

Risk Assessment for Maritime Safety: A brief research review

Rhythm Wadhwa¹

¹ NTNU
Gjøvik, 2815, Norway

Abstract

Few legal and technical scholars have attempted to study and compare risk assessment methods using statistical quality tools for the legal context for shipping and energy sectors. Proactive methods such as risk assessment for the legal context could be inspired by similar methods that exist in other disciplines such as engineering and business management. This paper attempts to present a current short review of the research challenges in risk assessment for maritime safety.

Keywords: Risk Assessment, Safety, Marine Engineering.

1. Introduction

There have been, mainly, seven landmark accidents since 1980, which provided the impetus for rigorous enforcement of safety regulations, improvement of ship construction and making risk assessment mandatory upon ship operators, flag states, classification societies and port authorities: *The Derbyshire* (1980), *The Herald of Free Enterprise* (1987), *The Braer* (1993), *The Sea Empress* (1996), *The Erika* (1999), *The Presetige* (2002), and the *Costa Concordia* (2012). Some general points about application of risk management needs to be made: First, risk management is a science, which can be complex in its application because it requires multidisciplinary skills and knowledge. Secondly, risk assessment systems develop gradually over the years in other industries, such as aviation and rail, for the protection of human life. Third, improvements in technical standards, coupled with demanding survey regimes and rigorous enforcement of regulations, have, undoubtedly, had a very positive influence on safety. Fourth, the management of risks has been central to the shipping and other heavy machinery industries; the process has been greatly facilitated by new systems, guidelines and codes.

In order to understand and appreciate the complexities involved in the application of risk management, it becomes important to understand the interrelationship between the infrastructures that are within or outside a shipping company and, inevitably, influence how the company is operating and trading. The interrelations between infrastructures of shipping and energy businesses are

complex, and the topic of risk management can be evaluated within a common framework between the two businesses.

For the purpose of risk management, risk has a special meaning. It can be understood as the *possibility of harm or loss* associated with an activity, or the *likelihood of an incident happening* that may result in danger to life, property or the environment, or may lead to commercial disputes and litigation. The phrase *risk assessment* is used differently in different contexts. To a professional manager of business, the application of risk management broadly means a systematic approach to taking safety precautions at all levels of business, perhaps intuitively including the management of financial and commercial risks, and the obtaining of insurance cover. To a safety and quality assurance manager, it is the application of a systematic approach to hazards; the process, as derived from the ISM code, includes: (a) the identification of hazards; (b) the assessment of risks associated with these hazards; (c) the evaluation of their frequency and potency in terms of the magnitude of possible consequences; (d) the application of controls to reduce the eventuality of their occurrence; and (e) the monitoring of the effectiveness of controls. These are simply the steps which may not mean anything, unless applied. A company with a good safety culture philosophy aims for transparency of management and operational practices, and the minimization of identified risks that are due to human element. Regular audits, risk assessment and evaluation, as well as implementation of plans to control risk exposure, should enhance the safety culture and lead to a company almost free from risk incidents. In the real world, however, there are factors that are not within the control of the shipping or energy companies. Part of the challenge for risk managers is the complexities created by the interlocking infrastructures of the company, which require the risk/quality manager to coordinate the activities of each department, or subsidiary company, or subcontracted company, in order for them to work in harmony with each other.

Legal risk assessment is somewhat an indeterminate term, which in its narrow sense could mean identifying risks that might arise from the drafting and/or performance

of contracts, or risks that need insurance cover. A more inventive risk manager may consider that the concept is broader than that and it should include evaluating the legal consequences of operational risks and the potential liabilities arising therefrom, judging from previous experience and precedents. The term could encompass any risks that may potentially result in legal consequences, and, for this reason, the management of legal risks should be integrated into the broader risk management process. Issues to be addressed include, among others, the following:

-Since 2001, there have been a raft of innovative developments by both EU and IMO in legislation to combat substandard ships, insisting on implementation of risk assessment practices and reinforcing a culture of safety at sea. Since 2007, the EU has shown a particular determination to implement the Erika III measures. EU and IMO seem to be working in harmony towards the goals of safer, cleaner and secure seas. It is planned look into new developments in legislation with regards to improved safety regulations.

-Energy claims principles- Marine energy claims is a complex subject. The policy wording specifies that in an event of an accident or incident which may give rise to a claim the assured notifies the insurers and their agents. When the incident involves third party damage, loss of life, injury or pollution, or a combination of all three; it is of interest to see how risk assessment and legal reasoning and uncertainty can be modeled using statistical quality tools, thus laying the framework for implementing a modeling/simulation tool for future.

The methodology for addressing such an endeavor is presented below.

2. Method

While risk assessment is practiced quite differently in engineering, finance and applied natural sciences, one of the key elements of most approaches seems to be a structured process for managing risk. The design research is mostly influenced by research methodology from engineering research. Parts of the work focus on theoretical and conceptual aspects of risk assessment. On a general level, we may distinguish between *descriptive* (positive) theories and *prescriptive* (normative) theories, but several theories combine both perspectives. Descriptive theories seek to describe phenomena and make claims about the nature of reality. Prescriptive theories contain propositions about what *ought to be* rather than

about what *is*. This research work includes both prescriptive and descriptive elements.

The prescriptive perspective is presented in the above hypotheses about the potential utility of risk assessment for the legal context. The hypotheses addresses both legal risk assessment in general and the method in this work in particular. The key element in these hypotheses is that legal risk and reliability assessment *ought to be used* in the legal context. If the hypotheses can be strengthened or refuted, then this would be a minor contribution to the theoretical knowledge about methods that may be useful for the analysis of legal issues.

By comparison, some of the concepts discussed in parts of the research work (reasoning about law and risk) should be understood both prescriptively and descriptively. Discussions on key risk concepts, such as risk and legal risk, can adopt a prescriptive perspective, and they can include select description of actual language usage. Concepts on risk assessment can be partly descriptive in the sense that they attempt to represent how (for some) lawyers / clients could anticipate legal reasoning. Specifically, the analysis of approaches for the modeling of uncertainty can contain descriptive elements, focusing on how uncertainty is in fact discussed by lawyers and other experts. Yet, the main focus is on how risk assessment and legal reasoning can be combined and how uncertainty can be modeled.

An interesting research attempt would be to clarify whether risk assessment could be useful for analysis of legal issues. In order to research the hypothetical utility of legal risk assessment, the research attempts to make a *bona fide* attempt to make risk management work for legal assessment, attempting to avoid potential pitfalls. On one hand, some faith in the potential utility is necessary in order to make this work. Otherwise, we may be tempted to conclude that risk management has no utility for lawyers whenever there is a problem or a challenge that needs to be solved, because the risk management methods need to be adapted to the legal domain. The work could make an attempt to avoid being overly enthusiastic about legal risk assessment, because this could impede the intended neutrality of the research. If the research could show that legal risk assessment - as conceived in the intended work - has little or no utility in the legal domain, or that it comes at exceedingly high costs, then this would be a relevant and interesting finding, particularly given the interest apparent in literature. This, by no means, attempts to *sell* the interdisciplinary research to the legal community. Nevertheless, some degree of good faith is necessary in order to overcome the obstacles in way.

Another challenge that needs to be highlighted is that the intended work attempts to research the general utility of risk management for legal analyses, and would only examine a subset of the risk management methods. This could have implications for the degree to which conclusions could be drawn from the work about the utility of risk management in general.

3. Summary

When addressing a complex technical topic in an interdisciplinary context, one has to take into account the individual readers within the intended audience may have a diverse knowledge background. The main target group of lawyers can quite possibly be heterogeneous. Law is to a certain degree practiced differently in different jurisdictions and while there is a theoretical literature that may be shared across jurisdictions, some of the basic assumptions might not be identical. However, some assumptions made about legal reasoning might not be fully transferrable into multi-jurisdiction context.

References

- [1] ISO 28000, 2007. Specification for security management systems for the supply chain.
- [2] ISO 31000, 2009. Risk management- principles and guidelines.
- [3] ISO 31010, 2009. Risk management- Risk assessment techniques.
- [4] ISO 27001, 2013. Information technology- Security techniques- Information security management systems- Requirements.
- [5] Kirwan, B., 1994. A guide to practical human reliability assessment, Taylor and Francis, London.
- [6] IEC 61508. 2010. Functional safety of electrical/ electronic / programmable electronic safety-related systems. Geneva: International Electrotechnical Systems (IEC).
- [7] International Maritime Organization. 2006. Alternative design arrangements. SOLAS Chapter 1. Regulation 55 (Consolidated edition 2006).
- [8] International Maritime Organization. 2010a. Casualty threshold, safe return to port and safe areas. SOLAS chapter II-2. Regulation 21.
- [9] International Maritime Organization. 2010b. Design criteria for systems to remain operational after a fire casualty. SOLAD chapter II-2. Regulation 22.
- [10] International Maritime Organization. 2010c. System capabilities after a flooding casualty on passenger ships. SOLAR Chapter II-1. Regulation 8-1.
- [11] Maritime Safety Committee. 2006a. Adoption of amendments to the international convention for the safety of life at sea, 1974, as amended. Resolution MSC.216(82).
- [12] Maritime Safety Committee. 2006b. Guidelines on alternative design and arrangements for SOLAS chapter II-1 and III. MSC.1/Circ.1212.
- [13] Maritime Safety Committee. 2008. Formal safety assessment- cruise ships. Details of the Formal Safety Assessment. MSC 85/INF.2.
- [14] Maritime Safety Committee. 2010. Interim explanatory notes for the assessment of passenger ship system's capabilities after a fire or flooding casualty. MSC.1/Circ 1369.
- [15] Cooper H. & Hedges L. 1994, Handbook of research synthesis , NY, Russel Sage Found.

First Author Rhythm Wadhwa is an Associate Professor at NTNU Norway.