# RISK.01

# Knowledge-Based Proactive Project Risk Management

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Project risk management (PRM) is an invaluable facet of project management. It has always been present in one form or another, perhaps, for example, in the guise of informal discussion, carefully drafted terms of contract, mental calculation or, heaven forbid, *gut feel*. Times have changed though and over recent years there has been a growing number of professionals who have recognized the benefits of formally documenting, objectively analyzing and transparently managing risk (see Figure 1). There are however, almost as many different approaches to managing risk as there are practitioners.

| *'Hard' Benefits* | | *'Soft' Benefits* | |
|---|---|---|---|
| H1 | Enables better planning, scheduling and budgeting. | S1 | Improves corporate experience and general communication. |
| H2 | Increases the likelihood of a project adhering to its schedules and budgets. | S2 | Leads to common understanding and improved team spirit. |
| H3 | Leads to the use of the most suitable type of contract. | S3 | Helps distinguish between good and bad management (& good and bad luck!). |
| H4 | Allows a more meaningful assessment of contingencies. | S4 | Helps develop the ability of staff to assess risks. |
| H5 | Discourages the acceptance of financially unsound projects. | S5 | Focuses project management attention on the real and most important risks. |
| H6 | Contributes to the build-up of statistical information for better decision making. | S6 | Facilitates greater risk-taking, thus increasing benefits gained. |
| H7 | Enables a more objective comparison of alternatives. | S7 | Demonstrates a responsible approach to clients. |
| H8 | Identifies and allocates responsibility to the best Risk Owner. | S8 | Provides a fresh view of the personnel issues on a project. |

**Figure 1 – The Hard and Soft Benefits of Project Risk Management [5]**

Globalization over the last decade has encouraged the pursuit of overseas projects for many contractors (Aker Kværner, Skanska, Amec and Balfour Beatty for example) seeking to gain an international footing. By virtue of the fact that these players are operating in more uncertain environments, there are consequently much higher levels of risk that they need to manage. Additionally, with multinational construction companies taking more of a project management role, "most construction work [today] is undertaken by subcontractors resulting in many points of responsibility, greater problems of risk communication and less control over the way in which risks are distributed over the supply chain." [20] These trends are likely to continue and one should expect that we shall see risk management further evolve and reach higher levels of maturity within these organizations over the next few years. "As projects become more complex, so does risk management. [In the] era of mega projects, bets are bigger, rewards are larger and risks are greater. Even major corporations cannot afford to miscalculate the risks" [22].

## WHAT IS PROACTIVE PROJECT RISK MANAGEMENT?

Very often, people mistake a risk assessment or Monte Carlo simulation for risk management. Risk Analysis or risk assessment is just one component of a successful risk management program. For the best returns, risks are not just analyzed at one point in time, but continually reviewed throughout the project life cycle. Risks are dynamic. Risk profiles can change from one period to the next and associated Response Plans will need to be updated accordingly. In essence, this is risk management and by virtue of the fact that we are seeking to enact a Response Plan prior to the occurrence of a risk event(s), the approach is proactive. PRM becomes reactive if, for example, "unknown unknowns" transpire to become "known unknowns", and take up residency in the project risk Register. At that point in time, teams are only left to respond to those risks reactively.

In 2005, the US National Research Council defined the tenets of a proactive approach to project risk management through the following basic actions:

- "Establishing and maintaining management commitment to performing risk management on all capital projects.
- Starting the risk management process early in the project lifecycle.
- Including all key stakeholders in the process.
- Evaluating [and updating when appropriate] project risks and risk responses periodically during the project life cycle.
- Following through with [Response Plan] actions until risks are acceptable.
- [Align] a project's level of risk [with] cost and schedule contingencies. And,
- Effectively communicate to all key stakeholders the progress and changes to project risk and [response plans]" [24].

To the seasoned project veteran, this approach may not appear to provide anything particularly new. However, what needs to be recognized is that the key to a successful PRM process is for project risk to be formally discussed, documented, tracked and reported by the project Team in a consistent and structured way using a recognized and common language.

### A Brief History of Risk Management

Baker, Ponniah and Smith summarize an interesting history of risk management [4]. They describe the Asipu people in the Tigris-Euphrates valley providing services akin to a modern risk consultant, analyzing and advising on problems of the day, albeit usine data sources that were no more than signs from the gods! "So what's new?" the cynic may ask. They then go on to describe games played by primitive man using cubical knuckle or heel bones of deer or oxen. These artifacts are apparently found quite frequently by archaeologists in Egyptian, Sumerian, Roman and Assyrian sites along with scoring boards. Baker et al comment that it should follow that the mathematical calculation of averages, probabilities and so forth should perhaps be as old as these games; yet, the associated theories did not appear until 1,500 years later in the work of Pascal, Laplace and others. In 1792, the true prototype of modern quantitative risk analysis was provided by Laplace by way of an analysis of the probability of death with, and without, smallpox vaccination. In 1964, Hertz first coined the term "risk Analysis" when deriving the probability distribution of the rate of return of an investment project.

Although the practice of risk management began evolving in the insurance and financial sectors many decades ago, it has only become an integral part of the construction industry over the last few decades. The rapid advancement of technology has encouraged more wide spread use over the last ten years. In 2005, Schaufelberger acknowledged that, "the current level of risk analysis is often driven by the capabilities of the available tools and techniques. The depth of analysis could be improved by [amongst other things, the] use of advanced information technology capabilities to enable effective knowledge management and learning from experience, for example using artificial intelligence, expert systems or knowledge-based systems to permit new types of analysis" [27].

However, despite the coming of age of risk management as a profession, "there is no global [project risk management] industrial standard" [4].

## LOOKING FOR A GLOBAL STANDARD

Historically, it was not until the 1950s that project management was recognized as a separate management function. This specialized methodology differed from the more traditional management methods and was first

employed in government and corporate business [25]. It has taken a surprising half century, since Henry Gantt first wowed the world with his scheduling charts, for project management standards to become established. If the catalyst for that change has been globalization, dare we hope that a global standard for risk management emerges in a shorter time frame?

Del Cano and de La Cruz perhaps provide that hope since they suggest that we can not be far away from reaching a consensus. In 2002, they wrote that the UK Ministry of Defense, BSI (British Standards Institution), NASA (US National Aeronautics and Space Administration), US Department of Defense and US Department of Transport have adopted risk management processes that are orientated around four or five iterative phases [10]. Del Cano and de La Cruz describe these phases as including initiation, identification, analysis, response planning and control. They further acknowledge that the idea that risk management should be an important and integral part of project management by highlighting the fact that PRM, or project risk management, is widely recognized by the leading project management Institutions. Among the "most noteworthy, comprehensive and sound" processes, they praise PMBok-2000 and PRAM. Furthermore, "PRM practice is not very different in North America and Europe."

PRAM, otherwise known as the project risk Analysis and management Guide was first published in 1997 by the UK based Association of project Managers and was updated in 2004. The PRAM guide carries kudos because it was the first highly comprehensive project risk management process document to be developed by a large team, including both practitioners and academics.

## HILLSON'S RISK MANAGEMENT MATURITY MODEL

In the absence of global standards, how can an organization assess how well their project risk management program is developed?

As described earlier, some project management institutions provide insightful reading on what constitutes best practice, but it is perhaps Hillson's risk management Maturity model [15] that readily conveys to the reader the level to which a project risk management program is advanced.

> "[although] it appears that risk management is a mature discipline, it is still developing, and there is some way to go before its full potential is realised." [14]

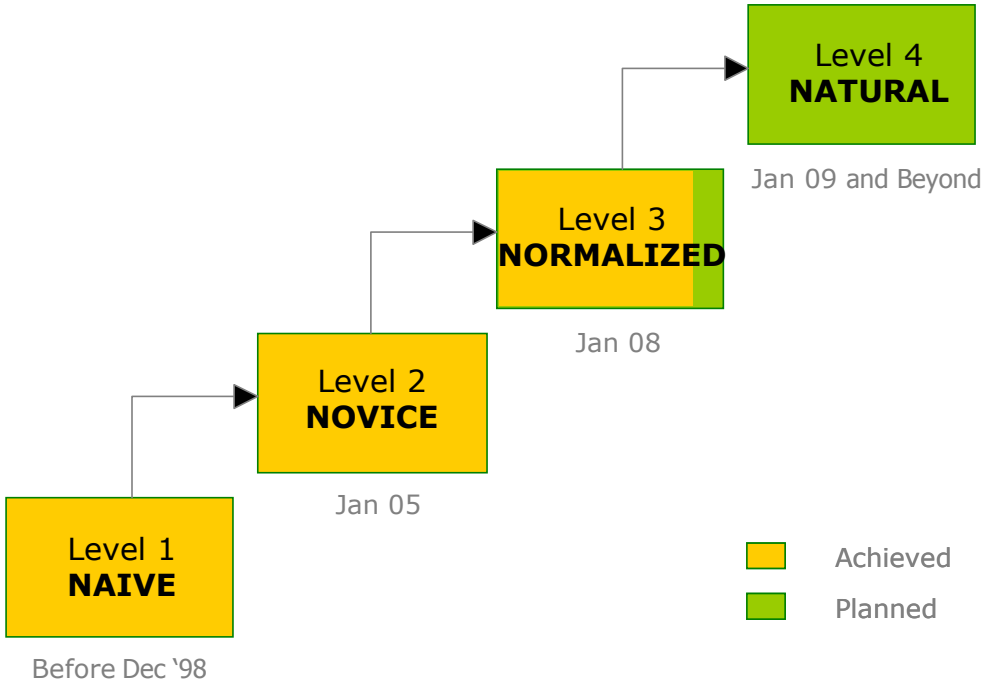


**Figure 2 – KBR's Development Compared Against Hillson's Risk Management Maturity Model**

Each level of risk management maturity shown in Figure is briefly described as follows.

- **Naïve**: at this level, the organization is unaware of the need for risk management.
- **Novice**: a small number of individuals within the organization begin to experiment with risk management but there's no generic, structured approach to manage risk.
- **Normalized**: risk management is included in normal business processes and consistently implemented on all or most projects. Generic risk management processes are applied in a formal way and the organization uses an integrated set of techniques and tools. The organizational culture includes an accepted policy for risk management. And,
- **Natural**: at this level, the organization has a risk-aware culture with a proactive approach to risk management, in all aspects of the business and with an emphasis on opportunity management. The organization is continuously updating its processes and constantly learning from experience.

An independent study conducted by del Cano and de La Cruz in 2002 concurred with Hillson's original findings by concluding that, "few organizations are currently at level 4; many organizations are either at levels 2 or 3, and a significant number remain at level 1" [10]. In addition, Walewski wrote in 2003 that, "Few owners and contractors have developed a process to optimize the portfolio of risks across an entire project life cycle," and assessments, "often fail to give adequate consideration to how [risks] may change over time" [31].

## KBR'S KNOWLEDGE-BASED PROACTIVE RISK MANAGEMENT

### How Does KBR's Project Risk Management Compare to the Industry Guidelines That We Have Described?

The state of the KBR solution is undergoing continuous development and is constantly adapting new, beneficial ways of working. KBR has established a "shared language and definitions for risk" that facilitate a common understanding across project teams [13]. Furthermore, KBR has risk management business processes that are consistently implemented on all or most projects. These processes revolve around five iterative and periodic steps which apply throughout the project lifecycle (see Figure 2). It is a generic framework that is adapted to meet the specific needs of a given project size and type. This and its associated terminology are largely influenced by the PRAM guide [8].


**Figure 2 – Sample PRM training aid (Copyright KBR Inc. 2007)**

In addition, and largely influenced by the PRAM guide, but not exclusively so [28, 30], KBR uses a risk breakdown structure (RBS) to organize and manage data at a tactical and strategic level. The RBS is not only a useful tool for risk identification, it also provides a useful structure against which to assign resources or even, as described by the pram guide, manage risk ownership. Risk data is in turn, managed by KBR's bespoke tool, RMS (risk management system). This lucidly labeled web based tool is used by personnel to capture, maintain and manage risk data at each stage of the PRM process.

RMS offers huge efficiencies, not only today, but with every day it ages. Unlike the majority of other industry processes, construction is renowned for the one-off nature of its projects. Traditionally, inefficiencies arise because as soon as a project team disbands, so the wisdom developed by them becomes diluted. RMS provides a means of capturing this wisdom in real-time. In the long-term, it also offers KBR the potential to look back on the knowledge base so that KBR may develop risk metrics and benchmarks. This will reveal for example, what are the most common risks that affect each branch of the RBS on particular projects, what were the most effective ways in which KBR responded and, based on past performance, what are likely to be the most realistic cost and schedule contingency predictions.

"With a single repository of best practices and learning, a centralized knowledge system helps companies accelerate their efforts to backfill their technical capability gaps, recognize and anticipate problems, and avoid reinventing the wheel across multiple projects" [22]. "Knowledge-based methodologies that assist in capturing and organizing risk management knowledge gained on past project for reuse on future projects, hold considerable promise for developing a comprehensive yet practical approach for use by industry." [8] One area where KBR is working to exploit this new treasure trove of risk data is in the development of animated or four-dimensional trending charts.

Doesn't that all sound fantastic? Surely, if a company has such well developed PRM processes and systems, they must have reached level four maturity and be natural risk management practitioners? Not necessarily.
The literature reviewed in the preparation of this paper was reassuring in its disclosure that the most common PRM process failures stem from either inadequate RRP (risk response planning) development or insufficient risk monitoring [17, 30].

And why is that? Simply because: PRM philosophies are still new for many people, change takes time and people adapt at their own speed.

Perhaps the most significant barrier to attaining level four risk management maturity is cultural.

## LEARNING TO OVERCOME CULTURAL BARRIERS

Even when an organization has all the best tools and processes in place, risk management cannot succeed if it is not embraced at a cultural level. One must work at nurturing and maintaining the highest levels of risk Awareness. Risk management needs to be a way of thinking that permeates through all levels of the company and project environments [29]. So how is that achieved? There is much leverage to be had from the HSE training or safety awareness campaigns which have, relatively recently, truly come of age. When looking back just 15 years or so at the various training campaigns, it really is quite surprising how effective those initiatives have been in turning around long held attitudes.

The idea that we look to other areas of industry is also supported by Hillson. He has suggested that the, "depth of analysis could be improved by [amongst other things, the] development of existing techniques from other disciplines for application within the risk arena, for example from value management, system dynamics, safety and hazard analysis, financial trading, etc." [14]

How do we best facilitate cultural change? Motivational theory aside, one aspect that has become apparent is that any new technological silver bullet will not get far if its intended users are not involved in its development from the outset. Recently, in **Cost Engineering Journal**, White wrote of the need to "engage all stakeholders in the development and/or adoption of a new system." [32] Experience has shown that it is so important to have end-user buy-in before believing that an IT development project can be considered complete. Moving away from knowledge based solutions and thinking more holistically, Hillson describes that, "risk management is often perceived as a specialist activity undertaken by experts using dedicated tools and techniques [and, in order for] the overall organization to gain the full benefits from implementing the risk process, it is important that risk management

should become fully integrated at both operational and strategic levels. Without such integration, there is a danger that the results of risk management may not be used appropriately (or at all), and that project and business strategy may not take proper account of any risk assessment." [8]

## PROJECT MANAGEMENT ZEITGEIST

"Some of us lag behind the advancing wave of the changing [Zeitgeist] and some of us are slightly ahead." [11] Clearly there has been significant growth in the interest shown toward all aspects of risk management. Simplistically, this can be seen in the increasing number of risk management tracks running at the AACE International annual meetings over recent years. More scientifically and as described earlier, del Cano and de La Cruz have identified through their work that the leading project management institutions promote the idea that risk management should be an important and integral part of project management. However, "with the best will in the world," we can not realistically expect the message delivered by these institutions to permeate and enlighten all organizational levels within the construction industry.

Conversely, where the importance of managing risk is wildly recognized "there is a tendency to manage risks in departmental, regional or functional silos". What continues to be "a surprise is the continuing high level of disagreement about appropriate risk distributions between those parties who are normally contractually linked (average 42 percent)" simply because, "there was no understanding of the extent to which risk perceptions differ and where they differ." "Effective risk communication [is crucially important and remains] a subject largely neglected in the construction management literature." [20].

The type of paradigm shift that is required to overcome these PRM process shortfalls can only be achieved at a personal level, and over timescales which may seem imperceptible.

As suggested earlier, one of the more striking and impressive cultural changes over recent decades concerns attitudes toward and health and safety in construction. Let us consider for example, Charles C. Ebbets' famous 1932 photograph of New York construction workers lunching on a crossbeam (Lunch atop a Skyscraper) [12]. Safety boots, hard hats, harnesses or cigarettes and alcohol; all these things are inversely abundant on the modern day construction site! Imagine if today somebody were spotted recreating that scene. It's likely the police would be called to talk the person down! So attitudes towards construction Health and Safety have significantly changed, albeit slowly.

We can only encourage attitudes to evolve. Some of our greatest challenges have to be met by well conceived training programs. Since "behavior breeds behavior," we must also lead by example, encouraging a frequent and open debate throughout the project lifecycle which engages all stakeholders, so that fair credence is given to where project risks lie and who is considered best able to bear that risk. As so often appears to be the case in the construction industry, contract negotiations need to be less about the surreptitious assignment of risk. If more could be made of partnering or alliancing, contract negotiations could in turn evolve and be more about the assignment of premium in recognition of the acceptance of risk.

## A SEED OF THOUGHT FOR A NEW ERA

Remember how innovative the triple constraint of time, cost and scope appeared not so long ago? Over time, this simple diagram has proven highly effective at illustrating the fundamental project management concept that one constraint can not be changed without impacting the others. This has slowly undergone some refinement over recent years. A simple web search using the words "triple constraint or "project triangle" returns hundreds of thousands of results revealing that there are many disparate groups have adopted this simple model. Interestingly, there are many subtle variations, with much debate over the relative influence each constraint has over another.

If cultural changes permit, perhaps the project management triangle may evolve into a more robust pentagon (See Figure )? The exact nature of the constraints is a topic for later debate but, for our purposes, the project management pentagon supports our goal of nurturing a paradigm shift by acknowledging that:

- Project teams are open to the idea of competing constraints and they are sophisticated enough to recognize that, on complex projects, more than three or four constraints must be clearly monitored in order to achieve the project objectives.

- Risk can help define the underlying uncertainty behind a project, in terms of individual constraints and the interplay between constraints. And,
- Risk management must be a fundamental facet of project management. It is not a bolt-on tool.

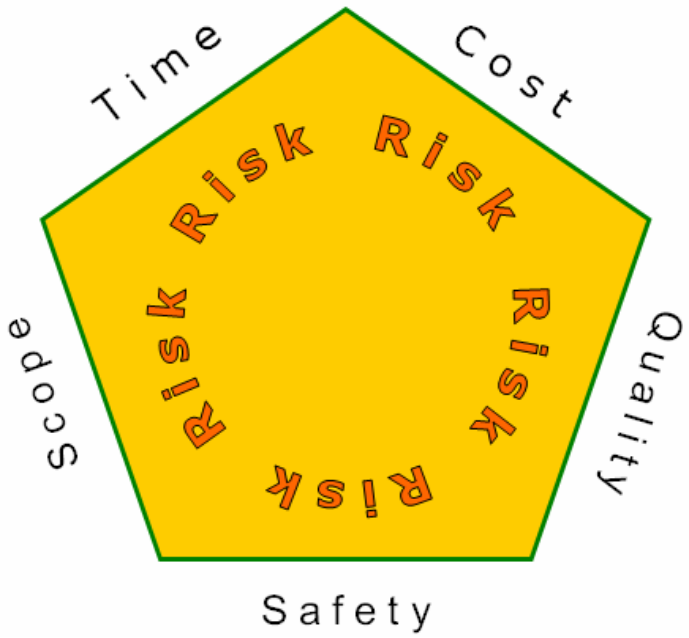


**Figure 4 – The Project Management Pentagon (Recognizing Risk Management as a Facet, Not a Bolt-On).**

Knowledge-based proactive project risk management is not a new idea. It is a concept that has been discussed theoretically for more than fifteen years. Few organizations within the construction industry successfully employ this approach on their project work. It is a way of working which is only most effective when it is employed in conjunction with the continuous support and input from all functional units within an organization. Knowledge-based Proactive project risk management is a facet of project management from which only the most mature organizations can fully benefit.

The key benefit of proactive risk management is that resources are assigned to areas where the greatest risks lie, as opposed to where the biggest fires rage. Proactive risk management is very much a pragmatic way of working toward project objectives. If project management is the art of getting things done, Proactive risk management is its scientific soul mate.

Looking ahead, our biggest challenge is to “create a culture in which risk management is everyone's job” [29]. The consulting firm, Accenture, succinctly state the reality of this challenge; “People within an organization tend to conceal operational problems until they get out of hand. Usually, this breakdown is the natural consequence of a system that has assigned risk management to specific individuals or to executive management that sees such projects simply as more work. Adequate reporting and oversight from leadership is not enough. Companies must also create a culture in which the entire organization—every employee, every function, every level—has the capability and the responsibility for managing risk.”

There is a need to develop strategic risk-based thinking within organizational culture. The denial of risk is common at senior management levels. Much of the value of implementing risk management can be diluted or lost if decision-makers do not properly take account of risk. risk management must be seen as an integral part of doing business, and must become “built-in not bolt-on”, a natural feature of all project and business processes, rather than being conducted as an optional additional activity [8].

As companies further develop their own levels of PRM maturity, and each major organizational unit becomes proficient in conducting their own form of risk management, it is only natural that they eventually combine, to pool their efforts. This will soon happen at the intra-organizational level and could possibly happen at the inter-organizational level, with risk managers becoming more closely involved with contract negotiations and change control, helping to ascertain the true premium associated with risk allocation.

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