CHAPTER 1

The Laws of the Laws

Laws are like cobwebs, which may catch small flies, but let wasps and hornets break through.

—Jonathan Swift,
"A Critical Essay upon the Faculties of the Mind," 1709

The time is far in the future. A commercial space towing ship, the Nostromo, *makes an unscheduled stop at a remote planet, where one of the crew members is attacked by a parasite. A horrible scene in which the parasite bursts through his chest sets up the rest of the story in which each crew member meets a horrible death until only one remains. As it turns out, the encounter was intentional. The creature, a perfect killing machine, was known to authorities months before and they wanted to use the ship's crew to bring one of them back so it could be weaponized. The crew, of course, had no idea.*

—Synopsis of the movie *Alien*

The lesson we can learn from *Alien* is profound and has many aspects. One lesson, perhaps, is that if you find yourself in an unknown situation, assume the worst case and don't get too close to the unknown danger. Another is that if you don't know your

real mission, disaster is likely to follow. *Alien* is all about risk, the unknown single point of failure, and the consequences of operating in an undefined environment. The movie should be required watching in every organization and in every business school.

Have you ever considered the possibility that the premise on which you built your organization might not be valid anymore? It is a profound suggestion not only because the answer might startle you, but because the question does not occur to many of us. Poor Ripley, the sole survivor in *Alien*, thought she was towing ore and had no idea that she was really set up as bait for the perfect killing machine alien creature. And like the movie itself, the lessons have a lot to say about the nature of risk in today's organization.

Risk is a parasite that resides in every process.

We have lost the association of risk as a threat or even as a negative. Risk itself has become meaningless. Terms like "risk management" and "risk expert" have normalized the concept of risk as a parasite and as a very real threat, not only to profitability and brand but often to an organization's ability to survive. Much new risk has been introduced—threats once not relevant now impact global supply chains with greater frequency and consequences. Thanks to globalization, the risk parasite can quickly weave its way through the logistics, sourcing, and production processes that support these long-tailed supply chains. The parasite can lie dormant in these processes, undetected by the organization. Then an event unleashes the parasite, creating a single point of failure, a broken link in the chain. The catastrophic outcomes can affect any stakeholder in the supply chain regardless of geographical or organizational boundaries. The trigger, large or small, can result in the same outcome. No longer can we distinguish between low-probability/high-impact events and everyday incidents. Whether an explosion at a natural gas plant or the availability of a single part, today's interdependent and lean supply chains as well as a fiercely competitive global marketplace leave little space, or time, for error.

Consider, for example, that an explosion in western Australia in the summer of 2008 to an Apache Energy gas line significantly threatened global commodities supplies because Rio Tinto and Alcoa, two major miners in the region, lost power to their mines. Or, in another case, the shortage of components for windmills (which have 8,000 components) and solar panels has been hampering the

growth of alternative energy. Even the failure of a single ingredient, such as osteoblast milk protein (melamine), in the food and dairy supply chain, can be far-reaching. In a recent case, melamine was added to the product and allegedly killed eleven; sickened another 296,000; bankrupted Sanlu Group, a major Chinese dairy company; and caused significant negative global media attention to Fonterra Co-operative Group Ltd, a joint partner of Sanlu Group and a major contributor to the global dairy supply chain. The parasite was released; as a result, globally interconnected supply chains were idled. The release of the parasite is not limited to natural hazards or events that affect only physical assets. In June 2009, the Venezuelan government ordered Coca-Cola Company to withdraw its Coke Zero beverage from the country, citing unspecified health risks.[1] No organization is exempt from the parasite and most have experienced its wrath—ExxonMobil Corporation, Fonterra Co-operative Group Limited, Rio Tinto Group, Gazprom, Cadbury Schweppes plc, Apache Energy, Wal-Mart, General Motors Corporation, Baxter, Intel, Petróleos Mexicanos (PEMEX), Microsoft, Toyota, and Mattel—to name only a few.

I think of the risk parasite as a metaphor to remind me how to address existing vulnerabilities and anticipate future challenges throughout the supply chain before they become catastrophic. The risk parasite knows no boundaries. It resides in every resource and attaches to every process flow. However, often an organization divides its supply chain risk defenses against the threat of a parasite by organizational functions. A security issue is treated by the Security Management group, an environmental issue by the Environmental, Health and Safety group, and an IT risk issue by the IT Risk group. Each function has its own assessment techniques and standards for measurement, as well as its own turf. However, the risk parasite does not distinguish between functions and locations. When the parasite is attached to the process, it can take on any form and easily travel up- and downstream in the supply chain. Unlike each of these groups, this invasive parasite has freedom of movement.

But risk management is not separate and distinct; the effective approach is to think of the supply chain risk management process as part of the supply chain network. It is an overlay to the major processes of the network: sourcing (material requisition, third-party management), logistics (transportation, distribution, warehousing, inventory management, IT/ERP), and production (manufacturing,

Exhibit 1.1 Supply Chain Risk Overlay

assembly, subassembly). Refer to Exhibit I.1 in the Introduction. Simply stated, an effective supply chain risk strategy is one that is holistic and mirrors the supply chain network design and cash, information, and product flows, not just the functional design. The risk strategy is discussed further in later sections.

The strategic supply chain risk overlay shown in Exhibit 1.1 identifies and minimizes the impact of potential single points of failure, improves quality, protects critical data, and makes the supply chain more efficient. The risk parasite is a negative but realistic metaphor; the solution is to manage the whole body of the supply chain by identifying and removing, containing/isolating, or reducing the effects of the risk parasite.

Laws of the Laws

This book is organized into a series of laws that apply to everyone along the extended supply chain. However, before proceeding, I want to provide you with a brief set of questions about the nature of your business network, the value your organization creates, the supply chain relationship, and a definition of risk.

Questions to ask yourself before you proceed:

- How does my business create value and what role does the supply chain play in that process? Can I visualize the risk, worst-case scenarios, and impact at various points throughout the supply chain, as well as identify the point of maximum impact (i.e., maximum exposure)?
- How do my customers, investors, business partners, and other key stakeholders view and define supply chain risk, if at all? What are their expectations? How do they measure success and failure? Do they even consider these critical issues?

- What impact does my ability to manage supply chain risk have on protecting brand, ensuring margins, moving cash, and generating revenue to assure long-term growth?
- Who in my organization is responsible for the management of supply chain risk? Who at my third-party providers is responsible?

A good starting point for any challenge is to understand the context in which the solutions must be implemented. What are the practical realities of the culture, behaviors, and intangibles that cause the solution to succeed or fail? Most people know these unwritten rules, whether they are budgeting an expansion program, introducing a new product, eliminating manufacturing defects, or heading up a quality control team. This premise leads to four specific precepts that I call the Laws of the Laws. These specific points are articulated below and reflect how most of them successfully attack the parasite based on the unique culture of your organization. The ten laws of the supply chain risk process you find in the following chapters all have to address these four basic precepts on some level, and often on several levels.

Risk Management Defined

Before getting to these precepts, I have to start with the basic definition of *risk management* itself. There are many definitions in use and the meaning varies depending on your role. During my travels through Singapore, I ran into Rajeev Kadam, Vice President of Olam International Ltd., a global leader in the supply chain management of agricultural products and food ingredients. Rajeev articulated a simple but concise definition of risk.[2]

Risk has two essential components:

1. Uncertainty
2. Exposure to uncertainty

> We face risk when both uncertainty and exposure are present.

Consider an example: A man jumps from a sixty-story skyscraper. According to our definition above, there would be no uncertainty if the man were to jump off the building without a parachute. His chance of survival would be zero. However, if the

man were to jump with a parachute, then there would be some degree of uncertainty about whether the man would live or die. The jumper faces risk because he is personally exposed to the uncertainty of the parachute failing to open. We could begin to calculate this uncertainty.

Suppose you are watching this event as a bystander from the pavement below this tall building. Are you facing any risk even if there is uncertainty in this event? The answer is no, because you are not personally exposed—unless the jumper is your relative, or has borrowed money from you, or you have a coffee shop on the pavement where he may crash land.

We could continue with this example but I am sure you understand the point. Uncertainty can be difficult to calculate, especially when the exposure is not understood or realized. This, by far, is the most fundamental challenge of supply chain risk management—organizations not knowing or understanding how exposed their supply chains are to uncertainty, or to how much.

You need to define exposure to uncertainty in terms of impact: the cost of the loss, and what that loss means in terms of stakeholders, your brand and reputation, and even to the basic ability to provide your goods and services to your customers. With this definition in hand, I can now introduce the practical realities, or the Laws of the Laws, to guide you with the execution of your own supply chain risk management. Consider these four precepts.

Law of the Laws #1: Everyone, without exception, is part of a supply chain.

Law of the Laws #2: No risk strategy is a substitute for bad decisions and a lack of risk consciousness.

Law of the Laws #3: It's all in the details.

Law of the Laws #4: People always operate from self-interest.

The following will expand on these four precepts.

Law of the Laws #1: Everyone, without Exception, Is Part of a Supply Chain

It was a revolutionary innovation in assembly line automobile production when a major manufacturer decided to give any individual on the line the power to stop the process if he or she saw a flaw.

Before that, without the vested interest, the theme "It's not my job" allowed visible flaws to proceed through the line even though dozens of assembly line workers saw the flaws. Because "It's not my job" was the cultural rule, several points prevented diligence on the assembly line:

- Pointing out quality and safety defects was seen as criticizing a fellow line worker.
- Delaying the process reduced shift output and was seen as a negative.
- Pay was based on units produced and not on quality.

All of these flaws added to supply chain problems rather than solving them. In the 1980s, Toyota Motors first employed *jidoka*, the concept of empowering workers to stop an assembly line to prevent defects. The goal was to make it possible for everyone, at all critical points, to understand their role in the greater goal of supply chain value creation and, when appropriate, participate. This idea flew in the face of assembly line standards set by the Ford Motor Company, where once the line began to move, *nothing* was allowed to stop it:

> At every stage of the assembly line, Toyota employs devices allowing workers to stop production to correct defects. Such devices may be as simple as a rope strung above the assembly line, or a button that can be pushed. In other cases, it is sophisticated monitoring software such as Activplant's Performance Management System, which can alert operators to problems with equipment or robots in real time.[3]

The concept of allowing individual assembly line workers to bring the whole line to a grinding halt because they see a flaw is culturally revolutionary. It is also diligent, a method for gaining participation among key stakeholders—the employees—and preventing and correcting flaws many steps before end-users discover problems after purchase. By changing the broad assumption to "It *is* my job" and doing away with the self-interest of the individual or even of the shift, assembly line workers were given a sense of ownership in the end-result quality of their product. They recognized their individual contribution and were empowered to the end goal of producing the highest value to the customer. Toyota acknowledged

early that workers were not just part of the supply chain, they *were* the supply chain. If they failed, the supply chain failed.

This is a relevant example of how supply chain risk thinking usually works versus how it should work. The Toyota example demonstrates why there can be no shortcuts and everyone is part of the whole. Before the institution of *jidoka*, an assembly line worker might fear punishment for making waves, not to mention the antagonism of fellow workers, notably those on whom the whistle had been blown. The observation that "There can be no shortcuts" can be expressed in another way: "Without diligence, no supply chain can be expected to work."

A point of view worth adopting is that performance based on diligence is the only acceptable operating method. Diligence is a means for assigning responsibility for all of the pieces that add up to the whole. An auto assembly worker is trained to recognize that any flaws make the singular product defective. Stopping the line to correct existing flaws and prevent new ones is essential. You can apply the same thinking to anyone's home life. The necessities—food, shelter, energy, safety, transportation—do not simply appear on their own. The household pays for all of these necessities, but the family also relies on food growers, stores, and transportation facilities; on home builders and designers; on financial institutions for credit; on an endless range of experts required to maintain the property; on utility companies and energy generation as well as raw materials; on infrastructure at local and national levels that creates roads for vehicles; as well as on auto manufacturers and mass transit facilities. This primary residential supply chain is complex and far-reaching, involving all aspects of commerce and government not only in one country but internationally. It requires incentives and the consciousness and empowerment of all those involved—that is, to hit the stop button when someone witnesses something wrong. The personal supply chain is an excellent model for beginning to develop an appreciation of the basic law. Imagine trying to find shortcuts for provision of food or shelter.

It would have a snowball effect and cause great suffering and loss throughout the supply chain. Supply chain risk management begins with awareness, a consciousness that everyone is part of an endless stream of supply chains, which are linked together by relationships and configured according to needs. Ask yourself the following:

- What are the products and services I rely on—for health, energy, food, water, my livelihood?
- Where am I exposed to uncertainty? Who have I entrusted to create and deliver high-quality, safe, and risk-free products?
- Do I understand the basics of these supply chains—who and what's involved? Is there transparency into critical interdependencies and do I have confidence that those touching the chain are managing the risks?
- What adjacent and interdependent supply chains are required to satisfy my needs (transportation, communications, energy, shipping, trucking, and so on)?
- How will delays or disruption in these supply chains affect me and my business if the product is unavailable for a day? A month? Permanently?
- Do I understand the financial, brand, regulatory, and strategic impacts of a risk being realized?

Whatever products your organization sells or what services it offers, your role is an essential part of the supply chain, and potentially of other supply chains within the organization. Be ready—you will need to be able to continually measure value and impacts and prioritize risk within your supply chain.

We are living in the age of interdependency; small ripples upstream cause tidal waves downstream.

Numerous examples in today's world involve seemingly small glitches causing large consequences. In one such example, jellyfish caused a reactor to shut down. PG&E Corporation, California's largest utility company, silenced its Diablo Canyon 2 reactor and was forced to operate another reactor at 50 percent capacity when a rapid influx of jellyfish reduced water flow to pumps. This is not the only case. Globally, jellyfish have caused hundreds of millions of dollars in damage to fisheries, seabed mining operations, ships, and other industrial operations.[4]

It's not always a material issue. Look at what happened in 2008 and 2009 with the market-wide credit meltdown. In the past, you might have trusted your "establishment institution" to protect your assets, if only on the premise that they were experts in managing other people's money. After the meltdown, in which many of those banks and brokerage firms went broke or were bought out at bargain-basement prices, it became obvious that you could not merely

assign risk to the experts. It was *your* risk as well, and it had been your risk all along. They were merely custodians of your assets. You were always part of the supply chain involving capital, credit, investment, money management, market risk, and even basic evaluation of companies. The fact that the brokerage firm did not do its job (assuming that included protecting clients against market risk) does not exclude anyone from the supply chain, or from its very real risks. You owned the risk, you were exposed to uncertainty, and you felt the pain.

We all know that now, of course. But in the future, how can you better protect yourself and reduce these market risks? Some fundamental changes may include self-directing most of your money and using outside experts for advisory help only (risk ownership); distributing capital among several management resources, such as banks, brokerages, or mutual funds (risk diversification); and improving knowledge about the range of risk activities of a firm. For example, is your brokerage firm holding billions in mortgage obligations? If so, what are those risks (risk education, measurement, and transparency)? Ultimately, you are responsible for risk itself (risk accountability). The same is true for the management of supply chain risk—seeing, understanding, measuring, and mitigating or financing. One fact is certain—everyone, without exception, is part of a supply chain.

Law of the Laws #2: No Risk Strategy Is a Substitute for Bad Decisions and a Lack of Risk Consciousness

The main theme for the second Law of the Laws is that almost all adverse impacts can be traced back to a bad decision somewhere in the chain. Bad decisions are made without accurate or relevant information (uninformed decisions), significantly influenced by emotion and not made fast enough. One case of an organization not moving fast enough was that of Intel's Pentium FDIV bug. The Pentium FDIV bug caused errors in certain floating point division operations. According to Intel, a few missing entries in the lookup table used by the divide operation algorithm caused the bug. The flaw was discovered by a professor at Lynchburg College, who subsequently reported the issue to Intel. Intel would later admit that it had been aware of the flaw during testing but did not take action. This was bad decision making by Intel. It had knowledge of the

bug but chose not to manage the risk fast enough. While many independent estimates found that the bug would have negligible effect on most users, public outcry ensued. Intel offered to replace flawed Pentium processors on the basis of requests in response to mounting public pressure that brought a huge potential cost to the company.

This makes the point that in protecting yourself and your organization against the risks inherent in the supply chain, you need to develop a strategy to support effective and efficient risk decision making (intelligence gathering and tracking, monitoring, filtering, surveillance, and analysis) to keep things flowing and to engage all others in your supply chain; for knowing how to prevent potential losses; and, of course, to respond if and when a loss or delay does occur. You need to understand interdependencies, pain points, impact of failure at each link, and alternatives to ensure free flow of information, products or services, and cash. No one can plan for everything; understanding how big an impact the issue might present and gauging an appropriate response can help you navigate around *most* losses.

Only by recognizing that everyone is part of the supply chain and that risk decisions will be part of standard operations can you expect yourself to effectively take the needed steps. Being resilient, agile, and ensuring against insurable losses is only a small aspect of the larger, more enlightened, and more progressive approach. Other behavioral attributes of good risk decision making include education, awareness, and training; critiquing and learning from failures and near misses; and understanding motives, incentives, and penalties.

A well-recognized supply chain risk management case that shows the benefits (and consequences) of good risk decision making involves a major supplier to Nokia that produces semiconductors for Nokia phones. The company suffered a severe fire at its plant in Albuquerque, New Mexico, on March 17, 2000. Smoke spread throughout the facility and contaminated wafers in almost every stage of production, destroying millions of chips in just a few minutes. Consequently, production of cell phone chips intended for Nokia and Ericsson was halted. Nokia quickly realized that the disrupted supplies would prevent production of some four million handsets and could impact 5 percent of its annual production. The team quickly ascertained the availability of alternate sources for the parts. Nokia responded by working with existing suppliers to ensure that Nokia operations would continue with minimal interruption.

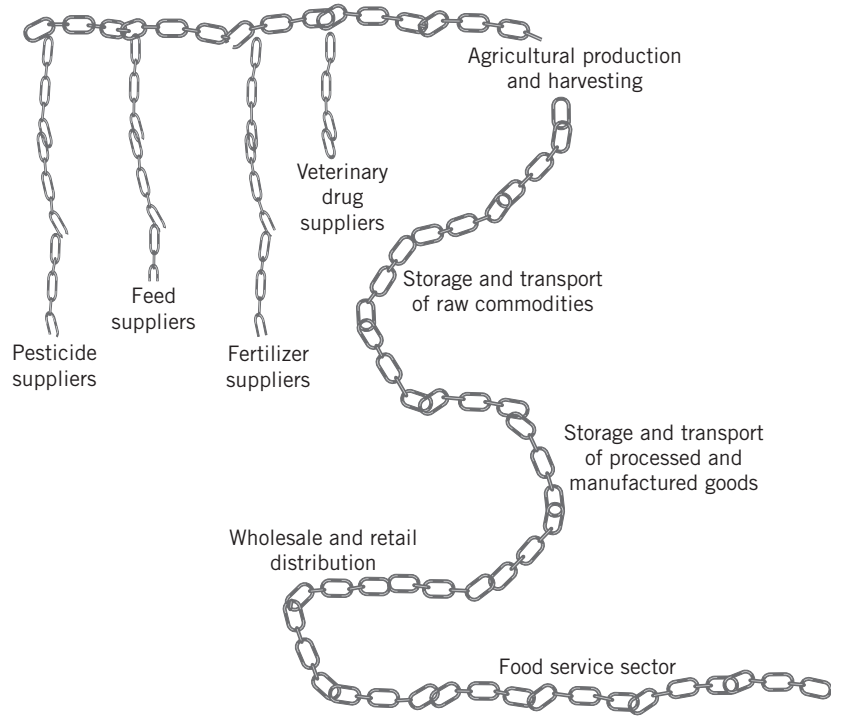


Exhibit 1.2 Food Supply Chain

When it was clear that the much-needed chips were significantly delayed, lower-level employees at Ericsson did not communicate the news to their bosses. The head of the consumer electronics division did not learn of the problem until several weeks after the fire. By the time Ericsson realized the magnitude of the problem, it was too late and it lost market share to Nokia. If Nokia were to follow the Band-Aid approach, it would have stopped after the disrupted supplier had recovered. However, it took further action following this event. Nokia developed a series of visibility systems to track major shipments of all of its major suppliers. It also established a risk management assessment for each of its major suppliers and created contingency plans for disaster planning at each location. Then, suppliers were trained in all of these planning elements. Finally, Nokia reevaluated its entire supply chain network to avoid single sourcing any major component, and it integrated these plans into its global sourcing strategies.[5]

Law of the Laws #3: It's All in the Details

What risks to your supply chain are you worried about the most? In my travels, I often hear a response from executives such as "I'm doing business in China and I am worried about risk to my supply chain." But to truly understand the risk we will have to revert to our definition of risk—uncertainty and exposure to uncertainty. In the case of the food supply chain, what precisely is the fear of the executive? Is it the uncertainty, the threat of a pandemic or snowstorm? Or is it the exposure to uncertainty, the vulnerabilities that apply to an organization's specific supply chain, such as poor worker hygiene practices by upstream factory workers during processing and materials handling. Or maybe it's poor temperature and expiration date control in wholesale and retail distribution or the food service sector. Exhibit 1.2 illustrates a few of the many risks that exist throughout the extended food supply chain.

The point is that the details are needed to understand and manage risk in the flow of products, services, information, and cash. Broad generalizations can be costly by over-allocating resources to the wrong priorities. The specifics must be articulated—the financial, brand, strategic, and compliance impacts, and acquisition, deployment, and maintenance investment to manage the exposure. Exhibits 1.3 and 1.4 represent the cost of the each threat to the organization and the potential investment areas.

Scenario	Impact
Threat Scenario 1: Unclean processing and materials handling	$$$$
Threat Scenario 2: Contamination of goods	$$$
Threat Scenario 3: Poor temperature and expiration control	$$

Exhibit 1.3 Threat Scenarios

Law of the Laws #4: People Always Operate from Self-Interest

We are all aware of what we need and want as a greater priority than the more abstract "greater good." The functional organizational construct exacerbates the issue. Everyone is categorized and incentivized into their function—armed with a checklist and motivated by an

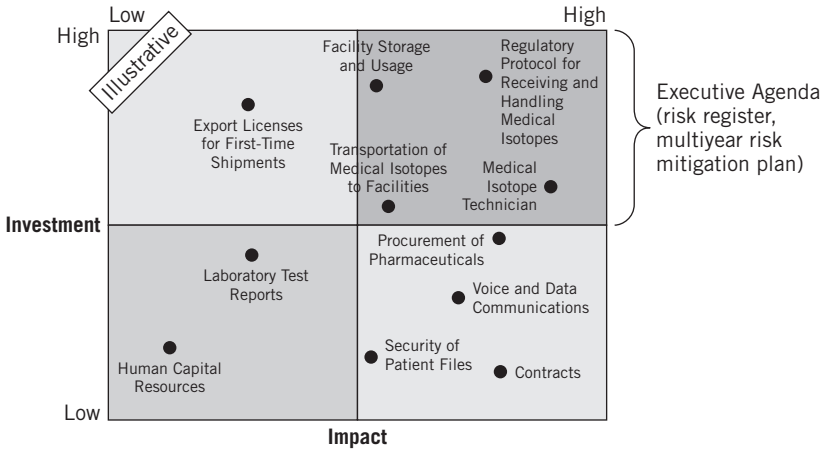


Exhibit 1.4 Specific Resource Risk Prioritization

evaluation system that teaches them to think about the parts, especially the parts in their own organization, rather than the whole.

Managing Risk of the Parts Is Not Equal to Managing Risk of the Whole

In behavioral science, one theory that describes how people think is called the Tragedy of the Commons. This theory, first published in 1968, makes a point by illustrating how people act in a given situation. In this game theory, many individual herders share a single piece of land where all are entitled to graze their stock. A paradox develops because each individual perceives maximum benefit by grazing as many cows as possible, but over-grazing will destroy the pasture for everyone. Any individual herder who adopts the long-term view and reduces grazing so that all can benefit ends up losing not only immediate profits but the entire pasture along with everyone else.[6]

The concept that people work from self-interest is not new. While the Tragedy of the Commons expressed this idea with a story everyone could understand, the problem has been recognized since ancient times. As one Greek writer stated it long ago:

> . . . people tend to devote a very small fraction of time to the consideration of any public object, most of it to the prosecution of their own objects. Meanwhile each fancies that no harm

> will come to his neglect, that it is the business of somebody else to look after this or that for him; and so, by the same notion being entertained by all separately, the common cause imperceptibly decays.[7]

The problem is universal, and the closest anyone can come to overcoming it involves cultural and systemic supply chain changes. The previously cited example of *jidoka* in the Toyota assembly line is one method for achieving this, but it involves more than simply giving individual participants the right to stop the assembly line or giving people a sense of ownership in the process.

The education of participants or stakeholders in the supply chain requires providing a *clear line of sight* from beginning to end and creation of a real sense of the big picture, allowing people to overcome their narrow view of their own jobs and enabling them to contribute to the organization's value proposition. They must understand the concepts of value, flows (product, service, cash, information) impact, and exposure (hence the earlier questions about the business). Problems in supply chain processes occur in big companies with complex international interdependencies, but they also happen to every small to medium-size business, individual, and family.

This reality can bring home the crucial importance of group thinking rather than self-interest. In the Toyota example, it was necessary to overcome the concept that an employee would get into trouble by pointing out defects created by someone else, or would bring anger on themselves by reducing output for the shift. Even union members have often tended to think in terms of "us versus them" when it comes to management, making it even more difficult to create a real team approach within the supply chain. If management is prevented from taking steps to reduce defects and, in many cases, from even communicating directly with workers without a union representative present, the challenge can make success close to impossible.

In another real-life example, the procurement manager of a technology manufacturing company was told to cut material costs by 5 percent for the coming year, after cutting material costs by nearly 26 percent in the two prior years. His compensation was based on this 5 percent target and, although not explicitly stated, the security of his job was dependent on meeting this objective. He responded by notifying suppliers that they needed to figure out how to cut 8 to 10 percent out of the cost structure. As has been said,

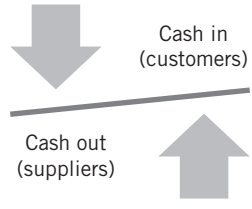
it rolls downhill. He informed the suppliers that they needed to comply or "lose the relationship." Of course, the suppliers in turn communicated the message to their material suppliers, contractors, and job shops. As is typically the case, as the message moved farther upstream—the greater the impact and the smaller the shop. Many of the upstream suppliers were able to cut costs by 1 or 2 percent without cutting corners, but those last few percentage points meant they had to do something drastic.

I liken it to the difference in the repercussions between a magnitude 5.0 and 6.0 earthquake. When moving up the scale, the increase is not linear but rather exponential, or in the case of the Richter scale and earthquakes, it's a tenfold increase when moving from 5.0 to 6.0. This kind of consequence is an accurate business-model emergency, or what I call ER, which means "exponential repercussion." I checked back with the procurement manager several months later and asked him if there were any negative consequences of the squeeze. He told me that most of the suppliers conformed to his requests and the net reduction turned out to be about 5.5 percent. However, he went on to say that the company was now beginning to notice a significant decrease in quality measured by the increased number of customer complaints. The increase in the number of returns was believed to be linked to use of subpar materials. Their investigation revealed that materials were being sourced from another geography. I thought to myself, *What other risks lie beneath and how did these vendors cut so much cost out of an already thin margin chain?*

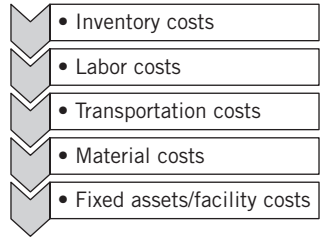
Operating in Self-Interest Yields Short-Term Gains and Long-Term Risk

In every supply chain, the supply chain and operations managers face four constant pressures. These pressures establish their perspective and motivations toward supply chain risk management actions. The four pressures are:

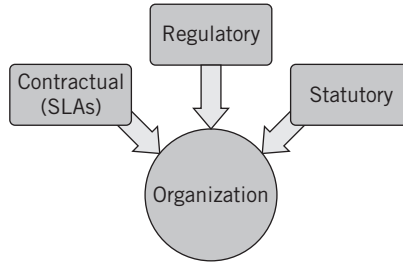
1. Continuously improve the velocity of cash (time between receipt of money for goods and payment of money to suppliers).



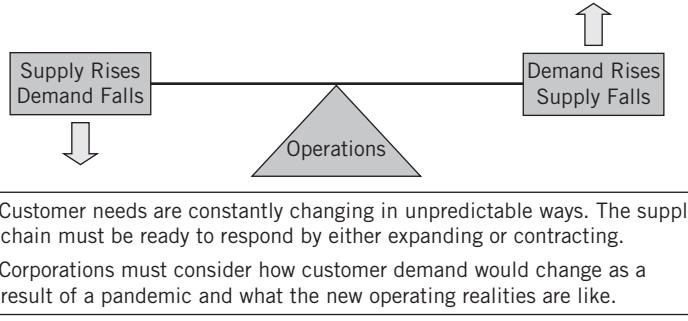
2. Continuously improve operating margins—cut costs and expenses.



3. Always comply with service-level agreements, plus other legal and regulatory obligations.



4. Always have product for the customer (i.e., never have a stock out/no inventory).



Recognizing the flaws in working from self-interest, management needs to focus on how relationships work throughout the supply chain. The base motivations point out root causes of supply chain breakdown and increase risk. People do not want to expand their levels of responsibility even if extra authority comes with it. So management faces a real challenge in changing this cultural stumbling block.

To rectify this self-interest problem and improve supply chain processes, two levels of change are required. The first involves detailed internal controls, checks and balances, and oversight, in which weak links are identified and either eliminated, made less prone to error, or more carefully monitored. This most obvious form of change is dynamic because as one series of defects and weak links is eliminated, new ones continually rise up. The second change to the self-interest problem is cultural. Moving employees from thinking as individuals operating in self-defense to thinking as parts of a larger team effort with an enlightened sense of real job security is a massive task. Initiatives like Six Sigma, a quality control system designed to create effective team approaches to problems, address this issue. Companies employing Six Sigma recognize the dual role, the first process- and quality-driven and the second one cultural. The attitude of top-to-bottom participation in a real sense is one way to change how people perceive their role in the organization, and even come around to redefining what self-interest really means. The revelation may come down to acknowledgment that real self-interest grows from improved supply chain processes and management.

However, self-interest is reality; the action item is to understand the motivations, incentives, and penalties of the individual or function responsible for performing the supply chain risk actions. The need for collaborative tools, rewards, and communications vehicles and an iterative learning process is essential to migrate away from self-interest.

Indirect and Secondary Impacts

Is systemic failure inevitable? Given well-publicized examples of very serious single points of failure (lead paint on toys, melamine in pet food, peanut and heparin infections), you have to ask whether these close calls, these supply chain failures, are just the tip of the iceberg.

There are many troubling signs growing out of internationalized business, outsourcing, and growing dependence on remote supply chains that involve people and organizations outside of centralized control. These are potentially severe, but systematic failure is not inevitable. The solution is to develop an appreciation of the specific laws given in the following chapters, and then apply them to reducing single points of failure in every phase of your supply chain—whether that means a mom-and-pop store or a multinational corporation with thousands of suppliers and vendors.

The basic Laws of the Laws apply to all of the ten specific laws in the following chapters, without exception. All of these laws have to be observed and acknowledged as a matter of survival. But in addition to the immediate and direct impacts you need to plan for, there are numerous indirect impacts as well, which you need to include in a comprehensive supply chain risk management program. These secondary impacts are no less important or critical than the primary ones, but these are not directly related to the supply chain. Outside influences such as these have as much potential impact as the weak link in the immediate supply chain.

These indirect and secondary threats include:

- Legal threats (lawsuits, noncompliance with multiple nations' laws)
- Regulatory repercussions from noncompliance (multinational due diligence, supply chain restrictions)
- IT failures, especially enterprise resource planning, customer and supplier relationship management systems (losses, damage, sabotage, recovery)
- Human resource–based threats (strikes, disputes, inefficiency, apathy)
- Security (internal and external threats, including employee sabotage, industrial espionage and sabotage, piracy)
- Natural disasters (losses from process and transportation problems)
- Health-related (pandemic, chemical, and biological attacks)
- Product flaws (lead and poison in products, dangerous construction)
- Financial and economic (credit issues, embezzlement, recession)
- Environmental (major contamination, pollution, regulatory)
- Energy (supply shortages, expense, alternate fuel costs)

What Can You Conclude?

From this discussion about laws applied to the ten basic laws, you may conclude that:

- Knowing where to start is the key; it invariably demands comprehension of the scope of aggregate risk in the supply chain. It also demands adoption of the enlightened view that we are

all part of the supply chain, without exception. You will need to understand uncertainty through the supply chain and your organization's specific (measurable) exposure to uncertainty.

- Your role in the big picture is going to be crucial, especially if you are among the minority of enlightened individuals who know how expansive risk is, and how dangerous single point of failure is to the entire big picture (the head of manufacturing at a consumer products company may be intimately aware of the skills, factory, and machinery needed to support his operation, but only when he looks beyond the four walls of the plant does he see all those he is dependent on—transportation carriers, public infrastructure, numerous tiers of suppliers, raw material providers, port operators—to name a few).
- A risk strategy is not a solution if it is offset by poor decisions, most often made by uninformed management. The appropriate strategy demands creative and out-of-the-box thinking, a creative approach to what otherwise might seem a hopeless dilemma. It requires a thorough understanding of behavioral elements, the absence of which can cause root failure. Too often, management settles for a decision (at times, *any* decision) as a way to address the problem, but this ends up not accomplishing any solution at all.
- "The devil is in the details," as the old saying goes. A risk very seldom materializes as a singular failure in a big way, but more often consists of one or more very small single points of failure, a combination of poor judgment, lack of awareness, and wrong assumptions. Like the television show *Seconds from Disaster*, which analyzes the series of connected events leading up to a catastrophic result, the supply chain is a collective of very connected details. In an anthill, a single ant making a wrong move can destroy the whole colony; and the same is true of the supply chain at every link along the way.
- Everyone operates from their own self-interests. This is a limiting factor in addressing single points of failure, but accepting this as a reality helps you articulate an effective risk strategy. There is no shortcut to justifying risk investment; it requires a thorough and well-articulated understanding of risk, the impacts, and the purpose of mitigation or finance investment required.

One final thought: It's important to recognize that all supply chains are unique and different. Because no two are alike, you cannot adopt a program or internal control system from another situation and apply it to your own. As I stated before, "If you've seen one supply chain, you've seen one supply chain." Those are words worth remembering.

Notes

1. Fabian Cambero and Antonio de la Jara, "Venezuela Bans Coke Zero, Cites 'Danger to Health,' " *Yahoo! News*, June 10, 2009.
2. The original source of "risk" from www.riskglossary.com/, which is from the family of Web sites by Glyn Holton (main Web site: www.contingencyanalysis.com/).
3. Mel Duvall, "What's Driving Toyota?" *Baseline Magazine*, September 5, 2006, at www.baselinemag.com/c/b/Projects-Processes.
4. Aaron Clark, "PG&E Shuts Down Diablo Reactor as Jellyfish Threaten Pumps," Bloomberg.com, October 22, 2008.
5. Supply Chain Resource Cooperative, "A Managerial Framework for Reducing the Impact of Disruptions to the Supply Chain," http://scm.ncsu.edu/public/risk/risk3.html.
6. Garrett Hardin, "The Tragedy of the Commons," *Science*, 162(3859), December 13, 1968, 1243–1248.
7. Thucydides (ca. 460 B.C.–ca. 395 B.C.), History of the Peloponnesian War, Book I, Sec. 141.