

# New Risk Management Paradigm for Risk Analysis

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**ABSTRACT:** The term ‘risk’ has been used in many different applications. The notion of the risk society has attracted considerable attention within the academic literature. Kinds of risk management paradigm are introduced by scholars. Different paradigm is focus on different type of risk. All paradigms have the similar aspects, however keep keystone into different area. The aim of the paper is analyzed the current risk theory and risk management framework, the argument base on the review of the current literature. From a review of the risk literature, there is a lack of an integrative theory that can address and evaluate all risk properties, the evaluation of the popular risk management is conducted.

**KEYWORD:** risk analysis; risk management; risk management framework.

## 1 INTRODUCTION

The nature of risk has intrinsic properties which include complexity, social conflict, uncertainty and dynamic change of scientific and social knowledge over geographic and cultural space, and over time. (Macgill & Siu, 2004). From a review of the risk literature (Beck, 1992; Cohen, 1984; Knight, 1921 and Zinn, J., 2004), there is a lack of an integrative theory that can address and evaluate all these risk properties. Therefore, a new risk theory was proposed by Macgill & Siu based on a holistic, systems approach to address the fundamental risk issues. Additionally, effective risk management should be able to help to avert adverse effects, reduce detrimental consequences from these adverse risk events, and to reduce social conflicts.

## 2 THE NEW RISK MANAGEMENT PARADIGM

### 2.1 Current theory

The new risk management paradigm for risk analysis (or the new risk management paradigm is based on the investigation of the nature of risk. It is due to the deficiencies of the existing risk literature on defining risk. Broadly, in the existing risk literature, there are two schools of thoughts of defining risk. The two schools of thoughts are primarily based on:

(1)The physical/scientific understanding of risk – the fundamental elements are the probability or likelihood of a risk event to happen, the potential

consequences and the magnitude, particularly the detrimental, unwanted, or negative effects (Rowe 1977; Beer and Ziolkowski 1995). Examples of risk events include technological disasters (such as the environmental impact of low-level liquid radioactive wastes from the Sellafield discharges in 1950s, the 1984 chemical release at Bhopal, the 1986 Chernobyl nuclear clear disaster, and the 1989 Exxon oil spill), natural disasters (such as the 1985 Mexico City earthquake, the cyclone in Bangladesh in 1991, Hurricanes Andrew and Iniki in 1992, the Northridge and Kobe earthquakes of 1994 and 1995, and the Asian tsunami in 2004) among many others. To quantify and estimate risk is the primary objective in this school.

(2)The social/cultural understanding of risk – the fundamental elements are social norms or cultures (Douglas and Wildavsky 1982; Douglas 1985), get feelings (e.g. Slovic, P. *et al* 2004) and individual or group experience and value judgment.. Risk is a social construction in a particular historical and cultural context (Zinn 2004). Douglas and Wildavsky (1982), describe views on risk not as reflections of objective reality, ‘but rather as cultural phenomena that reflect societal and group values and that must be interpreted in light of their broader cultural functions’<sup>1</sup>. Kirby (1990)<sup>2</sup> argues that “the individual’s perception of risk is usually dependent upon a social representation, which can be defined as

<sup>1</sup> Zinn, J. 2004:3

<sup>2</sup> Kirby, 1990:282

a culturally conditioned way of viewing the world and the events that take place there.” In Beck’s book ‘Risk society’ (1992) emphasizes that to analyze risk perception and response within the overall framework of a cultural discontinuity gives rise to a new form of modernity. To understand how people perceive risk difficulties is the primary objective in this school.

## 2.2 Limitations of the existing theory

There are limitations in the above two schools of thoughts. From the physical/scientific understanding of risk, the social values, culture norms, individual experience etc. are not taken into consideration in defining risk. The methodological and statistical uncertainties, as well as largely ignored fundamental indeterminacy. Also from the social cultural understanding of risk, due to the intrinsic openness of meaning with social discourse, problems such as information overload, the impossibility for non-specialists to comprehend technical information, and issue of mistrust and distrust among different social groups are often found (Macgill and Siu 2004). Due to these deficiencies the new risk management paradigm advocates an integrated view of physical (risk estimation) and social (risk perception) understanding of risk; and re-define risk into: ‘the union of the dynamically evolving risk knowledge of the physical and social worlds’(Macgill and Siu 2001a). This paradigm adopts a holistic approach, focusing on the multi-dimensions and disciplinary nature of risk in terms of risk management perspective.

## 2.3 Improvement by the new risk management paradigm

From the existing schools of thoughts risk events are static and risk issues do not change or evolve through time. Meanwhile, the role of risk definition in the current risk management only lies in the stage of risk characterization. The new risk management paradigm advocates that “risk is an intrinsically dynamic and unstable phenomenon” (Macgill and Siu 2004). In the long-term perspective, risk issues are changing from thousand years ago to nowadays. In the past, natural catastrophe is the dominated risk which cause damage and injure; in the recent ten decades, along with development of technology risk issues change from natural catastrophe to biological, nuclear and other factitious behaviour; in the short-term perspective, one risk issue could change as well as time or geography changes. In this way, a dynamic process of defining risk is integrant and ascensive. GM food is a good example which Macgill and Siu used it to demonstrate the dynamic nature of risk issues (Macgill and Siu 2004).

Besides offering new contributions to risk theory and providing improved management to risk practitioners, the new risk management paradigm brings in decision making insights aspect to risk management process; as well advocates for the public an inclusive approach which puts people’s risk knowledge in managing risk issues.

The new risk management paradigm considered six core aspects of risk management, which are: problem diagnosis, option assessment, planning, decision making, communication and implementation. Most of the aspects are quite common in the current risk management process, however, each of the six aspects are re-interpreted from a knowledge-base perspective by Macgill and Siu (2001b). The six components together constitute a set of closely integrated stands of mutually complementary activity, which generating a unified, knowledge-based reformulation of the widely recognized but as yet incompletely defined in risk management.

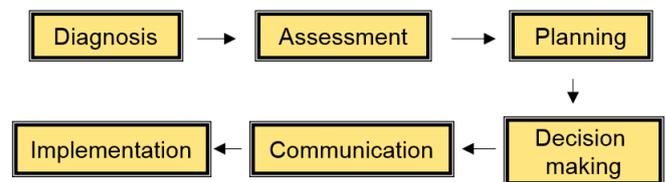


Figure 1. Six aspect of risk management

Risk Management can be formally and powerfully re-defined as: ‘the management of people’s knowledge of risk.(Macgill and Siu 2001b). Macgill and Siu (2001a) states risk issues exist only rely on the knowledge people have of them. “a risk stimulus in the physical environment becomes an issue for a societal agenda is determined by the level of social response through the knowledge people have of it.”(Macgill and Siu 2004)<sup>3</sup>.

Broadly speaking, people’s knowledge of risk can be considered as one or both of:

(a) knowledge of it physical properties and qualities, (focus on how big the expected impacts are<sup>4</sup>);

(b) knowledge of it significance for their own lives, with a primary focus on whether the risk is acceptable. (More specifically, the physical properties and qualities of risk can be formally investigated, but only through people’s emotional feeling, perceptions, opinions, beliefs, judgments and cognitions.)

More importantly, new computer-aided risk management tools are needed to practice the new risk management paradigm, however, current software tools can only perform limited aspects of

<sup>3</sup>Macgill, S.M. and Siu, Y.L. 2004:5

<sup>4</sup>Often represented in terms of risk event magnitude and probability.

the new risk management paradigm<sup>5</sup>; or some other powerful risk software which broadly in use but constrain in risk areas/perspectives.<sup>6</sup> An integrated and functional computer-aided tool is needed to be developed to testify and actualize the new risk management paradigm.

### 3 RISK MANAGEMENT FRAMEWORK

#### 3.1 Main risk management framework

Base on the current exiting risk theory and risk management, the risk management frameworks have been investigated, which including:

- Rasmussen’s RM Framework
- Benchmark Framework
- Defence Environmental RM Framework
- Australian/New Zealand Standard AS/NZS 4360
- Integrated Risk Management Framework

#### 3.2 Proposed evaluation criteria

The current risk management frameworks are widely investigated; meanwhile, a set of criteria was proposed to guide and develop the risk management frameworks. The criteria have been modified and upgraded in below. The following qualities are considered in developing the evaluation criteria:

- ⊕ Capability- Nature of risk (definition/level/perspective/context)
- ⊕ Application – Usage of the frameworks
- ⊕ Flexibility of process
- ⊕ Transparency of process (Structured, documented, consistent approach)
- ⊕ Harmonization of approaches (Comprehensive and well-defined approaches)
- ⊕ Risk Communication
- ⊕ Decision-Making Principles
- ⊕ Management Tools

Scoring method is used to rate the frameworks. Frameworks are scored 1 to 5, with 1 being the lowest and 5 being the highest score, relative to 8 criterion. The total of the weights when added will provide a score out of 40, more sufficient or more effective framework would score higher rate. This is then easily compared to evaluate the excellence of the framework.

<sup>5</sup>E.g. considered management tools for ‘Diagnosis’ – Risk knowledge intermediary; Risk signalling toolkit  
 Considered management tools for ‘Assessment’ – Risk portfolio; Risk mapping template.  
 Considered management tools for ‘Planning’ – Risk zoner; Risk gaming  
 Considered management tools for ‘Decision making’ – Monitoring tool; SAP typology  
<sup>6</sup>For example, ‘@risk’ works for finance/economic/business risk  
 Analytica works for building business models or policy analysis  
 FRAMES works for environmental risks.

Table 1. Comparison of the current risk management framework

	Level	Perspective	Application	Tools	Strength	Weakness
Rasmussen's RM Framework	Individual + organisation	Extensive approaches	Public health; transport	Questionnaire/ software tool	<ul style="list-style-type: none"> <li>• widely applicable</li> <li>• cover both individual and organisation level</li> <li>• extensive approaches</li> <li>• hierarchy -horizontal research efforts with additional need for vertical alignment across the levels</li> </ul>	<ul style="list-style-type: none"> <li>• risk communication is not explicitly included</li> <li>• limited guidance on conducting the quantitative risk assessment</li> </ul>
Benchmark Framework	Organisation	Engineering	Transport, blood systems, waste disposal, health, climate change, risk "standards", and marine navigation.		<ul style="list-style-type: none"> <li>• Comprehensive</li> <li>• widely applicable</li> <li>• widely used</li> <li>• multi-level</li> <li>• criteria are identified</li> <li>• strong collaborative</li> <li>• involvement of stakeholders</li> <li>• standard set of risk terminology</li> </ul>	<ul style="list-style-type: none"> <li>• target to organisation level only</li> </ul>
Defence Environmental RM Framework	Corporate /regional level	Engineering	Environment		<ul style="list-style-type: none"> <li>• Comprehensive</li> </ul>	
Australian/New Zealand Standard AS/NZS 4360	Government/ organisation	Economic Industry	UK National Health		<ul style="list-style-type: none"> <li>• Comprehensive</li> <li>• strong evaluation component</li> <li>• multifaceted process</li> <li>• structured framework</li> </ul>	
Integrated Risk Management Framework	Individual + government	Economic	Public service	Risk maps; modelling tools (scenario analysis/forecasting models); framework on the precautionary approach; qualitative techniques; internet and organisational intranets.	<ul style="list-style-type: none"> <li>• Simple and easy to understand</li> <li>• strengthen decision-making in the public interest</li> <li>• emphasis on consultation and communication</li> </ul>	<ul style="list-style-type: none"> <li>• no stakeholder involvement</li> </ul>

Table 2. Scoring of Selected Approaches

	Capability	Application	Flexibility	Transparency	Harmonization	Communication	Decision making	Tools	Total
Rasmussen's RM Framework-	5-	3-	3-	4-	4-	0-	0-	3-	22-
Benchmark Framework-	3-	4-	5-	5-	5-	4-	4-	3-	33-
Defence Environmental RM Framework-	3-	2-	4-	5-	4-	3-	2-	3-	26-
Australian/New Zealand Standard AS/NZS 4360-	4-	5-	5-	5-	5-	3-	4-	2-	33-
Integrated Risk Management Framework-	3-	3-	3-	3-	3-	2-	0-	4-	21-
The new risk management paradigm-	5-	5-	4-	4-	4-	4-	4-	1-	31-

### 4 CUNCULSION

In sum, the merits and limitations of the new risk management paradigm are as follows:

- Adopt Holistic and integrative, capable of multi-dimensions and disciplinary perspectives.
- Reflect the dynamic nature of risk issues.
- Integrate ‘decision making’ aspect to risk management process.
- Engage with the knowledge of everyone who has been affected in any way by a given risk issue. Knowledge determines the way risk issues are perceived, defined and assessed.
- However, there is a lack of computer-aided RM tools for the new risk management paradigm.

According to the research review, the existing frameworks have various limitations that are often not acknowledged or addressed by practitioners. The reason for this may due to complex phenomena of risk; uncertainty commonly existed and risk has always been fraught with confusion and controversy. By overlooking of the existing risk management frameworks, it concludes that the risk management frameworks always emphasize particularly on the government/organization level than the individual perspectives. Most of frameworks lay stress on analyze and mitigate the probabilities and magnitudes of expected detriments by physical phenomenon during engineering and economic

approaches, while ignoring peoples' beliefs, perceptions, opinions, judgments and cognitions all of which categorise as social knowledge.

The improved risk management framework intends to complement such limitations, the improved framework will deal with a duality between both social and physical qualities and properties, in principle allowing for equal importance to be given to each aspect, in another words, it need to integrate physical and social constructs; it will entail the need to make formal distinctions between different levels of resolution in order to be able to address risk issues systematically; the multi-dimensional and dynamic considerations are compulsoryre organization of risk management framework. Risk is an intrinsically dynamic and unstable phenomenon. Risk agenda in western developed country today are very different from issues in the 1900's, and very different again from current in the developing world. The dynamic movement of a risk issues is the product of the co-evolution of social and scientific knowledge among and between different constituencies.

## ACOKNOWLEDGEMENT

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