

Risk Management REVIEW



RISK MANAGEMENT
AND DECISION
PROCESSES CENTER

FALL 2004



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Bridging the Gap: Sustainable Environment

The First United Nations Global Compact Academic Conference is the result of a cooperative venture between The Wharton School of the University of Pennsylvania in the United States and Sabanci University in Turkey. The objective of the conference is to bring together academicians, private sector, public sector, and NGOs to share their

experiences, to identify problems, and to discuss their potential solutions with regards to accomplishing the environmental principles of the UN Global Compact (GC). Part 1 of this international conference took place in Istanbul, Turkey on May 30-June 1, 2004 and was hosted by Sabanci University. Part 2 will take place at Wharton on September 17-18, 2004.



Sabanci Conference organizers pose for the camera along the Bosphorus.

The Sabanci Conference was co-chaired by Professors Yildiz Arikan and Dilek Cetindamar of Sabanci University. The Conference touched on a number of key issues in the

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Risk Center on the World Wide Web

Visit the Wharton Risk Management and Decision Processes Center's homepage on the World Wide Web at:

[Http://opim.wharton.upenn.edu/risk/](http://opim.wharton.upenn.edu/risk/)

Managing Losses from Natural Disasters

Co-Director's Corner



Hurricanes Charley and Frances taken together are likely to cause more damage than any other natural disaster in U.S. history. The impacts of these storms go far beyond the direct property losses and damage to infrastructure. There are estimates that 10,000 individuals lost their jobs from Charley and a similar number could be in the same boat after Frances. Residents may not be able to return to their homes for days, in some cases weeks, both because of the damage to their structures and because of lack of electricity and other vital services.

On a broader level, natural disasters raise a set of questions as to what roles the public and private sectors should play in promoting cost-effective measures that could reduce losses from future disasters. There is considerable empirical evidence that many residents in hazard-prone areas do not invest in prevention because they believe that the disaster will not happen to them. People also tend to be short-sighted. The benefits of investing in loss reduction measures should be calculated over the expected life of the structure. By focusing only on the next year or two, one may not be able to justify the invest-

ment costs. If a homeowner or business has budget constraints this compounds the problem.

There are also problems of interdependency when deciding on an appropriate strategy for protecting property in harms way. Insurers will not reward the safe homeowner with significant premium discounts if it knows that its neighbors are not investing in protection. For example, in the case of a hurricane, a poorly constructed house could have its roof blown off causing damage to a nearby structure whose roof was intact. Disruption of electric power will affect homes and businesses even if they have suffered no physical damage. The importance of backup generators due to these interdependencies may only become evident after a disaster.

What steps can be taken to reduce future losses from natural disasters while at the same time making it financially palatable to property owners who may have to incur protection costs? One should reexamine building codes to make sure that they are tough enough and are well enforced. Following Hurricane Charley there has been a call for ensuring that mobile homes are anchored solidly to the ground. Many of these homes were not anchored, despite a 1999 rule in Florida requiring stronger tie-downs.

Well-enforced building codes will reduce both the direct property damage from the disaster as well as indirect losses from nearby structures. Insurers are then likely to provide premium reductions to all property in the area, reflecting the benefits of

adhering to the building code. The property owner may still resist undertaking these measures because the costs of doing so are high. One way to reduce this expenditure is to convert the upfront investment expenditure to a loan tied to ones mortgage. The extra monthly charges are then likely to be very small. In fact, the premium reduction provided by the insurer, if rates are based on risk, could be greater than this monthly cost. The resistance by the property owner to investing in such measures will then vanish.

Finally, and perhaps most importantly, protecting property and infrastructure against natural hazards can save all taxpayers considerable amounts of money in disaster relief. This is particularly true in an election year where there is already considerable political pressure to provide liberal aid to Floridians who have suffered losses from the two hurricanes. One instructive example in this regard is Tropical Storm Agnes, which occurred in June 1972, less than five months before the Presidential election. Few victims in the damaged areas of Pennsylvania, New York and Maryland had flood insurance at the time, so that Congress provided up to \$5000 in grants and 1% loans to cover the remaining amount of damage.

We are unlikely to see this type of aid today, since most homeowners are insured against wind damage--- they are required to have this protection as a condition for a mortgage. However, there will be losses not covered by insurance, including

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Co-Director's Corner

Since Adam Smith's great treatise on *The Wealth of Nations* in 1776, it has been understood that specialization and trade are at the heart of economic growth. Certainly the trends of the past several decades have underscored this with the emergence of China and India as major trading partners, and with outsourcing and contract manufacturing reshaping everything from human resource activities to manufacturing. In the retail sector, in particular, we have seen a huge growth of sourcing activities directed towards China and other emerging economies where cheap labor and very responsive companies and governments are supplying textiles, motors, toys and a broad variety of other goods. Currently, on an annual basis, some 6,000,000 containers, filled with these goods, are shipped through various ports of the world and deconsolidated for store distribution and end consumption.

The global supply chains that source, ship, and facilitate the trade that now is the backbone of global economic development are, however, threatened by the same problems of terrorism that threaten other areas of critical infrastructure. A single disruptive event, such as the strike that shut down West Coast U.S. ports in 2002, can have laming effects for months or even years thereafter, with disastrous effects on trading partners involved in any supply chain going through such a port. On the other hand, attempting to monitor fully or inspect every one of the containers that enters a country would bring the same supply chains to a

halt. What is to be done? Associates of the Risk Center will not be surprised to see us in the middle of this discussion, looking for answers in the form of private sector initiatives, together with public-private partnerships to reinforce and guide best practices.

On the private sector side, global supply chains are complicated systems that differ greatly from one company to the next. So security metrics and management systems must be integrated with ongoing supply chain management systems designed to accomplish the principle function of these supply chains, which is to move goods efficiently and quickly from manufacturing sites to end markets. For security, global supply chains would need to be fully vetted for security, personnel, and process control. Supply chain compliance would need to be fully auditable and integrated electronically with the appropriate Department of Homeland Security systems as well as those of relevant international customs agencies. How this is to be accomplished still remains relatively unexplored. What is proposed in the Center's emerging research is to combine theory building, in association with the Wharton Risk Center's deep knowledge of supply chain design and risk management, together with case studies of major retailers and logistics providers who are currently in the process of developing security management systems and metrics for their global supply chains.

To properly ground this study in practice, the Wharton Risk Center has been working with the National

Global Supply Chain Security



Defense Transportation Agency (NDTA) Security Best Practices Committee, in conjunction with the Department of Homeland Security (DHS) and the Transportation Security Agency (TSA). This industry-government-academic working group is focused on developing the principles underlying a public-private partnership approach to cargo security that can be summarized as a "trusted supply chain partner program", in line with the provisions of C-TPAT (Customs-Trade Partnership Against Terrorism). The program envisages the development and diffusion of best practices in global supply chain security, including improved inspections and clearance processing in ports.

We are also working with the Retail Industry Leaders Association (RILA) and the George Washington University Institute for Crisis, Disaster, and Risk Management to support knowledge development and consensus on the appropriate design of the "trusted supply chain partner program". To this end, a Workshop with major retailers and representatives from academia and government will be conducted in the Fall, 2004. We expect any solution to these problems to incorporate ele-

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sustainability debate, with a primary focus on the innovation and diffusion of environmentally sound technologies (ESTs) and the role of the GC in promoting ESTs. The role of regulation as a driver of sustainability practices was also highlighted. It was noted that environmental regulations in emerging economies are often based on leading countries' and organizations' practices (e.g., from the OECD). Several case studies reported on the difficulty of adapting external regulations from advanced economies to the local environmental system due to differences in climatic conditions, ratios of polluting materials, and incompatibility of existing technologies with local regulations and cultures. For example, a technology that is developed for a rainy environment would not be suitable for other locations where it may rain once every 20 years. Further, advanced environmentally sound technologies of developed countries may not fit local markets and thus may impair the innovation and growth of low cost, self sustaining, local technologies.

Similarities and differences between the expectations and practices of developed and developing countries were further highlighted in the discussion of the energy sector. In developed countries, such as Germany, where everyone expects to have electricity all the time, significant reserve capacity in the form of conventional power plants is required to provide backup to wind energy facilities to provide energy when there is no wind. In developing countries, poverty itself can be a driver for adapting non-grid energy investments and people

can be more tolerant of occasional power outages. On the other hand, for developing nations, the economic development and extension of the national grid may impair the development of renewable energy in decentralized small-scale power systems.

The role of business in promoting sustainability was a key aspect of the Sabanci Conference and is expected to continue at the Wharton Part 2 Conference. From industry's perspective, three key drivers for environmental innovations in emerging economies were noted: profit, pressure and poverty. Given the role of profits in business, financial viability of ESTs is critical. In some cases, environmentally sound technology is also the more economic one. A case from Pakistan illustrated the point; once a municipality decided to measure the water usage of leather manufacturers to determine their wastes and charge accordingly for their environmental pollution, local manufacturers realized how much dye they were disposing of and modified their process. The result was less environmental pollution and a more profitable process.

In all, the Sabanci Conference triggered an exciting debate on the nature of sustainability, on the roles of individuals and corporations in achieving it,

and on the characteristics of environmental technologies that will be required to promote sustainability. We look forward to an exciting Part 2 of this First Global Compact Conference at Wharton, with many of the participants of the Sabanci Conference in attendance, bringing the energies and perspectives generated at Part 1 in beautiful Istanbul.

Ulku Oktem

*Senior Research Fellow
The Wharton Risk Center
Conference Coordinator*



Dining in style— conference attendees enjoy fine food and company at the farewell dinner



Interdependent Security and Managing Extreme Events

To initiate this year's Extreme Events Project, a meeting of the project sponsors and other interested parties was held at Wharton on January 30, 2004 as a Roundtable on "Interdependent Security and Managing Extreme Events". The Roundtable was sponsored by the Wharton Risk Center and the Earth Institute of Columbia University, and it brought together representatives from the insurance and reinsurance industries, government and academia to discuss research and policy challenges in areas related to extreme events and interdependent security.

The Roundtable highlighted the interdependent nature of security risks as a unique challenge in the age of global terrorism. Risk management strategies such as enhanced security measures or terrorist insurance policies can only be effective if all entities in a given operating system are similarly protected. The decision by an airline, for example, to screen every item of luggage on every flight will be compromised if other airlines whose flights connect with it do not also follow the same rigorous procedure. Similarly, the collapse of the World Trade Center on Sept. 11, 2001 could be attributed in part to the failure of security at Boston airport to prevent some of the terrorists from boarding the planes that flew into the twin towers.

Recognition of the vulnerability of one part of a system to weaknesses elsewhere can act as a disincentive for individual components of the system to improve their own risk management. Why, for instance, incur the expense of install-

ing x-ray machines at every airline baggage counter if you know that not every airline has taken similar measures?

Effective risk management strategy development will require public-private partnerships charged with improving data, providing incentives, issuing regulations, providing compensation and buying insurance or reinsurance against extreme events such as a terrorist attack.

All parties seeking to manage terrorist risk continue to be hampered by the difficulty of estimating the likelihood and nature of an attack. Officials within the Department of Homeland Security (DHS) are operating on the basis of "not if but when" another terrorist attack occurs. The expectation that another attack will be catastrophic is increased by the belief that terrorists will seek to gain the maximum impact from their limited resources.

Modelers continue to accumulate data and simulate the circumstances of possible terrorist attacks via the construction of scenarios for a range of institutions including the electric power generating industry, the U.S. navy, and for major ports. They are challenged by the need to obtain high-quality information such as the number of people working in a particular building in the course of assessing risk. Insurers typically use the models to gauge their proximity to targets, identify large losses and aggregate their risk. There is a need for better information on indirect losses such as business interruption stemming from extreme events.

Though there has been increased interest since 9/11 in assessing and managing extreme events, there is a need for the private sector to be more proactive in the development and implementation of risk-management strategies, rather than waiting for government requirements or incentives. Strategies should integrate enhanced physical and cyber security as a core element of the corporate culture.

Future research needs highlighted by the Roundtable participants included:

- Shoring up the weakest link
- Identifying sources of interdependence
- Modeling the risks
- Indirect losses such as business interruption
- Alternative risk-sharing mechanisms as well as international comparisons
- Behavioral research on decision processes and choice
- Understanding institutional arrangements for specific problem contexts
- Public-private cooperation in the United States and abroad

The Center has begun to address several of these research challenges in new projects under the Columbia-Wharton Radiant Trust Center of Excellence and under on-going research under the Extreme Events Project.

For more information on the Extreme Events Project, visit <http://grace.wharton.upenn.edu/risk/exteve.pdf>.

Chemical Process Safety Management Roundtable

On April 22, 2004 a Roundtable on the subject "Designing and Auditing Management Systems for Safety, Health, and Environmental Risks Related to Chemical Processing" was held at the Risk Center. The Roundtable dealt with the issue that although there is general agreement that by far the largest root cause of Major Chemical Process Safety Accidents is inadequate process safety management systems, there is no accepted operational definition of what constitutes an "adequate" process management system. While the CCPS (Center for Chemical Process Safety) defines the elements of what are believed to be an adequate Process Safety Management System, and EPA RMP (Risk Management Program) and OSHA PSM (Process Safety Management) regulations are based on the CCPS elements, these regulatory requirements are not operationally defined. Therefore, a company's management system can meet RMP and PSM perfunctory requirements and still be inadequate.

The morning session featured presentations of two Process Safety Management approaches by companies that are considered to have above average process safety performance: Dupont and Rohm and Haas. Both presentations addressed the subject well and the Dupont material and presentation was exceptionally thorough and detailed. The subsequent Roundtable discussion revealed that the attendees felt that the elements of both of these companies' plans had many similar features, though the emphasis in the two plans and their execution was somewhat different.

The afternoon session featured two presentations that were aimed at addressing the following question: Are ISO, 3rd Party, Responsible Care audits or other tools available that would allow stakeholders such as the local public, insurers, government regulators, etc. to arrive at a sound judgment about the effectiveness with which a facility is managing its LP-HC (Low Probability-High Consequence) process safety risks? Unfortunately, the answer appears to be that no such demonstrated Audit Tools are available, though the CCPS "Pro-Smart" tool appears to be promising. The Risk Center believes that because major process accidents are LP-HC events, an epidemiological approach is the probably the best way to establish what are the essential elements of an effective risk management plan and also the validity of an audit tool to distinguish between effective and ineffective plans. Therefore, the Risk Center is developing and seeking support for this epidemiological research objective in partnership with various parties who participated in this Roundtable. Stay tuned for results on our research on Chemical Process Safety Management systems on the Center Website <http://opim.wharton.upenn.edu/risk/info.html>.

The last session of the day was concerned with responding to the basic questions of the day of what are the essential elements that a firm must have in its process management system in order to assure process safety and could the presence of such vital elements and their adequate execution be determined by a properly designed audit. This general issue was addressed by four different groups of stakeholders at the Roundtable - Regulators, Supporting Or-

ganizations, Consultants and Audit Service Providers, Insurance and Risk Management Professionals and Industry. The summary comments of each group are found on the above mentioned web site.

This Roundtable underscored the need to recognize that process safety management is part of an enterprise risk management system. In particular, in undertaking process safety management we need to be cognizant of the links between risk assessment, risk perception and risk management. We again invite you to the web site for a fuller exposition of these links.

At the end of the Roundtable the following open questions were posed which we look forward to examining with you in the months to come.

- How can we utilize the new RMP*INFO database for evaluating and improving process safety management?
- What are the appropriate roles of insurance and 1st, 2nd and 3rd party inspections and audits?
- What are the differences between good and poor systems and what criteria should we use to judge good performance systems?
- How can we determine Type I and Type II errors and their costs as part of the process safety management process?
- What is the appropriate role of regulations and standards as part of the process safety management process and how can they be well enforced through public-private partnerships? (i.e. role of third party inspections, audits, and insur-

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Worker Safety in Louisiana

In the last issue of the Risk Center Newsletter we introduced the dialog that was occurring between the Risk Center, the Louisiana Workers Compensation Corporation (LWCC), and the Louisiana Office of Workers Compensation (OWC). At that time, a concept of having LWCC loss prevention consultants (LPC's) inspect sites in lieu of OWC, during the course of the consultant's normal visit, was proposed. As this concept was explored further, it was recognized that this would be a diversion from the LPC's regular duties and thus was impractical. The Public-Private partnership between La. OWC and LWCC that was started by these discussions has evolved into the Program that is described below.

LWCC is organized by teams based on size of policy and jurisdiction, Federal and maritime versus state only. Loss prevention consultants (LPC's) are assigned to each team. There is a management team that directs the activities of the operating teams. On that team there is a safety engineer that coordinates the activities of the team LPC's. That safety engineer, John Liles, has been communicating with and negotiating with the Louisiana Office of Workers Compensation (OWC) concerning the structure of the LWCC Fast Track program. Two different programs are proposed. The one for cost containment relates only to insureds with an experience modifier (e-mod) of 1.5 or higher with its terms set by state law. The cost containment program, described in the last edition of the Newsletter,

encourages facilities with poor worker safety records to undergo consultation inspections for which the facility receives a 2% reduction in its workers compensation (w.c.) premiums with an additional reduction of 5% in its w.c. premium if it follows through on recommendations arising from the inspection. The first here would be the joint effort of LWCC and the OWC to reach those people to inform them of the benefits available from raising their safety profile. There are only about 100 such insureds on LWCC's books. The other program would be available to the over 20,000 policy holders that LWCC serves. It involves using both the OSHA Consultation Office and Workplace Safety and Health Division of the OWC to deliver free service to insureds that request it directly from the respective OWC unit. John Liles held meetings with the LWCC LPC's to discuss the implementation of the Fast Track programs. The LPC's said that they were not aware of the nature and quality of the work product of the respective OWC safety units. To educate them, John scheduled a meeting for all the LPC's and some underwriters to see a training program presented by the OSHA consultation office. It was an opportunity for OWC to answer any questions the LPC's had. At that meeting it was clear that the use of workplace safety rather than OSHA compliance may be a better front door because of potential regulatory concerns, limited though they are. It was made clear, though, that the insured at its sole discretion invites the help of the OWC and makes its own decision as to whether or how to proceed. Regardless, the LPC's wanted to be sure

that they were introducing a quality product. John currently is resolving the issues related to such.

To deal with the vast number of accounts that have no annual visit from an LPC, we are looking at implementing a form of the self-assessment approach discussed at a break out session at the last Risk Center Advisory Committee meeting. We will prepare a brief self-assessment form that could be sent with the Fast Track form to guide the activities of the insured that gets no visit from a LWCC LPC. It will be useful to see who responds to the voluntary self-directed approach. But these people fly below radar and as such get little or no direct attention because of their small size. The self-assessment could prove useful in filling this void and in focusing some thought on safety matters. Activities should come together by the beginning of the fourth quarter of 2004.

We plan to track the loss experience of the companies who use the OWC help compared to their own performance prior to the help. This can also be tracked relative to others who do not use the help. The self assessment is a prelude to Fast Track counseling. In completing the self-assessment facilities should gain insight into the areas where they can most benefit from the consultation program.

Larry Yuspeh

Director of Research and Development, LWCC

Investigating Operational Failures in Healthcare

Mrs. Jarvis, the patient in bed #1 room 411 at Mountain View Hospital, was left unattended for over two hours while recovering from an invasive surgery the previous day. A difficult mix of patients prevented a straightforward assignment of nurses to patients by blocks of rooms. Consequently the assignment board, which showed which one of the seven nurses was designated to care for each of the 40 patients on the floor, was complicated and hard to read. As a result, the assigned nurse misread the board and mistakenly thought another nurse was caring for Mrs. Jarvis. This misinterpretation was cleared up only by chance when the nurse commented to the charge nurse about her light load. Although the patient suffered no harm as a result of being ignored for several hours, the situation could have had more serious consequences if the patient had taken an unobserved turn for the worse.

Poor work systems, rather than incompetent or negligent care providers, are often cited as the cause of medical error or low quality of care. . Our goal was to understand how organizations can learn from these small, daily failures and improve their work systems—before faulty systems result in more harmful events.

We spent 239 hours shadowing 26 different nurses at nine hospitals and recording detailed information about their work activities. The hectic pace of nursing work and concern about influencing the nurses' behaviors precluded asking questions while observing a nurse. Therefore, after the observation period we conducted 60-minute

interviews with thirteen nurses, ten of whom had been observed.

What we found sheds insight into how organizations can utilize their front line employees' experiences with operating failures to improve work systems. First, nurses encountered a large number of small problems that cumulatively accounted for an average of 41 minutes of nursing time to work around per 8-hour shift (see Figure 1, page 9). 35% of the failures accounted for 82% of the cumulative time of nurses working around failures. This contradicted the commonly accepted Pareto Principle, which states that a relatively small number of problems—usually 20%—cause the bulk of the damage. Thus, our data suggested that to improve work systems, managers and employees must address a wide range of smaller problems rather than limiting problem solving attention to only a few high impact situations.

Second, 61% of the problems we observed crossed departmental boundaries, which made it more difficult for nurses to individually remove underlying causes. The need to negotiate with other functional groups, such as physicians and central supply, highlighted the importance of managers being directly involved with daily activities. This finding underscores the importance of focusing on the overall system, rather than on individual functions within the organization. For example, Deming recognized that many problems occur at functional interfaces and consequently recommended that boundary spanners be identified on all process maps and cross-functional teams be used to solve problems (Deming, 1986). Unfortunately, many nurses we inter-

viewed stated that their managers did not want to hear about small problems, perhaps because the notion of empowerment combined with a wide span of managerial control resulted in nurse managers who were stretched thin attending to other matters such as hiring, scheduling, or large scale projects.

Third, nurses quickly worked around failures, which had the unintended negative consequence of hiding the impact of failures from people essential for solution, such as managers, doctors, and employees from problem-originating departments. Nurses typically did not recognize these incidents as opportunities for improvement and therefore “incident reporting databases” designed to gather information regarding frequency and impact of failures will not capture these seemingly small, but frequent events. This inability to discern which failures warrant further investigation underscores the value of clear guidelines for raising awareness about such issues. For example, the PLAN-DO-STUDY-ACT (PDSA) cycle, as well as control charts and other quality management tools, are designed to identify problems, uncover their causes, and eliminate them.

What can managers and employees do to break this cycle of non-improvement? We have several recommendations. First, employees must recognize that although their efficient work-around behavior enables them to meet the daily hassles, it contributes to the stream of problems that they face. Second, managers must demonstrate a commitment to resolving work system failures, which will help create confidence in

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employees that it is worth their time to raise awareness about improvement opportunities. Third, employees must feel safe discussing errors and problems, not only ones they commit themselves, but also those made by powerful others—especially when they work in another department. It requires constant attention to remove myriad sources of operational failures, but doing so can create a unit where everyone pulls together to improve their work systems, which can increase patient safety as well as create a more productive and satisfying work environment. These lessons are especially true in healthcare, where many different medical specialties interact to provide patient care, highlighting the importance of developing problem solving systems that strive to find

global, rather than local, optimum and provide employees tools for resolving cross boundary failures.

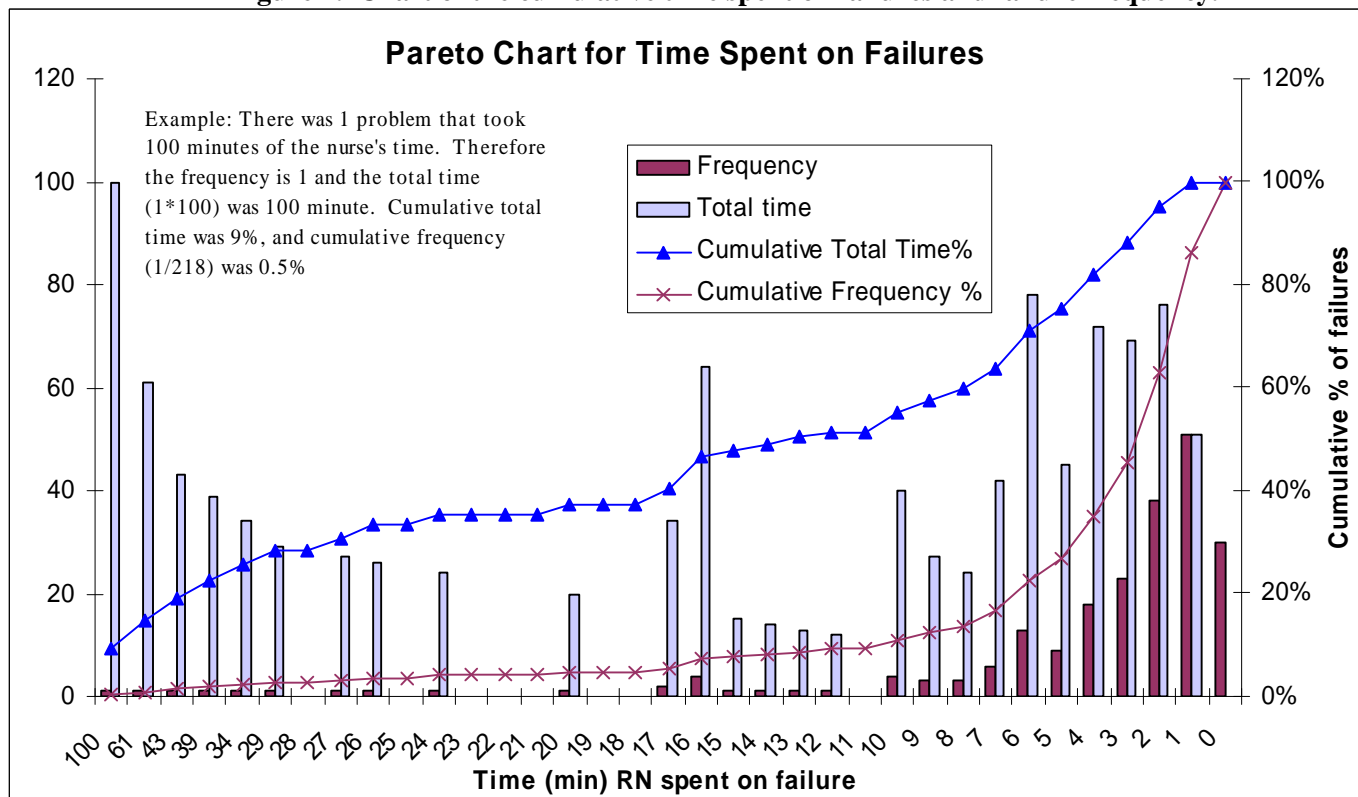
Acknowledgements: This article was also featured in the *POMS Chronicle* (Production and Operations Management Society).



Anita Tucker

Assistant Professor of Operations and Information Management

Figure 1. Chart of the cumulative time spent on failures and failure frequency.



CORPORATE ASSOCIATES

The Corporate Associates program is a vital part of the Risk Center's operation. Corporate Associates sit on the Center's Advisory Committee, participate in roundtable discussions and offer information and insight into the value, direction and timing of research projects. The Center currently receives approximately \$265,000 annually from Corporate Associate Members.

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ance).

- What type of interdependencies exist that need to be considered in process safety management?
- What are the appropriate trade-offs that should be made in developing process safety management systems?
- How can we improve learning from past data and past experience (process safety enhancement)?
- What roles can trade associations play in dealing with process safety management (e.g. ACC, SOCMA)?

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those of many mobile home owners who did not have mortgages and had not purchased coverage on their own. It is unclear whether Congress will provide them with special relief. Although one has to be sympathetic with their plight after a disaster, we need to find ways to have them and others protect themselves before an event. It is always clear following a disaster that the public sector has a key role to play in aiding the recovery process. The challenge is to develop effective private-public partnerships so that we can reduce future losses so they will not have to come to the rescue with massive amounts of federal relief.

Howard Kunreuther

September 7, 2004

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ments of our growing understanding of interdependent risk and security systems and to be further integrated with enterprise-wide risk management systems.

The special features of global supply chains make this problem very difficult. These include multiple organizations and multiple governmental jurisdictions. Just focusing on the multiple organizations, one can expect purposeful agents to attempt to disrupt the weaker links of the supply chain. Thus, assuring a robust security management system must address the entire supply chain. Attempting to set standards, e.g. for RFID tracking technology or for supplier certification, will therefore require significant coordination, information sharing and partnering across the supply chain in ways that go well beyond the normal cost, quality and timeliness aspects of supply chain management. How this is to be accomplished, while still assuring ourselves of the huge economic benefits the world has come to expect of global trade, will require some very innovative thinking by all parties, private and public, in this unfolding new area of interdependent risk and security management.

Paul Kleindorfer

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