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# TEACHING DISASTER RISK MANAGEMENT: LESSONS FROM THE ROTMAN SCHOOL OF MANAGEMENT

ENSEÑANDO LA GESTIÓN DEL RIESGO DE DESASTRES: LECCIONES DE ROTMAN SCHOOL OF MANAGEMENT

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## ABSTRACT

This article describes how disaster risk management topics are taught at the Rotman School of Management at the University of Toronto and thus highlights opportunities for developing similar course modules on disaster risk management at other institutions. An undergraduate and MBA elective course, titled Catastrophic Failure in Organizations, contains four modules that are directly relevant to disaster risk management. The first module focuses on the need to move from risk indifference to risk sensitivity. The second module considers the importance of business continuity and crisis management plans and explores their common shortcomings. The third module uses a case study to examine the topic of prospective risk management. The fourth module focuses on the vulnerability of supply chains and other complex systems to disaster risk. The article describes the details of implementing these modules and discusses opportunities for further integration of disaster risk management topics in other parts of the curriculum.

## KEYWORDS

Risk management; disasters; business continuity; business education.

## RESUMEN

Este artículo describe cómo se enseñan los temas de la gestión del riesgo de desastres en la escuela de administración, Rotman School of Management, de University of Toronto y, de esta manera, resalta las oportunidades para desarrollar módulos de cursos de gestión de riesgo de desastres similares. Un curso de pregrado y uno electivo de MBA, llamado Falla Catastrófica en las Organizaciones, contiene cuatro módulos que son directamente relevantes para la gestión del riesgo de desastres. El primer módulo se enfoca en la necesidad de pasar de la indiferencia a la sensibilidad al riesgo. El segundo módulo toma en cuenta la importancia de la continuidad de negocio y los planes de gestión de crisis y explora las deficiencias que tienen en común. El tercer módulo utiliza un estudio de caso para examinar el tema de la gestión prospectiva del riesgo. El cuarto módulo se enfoca en la vulnerabilidad de las cadenas de suministro y otros sistemas complejos del riesgo de desastres. El artículo describe los detalles de la implementación de estos módulos y discute las oportunidades para una integración más profunda de los temas de gestión de riesgo de desastres en otras partes del currículo.

## PALABRAS CLAVE:

Gestión del riesgo; desastres; continuidad de negocio; educación de negocios.

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## INTRODUCTION

Given the potential importance of private sector organizations in managing disaster risk (e.g., Izumi, & Shaw, 2014; Jain, 2015; Surminski, 2013), business education can play an important role in reducing disaster risk and strengthening disaster preparedness. This article describes disaster risk management (DRM) content in the curriculum of the Rotman School of Management at the University of Toronto. It focuses, in particular, on Catastrophic Failure in Organizations, a recently developed course that brings DRM themes directly into undergraduate and MBA programs of study. In doing so, the article highlights a variety of opportunities for developing modules that focus on DRM themes and offers ideas for creating similar courses in business education in other institutions.

The Joseph L. Rotman School of Management (commonly known as the Rotman School of Management or, simply, Rotman) is the business school of the University of Toronto, a public research university in Toronto, Ontario, Canada. Rotman offers undergraduate, graduate, and Ph.D. programs and seeks to foster a new way to think that enables its graduates to tackle tomorrow's global business challenges. Rotman's undergraduate and graduate curricula occasionally touch on the topic of disaster risk management, but the treatment of this topic has traditionally tended to be implicit and somewhat haphazard. In 2014, however, the school introduced a new course, Catastrophic Failure in Organizations, which explicitly incorporates several core themes of disaster risk management.

This course contains four modules that are directly relevant to disaster risk management. The first module focuses on the need to move from risk indifference to risk sensitivity. The second module considers the importance of business continuity and crisis management plans and explores their common shortcomings. The third module uses a case study to examine the topic of prospective risk management. The fourth module focuses on the vulnerability of supply chains and other complex systems to disaster risk. This paper provides an overview of these modules and, in doing so, sketches the contours of a framework for thinking about DRM themes in the context of a business school course primarily focused on organizational failure. Finally, it considers others parts of the Rotman curriculum that touch on core DRM themes and discusses opportunities for bringing those themes more directly into the curriculum.

## METHODOLOGY

Catastrophic Failure in Organizations was developed and, for three semesters, taught by the author. The description of DRM content in the course is based on his direct experience in creating and delivering the course as well as his teaching notes and reflections on student assignments and course evaluations for the course. The course itself is based on the author's reading of a broad set of academic literatures, including normal accident theory (Perrow, 1984, 1999, 2011) and related work in sociology (e.g., Clarke, 1999), research on cognitive and perceptual biases (e.g., Bazerman, 2004;

Chugh & Bazerman, 2007), and the literature on high-reliability organizations (e.g., Weick, Sutcliffe & Obstfeld, 2008).

## CATASTROPHIC FAILURE IN ORGANIZATIONS: OVERVIEW

### Course objectives

The Rotman School offers Catastrophic Failure in Organizations as a 12-week undergraduate course and as a 13-week MBA course. In both programs, the course is offered as an elective. In the undergraduate program, it is open to third and fourth-year students. In the MBA program, it is open to second-year full-time students in their final semester, as well as evening and morning MBA students who have completed their core curriculum requirements.

The course focuses on managing the risk of catastrophic failure in business organizations. Thus, it covers both disaster risk and a variety of other risks that threaten companies and their stakeholders. The basic premise of the course is that addressing the risk of catastrophic failure is a critical challenge for business organizations (Bazerman & Watkins, 2004; Roberts, Bea, & Bartles, 2001; Weick, Sutcliffe, & Obstfeld, 2008). From Hurricane Sandy to BP's Gulf of Mexico oil spill to the Fukushima Daiichi nuclear disaster in the wake of the 2011 Tōhoku earthquake and tsunami, numerous events in recent years have exposed the vulnerabilities of firms to catastrophic failure (Abramson & Redlener, 2012; Perrow, 2011; Tilcsik & Clearfield, 2015). This course seeks to train students to recognize the inherent vulnerabilities of business organizations to disaster risks and other catastrophic failures and help them manage such risks more effectively.

To do so, the course explores the shifting risk landscape in which businesses operate—a landscape of increasingly complex supply chains, changing climatic conditions, extreme weather events, security issues, growing urban populations, and sophisticated yet vulnerable financial and technological systems (Perrow, 1984, 2011). As the course explores this new risk landscape, it uncovers the human, organizational, and systemic factors that conspire to make business organizations vulnerable to catastrophic failure. First, it considers biases in human cognition and awareness that prevent people from thinking effectively about risks. Second, it examines why the risk of catastrophic failure emerges in complex large-scale systems (Grabowski & Roberts, 1997; Perrow, 2011) and why trends like climate change and the increasing complexity of supply chains are causing such risks to proliferate and intensify. Third, it considers how organizational barriers to learning and communication can set firms up for catastrophic failure (Edmondson, 1999; Gaba, 2000). Throughout the course, the instructor and the participating students identify opportunities for executives and corporate strategists to manage these challenges. Ultimately, the goal is to help students—future executives, entrepreneurs, investors, and consultants in the private sector—recognize the need for stronger catastrophic risk management in general and stronger disaster risk management in particular.

### **Instructional methods**

Case discussions form the backbone of this course. Complementing the cases, lecture-style segments focus on relevant research findings that underscore and extend lessons from the cases. Simulation exercises focused on the management of catastrophic risk are also employed. In addition, three guest speakers share their experiences with students in the course. The first guest is the founder of a consulting firm focused on the management of technological and disaster risk. The second guest is a former Chief of the Major Investigations Division of the U.S. National Transportation Safety Board. The third guest is a former high-level Canadian government economist. Evaluation of student performance is based on class participation, individual reflection memos, and a long report providing an in-depth analysis of risks facing the industry or company of each student's choosing.

### **Enrolment**

Catastrophic Failure in Organizations aims to immerse students in the daunting managerial challenges that low-probability, high-impact failures represent in a wide range of industries. Thus, the course was designed to have wide appeal to business schools students. It is suitable to students with an interest in general management, operations, supply chain management, corporate strategy, management, consulting, entrepreneurship, change management, health sector management, and business law.

Indeed, since 2014, the course has attracted a highly international group of Rotman students with a diverse range of professional backgrounds and intended career fields, including finance and banking, insurance, construction, healthcare, hospitality and tourism, digital technology, consumer products, mining, manufacturing, information technology, power generation, energy exploration, and real estate and property management, among many others. Some of these students will be working at large corporations; others are planning a career at small or medium-sized enterprises; still others are in the process of founding their own start-ups.

## **DRM CONTENT IN CATASTROPHIC FAILURE IN ORGANIZATIONS**

### **Module 1. From risk indifference to risk sensitivity**

The course begins with a discussion of successful and unsuccessful risk management using examples from the destructive effects of Hurricane Sandy in the New York metropolitan area. Students compare and contrast how three organizations in New York City—Goldman Sachs, NYU Langone Medical Center, and a small quantitative trading firm—managed hurricane risk and how they fared in the wake of the disaster. This set of examples serves as a springboard to a broader discussion of why business forecasts and decisions tend to ignore catastrophic risk and, in particular, disaster risk. We introduce the idea that, for many businesses, disasters represent a “gray rhino”—a highly probable and high-impact yet neglected threat (Wucker, 2016; see also Bazerman & Watkins, 2004). To understand why this neglect is particularly

dangerous in the contemporary risk landscape, students consider the paradox that, while supply chains have become more sophisticated and economically efficient in recent decades, they have also created new vulnerabilities and geographic concentrations of risk in hazard-prone areas (Jüttner, Peck, & Christopher, 2003; Wagner & Bode, 2006). The goal is to show students that systemic challenges are proliferating and reshaping the risk landscape for modern businesses, big and small.

This unit of the course concludes by recognizing that managing disaster risk is no longer the exclusive domain of risk managers in a small set of industries; rather, the ability to create risk-aware and resilient organizations is becoming one of the defining traits of successful firms across industries (Weick, Sutcliffe, & Obstfeld, 2008). And because disaster events have potentially immense implications for the communities in which a business and its stakeholders operate (Okuyama, 2007; Sarmiento, 1995; Tilcsik & Marquis, 2013), business decisions about risk are ethical decisions (Power, 2003) and, as such, should be viewed as an essential element of the social responsibility of business.

### **Module 2. Business continuity and crisis management plans**

Many students who have worked at large corporations tend to be at least somewhat familiar with the paradigm of business continuity planning or crisis management planning. However, students whose work experience has been at small or medium-sized firms are typically less knowledgeable about the purpose and nature of business continuity plans. To bring all students to the same level, this unit begins by reviewing research findings that examines the vulnerabilities of contingency plans in a range of organizations (Clarke, 1999). The resulting discussion highlights the importance of effective business continuity plans and the dangers that the absence of such plans creates.

The next section of this module focuses on common shortcomings of business continuity plans. Though business continuity planning has been a dominant paradigm in recent years, research on the plans that firms actually develop provides little cause for optimism. For example, sociologists have shown that plans are often predicated on an implicit assumption that, save for the focal event itself, an organization will be in its usual, high-functioning state (Clarke, 1999; Perrow, 1999). A natural disaster, for instance, is expected to occur on an otherwise calm day on which all the resources necessary for a response will be available within the expected time frame. In reality, when crisis strikes, few organizations operate as effectively as they would on a normal day.

To highlight the most common pitfalls of business continuity planning, it is helpful to draw on comments by students who have first-hand experience in creating, practicing, or implementing continuity plans. Though this is rare in undergraduate populations, most MBA classes will have several students who have such experience in a range of industries. This creates a powerful opportunity for students to learn from one another and to exchange ideas across industries and types of organiza-

tions. A core takeaway from this discussion is that plans often fail to capture the complexity of disaster risk. For example, untested assumptions about the availability of resources and conflicting response claims reduce plan effectiveness, and unaudited plans are often more symbolic than operational (Clarke, 1999; Meyer & Rowan, 1977).

Student comments often highlight that many plans erroneously assume that critical resources—for example, transportation, communications, and IT systems, power, fuel, employees, external support, functioning backup locations, vendor services, well-maintained generators, and assistance from partners—will remain available in the wake of a disaster. Another common set of student comments tends to highlight the problem of unpracticed or unused plans. Because of factors like exercise fatigue and staff turnover, existing plans may remain unpracticed. In addition, in some cases, even well-practiced continuity plans are not actually used during disasters because those in control (e.g., senior leaders) might not have been involved in developing and practicing the plans. As a result, important elements of a planned response might be decoupled from actual implementation (Clarke, 1999; Meyer & Rowan, 1977; Tilcsik, 2010). Likewise, students often note that, because plans are usually updated in an incremental way, they continue to reflect an “imprint” of earlier assumptions that made sense when the plans were initially created but might have lost their validity and relevance if the environment has substantially changed since then (Marquis & Tilcsik, 2013).

### **Module 3. Prospective risk management**

The basic premise of this module is that risk reduction (i.e., prevention or mitigation) is in many cases less costly in the long run than disaster response and recovery (McGuire & Schneck, 2010). In fact, prospective risk reduction might generate additional business value because the ability to continue operations despite major disruptions and radical uncertainty in the environment can not only protect a firm from environmental forces but also become a source of strategic advantage over competitors and thus function as a source of business value.

To consider the challenges and benefits of an anticipatory rather than a reactive approach to managing the risk of catastrophic events, students delve into the case of the Canadian energy company Hydro One (Mikes, 2010). The course uses a multimedia case study to help students learn about enterprise risk management at Hydro One and explore how the firm’s executives constructed an understanding of the company’s evolving risk profile in an industry that faces challenges like climate change, extreme weather events, and a shifting regulatory environment. More than one million households and more than one hundred large industrial customers depend on Hydro One for electricity, but weather events frequently threaten the company’s power transmission and distribution systems. Despite these threats, the company had some successes in preparing for and addressing unplanned outages.

From the narratives of Hydro One’s chief executive officer, chief financial officer, head of public relations, and chief regulatory officer, students come to understand

how this company attempts to anticipate risks in the medium to long run and how it identifies risk mitigation strategies. The case also offers a discussion ground for possible weaknesses in Hydro One's risk management process, such as high costs in terms of managerial time, the subjectivity of risk assessments, and a potential for excessive risk aversion. At the conclusion of the case discussion, students debate how Hydro One's chief risk officer might address these challenges and how the company can most effectively integrate disaster risk management into its strategies and organizational processes.

After the deep dive into the Hydro One case, we consider the general managerial and cognitive challenges that arise as businesses shift their focus from business continuity planning to proactively identifying and analyzing catastrophic risks. Students learn about the cognitive and organizational challenges that executives face when reasoning about the risk of extreme events. In particular, humans have inherent cognitive biases that wreak havoc on our ability to reason about infrequent but high-impact events (Barnes, 1984; Gilovich, Griffin, & Kahneman, 2002; Tversky & Kahneman, 1974). Not only are these biases persistent and widespread, they are activated precisely when we need to make decisions about rare, risky events and changing conditions (Chugh & Bazerman, 2007).

At this point in the course, students complete a short paper assignment to help improve their ability to recognize the role of cognitive biases in managerial decision making. For the assignment, they are given a selection of readings about cognitive biases in managerial judgment and decision making, and their task is to apply the concepts they have learned from these readings to analyzing a decision situation that they themselves have witnessed, been a part of, or have deep knowledge about, where the influence of one or more cognitive biases contributed to making a less-than-optimal decision. In identifying and analyzing the role of cognitive biases in this situation, students are asked to explain why they reached their conclusions and provide specific examples, observations, and evidence to support their analysis.

#### **Module 4. The vulnerability of supply chains and other systems to disaster risk**

This module begins with a discussion of how and why systems that underlie modern business operations—supply chains, the power grid, information technology, and communication systems—are steadily becoming both more complex and more interconnected (Perrow, 1984, 1999). Students learn about three properties of modern systems that make them especially vulnerable to the effect of disasters. First, the components of these complex systems can interact in unintended and unanticipated ways when an external force, such as a natural disaster, disrupts one part of the system (Perrow, 1984). Second, it is often difficult to comprehend these cascading effects because critical parts of the system are hard to observe directly (Perrow, 1984). Finally, modern systems are often tightly coupled, meaning that the failure of one part quickly exerts a significant effect on the rest of the system (Perrow, 1984). These factors create systems ripe for quick and unexpected transitions from normal opera-



tions to catastrophic meltdowns (Perrow, 1984, 2011). Discussion of these factors creates a basis for considering the vulnerability of three important types of systems to disaster risk: supply chains, the power grid, and communications systems.

Most business students are aware of the advantages of a just-in-time approach to supply chain management; few are familiar with the risks this approach carries. During normal operations, these systems tend to work well. However, just-in-time supply chains leave suppliers and downstream consumers open to supply shocks and large supply or demand changes that can emerge as a result of a disaster. Although supply chains tend to be much faster today than twenty years ago, they are not necessarily more resilient (Jüttner, Peck & Christopher, 2003; Wagner & Bode, 2006). Students then consider and discuss strategies for building more resilient supply chains. Increasing inventories, building in redundancy, and relocating critical facilities to lower-risk areas are often discussed as viable strategies at this stage. The instructor also highlights the benefits of coordinating with public sector organizations in reducing supply chain risk.

The discussion of supply chain risks tends to lead naturally to the recognition that the electrical grid is the cornerstone of the modern economy. Students also come to recognize that the availability of electric power is critical when businesses respond to a disaster and attempt to implement business continuity plans. Though the power system is highly vulnerable to natural threats, and the loss of electricity is crippling to most organizations, many students are unaware of the true costs and the full extent of effects that outages can have on operations. To illustrate these effects, students consider the cascading effects of the 2003 Northeast blackout: factories and airports were closed, cellular communication was disrupted, and several major cities, including Detroit and Cleveland, were under a boil-water advisory because the blackout crippled their water treatment plants (Amin, 2003; Anderson, Santos, & Haimes, 2007; Beatty, Phelps, Rohner, & Weisfuse, 2006; White, Roschelle, Peterson, Schlissel, Biewald, & Steinhurst, 2003).

Another example that tends to resonate with students is the dependence of information technology (IT) on continuous power supply. This is a critical issue because IT has become essential to most business operations and is increasingly important to the execution of business continuity plans. As a result, the impairment of IT systems can have disruptive, cascading effects. To make matters worse, many operators do not know how to operate in a “non-tech” post-disaster environment because non-tech methods are rarely practiced or tested (Clarke, 1999). A critical, actionable takeaway for students is that, given the heavy reliance on electric power, business continuity plans need to prepare for power loss and the steps that will be taken in the event that such a situation occurs. Many continuity plans, however, assume that power will remain available during a disaster, but this is clearly not the case. A closely related lesson for students is that effective communication is critical in disaster situations. Within the last decade, reliance on communications systems has increased significantly, and the failure of these systems leads to cascading impacts. For exam-

ple, in the discussion of business continuity plans and the essential role of the power grid, students often report having observed an overreliance on commercial cellular service, noting that the loss of this service would cripple operations.

### **DRM CONTENT IN OTHER PARTS OF THE ROTMAN CURRICULUM**

One related course at the Rotman School that touches on core DRM themes is Business Sustainability Strategy, a recently launched MBA elective. This course relates primarily to the DRM theme of sustainable management and, secondarily, to the theme of generating business value from more effective disaster risk management. This course does not have an undergraduate version. Several MBA students who choose to take Catastrophic Failure in Organizations are also enrolled in Business Sustainability Strategy, and the faculty members teaching the two courses coordinate closely with each other.

The Business Sustainability Strategy course defines business sustainability as sustained resource efficiency that delivers enhanced corporate, community, and environmental resilience. It aims to teach students how to employ sustainability as an innovation platform to generate new growth, focusing on the design and delivery of business model innovation rather than only on technology. Students learn from both failure and success cases and examine how sustainable innovation is being implemented in both developing and developed countries.

This course is structured to take students on a practical journey of how companies design strategic intent around sustainability; how they employ this strategic intent to generate sustainability-led innovation; and how they design and deliver business models to market. Each class session includes industry examples presented by two to four industry executives, a question-and-answer session with the executives, and a summary of key learning points and takeaways by the instructor.

The overriding learning objective of this course is to expose students to practical examples of how executives build corporate cultures that embed sustainability and innovation as key strategic imperatives and how they design and deliver profitable business models to market. Though the topics of this course are not explicitly framed as topics in disaster risk management, they indirectly link to the DRM themes of sustainable management and generating business value because they focus on how private enterprises are generating value from sustained resource efficiency in the environment while potentially contributing to climate change mitigation and adaptation (Cutter & Gall, 2015; Schipper & Pelling, 2006; Thomalla, Downing, Spanger-Siegfried, Han & Rockström, 2006).

### **DEEPER AND WIDER INTEGRATION OF DRM CONTENT INTO THE CURRICULUM**

Both of the courses described above are relatively new. Catastrophic Failure in Organizations was launched in 2014, and Business Sustainability Strategy in 2016. There are promising signs suggesting that both courses will remain part of the curricu-

lum in the long term. Catastrophic Failure in Organizations has already received two awards from the Rotman School and one award from the school's MBA student association. It is also one of the highest-rated and most popular undergraduate courses at Rotman. Its MBA version is currently capped at 40 students, and there is usually a waitlist to get into the course. Given this interest, Rotman will offer two MBA sections in 2017, bringing the total enrolment to 80 MBA students. The undergraduate enrolment falls between 50 and 60 students, one of the highest among elective courses. Business Sustainability Strategy is still in its infancy and had approximately 30 students in its first year, but student feedback on the course has been positive, and enrolment is likely to grow over time.

There are opportunities for the deeper integration of DRM content into both courses. Catastrophic Failure in Organizations, for example, touches on disaster risk metrics only indirectly. When it examines cooperation between private enterprises and public sector organizations, it briefly considers joint private-public risk assessments and the exchange of risk information with government entities, but it currently covers little ground regarding the integration of disaster risk metrics into strategic and investment decisions and forecasts. This is an important area for improvement. Likewise, in Business Sustainability Strategy, a greater focus on sustainable business initiatives that directly reduce disaster risk is a promising way to bring DRM content more prominently into the course. There is also an opportunity for a greater focus on reporting disaster risks as part of sustainability reports.

In addition, given Rotman's extensive finance curriculum, there is an opportunity to engage more deeply with the theme of risk transfer (Linnerooth-Bayer & Hochrainer-Stigler, 2015), particularly in existing courses focused on financial risk management. This would help students examine how various risk transfer activities and instruments help reduce disaster-related economic losses and why risk transfer may be a very costly approach in that it does not directly address the vulnerability of assets in question.

The most promising but also most challenging future opportunity is to bring DRM content into Rotman's first-year core curriculum, which covers each of the fundamental disciplines of business. This approach could bring some introductory DRM content to every student and might also create greater demand for subsequent elective courses that discuss DRM content. Three core courses in particular—Fundamentals of Strategic Management, Business Ethics, and Corporate Finance—are likely to be the best candidates for integrating introductory DRM content. Because of institutional constraints, however, changes to the core curriculum require substantially longer time and more bureaucratic work than changes to elective courses. One important mechanism for change might be the movement of faculty between elective courses. Instructors who have taught DRM themes in their own electives might be particularly open to integrating those themes into core courses in a lasting and meaningful way.

## CONCLUSION

Business education can be a useful tool in strengthening disaster risk management efforts, particularly in the private sector. At the Rotman School of Management, Catastrophic Failure in Organizations is a recently developed course that brings DRM themes directly into undergraduate and MBA curricula. The course includes four main modules that are directly relevant to disaster risk management topics: a module on moving from risk indifference to risk sensitivity, a module on business continuity and crisis management plans, a module on prospective risk management, and a module on the vulnerability of supply chains and other complex systems. Though this course represents a promising first step, much work remains to be done. Integrating disaster risk management themes both more deeply and more widely into the curriculum is both a promising opportunity and a significant challenge.

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