David L. Olson
Desheng Wu (Eds.)

New Frontiers in Enterprise Risk Management

Springer

Chapter 2: The Human Reaction to Risk and Opportunity

David R. Koenig, Past Chair, Board of Directors, Professional Risk Managers' International Association; e-mail – david.koenig@charter.net

Introduction

Enterprise risk management is about increasing the value of an enterprise or system. The value of a system today is the discounted present value of some perceived set of possible future states of value of that system. By creating ductile systems that respond well to risk events we can positively change the distribution of and perception about expected future states of value of the system. We can also increase the expected life over which the system is being valued.

Quantitative methods, cultural awareness, processes and control are all important to an enterprise risk management framework that is ductile. However, a subtle but important contributor to the impact of a risk event, which defines future states of value, is often ignored in present-day enterprise risk management programs. This may lead to under-appreciation of the value of addressing risks and even false comfort levels in our programs. Intriguing psychological research has been published that shows that the impact of a "risk event" can be either attenuated or exacerbated by the human reaction to that risk event. The human reaction can be affected by present-day risk perceptions and framing, for example, or how risk is processed psychologically. Further, the weighting of possible future states of value, can be impacted by factors such as loss avoidance, small probabilistic changes in state and framing.

We are warned, by research in this area, that an over-reliance on quantitative measures can provide a false sense of security, lead to greater amplification of risk events and even generate unexpected risk events when incentives are improperly aligned with risk management objectives. Yet, we naturally seek this security as part of our psychological makeup, perhaps to our own detriment.

In total, our awareness of the psychological contributions to how risk events can change the value of our systems is important in any enterprise risk management program and to increasing the value of our enterprise.

Risk and Risk Events

Risk can be defined as the unknown change in the future value of a system. Kloman defined risk as "a measure of the probable likelihood, conse-

quences and timing of an event."[1] Slovik and Weber identified four common conceptions of risk:[2]

- Risk as hazard
  - Examples: "Which risks should we rank?" or "Which risks keep you awake at night?"
- Risk as probability
  - Examples: "What is the risk of getting AIDS from an infected needle?" or "What is the chance that Citigroup defaults in the next 12 months?"
- Risk as consequence
  - Examples: "What is the risk of letting your parking meter expire?" (answer: "Getting a ticket.") or "What is the risk of not addressing a compliance letter?" (answer: "Regulatory penalties.")
- Risk as potential adversity or threat
  - Examples: "How great is the risk of riding a motorcycle?" or "What is your exposure to rising jet fuel prices?"

While these last four conceptions all tend to have a negative tonality to them, the classical definition of 'risk' refers to both positive and negative outcomes, which the first two definitions of risk capture.

A *risk event*, therefore, can be described as the actualization of a risk that alters the value of a system or enterprise, either increasing or decreasing its present value by some amount.

Ductile Systems

Recent use of the term risk has been focused on negative outcomes, or loss. In particular, attention has been highly concentrated on extreme losses and their ability to disrupt a system or even to cause its collapse. This may be every bit a function of preference described as loss avoidance by Kahneman and Tversky where the negative utility from loss greatly exceeds the positive utility from an equal gain.[3]

By definition, a ductile system is one that "breaks well" or never allows a risk event to cause the entire system to collapse.[4] A company cares about things that can break its "system" like the drying-up of liquidity sources or a dramatic negative change in perception of its products by customers, for example, as such events could dramatically reduce or eliminate the value of the enterprise. Figure 1 below depicts the path a risk event takes to its full potential. In other words, absent any intervention, the full change in

value of the system that would be realized from the risk event is 100% of the potential impact of the risk event.

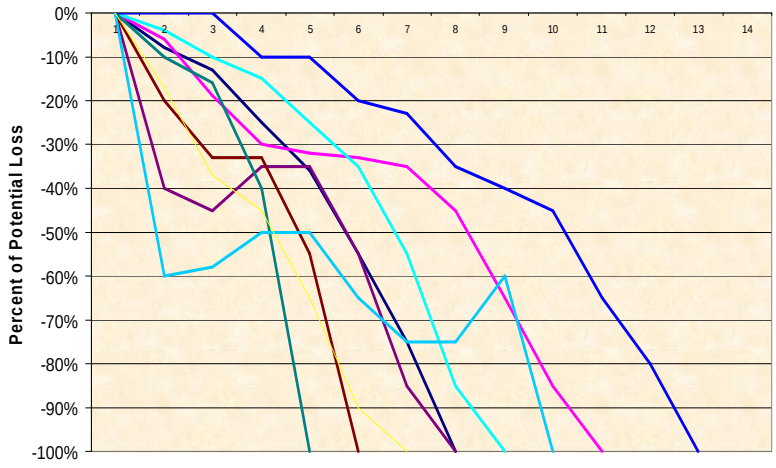

Figure 1 – The Path of a Risk Event

In this figure, the horizontal axis represents steps in time, noting that all risk events take some amount of time to reach their full potential impact. The vertical axis is the percent of the full impact that has been realized. All risk events eventually reach 100% of their potential impact if there is no intervention.

Hundreds of thousands of risk events are likely to be realized in any system and some very small percentage would, if left unchecked, break the system. In a corporate setting, these system-breaking events would be those that resulted in losses that exceed the company's capital.

Through interventions, which include enterprise risk management programs, dissemination of knowledge and risk-awareness can help make systems more ductile and thus more valuable. If the players in a system are risk-aware, problems are less likely to reach their full potential for damage. This is so simply because some element of the system, by virtue of the risk-awareness, takes an action to stop the problem before it realizes its full impact. Figure 2 depicts the path of a risk event in a ductile system.

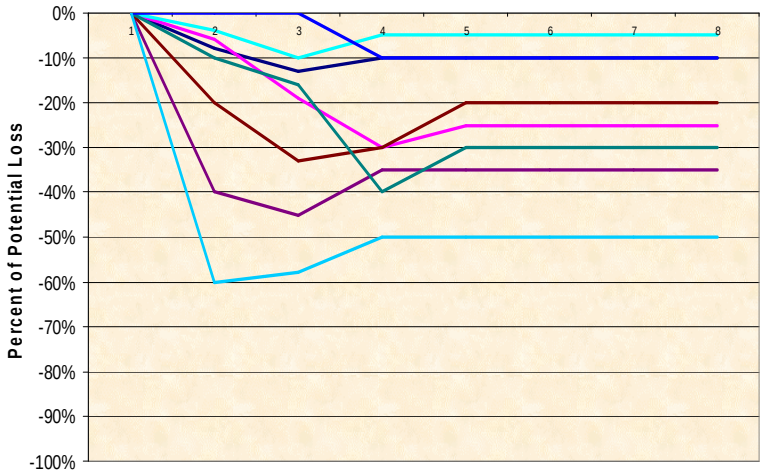

Figure 2 – The Path of a Risk Event in a Ductile System

In a ductile system, no risk event reaches its full potential impact.

The Value of the System

The general notion behind creating a ductile system is that if you can positively alter the perception of possible future states of value of the system through enterprise risk management, you can greatly increase the system's present value. This comes about through a reduced need for capital (reduced potential loss from a given risk event) and its associated expense, a greater ability to take business risks (perceived and real increases in growth) and more benefit from investor perception of the firm.

In classic theories of finance, risk has been used as a theoretical construct assumed to influence choice.[5] Underlying risk-return models in finance (e.g., Markowitz, 1954) is the psychological assumption that greed and fear guide behavior, and that it is the final balance and trade-off between the fear of adverse consequences (risk) and the hope for gain (return) that determines our choices, like investing or supply of liquidity.[6] How many units of risk is a person willing to tolerate for one unit of return? The acceptable ratio of risk to return is the definition of risk attitude in these models.[7]

In our ductile system, we can easily recognize how a trimming of the possible negative risk events and a shift right-ward towards higher ex-

pected gains from greater business growth can positively impact value in the Markowitz world.

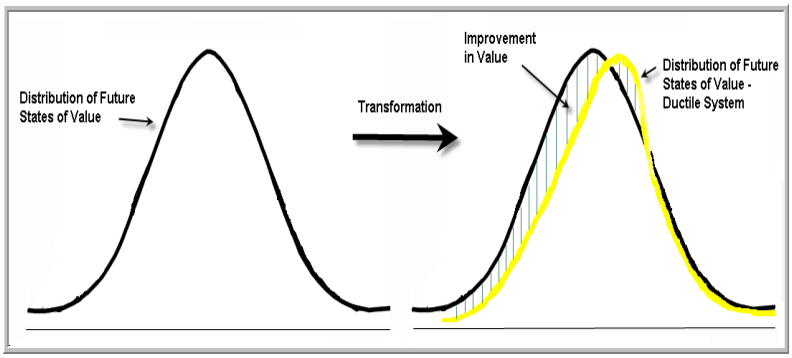

Figure 3 – Ductile Systems Shift the Distributions of Changes of Value

But, the variance (i.e., the square of the standard deviation of outcomes around the mean) used in such models is a symmetric measure, meaning the variation above the mean has equal impact to variation below the mean. Psychological research indicates that humans care much more about downside variability (i.e., outcomes that are worse than the average) than upside variability.[8]

The asymmetric human perception and attitudes towards risk mean that there is more that we must understand in terms of the human impact on risk events and valuation of a system than a standard Markowitz risk-return framework would suggest, or our enterprise risk management system might not be as effective as it could be. In other words, the enterprise risk management program won't be as valuable and some cost/benefit calculations will incorrectly reach the conclusion that no action is economically justified.

How does understanding the way in which risk events can be amplified matter? How do transparency and confidence lead to an attenuation of risk events? How do people psychologically process risk events and why does that matter? These are just a few of the questions that must be asked about our enterprises and the risks they face.

Social Amplification of Risk

In the late 1980's, a framework for understanding how the human response to risk events could contribute to the final "value" of the impact of a risk event was conceived under the Social Amplification of Risk Framework or SARF.[9]

The theoretical starting point of the SARF is the belief that unless humans communicate to each other, the impact of a risk event will be localized or irrelevant. In other words, its potential negative impact will be less than if the risk event is amplified through human communication. Even though this framework was developed in a setting focused on natural or physical risks, this foundation is essential to understanding the transmission mechanism that can lead to things like credit crunches, liquidity crises or dramatic devaluation of a system, firm or assets.

A key component of the human communication process about risk is portrayed through various risk signals (images, signs and symbols), which in turn interact with a wide range of psychological, social, institutional and cultural processes in ways that either intensify or attenuate perceptions of risk and its manageability through *amplification* stations.[10] Events may be interpreted as clues regarding the magnitude of the risk and the adequacy of the risk management process.[11]

Amplification stations can include social networks, expert communities, institutions, the mass media and government agencies, etc. These individual stations of amplification are affected by risk heuristics, qualitative aspects of risk, prior attitudes, blame and trust.

In the second stage of the framework, some risk events will produce ripple effects that may spread beyond the initial impact of the risk event and may even impact unrelated entities. Consider consumer reaction to the Tylenol poisonings. Tylenol tampering resulted in more than 125,000 stories in the print media alone and inflicted losses of more than $1 billion upon the Johnson & Johnson company, including a damaged image of the product.[12] Further, consumer demand and regulation following this led to the ubiquity of tamper-proof packages (and associated costs) at completely unrelated firms.

Similarly, the reaction to the events of 9/11 has led to an enormous cost on all who travel, businesses wishing to hire foreign talent the United States or businesses involved in import/export, for example. Other impacts from risk amplification can include potentially system-breaking events like capital flight as in the Asian currency crisis of 1997-1998.

This process has been equated to the ripples from dropping a stone into a pond.[13] As the ripples spread outward, there is a first group directly impacted by the risk event, then it touches the next higher institutional level (a business line, company or agency) and in extreme cases reaches other parts of the industry or even extra-industry entities.

In 1998, the Asian currency and Russian debt crises had ripple effects that led to the demise of the hedge-fund Long Term Capital Management (LTCM). This demise, in turn, was perceived as having the potential to lead to a catastrophic disruption of the entire global capital markets system

and resulted in substantial financial losses (and gains) for firms that believed they had no exposure to either Asia or Russia and certainly not to hedge funds. This amplification came through human stations.

In 1992, the same researchers who conceived of SARF evaluated their theory by reviewing a large database of 128 risk events, primarily physical risks, in the United States. In their study, they found strong evidence that the social amplification of a risk event is as important in determining the full set of risk consequences as is the direct physical impact of the risk event. Applying this result to internal risk assessments suggests that it would be easy to greatly underestimate the impact of a risk event if only first order effects are considered and not the secondary and tertiary impacts from social amplification or communication and reaction to the risk event.

Again, considering the Tylenol tampering case, an internal risk assessment of a scenario that included such an event might result in the risk being limited to be legal liability from the poisonings and perhaps some negative customer impact. However, it would be unlikely that any ex-ante analysis would have concluded the long-term impact on product packaging and associated costs that were a result of the amplification of the story. Or, if the scenario had involved such an event at a competing firm, the impact might have even been assumed to be positive for the "unaffected" firm.

The Perception of Risk, Dread and Knowledge

So, what are the factors that can increase the likelihood of social amplification or attenuation? How are hazards or risks perceived? It turns out, not surprisingly, that what people don't understand and what they perceive as having potentially wide-ranging effects are the things they are most likely respond to with some kind of action, e.g. a change in the valuation of a system.

Weber reviewed three approaches to risk perception: axiomatic, socio-cultural and psychometric.[14] Axiomatic measurements focus on the way in which people subjectively transform objective risk information (e.g. the common credit risk measure Loss Given Default and the equally common Probability of Default) into how the realization of the event will impact them personally (career prospects, for example).

The study of socio-cultural paradigms focuses on the effect of group- and culture-level variables on risk perception. Some cultures select some risks that require attention, while others pay little or no attention to these risks at all. Cultural differences in trust in institutions (corporation, government, market) drive a different perception of risk.[15]

But, most important, is the *psychometric paradigm* which has identified people's emotional reactions to risky situations that affect the judgments of

the riskiness of events that go beyond their objective consequences. This paradigm is characterized by risk dimensions called *Dread* (perceived lack of control, feelings of dread and perceived catastrophic potential) and *risk of the Unknown* (the extent to which the risk is judged to be unobservable, unknown, new or delayed in producing harmful impacts).

Recall that SARF holds that risk events can contain "signal value". Signal value might warn of the likelihood of secondary or tertiary effects. The likelihood of a risk event having high signal value is a function of perceptions of that risk in terms of the source of the risk and its potential impact. Slovic developed a dread/knowledge chart represented below, that measures the factors that contribute to feelings of dread and knowledge.[16]

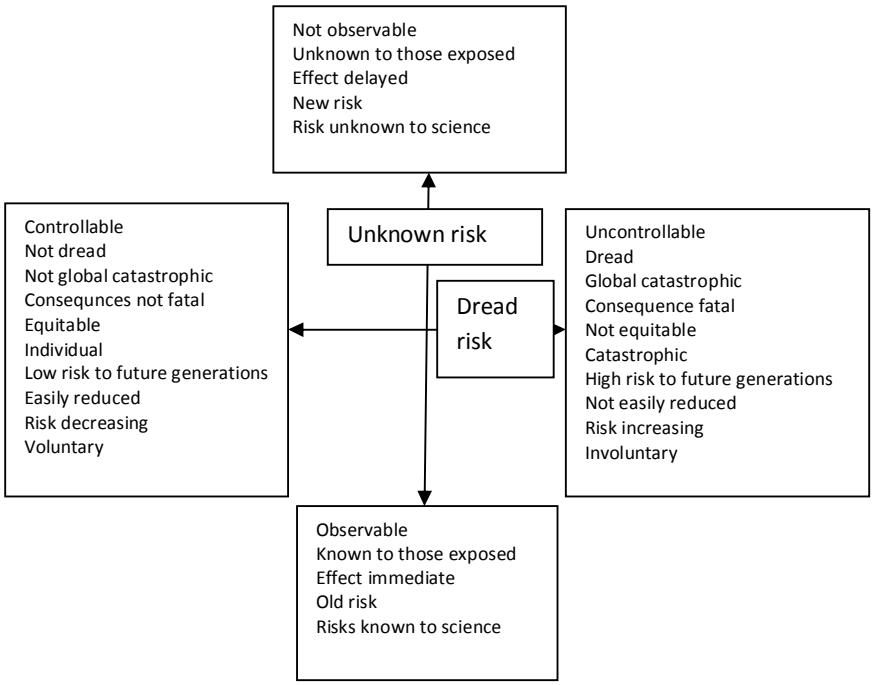

Figure 4 – The Dread/Knowledge Spectrum

In Figure 4, "Dread risk", captures aspects of the described risks that speed up our heart rate and make us anxious as we contemplate them: perceived lack of control over exposure to the risk, with consequences that are catastrophic, and may have global ramifications or affect future genera-

tions.[17] "Unknown risk", refers to the degree to which exposure to a risk and its consequences are predictable and observable: how much is known about the risk and is the exposure easily detected.

Research has shown that the public's risk perceptions and attitudes are closely related to the position of a risk within the factor space. Most important is the factor Dread risk. The higher a risk's score on this factor, the higher its perceived risk, the more people want to see its current risks reduced, and the more they want to see strict regulation employed to achieve the desired reduction in risk.[18]

In the unknown risk factor space, familiarity with a risk (e.g. acquired by daily exposure) lowers perceptions of its riskiness.[19] In this factor, people are also willing to accept far greater voluntary risks (risks from smoking or skiing for example) than involuntary risks (risks from electric power generation for example). We are loath to let others do on to us what we happily do to ourselves.[20]

From this depiction, we can recognize that both dread and our lack of familiarity with something will likely amplify the human response to a risk event. In other words, risks that are in the upper right hand corner of the dread/knowledge chart are the ones most likely to lead to an amplification effect.

Slovic and Weber use terrorism as an example, noting that the concept of accidents as signal helps explain our strong response to terrorism.[21] Because the risks associated with terrorism are seen as poorly understood and catastrophic, accidents anywhere in the world may be seen as omens of disaster everywhere, thus producing responses that carry immense psychological, socioeconomic, and political impacts.

We might also include the 2007 subprime mortgage crisis as an example of a risk event being amplified to affect general liquidity being provided to financial service companies. The Unknown in this case is the extent to which companies are exposed to subprime default risk and the Dread is that these defaults might affect home prices, thus affecting consumer spending and thus affecting the general well-being of banks and other companies.

One implication of the signal concept is that effort and expense beyond that indicated by a first-order cost-benefit analysis might be warranted to reduce the possibility of high signal events and that transparency may be undervalued, underappreciated or improperly feared.

The examination of risks that face a system should include a qualitative, and even quantitative assessment of where those risks fall on the dread/knowledge spectrum to assess the risk to underestimating their impact through traditional risk assessment techniques.

The Processing of Risk: Emotion versus Reason

We've looked at the way in which people perceive risk in terms of dread and their knowledge of a risk. But, what about how people process information about a risk event once it has occurred? How are people likely to react to risk event? Research indicates that people process information about risk events in two substantially different manners.[22]

The first system of information processing is more reactive, developed as an evolutionary response system, but also based on knowledge and experience. This experience or association-based processing enabled humans to survive during a long period of evolution and remains the most natural and most common way to respond to a threat.[23]

This is an *affective* paradigm, relying on images and associations, linked by experience to emotions, good or bad. It transforms uncertainty and threats into emotional or affective responses (e.g., fear, dread, anxiety) and represents risk as a feeling, which tells us whether it's safe to walk down a dark street or drink strange smelling water.[24]

The second paradigm for processing is more analytic and rule-based. Examples include formal logic, probability calculus and utility maximization as modes of process. As a result, it is slower and requires awareness and conscious control.[25] Its algorithms need to be taught explicitly and its appropriateness of use for a given situation needs to be obvious, i.e. it does not get triggered automatically.[26]

While these two processes work simultaneously, situationally, one can dominate the other. Weber uses the example of how a mind responds to the question "Is a whale a fish?"[27] The first process immediately says that the whale sure looks like a great big fish, while the second process says that it cannot be a fish because it is warm-blooded. When these two processes are in conflict, evidence strongly suggests that the affective, or emotion-based system will prevail.

This matters significantly in financial risk management, especially in market reactions to bad news. Consider an investor, with an open financial exposure to a company, who sees a 20 percent decline in that company's stock overnight. The affective response may be to immediately assume there is trouble and to cut-off further investment in or credit-extension to that company. Up to that point, though, the analytic process had indicated to the investor that the exposure was prudent. Further exposure might even have been possible. The fear that the drop in stock prices has been correlated with deterioration of the company, though, may immediately override the analytic process, even if it was still correct and the change in stock price presented a new and better opportunity.

A visceral reaction like fear or anxiety serves as early warning to indicate that some risk management action is in order and motivate us to execute that action.[28] Stepping into the realm of emotion, certain market behaviors like foreign-exchange overshooting, liquidity crises and the tendency of asset prices to move down more quickly and violently than they move up can easily be associated with the dominance of the affective process.

Quantification as a Coping Mechanism

Risk and uncertainty make us uneasy. We naturally prefer to move further down on the unknown risk factor chart, making ourselves more comfortable with things that we may not understand initially. Quantifications are one manner by which we try to turn subjective risk assessments into objective measures. We attempt to convert uncertainty, which is not measurable, into risk, which is believed to be measurable.

Consider a firm reviewing an unsecured $20MM line of credit to ABC Corporation. If the market price of a 1-year credit default swap on ABC trades at such a price as to imply a .5% probability of default, that firm could use this metric to decide what to do with the "risk as probability" by either buying or selling credit protection, selling any credit exposure that it has to ABC, taking on more ABC exposure or not accepting any more ABC exposure.

The firm providing liquidity to ABC, absent complete transparency, does not know the actual probability that ABC will default in the next 12 months. But, it does have a metric that makes it think that it does and it is thus more comfortable and likely to extend the credit.

Slovik and Weber note that much social science analysis rejects the concept of measuring uncertainty, arguing that "objective characterization of the distribution of possible outcomes is incomplete at best and misleading at worst."[29] Risk, they say, is "a concept that human beings have invented to help them understand and cope with the dangers and uncertainties of life."

The assignment of numbers to that which is not measurable creates its own risk, much in the way that an earthquake can disrupt ones faith in the stability of the ground on which we stand. This is particularly true if one has never experienced an earthquake and is in an area where earthquakes are not supposed to happen, as Prospect theory has found dramatic effect on human perceptions when a risk changes its state from the impossible to possible.

Define the terms 'public' and 'expert' in a general sense that conveys information asymmetry. The term expert is used to refer to someone or a

group with, or perceived to have, more information, and public is used to refer to a group with less or no information about a realized or potential risk. In the ABC Company example above, we consider the market for credit default swaps to be our proxy "expert". Should our expert prove to be wrong, we may alter our response to the realization of risk, figuring it to be farther up on the unknown risk spectrum than first believed and perhaps even of increasing risk and greater dread. This could trigger a greater emotional reaction and social amplification.

What is the impact when an expert is wrong? Reduced trust in institutions or experts results in stronger negative affective responses to potential risks and thus greater chance for amplification.[30] In the subprime crisis, early in 2008, we see less trust in credit risk models (proxy experts) and in guarantors of credit, suggesting further risk events resulting in credit losses will spur larger negative reactions, absent any change in transparency. Risk signals and blame attributable to incompetent risk management seems particularly important to public concerns.[31]

Incentives and Operational Risk

In addition to understanding how human perceptions and the processing of negative risk events can alter our value perception with respect to the true value of an enterprise risk management system or the value of an enterprise, there are also important psychological aspects to how humans within our systems will respond to incentives to perform better. In particular, work by Darley notes that rigid or overly quantified incentive or criterial control systems can create new risks of their own which are unknown or unexpected to those involved in the system.[32]

Darley's Law says that "The more any quantitative performance measure is used to determine a group or an individual's rewards and punishments, the more subject it will be to corruption pressures and the more apt it will be to distort and corrupt the action patterns and thoughts of the group or individual it is intended to monitor."

Darley's Law is a good warning to organizations that employ overly objective incentive or valuation systems. Humans are quite adept at manipulating rules to personal benefit. Success in recognizing this and in aligning incentives with behavioral objectives means that incentives must be carefully crafted so that the mix of measurable and qualitative inputs to the award match the behavior desired from the individual being incented. We must, as a first root, understand how humans respond to incentives and controls before we are able to build structures to match desired behaviors with compensation.

In 2001 the Risk Management Group (RMG) of the Basel Committee on Banking Supervision defined operational risk in a causal-based fashion: 'the risk of loss resulting from inadequate or failed internal processes, people and systems…'

Darley describes compensation and incentive programs as being 'criterial control systems'.[33] We set criteria for people's performances, measure, and reward or punish according to a process or system. The general intent of criterial control systems is to develop calculations or, in the business vernacular, "metrics" of how individual contributions have helped the organization to reach corporate goals. By inference, the corporate goals are metrics like share price, earnings and market share, expecting that the company will be rewarded by "the market" for making goals and punished for not doing so. Such systems are designed to pay off those who make their numbers and punish those who do not.

Incentive systems, simple or complicated, are typically based on objective measures upon which all parties agree, ex ante. Employers formulate a choice and employees respond to the potential outcomes perceived and the risks with which they associate them.

The appeal for the employer of such systems is in the perception that they provide more predictable budgeting, they may make employees behave more like owners and they help to retain attractive human capital.

Such systems, though, may inadvertently attract a concentration of a certain type of human capital. Employees who are averse to subjective systems under which they perceive less control are more likely to be drawn to highly objective or criterial control systems. The cause of their preference may be related to a level of trust in organizations, or something deeper in the personality of the employee. Whatever the source, the more rigidity there is in a criterial control formula; the more tightly defined will be the personality attracted to it and the greater the potential impact of concentrated misalignment.

Prospect Theory research has yielded numerous examples of how the framing of a choice can greatly alter how that choice is perceived by humans. If the behavior that an organization is seeking to stimulate through criteria-based incentives provides the employee with a choice in an 'incorrect' manner, the organization might be creating risk of which it is not aware, or, in fact, exacerbating risk that it thought the incentive system was reducing. Further, this risk might be highly concentrated in places where its realization it is also likely to have high impact, like trading desks, sales teams or business line management.

Darley also suggests that a highly objective system is not necessarily a morally neutral system.[34] Objective systems may create certain pressures on the actors within the system that may be not at all what the performance

measurers intended. This goes beyond the framing issue of Prospect Theory and into even more complex behavioral notions.

Three general sorts of occasions arise when the criterial control system is not morally neutral:[35]

> *1. A person, in hopes of advancement or in fear of falling behind, "cheats" on the performance measurement system by exploiting its weaknesses to "make his or her numbers." Others who see this, and see this action succeeding, are then under pressure to cheat also. There is a diffusion of a corrupt innovation that corrupts the individuals within the system.*

This group behavior can become pervasive. Consider two employees at the same level in an organization, both seeking advancement within the organization. If one succeeds in cheating, the second may perceive his/her chances for promotion slipping away. That person is thus pressured to engage in the same or 'better' cheating. The increased cheating is more likely to stimulate cheating behavior by other advancement-hungry peers.

> *2. Or a person, with the best will in the world, does what optimizes his or her performance measurements, without realizing that this is not what the system really intended. A performance measurement system is a powerful communication that the authorities have thought these issues through, and want what they reward. The individuals in the system are to some extent relieved of their responsibilities to think through the system goals, and to independently determine their contributions to those goals.*

In this instance, the rules of the game have been defined and the employee simply plays the game to their highest benefit.

> *3. Or a person who has the best interests of the system in mind, may "game" the performance measurement system in various ways, to allow the continuation of the actions that best fulfill his or her reading of the system goals. However, this "takes underground" those activities, and diminishes the possibilities of dialogue about system goals or modifications in system measurements.*

There is ample evidence of Darley's Law being realized in financial loss case studies like Enron, Joseph Jett and Kidder Peabody, National Australia Bank and Barings. See Koenig, for a more detailed examination of these cases in this context.[36]

Another approach to understanding the human response to the framing of incentives or expectations is highlighted by Angelova as risk-sensitive foraging theory.[37] The argument made is that real-life has baselines, such as death, or total capital, below which one must not fall. These baselines can affect how one chooses risk or processes risky options.

Suppose that a sales person needs to realize $2MM in sales in order to keep their job. Two sales approaches that both have a $2MM expected value are available, but one has greater variability, while the other guarantees $2MM in sales. The rational sales person should choose the approach with no variability as that ensures their survival. However, if the requirement to maintain employment is shifted to $2.1MM, the sales person must choose the riskier approach or realize the loss of their job with certainty. They will, therefore, move from risk-averse behavior to risk-loving with only a modest change in the paradigm that they face.

Poorly framed incentive structures have broken systems. These structures are often not given enough attention, if any at all, by traditional enterprise risk management programs. Yet, they fall into the category of low-probability, high-impact events and have the potential to dramatically affect the value of the firm in a negative sense when their crafting was an attempt to shift the value upward.

Conclusion

Within most organizations the debate about whether an enterprise risk management function adds value is less contentious than even five years ago. However, there are still ample situations in which risk management is either not being used, is not well understood or is undervalued because of a lack of appreciation for the importance of how humans respond to risk and opportunity and how risk management programs can be structured to mitigate the risks of such reactions.

In effect, through enterprise risk management, we are attempting to reframe the perceptions, of investors, customers and liquidity providers, of the system to which risk management is being applied. We are seeking to increase its value by understanding what risks are perceived to be most important by those most important to our enterprise.

Psychological research being applied in past decades to finance and economics suggests that many of our traditionally held assumptions about valuation and utility are not as complete or effective as had been previously assumed. In particular, traditional models of valuation have not placed enough emphasis on the perceived impact on value assigned by humans to loss, extreme loss and rare events. When this increased valuation or *loss avoidance* is taken into account, enterprise risk management

systems, designed to create ductile systems (corporations, firms or other), receive greater importance and the cost-benefit decisions about preemptive risk management initiatives become less subject to error via a negative decision.

Understanding that risk events need not lead to an amplification of their impacts, which risk events might spur emotional reactions, how transparency can reduce this effect via a movement down the unknown risk spectrum and understanding how people evaluate prospects can dramatically and positively alter the value of our systems.

The literature on human responses to risk and opportunity, while relatively new, is quite vast. Only a very small segment of that research has been discussed in this chapter. Readers are recommended to study the works of Kahneman and Tversky, Weber, Slovic and Darley in particular. For those interested in a highly concentrated review of some of the psychological influences on finance theory, see Shiller.[38]

One final note which serves as a warning is that some of the research has found evidence of something called *single-action bias*. This expression was coined by Weber for the following phenomenon observed in a wide range of contexts.[39] Decision-makers are very likely take one action to reduce the risk that they encounter but are much less likely to take additional steps that would provide incremental protection or risk reduction. The single action taken is not necessarily the most effective one. Regardless of which single action is taken first, decision-makers have a tendency to stop from taking further action presumably because the first action suffices in reducing the feeling of fear or threat. In the absence of fear or dread response to a risk, purely affect driven risk management decisions will likely result in insufficient responsiveness to the risk[40].

As the understanding of human behavior advances so too will the practice of enterprise risk management, adding greater value to the systems in which it is practiced.

---

1 Kloman, F. (2007). What Is Risk Management?, Unpublished, Seawrack Press, Inc., Lyme, CT 06371

2 Slovic, P. & Weber, E. (2002). Perception of Risk Posed by Extreme Events, prepared for discussion at "Risk Management Strategies in an Uncertain World", April 12-13.

3 Kahnemann, D. & Tversky, A. (1979). Prospect theory: An analysis of decision under risk, *Econometrica*, 47:2, 263-291.

4 Koenig, D.R. (2004). Understanding risk management as added value, *Derivatives and Risk Management Handbook*, Euromoney Yearbooks

[5] Weber, E. (2003). Origins and Functions of Perceptions of Risk, presentation at NCI Workshop on Conceptualizing and Measuring Risk Perceptions, Feb. 14-14.
[6] Markowitz, (1954).
[7] Weber (2003), op cit.
[8] Ibid.
[9] Pidgeon, N., Kasperson, R.E. & Slovic, P. (2003). The Social Amplification of Risk, 13-46, Cambridge University Press, Cambridge, UK
[10] Kasperson, J.X., Kasperson, R.E., Pidgeon, N. & Slovic, P. (2003). The social amplification of risk: assessing fifteen years of research and theory, in The Social Amplification of Risk, edited by Pidgeon, N., Kasperson, R.E., & Slovic, P., Cambridge Press, Cambridge, UK.
[11] Slovik & Weber (2002), op cit.
[12] Ibid.
[13] Kasperson et al. (2003), op cit.
[14] Weber, E. (2001), Risk: Empirical studies on decision and choice, in International Encyclopedia of the Social & Behavioral Sciences, Elsevier Science, Ltd
[15] Ibid.
[16] Slovik & Weber (2002), op cit.
[17] Weber, E. (2004), Who's afraid of poor old age? Risk perception in risk management decisions, in Pension and Design Structure by Mitchell, Olivia S. & Utkus, Stephen P., Oxford University Press
[18] Slovik & Weber (2002), op cit.
[19] Weber (2004), op cit.
[20] Angelova, R. (c. 2000). Risk-Sensitive Decision-Making Examined Within an Evolutionary Framework, Blagoevgrad, Bulgaria.
[21] Slovik & Weber (2002), op cit.
[22] Ibid.
[23] Ibid.
[24] Ibid.
[25] Weber (2004), op cit.
[26] Weber, E. (2006). Experience-based and description-based perceptions of long-term risk: Why global warming does not scare us (yet), *Climate Change* 77: 103-120.
[27] Weber (2004), op cit.
[28] Weber (2006), op cit.
[29] Slovik & Weber (2002) op cit.
[30] Weber (2001), op cit.
[31] Kasperson et al. (2003), op cit.
[32] Darley, J.M. (2001). The dynamics of authority in organizations and the unintended action consequences, In J.M. Darley, D.M. Messick, & T.R. Tyler (Eds.), Social Influences on Ethical Behavior in Organizations, pp. 37-52 , Mahwah, NJ: L.A. Erlbaum Assoc.

[33] Darley, J.M. (1994), Gaming, Gundecking, Body Counts, and the Loss of Three British Cruisers at the Battle of Jutland: The Complex Moral Consequences of Performance Measurement Systems in Military Settings, Unpublished Speech to Air Force Academy, April 6, 1994

[34] Ibid.

[35] Ibid.

[36] Koenig (2004), op cit.

[37] Angelova (2000), op cit.

[38] Shiller, R.J. (1999). Human behavior and the efficiency of the financial system, in Handbook of Macroeconomics, Taylor, J.B. & Woodford, M., Eds., Chapter 20, Volume 1C.

[39] Weber, E. (1997). Perception and expectation of climate change: Precondition for economic and technological adaptation, in Bazerman, M., Messick, D,m Tenbrunsel, A. & Wade Benzoni K (Eds.), Psychological Perspectives to Environmental and Ethical Issues in Management (pp. 314-341). San Francisco, CA: Jossey-Bass.

[40] Weber (2004), op cit.