledge or unbalanced knowledge, in the sense that some knowledge types are well-understood and credible, while others are not. This is a particular challenge that is addressed using the method. The five steps are described in the following.

Step 1: Identify suitable risk metrics, with the knowledge supporting the metrics. First, we ask the following questions: 1) *What can go wrong*, 2) *If it does happen, what are the consequences*, 3) *How likely is it that this will happen?* [27].