



# Transforming project risk management into project uncertainty management

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## Abstract

This paper argues that all current project risk management processes induce a restricted focus on the management of project uncertainty. In part this is because the term ‘risk’ encourages a threat perspective. In part this is because the term ‘risk’ has become associated with ‘events’ rather than more general sources of significant uncertainty. The paper discusses the reasons for this view, and argues that a focus on ‘uncertainty’ rather than risk could enhance project risk management, providing an important difference in perspective, including, but not limited to, an enhanced focus on opportunity management. The paper outlines how project risk management processes might be modified to facilitate an uncertainty management perspective.

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## 1. Introduction

This paper suggests that project risk management (PRM) processes as currently operated have a limited focus which restricts the contribution to improving project management practice and hence project performance. The authors argue that a broader perspective concerned with managing uncertainty is needed.

A recent paper by Green [1] makes a related argument, although his characterisation of project risk management as ‘*primarily concerned with quantitative techniques*’ is inappropriately narrow, and we do not agree with his recommendation. Green’s concern is that established techniques of risk management pay too little attention to uncertainty associated with stakeholder interactions, and the uncertainties that ‘*characterise the strategic interface between construction projects and client organisations*’. Green argues for the use of Friend and Hickling’s ‘Strategic Choice’ approach [2] to project uncertainty, which seeks to aid decision making processes by conceptualising three types of uncertainty related to the working environment, guiding values, and related decisions. The present authors are sympathetic

to Green’s concerns. Further, as a generic framework the Strategic Choice approach is certainly capable of useful deployment in a project management context. However, as a generic process Strategic Choice lacks focus on project management issues. Rather than pursue this approach to enhance the management of uncertainty in projects, the present authors argue for transforming existing PRM processes into Project Uncertainty Management. Strategic Choice can be used within this framework as appropriate. This will facilitate and extend the benefits of what is currently PRM. However, it will also help direct attention towards areas of project related uncertainty and associated management issues that are not addressed in current PRM processes.

The authors have been moving towards this position over a number of years, in the light of issues that have arisen in consultancy work, conceptual development of existing techniques, and reactions of project managers to presentations on the subject. Nevertheless, the arguments and proposals presented here have not been widely tested. They are offered here to stimulate debate and to encourage empirical testing.

The arguments presented here begin by considering how use of the term ‘risk’ induces a restricted focus on the management of project uncertainty. The middle part

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of the paper identifies some basic kinds of uncertainty that need to be addressed in projects. The final part outlines how PRM processes could be modified to avoid inducing a restricted focus and to address a wider set of sources of uncertainty.

## 2. Problems with the term 'risk'

In dictionary definition terms 'risk' means: "*hazard, chance of bad consequences, loss, exposure to chance of injury or loss*" (Concise Oxford Dictionary). Such definitions illustrate one problem with the term 'risk'—its ambiguous use as a synonym of probability or chance in relation to an event or outcome, the nature of an outcome, or its cause. In an entertaining and well referenced paper, entitled "Against risk", Dowie [3] argues persuasively for abandoning use of the term 'risk' altogether. "*It is simply not needed*". Dowie argues that the term 'risk' is

an obstacle to improved decision and policy making. Its multiple and ambiguous usages persistently jeopardize the separation of the tasks of identifying and evaluating relevant evidence on the one hand, and eliciting and processing necessary value judgements on the other.

(The term) 'risk' contaminates all discussions of probability because of the implicit value judgement/s that the term always brings with it, just as it contaminates all discussions of value assessment because of the implicit probability judgement/s that it contains [3].

The present authors are inclined to disagree with Dowie about abandoning use of the term 'risk' completely, but we are very sympathetic to his concerns.

One of our concerns relates to the association of the term 'risk' with adversity, implying that project risks are potential adverse effects on project performance, and that sources of risk are 'things that might go wrong', or threats to the project. With this association, PRM would seem to be about identifying and managing threats to project performance. As is widely recognised, this view of PRM is restrictive because it fails to consider the management of opportunities, in the sense of 'potential welcome effects on project performance'.

In any given decision situation both threats and opportunities are usually involved, and both should be managed. A focus on one should never be allowed to eliminate concern for the other. Moreover, opportunities and threats can sometimes be treated separately, but they are seldom independent, just as two sides of the same coin can be examined at one at a time, but they are not independent when it comes to tossing the coin. Courses of action are often available which reduce or

neutralise potential threats, and simultaneously offer opportunities for positive improvements in performance. It is rarely advisable to concentrate on reducing threats without considering associated opportunities, just as it is inadvisable to pursue opportunities without regard for the associated threats.

Recognising this, guides published by the US Project Management Institute (PMI) and the UK Association for Project Management (APM) have adopted a broad view of risk. Their definitions of risk are very similar, as follows:

*Risk—an uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective* [4, p127].

*Risk—an uncertain event or set of circumstances that, should it occur, will have an effect on the achievement of the project's objectives* [5], (p 16).

These definitions encompass welcome 'up-side' as well as unwelcome 'down-side' effects. In spite of this, there is still a tendency for practitioners to think of risk in largely down-side, threat terms (a tendency which the authors are not always able to resist), and PRM as primarily threat management. For example, Table 1 lists references in the PMI guide [4] to risk in down side, threat terms which include: illustrative examples of risks as threats, terminology, descriptions of risk responses, and the use of probability impact matrices. The preponderance of such references suggests at least an emphasis, if not a pre-occupation, with threats rather than opportunities. This emphasis might reflect a difficulty in throwing off the commonly understood meaning of 'risk'.

Another of our concerns is the focus on 'events' or 'circumstances' which these definitions suggest. We suggest it is important to take uncertainty about anything that matters as the starting point of uncertainty management, defining uncertainty in the simple 'lack of certainty' sense.

## 3. Uncertainty management

To emphasise the desirability of a balanced approach to opportunity and threat management, the term 'uncertainty management' is increasingly used in preference to the more established terms 'risk management' and 'opportunity management'. However, uncertainty management involves rather more than the combination of risk management and opportunity management. Uncertainty management is not just about managing perceived threats, opportunities and their implications. It is about identifying and managing all the many sources of uncertainty which give rise to and shape our perceptions of threats and opportunities. It implies exploring and understanding the origins of project uncertainty before seeking to manage it, with no preconceptions

about what is desirable or undesirable. Key concerns are understanding where and why uncertainty is important in a given project context, and where it is not. This is a significant change in emphasis compared with most PRM processes.

#### 4. The scope of uncertainty

The scope for uncertainty in any project is considerable, and most project management activities are concerned with managing uncertainty from the earliest ‘Conception’ stage to the final ‘Support’ stage of the project life cycle (PLC) [6], clarifying what can be done, deciding what is to be done, and ensuring that it gets done. Uncertainty in the plain English sense of ‘lack of certainty’ is in part about ‘variability’ in relation to performance measures like cost, duration, or ‘quality’. It is also about ‘ambiguity’ associated with lack of clarity because of the behaviour of relevant project players, lack of data, lack of detail, lack of structure to consider issues, working and framing assumptions being used to consider the issues, known and unknown sources of bias, and ignorance about how much effort it is worth expending to clarify the situation.

In a project context these aspects of uncertainty can be present throughout the PLC, but they are particularly evident in the conceive, design, plan and allocate stages [6]. Here these aspects of uncertainty contribute to uncertainty in five areas: the variability associated with estimates of project parameters, the basis of estimates of project parameters, design and logistics,

objectives and priorities, and relationships between project parties. All these areas of uncertainty are important, but generally items become more fundamentally important to project performance as we go down the list. Potential for variability is the dominant issue at the top of the list, but ambiguity rather than variability becomes the more dominant underlying issue towards the bottom of the list. Uncertainty about variability associated with estimates involves the other four areas, each of them involving dependencies on later areas in this list.

##### 4.1. Variability associated with estimates

An obvious area of uncertainty is the size of project parameters such as time, cost, and quality related to particular activities. For example, we may not know how much time and effort will be required to complete a particular activity. The causes of this uncertainty might include one or more of the following:

- lack of a clear specification of what is required;
- novelty, lack or experience of this particular activity;
- complexity in terms of the number of influencing factors and inter-dependencies between these factors;
- limited analysis of the processes involved in the activity;
- possible occurrence of particular events or conditions which could have some (uncertain) effect on the activity.

Table 1  
Illustrations of a threat perspective

#### Examples of a focus on risks as threats

Risk categories largely threat orientated using terms like ‘poor’ allocation/use, ‘inadequate’, ‘lack of’, ‘interruption’, ‘conflicts’, *force majeure* (11.2.1.3).

Rating impacts for a risk (Figure 11.2), most table entries expressed in threat terms.

Individual illustrative examples all threat based (11.2.3.2/3, 11.5.2.3/4, 11.5.3.4).

#### Terminology

Risk described in terms of *severity* (11.3.3.2, 11.5).

The term ‘impact’ is linked with *severity of effect* (11.3.2.2).

High impact risks considered undesirable: non linear scales “reflecting the organisation’s desire to *avoid* high-impact risks” (11.3.2.2, Figure 11.2).

#### Description of types of risk response (11.5.2)

Responses categorised as avoidance, transference, mitigation, acceptance:

**Avoidance:** “is changing the project plan to *eliminate* the risk or condition or to *protect* the project objectives from its impact. Although the project team *can never eliminate all risk events*, some specific risks may be avoided.

**Transference:** “does not *eliminate* it (risk)”; “nearly always involves payment of a risk *premium* to the party taking on the risk”.

**Mitigation:** “seeks to *reduce* the probability and/or consequences of an *adverse* risk event to an acceptable threshold. Taking early action to *reduce* the probability of a risk’s occurring or its impact on the project is more effective than trying to *repair* the consequences after it has occurred.”; “...may take the form of...action that will *reduce* the *problem*”.

#### Use of probability impact matrices (11.3.2.2)

PIMs require an ordinal or cardinal scale “to determine whether a risk is considered *low*, *moderate* or *high*”. This treats risks purely as threats, since a ranking of opportunities and threats would require a more complex approach.

Only the last of these items really relates to specific events or conditions as referred to in the earlier definitions of a ‘risk’. The other sources of uncertainty arise from a lack of understanding of what is involved and as such, are less obviously described as threats or opportunities.

#### 4.2. Uncertainty about the basis of estimates

An important area of uncertainty relates to the basis for estimates produced by project parties [4], (p. 11.3.1.5). For example, it is often necessary to rely on subjective estimates for probabilities in the absence of sufficient relevant statistical data for determining probabilities ‘objectively’. The basis for such subjective judgments may be unclear, but articulating them at least makes these estimates available for scrutiny and comparison with other estimates. Uncertainty about the basis of estimates may depend on who produced them, what form they are in, why, how and when they were produced, from what resources and experience base, and the extent of any bias in estimates.

Adjustment for bias in estimates is especially difficult. Bias may be conscious or unconscious, pessimistic or optimistic, and clues if not data, may be available or not. Deliberate pessimistic bias to “protect” estimates may be systemically induced by previous management practice of arbitrarily cutting back all estimates provided from members of the project team. This is an implicit admission that management is uncertain about the status of estimates. If this cycle of padding and cutting back of estimates goes unchecked, then the uncertainty in subsequent estimates is amplified and may become considerable. This uncertainty is further compounded if related activities are not well defined, relatively novel, or complex, or there has been limited opportunity to develop a high quality estimate (as in many competitive tendering situations, for example).

A particularly important source of uncertainty is the nature of assumptions underpinning estimates. The need to note assumptions about resources choices and methods of working is well understood if not always fully operationalised (see for example: [4], (p. 11.2.2.4). However, estimates may also be conditional on the assumed non-occurrence of “*force majeure*” events, and possible changes in project context and scope. The effects of such events and possible changes may be difficult to quantify, even when they are identified. This gives rise to the characterisation of such events and possible changes as either ‘known unknowns’ where they are identifiable at least in qualitative terms, and ‘unknown unknowns’ when they are unspecified events or possible changes.

Estimates ought to be clear about the extent to which they have been adjusted to allow for factors in the above categories. Failure to make or identify such adjust-

ments, and the rationale for them, introduces additional uncertainty about assumed prevailing conditions. However, further uncertainty typically exists about what levels of adjustment to estimates are appropriate for different project parties. For example, to what extent should one party worry about allowing for *force majeure* events? If a client company out-sources a particular task to a contractor, the contractor’s view of what adjustment to cost estimates is appropriate to cover *force majeure* will be rather different from the client’s view. The set of *force majeures* that could impact on each party may be different, or the parties may have different perceptions of with whom the consequences of a given *force majeure* will finally rest.

The problem of uncertainty about the conditions underpinning estimates is even greater in respect of estimates of the probability of an event occurring. A large proportion of those using probabilistic analysis in projects often fail to get to grips with the conditional nature of probabilities and associated measures used for decision making and control.

#### 4.3. Uncertainty about design and logistics

In the conception stage of the PLC the nature of the project deliverable and the process for producing it are fundamental uncertainties. In principle, much of this uncertainty is removed in pre-execution stages of the PLC by attempting to specify what is to be done, how, when, and by whom, at what cost. In practice, a significant amount of this uncertainty may remain unresolved through much of the PLC. The nature of design and logistics assumptions and associated uncertainty may drive some of the uncertainty about the basis of estimates.

#### 4.4. Uncertainty about objectives and priorities

An aim of improving project performance presupposes clarity about project objectives and the relative priorities between objectives and acceptable trade-offs. Attempting project management or risk management when this clarity is lacking is like attempting to build a tower on wet sand. The implications of uncertainty related to the nature of objectives and relative priorities need to be managed as much as uncertainty about what is achievable. It is perhaps indicative of a perceived failure of conventional risk management and project management to address objectives and trade-offs that the concept of ‘Value Management’ has been introduced to encompass this [7].

Morris and Hough [8] argue for the importance of setting clear objectives and performance criteria which reflect the requirements of various parties, including stakeholders who are not always recognised as players (regulatory authorities, future customers, for example).

The different project objectives held by interested parties, and any inter-dependencies between different objectives need to be appreciated.

The nature of objectives and priorities assumptions and associated uncertainty may drive some of the uncertainty about the basis of estimates and the amount of variability estimated. For example, if the relative priorities of time, cost and performance are not clear, the associated uncertainty for all three will be larger than it would be if clear priorities were determined.

#### 4.5. *Uncertainty about fundamental relationships between project parties*

A pervasive source of uncertainty is the multiplicity of people, business units, and organisations involved in a project. The relationships between the various parties may be complex, and may, or may not, involve formal contracts. The involvement of multiple parties in a project introduces uncertainty arising from ambiguity in respect of [9]:

- specification of responsibilities;
- perceptions of roles and responsibilities;
- communication across interfaces;
- the capability of parties;
- contractual conditions and their effects; and
- mechanisms for coordination and control.

Included here can be ambiguity about roles and responsibilities for bearing and managing project related uncertainty. This ambiguity ought to be systematically addressed in any project, not just those involving formal contracts between different organisations. Contractor organisations are often more aware of this source of ambiguity than their clients, although the full scope of the risks and opportunities that this ambiguity generates for each party in any contract (via claims, for example) may not always be fully appreciated until rather late in the day. For example, interpretations of risk apportionment implied by standard contract clauses may differ between contracting parties [10,11].

The nature of assumptions about contractual relationships and associated uncertainty may drive uncertainty about objectives and priorities with further knock-on effects. For example, if a 'fair weather partnership' cracks when the going gets tough, everything else comes apart, and lost opportunities may be the biggest casualty.

## 5. Towards uncertainty management

Efficient and effective project management requires appropriate management of all the sources of uncertainty outlined in the previous section. PRM processes which adopt a focus on threats will not address many of

these sources of uncertainty. A comprehensive PRM process concerned with threats and opportunities will do better, but will still tend to be focussed on uncertain events or circumstances. This does not facilitate consideration of aspects of variability which are driven by underlying ambiguity. To address uncertainty in both variability and ambiguity terms, we need to modify and augment existing PRM processes and adopt a more explicit focus on uncertainty management. An obvious first step is to consider the usefulness of terminology involving the word 'risk' and various threat orientated terms. Other steps involve modifications to PRM processes to address the various sources of uncertainty outlined in the previous section.

### 5.1. *Revise terminology*

Present use of the term 'risk' is ambiguous. Best practice regards risk as encompassing both threat and opportunity, but guidance on PRM is frequently couched in threat management terms, and in common parlance risk is more usually synonymous with threat. More fundamentally, widely followed guidance is defined in terms of 'events' or 'circumstances'. An obvious first step towards uncertainty management is to remove this ambiguity by using the term 'uncertainty' in the everyday sense of 'lack of certainty' as a starting point. A less obvious second step is to associate 'downside risk' with the *implications* of significant 'threats', or unwelcome consequences, and 'upside risk' with the *implications* of significant 'opportunities' to welcome consequences. Consideration of significant threats and opportunities then becomes part of uncertainty management. Risk becomes 'the implications of significant uncertainty about the level of project performance achievable', a useful clarification consistent with everyday usage if not identical to dictionary definitions. This is the definition adopted in Chapman and Ward [6], (p. 7) because it clarifies the core pursuit of 'risk efficiency'.

Replacing 'risk' with 'uncertainty' as a starting point could significantly broaden thought processes in 'risk identification' which becomes '*uncertainty* identification'. In particular, a process involving '*uncertainty* identification' (rather than 'risk identification'), would draw attention in a natural way to items 3, 4, and 5 in Table 2: uncertainty about design and logistics, uncertainty about project objectives and priorities, and uncertainty about fundamental relationships between project parties.

Additionally an '*uncertainty* identification' process would induce identification of a wider set of responses for managing a particular source of uncertainty. For example, a 'risk identification' process, focussing on potential threats, might highlight 'unavailability of a key resource', prompting possible responses such as 're-schedule activities', 'obtain additional resource'. However,

an exercise seeking to identify sources of *uncertainty* encourages a more open ended, neutral description of factors, which facilitates a less constrained consideration of response options. Thus instead of the risk ‘unavailability of a key resource’, an exercise identifying sources of uncertainty would express this as ‘uncertainty about availability of a key resource’, prompting questions about all factors influencing availability, essential characteristics of the resource, and the possibility of excess as well as shortage of the resource. In particular, how to make good use of excess resource has to become an issue.

After simple substitution of ‘uncertainty’ for ‘risk’ in all terminology, an additional step would be to modify wording in PRM guidelines wherever this associates risk (uncertainty) with threat. For example, in Table 1, the risk response of ‘mitigation’ is described as *reduction* of probability and/or consequences of an ‘adverse risk’ [4]. Taking an uncertainty perspective, Chapman and Ward [6], refer to the generic response of ‘mitigation’ as impact *modification* (rather than impact *reduction*), and the generic response of ‘prevention’ as *changing* the probability of occurrence (rather than *reducing* it). Decisions about the transfer of *risk* would become decisions about the transfer of significant *uncertainty*, the upside and the downside. Not only would this terminology induce a more considered view of the wisdom of risk (threat) transfer, it would also stimulate con-

sideration of wider implications of transfer strategies. Table 3 gives further examples drawing on terms included in Table 1.

An important further benefit of this terminology is the way it encourages an iterative approach with an initial focus on the question ‘does it look like uncertainty matters, or can uncertainty be safely ignored, in some areas if not in total?’ Where it may matter or if it may matter, further iterations can then address whether or not associated risk needs to be managed, the depth of understanding warranted, and the detail of the uncertainty management strategy. The perceived risk may change as the understanding of uncertainty develops.

A further important benefit of this terminology is a shift in emphasis without a need to throw away the useful terms ‘risk’ and ‘risk management’, and a re-emphasised focus on ‘risk efficiency’. Their meaning changes only very slightly in terms of APM and PMI terminology, not at all in terms of closely related and widely adopted terminology [6]. Critically important, in these (revised) terms we need to move our focus from the product to the process. ‘Uncertainty management’ is the process which is the focus of our attention. ‘Risk management’ is one of the products. Other products included are enhanced communication, more focus on project objectives, more focus on value analysis issues, and a range of other widely appreciated spin-offs which are valuable in their own right.

Table 2  
Types of uncertainty

1. Variability associated with estimates
2. Uncertainty about the basis of estimates
3. Uncertainty about design and logistics
4. Uncertainty about objectives and priorities
5. Uncertainty about fundamental relationships between project parties

Table 3  
Uncertainty Management terminology

Risk management	Uncertainty management
a downside risk	a threat (giving rise to downside risk)
an upside risk	an opportunity (giving rise to upside risk)
a risk (upside or downside)	a source of uncertainty
a (possible) source of risk	a source of uncertainty
a problem	an issue
an impact	a consequence/effect
a weakness	an issue
a poor allocation	an inappropriate/unclear allocation
inadequate	Inappropriate
avoid risk	resolve uncertainty
mitigate	modify
lack of	shortage or surplus of
major risk	significant uncertainty
absence of	availability of

### 5.2. *Expose and investigate variability*

Single point estimates of a particular parameter are of limited value for uncertainty management (and PRM) purposes without some indication of the potential variability in the size of the parameter. Thus a best estimate of the cost of a particular activity is of limited value without some indication of the range or probability distribution of possible costs.

In respect of particular sources of risk, the current widespread use of probability impact matrices to size risks generates unnecessary uncertainty by over-simplifying estimates of impact and associated probability. An alternative, a ‘minimalist’ approach [12] is to identify explicit ranges not only for estimated impacts, but also for associated probabilities, and to combine these in a way that does not obscure or underestimate potential variability. In the minimalist approach expected values and associated ranges for all quantified sources of uncertainty are presented graphically in a way that displays the contribution of each to the total, clearly indicating what matters and what does not. A first pass display provides a basis for managing subsequent passes of the process in terms of data acquisition to confirm important probability and impact assessments, refinement of response strategies and key decision choices. The first pass is an attempt to size variability reflecting all relevant underlying ambiguity associated with the size of uncertainty about both the impact and probability of risk events occurring, with uncertainty about the size of probabilities often dominating uncertainty about the size of impacts. The approach is deliberately conservative (pessimistic) about variability to counteract natural bias towards ranges that are too narrow, to manage expectations that any subsequent refinement of estimates should indicate less uncertainty rather than discover more, and to avoid dismissing uncertainty which may be significant.

As noted earlier, difficulty in estimating time or effort required to complete a particular activity may arise from a lack of knowledge of what is involved rather than from the uncertain consequences of potential threats or opportunities. Attempting to address this difficulty in conventional PRM terms is not appropriate. What is needed is action to improve knowledge of organisational capabilities and reduce variability in the performance of particular project related tasks. For example, uncertainty about the time and cost needed to complete design or fabrication in a project may not be readily attributable to particular sources of risk, but to variability in efficiency and effectiveness of working practices. An uncertainty management perspective would seek an understanding of why this variability arises, with a view to managing it. This may require going beyond addressing uncertainty associated with a specific project, to trigger studies of operations which

provide an input into a range of projects, as illustrated by this example.

### 5.3. *Clarify uncertainty about the basis of estimates*

The basis for all estimates needs to be understood, in terms of the quality, reliability and integrity of underlying data [4], (p. 11.3.2.4, 11.3.3.2). As noted earlier, uncertainty about the basis of estimates may depend on who produced them, what form they are in, why, how and when they were produced, and from what resources and experience base. Recording answers to these questions would provide useful guidance on the quality of estimates. This would help counteract bias in estimates, discourage decision making based on inappropriately limited data, and facilitate selective, cost effective development of estimates where appropriate.

Existing PRM processes generally recognise the desirability of recording key assumptions used to generate estimates [4], (p. 11.2.2.4). However, practice could improve in terms of the extent to which assumed conditions are recognised and treated in estimates. For example, if certain conditions do in the event apply, a contractor may avoid the need to allow for the variation in cost arising from the presence of these conditions by appropriate contractual agreement, leaving the client to manage this variation in cost. However, this raises the issue of how such cost variations might be allocated within the client’s organisation. Should this variation in cost be incurred by the project manager’s budget?, or by higher, programme level or corporate level contingency funds? A key point is that the ‘known unknowns’, ‘unknown unknowns’, and bias in estimates referred to earlier may not be controllable or readily sized by the project manager, or even by corporate management. The project manager may not be the appropriate party to be responsible for them, but the organisation at some level has to be. Delineating what uncertainties the project manager is responsible for, and what is the responsibility of programme and corporate management, is an important aspect of uncertainty management. ‘Known unknowns’, ‘unknown unknowns’, and bias are inherently difficult to size, but they cannot be ignored for corporate management purposes. This problem is more readily identified with uncertainty management than it is with PRM focussed on the consequences of particular events on a given project’s objectives.

### 5.4. *Address uncertainty about fundamental relationships, as well as design and logistics*

Careful attention to formal PRM is usually motivated by the large scale use of new and untried technology while executing major projects, where there are likely to be significant threats to achieving objectives. A threat perspective encourages a focus on these initial motivating

factors. However, key performance issues are often unrelated to these motivating factors, but rather are related to sources of ambiguity introduced by the existence of multiple parties and the project management infrastructure. Such issues need to be addressed very early in the project and throughout the PLC, and should be informed by a broad appreciation of the underlying ‘root’ uncertainties. Chapman and Ward [6] offer a six Ws framework for this purpose based on the following six questions:

1. Who are the parties ultimately involved?
2. What do the parties want to achieve?
3. What is it that each party is interested in?
4. Whichway (how) is each party’s work to be done?
5. What resources are required?
6. When does it have to be done?

Understanding the uncertainty associated with each of these basic questions, and the implications of interactions between them, is fundamental to effective identification and management of both threats and opportunities. Use of the six Ws framework from the earliest stages of the PLC could usefully inform development of project design and logistics by clarifying key sources of uncertainty.

#### *5.5. Address uncertainty about objectives and priorities*

Strategies for managing project uncertainty cannot be divorced from strategies for managing project objectives and associated trade-offs. A key issue is ‘do all parties understand their responsibilities and the expectations of other parties in clearly defined terms which link objectives to planned activities?’ The six Ws are a core framework for considering the tradeoffs between time, cost and quality, the different tradeoffs for different project stakeholders, and the implications of tradeoffs that change over time. For many projects, objectives and related performance criteria can be refined progressively through the Conceive, Design, Plan and Allocate stages of the PLC [6]. However, in some projects, for example information systems or software development projects, it may not be practicable to ensure that all project objectives are well defined or crystallised prior to the Execute stage. This becomes apparent in previous stages where decisions to continue with the project acknowledge the continued ambiguity about objectives. In this scenario ‘control evaluation’, undertaken each time a milestone is achieved, ought to include a ‘configuration review’ of objectives currently achievable with the project [13,14]. If these objectives are unsatisfactory, further Design and Plan effort may be necessary. ‘Value management’ and related approaches to the formulation of objectives should be regarded as one part of the uncertainty management process [1].

Failure to develop operational measures of performance in a way that allows tradeoffs between performance criteria creates substantial uncertainty which has effects beyond individual projects. Consider for example, tradeoffs in producing in-house design work for a project. If no appropriate incentives exist, the potential for misalignment of objectives between the design department and the project is substantial. Important management questions are: how much is it worth to a project to be able to complete the design faster?; what might the effect on the quality of design be? Uncertainty management could involve design of internal incentive contracts between the design department and project manager to encourage appropriate tradeoffs by the design department. If incentives lead to more efficient working practises involving less multi-tasking, staff morale and staff turnover may improve. This could lead to opportunities associated with easier hiring, a deepening experience base, and qualitative improvements in designs on future projects with cumulative, ‘virtuous circle’ benefits.

## **6. Conclusions**

Risk management can make an important contribution to effective project management. However, there is some justification for the view that current PRM processes are threat orientated and that this can limit the contribution that PRM makes to improving project performance. Further a threat orientation is not the only concern. Specifically, it is suggested here that a threat and event-based perspective can result in a lack of attention to several important areas of project related uncertainty, including: variability arising from lack of knowledge, the basis of estimates, the treatment of assumptions about operating conditions, and the development of appropriate objectives and associated tradeoffs.

Comprehensive treatment of project uncertainty requires an approach which amounts to modifying and augmenting current PRM processes. A simple but effective starting place involves use of the phrase Project Uncertainty Management instead of Project Risk Management. This would help to shift PRM processes from a threat focus towards a greater concern with understanding and managing all sources of project uncertainty.

Further process modifications would also assist this shift of emphasis, and might include for example:

- More emphasis on recording information in suitable format about the basis for estimates in order to guide subsequent refinement of estimates and analysis.
- More emphasis on understanding ‘root’ uncertainties facilitated by frameworks such as the six Ws.



- Developing methods for articulating and comparing performance objectives and perceived trade-offs between them.
- More emphasis on quantitative approaches which do not obscure variability, reducing reliance on probability impact matrices and adopting approaches such as the ‘minimalist’ approach [12].

A weakness in current PRM processes is that they are not readily focussed on sources of operational variability in the performance of organisational activities. An ‘uncertainty management’ perspective facilitates such a focus and also draws attention to the need to understand and manage variability in organisational activities that have an input into a number of projects.

A similar argument applies to identification and treatment of the conditions (‘known unknowns’) assumed to prevail when developing estimates. ‘Unknown unknowns’ and bias need to be allowed for at some level in the organisation, and it is not efficient for these issues to be considered only at project level. Again an uncertainty management perspective highlights the need to address some aspects of project related uncertainty outside of particular project contexts, as part of managing the project infrastructure, taking a programme or corporate view.

Finally, an uncertainty management approach should facilitate integration with project management earlier in the PLC than a threat orientated PRM process. The need to explore and understand uncertainty (and avoid a largely pessimistic threat orientated perspective) is greatest in the earliest stages of the PLC, during conception when uncertainty is at its greatest. An uncertainty management perspective more naturally focuses attention on this stage of the project than threat orientated PRM. Comprehensive project uncertainty management should operate as an important extension of

conventional project development, with the potential to influence project design and base plans on a routine basis, occasionally influencing very basic issues like the nature of project stakeholders and their objectives.

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