



Examining risk tolerance in project-driven organization

Young Hoon Kwak^{a,*}, Kenneth Scott LaPlace^{b,1}

^a*Project Management Program, Department of Management Science, Monroe Hall 403, The George Washington University, 2115 G Street, Washington, DC 20052, USA*

^b*Cambridge Associates, 4100 North Fairfax Drive, 13th Floor, Arlington, VA 22203, USA*

Abstract

Risk tolerance is often misunderstood or overlooked by project managers. The levels and perspectives of risk tolerance are dynamic throughout the life of the project. Risk tolerance has three different perspectives when you are involved in a project: firm, project manager, and stakeholder. The firm's risk tolerance varies according to the firm's financial stability and project diversification. A project manager's risk tolerance is affected by job security and corporate culture. The stakeholder's risk tolerance is influenced by project objective. Unfortunately, failures in communication between the stakeholder and project manager are quite common because there are few applicable tools available to support the process. The project success will depend on agreeable level of risk tolerance and support of compensation policies, corporate culture, performance reviews, and early risk management planning.

© 2004 Elsevier Ltd. All rights reserved.

Keywords: Risk tolerance; Project management; Organizational culture; Technology-driven organization

1. Defining risk and risk tolerance

Issues involving risk are often difficult to distinguish and misunderstood by those making vital decisions for firms and projects. Risk is not tangible or visible, therefore, managers' risk perceptions in a particular project varies by risk characteristics and project's internal and external environment. Therefore, it is important to first define "risk" and "risk tolerance" as it relates to project management in a technology-driven organization.

March and Shapira (1987) observe that according to classical decision theory, risk is generally understood to be the distribution of possible outcomes, their likelihood, and their subjective values. In project management, this definition can be applied to time, cost, performance, and many other influential factors in any project that impact these three concerns. However, project managers, firms, and stakeholders rarely share the very same view or opinion of what the possible outcomes are for a project, much less their likelihood. Kahneman and Tversky (1979) and Tversky and Kahneman (1992) suggest that the reference points that people use to evaluate risky

prospects affect risk-taking. In this respect, risk tolerance is a subjective notion in the absence of clear and uniform communication and tools for risk analysis.

Risk tolerance is still a developing area of research because of its human dynamics. Pratt (1964), Arrow (1965), and Ross (1981) possessed a far too simple conception of risk tolerance: to put it simply, individual decision-makers are risk averse. In fact, a person does not necessarily choose to be compensated for variability in outcomes. Many other circumstances shape attitudes toward risk, and thus risk tolerance is a complex topic demanding a more complex definition.

Taking big risks can be beneficial to a firm that is able to accept them because it enables opportunity. For this reason, risk must be defined as including the probability of both good and bad outcomes. It is in this context that we analyze risk tolerance correctly and understand some managers' inclination for risk-taking.

Wilemon and Cicero (1970) point to two categories of "risk" which pertain to project managers and concern them most. These are project risk and professional risk. Project risk applies to the uncertainties for a project manager in achieving a project's goals in terms of time, cost, and performance. These risks are the main subject of risk management as they apply to project management. Professional risk deals with a project manager's uncertainties with respect to future job advancement and reward. This type of risk receives less

* Corresponding author. Tel.: +1-202-994-7115; fax: +1-202-994-2736.
E-mail addresses: kwak@gwu.edu (Y.H. Kwak), klaplace@cambridgeassociates.com (K.S. LaPlace).

¹ Tel.: +1-703-526-8500.

attention, but it can potentially drive a project manager’s decisions and cause those decisions not to be in line with defined risk tolerance levels.

2. Modeling and quantifying risk tolerance

Risk tolerance concerns both the probabilities of inherent risk occurrences taking place and the resulting impact of those occurrences. Tools and techniques have been developed to display these components for each risk and how the firm’s risk tolerance weighs against them. Fig. 1 depicts one illustrated by the Office of Government Commerce (OGC, 2001) using probability/impact matrix to summarize risk profiles.

OGC offers a risk profile generator on its website (www.ogc.gov.uk) that uses project risk register information to generate such a profile. The process begins with the firm determining how much of a negative impact it is willing to risk enduring given a probability. With this information, the risk tolerance line is mapped out. Each risk is plotted according to its perceived likelihood of occurring, as well as the impact it would have should a worst-case scenario happen. With this information charted out, the firm can identify the individual risks that lie above the firm’s tolerance level and focus resources towards those.

The utility curve is another straightforward tool for understanding risk tolerance. A concave utility curve shown in Fig. 2 demonstrates a risk-averse decision-maker while Fig. 3 shows a risk-taker. Theoretical tools such as this one can provide some assistance for managers as they define how much risk is acceptable in their project and make decisions accordingly.

When measuring risk and determining acceptable levels for tolerance, it is imperative that projects are viewed as a whole. By taking on multiple projects with uncorrelated or negatively correlated outcomes, a firm builds a portfolio of projects whereby the overall level of risk is lower than what one would perceive by looking at projects individually. Project risk is not uncommon to investment portfolio theory in this regard. As Kahneman and Lovallo (1993) recognize,

managers make fundamental errors in their forecasting and decision-making by ignoring this important facet of risk measurement.

3. Why is risk tolerance important?

According to Jarrett (2000), risk is not only a probability of success, but is also always a probability given a set of premises. The decision-maker’s risk tolerance must always be coupled with the established definition of risk. Though risk tolerance is often a neglected topic of discussion in many firms, there are numerous reasons why top management, project managers, and stakeholders should all have a unified vision and firm grasp of it in connection with any project.

Attention to risk tolerance leads to more efficient use of resources because the project team has a better understanding of how much of the project’s risk should be remedied. Managing risk can be an expensive scheme; therefore, it is important not only to prioritize risks and address the most crucial ones, but also to know how much to reduce them so that the risk is acceptable. The project team should have a better understanding of how far down the list of prioritized risks should go. This will result in improved decision-making that leads to lower costs, better performance, and a shorter duration of the project.

Minimizing risk as much as a project’s budget is quite straightforward and is the approach many firms take. Conversely, recognizing when a higher level of risk is suitable and accepting that situation to reap the benefits of innovation is much more difficult. Ahmed (1998) argued that many companies only pay lip service to the idea of innovation and that a precious few possess a culture to promote smart risk-taking. Great financial windfalls and industry dominance do not come without some measure of risk. When a firm’s strategy is to be first to market a new product, it is imperative risks be taken to ensure the product is not held up in development. In instances such as this, the project manager should have a detailed understanding of the firm’s tolerance level for the possible occurrence of

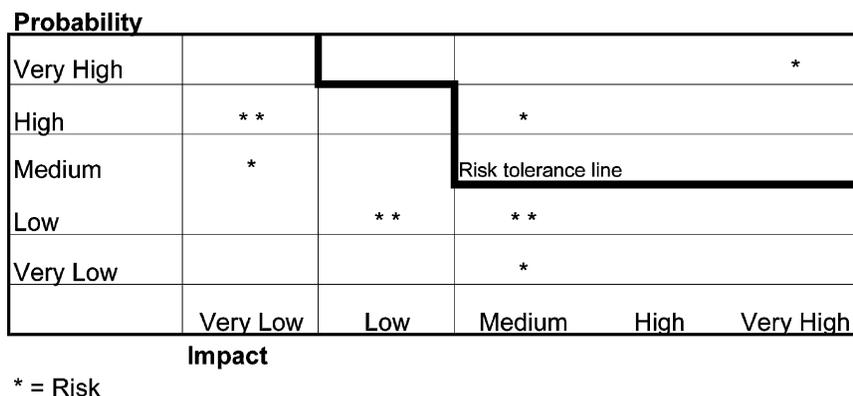


Fig. 1. Probability and impact matrix.

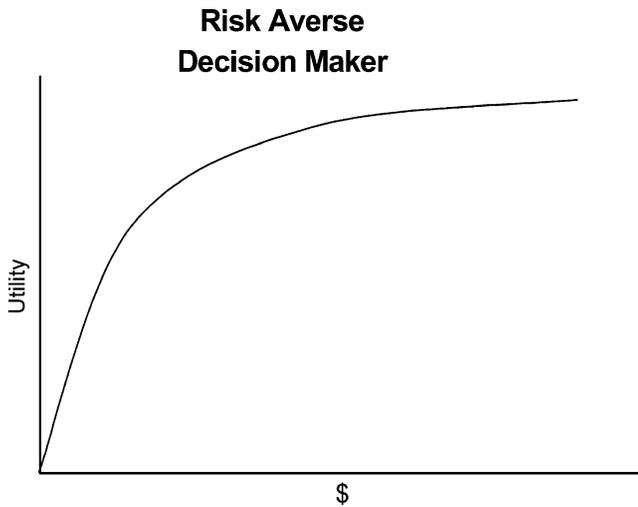


Fig. 2. Concave utility curve (risk-averse decision maker).

every sizeable risk. Because defined risk tolerance levels are rarely communicated effectively throughout the firm, lower level employees and managers are rarely willing to try to innovate and engage in activities that depart from traditional business.

4. Influencing factors specific to the firm

Risk tolerance is such an interesting topic because it is so dynamic and fluid. A firm's acceptance of risk changes throughout the duration of a project. For instance, as Daw (1999) notes, a company's commitment and investment in the project grows and more is at stake through its progression. Even though the project has fewer risks later, the ones that still persist can be even more detrimental. Under this most common scenario, the firm's risk tolerance could be graphed over time as shown in Fig. 4.

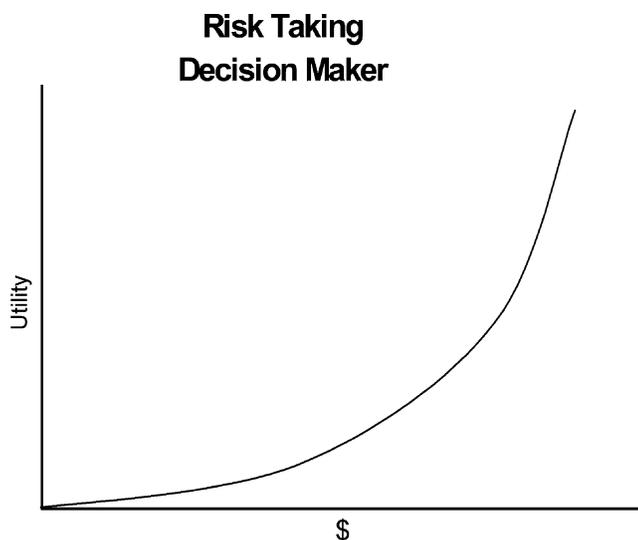


Fig. 3. Convex utility curve (risk-taking decision maker).

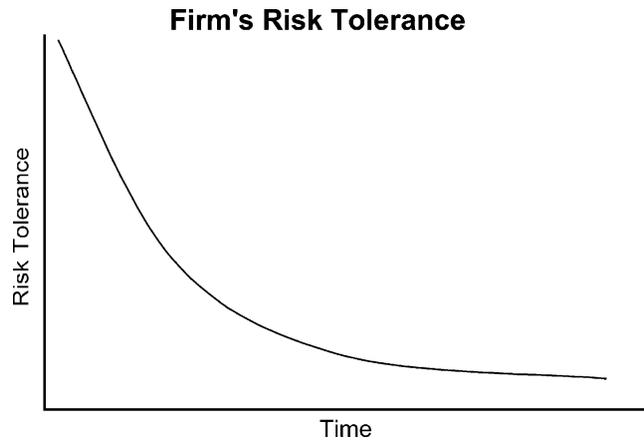


Fig. 4. Firm's risk tolerance.

As touched upon earlier in the discussion of measuring risk tolerance, firms may lower their overall risk exposure by taking on multiple projects with uncorrelated or negatively correlated outcomes. While this is true for the firm, it is not true for a project manager dedicated to one project. For this reason, upper management must make it a point to ensure project managers understand their project's role within the context of the aggregate project portfolio.

Both a firm's financial status and industry status impact its risk tolerance. A firm in financial distress, with mounting debt and dried up cash flow, is generally very willing to gamble in hopes of hitting it big. Likewise, a firm watching its market share deteriorate and its competitors passing it by is more likely to push new projects through as quickly as possible, ignoring dangerous risks, in hopes of recapturing business. Firms faced with severely adverse conditions are apt to choose high-risk gambles in place of sure losses (Kahneman and Lovallo, 1993).

Kahneman and Lovallo (1993) also argue that because firms have limited resources and various project proposals competing for them, there is an embedded incentive for overly optimistic estimates and forecasts. Combined with this, any expression of pessimism is often construed as disloyalty to the firm or the project team. These factors lead to serious concerns over whether well-informed decisions are made in line with established risk tolerance levels. It is no wonder most projects finish late, over budget, out of scope, and without meeting all the initial goals.

A project management study, cited by Wilemon and Cicero (1970), of the Apollo space program revealed projects could be plagued with conflicting viewpoints and tolerances of risks. While the project manager accepted a reliability index of "x" for a particular component, the R&D project participants outside of the project manager's immediate work unit insisted on a higher reliability. It is extremely difficult for all project participants to agree on risk tolerance levels of various components throughout the life of the project. Over time, this tends to be very costly to the firm.

5. Influencing factors specific to the project manager

A lack of understanding on management's part of risk, or even a perceived lack of management's understanding on the part of the project manager, can lead to misconceptions of risk tolerance. Daw (1999) recognizes how project managers many times feel that by simply identifying risk, they expose themselves to questions of whether or not they are good at their job. Their thought is that management will suggest risks should already be under control and that all risks are bad. As discussed earlier, risks are not all bad, but this scenario stresses the importance of open dialogue between the project manager and upper management.

Project managers are extremely susceptible to unjustified optimism and unreasonable risk aversion (Kahneman and Lovallo, 1993). There is rarely time or readily available information to engage in Bayesian forecasts and detailed probability analysis for every problem that confronts a project manager. So, project managers develop views of themselves of being prudent risk-takers even though many decisions are necessarily based on a given portion of the facts and plenty of intuition. What transpires in most managers' minds is an "optimistic denial of uncontrollable uncertainty" (Kahneman and Lovallo, 1993). Without proper recognition of inherent risks, any previous establishment of risk tolerance levels is nullified.

Naturally, a project manager, or any employee for that matter, weighs credit and blame when making decisions. A project's visibility and impact heavily influence a project manager's personal risk tolerance. If the manager possesses a strong drive to climb the corporate ladder, he or she may accept more risk in a highly visible project in an effort to gain accolades should the project come through. In a less visible project, there is less incentive for risk-taking. This can be in contrast with the firm's risk tolerance profile of a willingness to accept greater risk on smaller projects than larger visible projects.

March and Shapira (1987) argue that most managers fail to recognize the uncertainty about positive outcomes as a critical component of risk. Risk is too often associated with only negative outcomes. Most firms lack an adequate understanding of risk tolerance as a component to innovation. Project managers must be trained to dissect project risk absent of the myopic view that all risk is bad. It is important to note that risk and opportunities are related and opportunities cannot be realized by taking risks. Risk is essential to making progress and the key is to balance the two (Kirkpatrick et al., 1992).

Further, managers exhibit a reluctance to quantify risk once its existence is confirmed. While some managers pay lip service to what they think should be done to quantify risk, only a very few actually put it into action because, the quantification of risk requires heavy involvement from functional managers particularly in a matrix organization (Globerson and Zwikael, 2002). However, as evidenced by Ibbs and Kwak (2000), functional managers tend to be of

very little assistance in carrying out risk management processes, so the project manager is left to take care of him or herself. Risk quantification however is an important component of a risk management process, and without it, risk tolerance is easily exceeded and projects are jeopardized.

6. Influencing factors specific to the stakeholder

The stakeholder is the customer or client for which a project is being carried out. For example, NASA was a stakeholder of Thiokol's project to build solid rocket boosters. In this project, millions of dollars were at stake, and more importantly, lives were on the line. Risk tolerance levels must be examined by the stakeholder and conveyed to the project team, regardless of whether the tolerance level is low because of safety concerns. The purposes behind a project and the project's ultimate goals are generally laid out very early in the relationship between a contractor and client, and risk tolerance levels should be set and defined at the same time.

A clear communication strategy is paramount and the OGC (2001) proposes two main steps. First, the firm handling the project should identify who it is they need to establish channels of communication with, through which good and bad news can be delivered. This is very fundamental, but yet often missing, thus resulting in miscommunications of risk tolerance levels. The second step is to identify whose opinion, positions, and interests the firm should be aware of. This enables the firm to manage issues accordingly and more readily exploit opportunities. If the project manager does not receive input from the appropriate representatives of the stakeholder, or the messages are not cohesive, the project performance will suffer and accepted risk levels will not be met.

As expressed by Globerson and Zwikael (2002), the difficult reality is that very few formal tools and techniques exist to support the project manager in the communications area. Some unstructured tools do exist, but they are vague and fail to offer project managers with an easy ability to relate with stakeholders. As a result, projects all too often fail to meet all the stakeholder's criteria and finish late, over the budget and not meeting the project's objectives.

7. Recommendations and conclusion

The risk tolerance has been defined and modeled, the importance of its assessment has been put forth, and its influences have been put into context with relation to the firm, project manager, and stakeholder. What can be done to ensure that the hazards of deficient risk tolerance analysis are avoided? Followings are the possible steps.

First, a specific risk management plan should be put in place that pays very detailed attention to risk tolerance levels. It should address risk tolerance not only specific to the firm, but also with regard to the key participants and stakeholders of project. Very early assessment often seems

tedious and burdensome, but can pay huge dividends later as the project's issues become more large and complex.

Second, a firm should review its compensation policies for project managers and other employees. People weigh the possible rewards in making decisions that impact projects. By initiating a compensation structure whereby a portion of a person's salary is at risk and based on performance, a firm influences that person's likelihood of taking risks. This is a tool that firms can use to either increase decision-makers' risk-taking or increase their risk aversion.

Third, it is vital for companies to possess an organizational culture that supports proper risk-taking and innovation. Infusing a firm with a culture of innovation and calculated risk-taking is not an easy task. There are numerous factors that influence corporate culture and avenues to take to change culture (Ahmed, 1998). Risk-taking should be well thought out and measured. Project managers must be trained and prodded to quantify whichever risks it makes sense to do so since it is not uncommon to find managers failing in this regard. It is difficult to gather the necessary data; so upper management should lend a hand in getting functional managers involved in the risk management process.

Daw (1999) recommends as part of risk training for project managers to ask four questions:

- Am I a risk-taker or avoider?
- What about my project sponsor?
- How much will the project benefit my organization?
- What is the project team's experience and expertise?

By going through the process of addressing these issues, a project manager will go a long way in understanding his or her risk tolerance level as well as that for the project team and firm as a whole.

Fourth, comprehensive performance reviews of project managers are another important component for maintaining a shared understanding and vision of risk tolerance. In reviewing the project manager's performance, the upper management should critique the project manager's apparent level of risk aversion. By doing so, the project manager receives formal guidance for future decisions.

Finally, in performing risk assessment, Kahneman and Lovallo (1993) point out that a decision-maker should adopt an outside view. This means a project manager should make forecasts not only on historical figures and facts pertaining to the project at hand but more on what has happened with similar scenarios outside of the project and even outside of the firm. By doing so, there is less chance the project manager will make overly optimistic forecasts naturally leading to failed projects.

Project risk tolerance is a crucial part of any risk management plan. While it is at the heart of decision-making, it is all too often overlooked. Risk tolerance cannot be analyzed at the beginning of a project and later ignored, because it is ever changing with numerous influential

factors. Fortunately, this complex issue is coming to grips, thereby ensuring the integrity of valuable and potentially innovative projects.

References

- Ahmed, P.K., 1998. Culture and climate for innovation. *European Journal of Innovation Management* 1(1), 30–43.
- Arrow, K.J., 1965. Aspects of the Theory of Risk Bearing. Yrjo Jahnssonis Saatio, Helsinki.
- Daw, C., 1999. Risk training—the neglected part of project management. *The Training Report*. Crownhill Publishing. Available from www.trainingreport.ca
- Globerson, S., Zwikael, O., 2002. The impact of the project manager on project management planning processes. *Project Management Journal* 33(3), 58–64.
- Ibbs, C.W., Kwak, Y.H., 2000. Assessing project management maturity. *Project Management Journal* 31(1), 32–43.
- Jarrett, E.L., 2000. The role of risk in business decision-making, or how to stop worrying and love the bombs. *Research—Technology Management*. Industrial Research Institute, pp. 44–46.
- Kahneman, D., Tversky, A., 1979. Prospect theory: an analysis of decision under risk. *Econometrica* 47(2), 263–297.
- Kahneman, D., Lovallo, D., 1993. Timid choices and bold forecasts: a cognitive perspective on risk taking. *Management Science* 39(1), 17–31.
- Kirkpatrick, R.J., Walker, J.A., Firth, R., 1992. Software Development Risk Management: an SEI Appraisal. *Software Engineering Institute Technical Review '92 (CMU/SEI-92-REV)*. Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA, 1992.
- March, J.G., Shapira, Z., 1987. Managerial perspectives on risk and risk taking. *Management Science* 33(11), 1404–1418.
- Office of Government Commerce, 2001. A8: Managing Risk. Crown. Available from www.ogc.gov.uk
- Pratt, J.W., 1964. Risk aversion in the small and in the large. *Econometrica* 32, 122–136.
- Ross, S.A., 1981. Some stronger measures of risk aversion in the small and in the large with applications. *Econometrica* 49, 621–638.
- Tversky, A., Kahneman, D., 1992. Advances in prospect theory: cumulative representation of uncertainty. *Journal of Risk and Uncertainty* 5, 297–323.
- Wilemon, D.L., Cicero, J.P., 1970. The project manager—anomalies and ambiguities. *The Academy of Management Journal* 13(3), 269–282.

Dr. Young Hoon Kwak is a faculty member of the project management program at the management science department at The George Washington University (GWU) in Washington, DC. He received his M.S. (1992) and Ph.D. (1997) in engineering and project management from the University of California at Berkeley. Before joining GWU, he was a post-doctoral scholar at Massachusetts Institute of Technology. He has years of experiences consulting for Fortune 500 companies and various federal governmental agencies. Dr. Kwak's main research interests include project management and control, risk management, and technology management. For more information visit his homepage at <http://home.gwu.edu/~kwak>.

Kenneth Scott LaPlace is a senior research associate at Cambridge Associates, an investment advisory firm to endowed nonprofit institutions, international organizations, private clients, and corporations. Kenneth oversees the development of marketable alternative asset manager coverage, including long/short hedge funds, distressed securities, and arbitrage managers, within the firm's investment manager database group. Kenneth received his B.S. in Finance from Virginia Tech (1996) and M.B.A. (Magna Cum Laude) from The George Washington University (2002).