Value and risk –Twin Powers

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Abstract:
We say best value is achieved if all agreed functional requirements are provided for the least input of resources. Risk is often considered a separate issue - but it should not be because of the impact it can have on value. Value management practitioners seek to improve value by assisting key stakeholders to analyse functions and the cost and worth of functions and then deciding on a best value solution.

However, a decision on what is best value cannot be complete unless a rigorous analysis of risks has been carried out and it is known what impact risks may have on the owner, other stakeholders and the design, construction and operation of the project.

A single unrecognised or underestimated risk can render value decisions that are based only on cost and function; deficient. The World Trade Center disaster may be a tragic example of how outstanding functional value can be compromised by an underestimated risk?

This paper draws on research and the experience of Australasian Value Management (AVM) in assisting agencies to make value decisions for capital projects and programs. It deals with the interdependency of value and risk and discusses how the emphasis and type of risk is likely to change; depending on the stage a project is at. It also suggests a practical association between value management, value engineering and risk as applied to the project delivery process.

Emphasis is put on identifying risks that really matter and not wasting time on those that do not; the goal being to ensure that value outcomes are not excessively compromised by unidentified or unassessed risks. Types, categories and impact of risks are discussed and a simplified procedure for engaging stakeholders in relating risk to value outcomes, though the use of technology, is presented.

Key words:
Value, enabling resources, innovation, capital project, strategic service planning, stakeholders, likelihood, consequence, risk factor, project initiation, technology.

Introduction: Value and risk; what is the relationship?

The market place understanding of value is straight forward, i.e. "getting all wanted functionality from a service or product, at a price that is satisfactory". To assess what is *"good value"* we must consider not only the relationship between function and cost but also the worth of functional outcomes. Consequently, an increase in value may be achieved by providing all *necessary* functions at less cost or, increasing functionality for the same or *some* additional cost.

Value management (VM) is used to add value to functional outcomes of any project, process or thing by bringing into focus the difference between wants and needs and using "groupthink" to consider alternative ways of achieving required outcomes (functions) with less input of resources.

Risk management (RM) on the other hand seeks to manage "things" that have the capacity to detrimentally influence the achievement of outcomes, the cost of outcomes, the maintaining of outcomes - and hence the value of outcomes. Identification and assessment of risk is challenging because risks change throughout the life of a project and perhaps for this reason, value and risk are often considered separately. However, participants who have taken part in a VM workshop will know

that risk complicates the task of judgement because a new apparently value adding idea may introduce risks that had not previously been identified. Participants find themselves struggling to balance an increase in functional value against risk and so it follows that understanding the relationship between value and risk is extremely important if the effectiveness of a VM workshop is not to be compromised.

Some practitioners argue that value management is a subset of risk management; rather than the other way round. Others feel that risk is just another value consideration and that a formal integration of risk assessment into value management assists participants in understanding how the *value* of outcomes can depend upon adequate assessment and management of *risks*.

Some progressive Australian government agencies have recognised the relationship between value and risk and combine value and risk workshops at all phases of project initiation, including concept and delivery phases.

This paper uses aspects of the destruction of the World Trade Centre in New York to highlight the risk/value relationship generally and more specifically the consideration that should be given to value and risk in the birth and delivery of capital projects. The intention is to demonstrate that formal identification, evaluation and ongoing management of risks is essential if predictable, high-value outcomes are to be achieved and maintained and that these tasks sit comfortably within the method of value management.

What is risk?

In the author's opinion a risk may be seen as: ***"something that may or may not happen in the life of a project, process or thing that has the capacity to cause loss of one form or another"***.

Some risks have implications for value if something happens; such as delays in design/construction or accidents. Others may reduce the value of outcomes if something doesn't happen – such as expected service demand or customer acceptance not being achieved.

The losses associated with risks can include: financial, time, functional, relationship, human, intellectual property, reputation, political and market position losses. If losses due to risk occur then the anticipated value of outcomes for stakeholders and/or shareholders is reduced.

Risk management

Risk assessment and management is generally covered by some form of regulation or standard. In Australia it is the Australian/New Zealand standard (AS/NZS4360: 2004). Although there are variations in how risk is dealt with, the following elements are generally part of the process:

- Identify the risks;
- Categorise risks (relate to business case if possible);
- Assess the likelihood and consequence of risks;
- Compare risks for importance (risk factor);
- Determine what risks should be managed;
- Establish a management plan as appropriate; and
- Prepare a contingency plan as appropriate

Value Management

Value management in Australia is covered by the Australian/New Zealand standard AS/NZS 4183:1994 (in review) that recommends a 5 stage job plan, expressed generally as:

1. Inform all participants about the subject and establish objectives;
2. Analyse available information including required functions;

3. *Innovatively* speculate on how to provide functions in a better value way;
4. Critically assess speculative ideas for worth; and
5. Develop and consolidate value adding opportunities for decision makers.

What are the similarities and differences?

Value management and risk management both require strong commitment from senior management in order to deliver worthwhile outcomes and both rely on the knowledge of participants and their ability to speculate - in the case of VM to identify opportunities for adding value and for RM to reveal all the risks that may impact on outcomes.

Both RM and VM need to be undertaken by a group of *key stakeholders* who have an ability to think laterally and who very well know the project, process or thing under analysis and the system within which it exists.

The expression *"what if"* is extremely relevant to both VM and RM but in slightly different contexts. In the case of VM to elicit innovative ideas for better value and in the case of RM to ensure all *risks that matter* are brought out.

Both VM and RM use prioritisation techniques; in the case of VM to develop a focus on needs rather than wants and filter out ideas that have no added value. For RM they are used to quickly eliminate risks that don't matter and shift the focus to those that do.

Both VM and RM should take a system view – i.e. to get the best *overall* outcome for the *"system"* it may be necessary to make value and/or risk compromises in *"parts"* of the system.

A key process difference between VM and RM is that VM requires participants to think *innovatively* for the purpose of identifying alternative, better value ways of carrying out functions. Preparing a group to do this takes time and this requirement for innovation is what sets VM apart from RM and other cost reducing or loss mitigating methods that utilise groups of stakeholders.

Although it may be argued the outcomes are different; participant makeup, skills and the tools required for the identification, assessment and management of risks are similar to those required for a VM workshop.

The changing nature of risk

The opportunity for loss due to risk is inherent in all phases of planning and delivery of a capital project and may relate to: basic assumptions, project definition, estimates and costs, timelines, project features, client and community relations, procurement procedures, construction (including safety and workforce liaison) and subsequent operation. It follows that if a risk has the capacity to cause financial, functional, relationship, time, human and other losses, then it needs to be considered in the overall context of the *value* of outcomes.

The first opportunity to add value or allow possible risk losses to creep into a new resource is at its birth - the "inspiration" for a new capital asset. To ensure a new resource is the right business and service solution, other processes *should* have already taken place namely; Strategic Service Planning (SSP) and Strategic Resource Planning (SRP). These processes are critical in justifying a new resource and in deciding what functions it must deliver.

Emergence of a capital project

The need for a new capital project should only come out of an *effective strategic planning process*. Having an established series of processes that first relates resources to business strategies and vice-versa and then "shepherds" a new resource into existence are pivotal in ensuring that value and risk considerations are built into the delivery of capital projects.

Service and business strategies driven by customer needs, demand, technology, the availability of resources and others are often the subject of frequent change. To ensure services remain relevant and the necessary resources are available when needed, a cyclic process of Strategic Resource Planning (SRP) should be carried out in conjunction with Strategic Service and Business planning (SSP). Linking resources to services in a planned, structured way provides opportunities for adding value and reduces the likelihood of losses due to unforseen risks.

Both SSP and SRP require planners to take a stakeholder perspective (including that of customers) and to clearly understand why the organisation exists and where it is likely to be heading. Questions that should be asked include in this order:

- why do we exist and what is our business?
- where are we at in terms of business outcomes and services?
- what are the drivers of change?
- what direction should we be taking? and
- what resources do we need to ensure services are relevant and efficiently delivered into the future?

Service and business planning and resource planning have a mutual dependence on each other and should always be considered concurrently. The diagram below illustrates the relationship and is relevant for all enabling resources including: human, information, assets and financial resources.

As the diagram suggests, SSP may result in different practises being adopted, identify a change in demand and suggest opportunities for new and lost services. Such outcomes are likely have an impact on resources and must be fed into the SRP process so that changes to enabling resources can be proactively initiated.

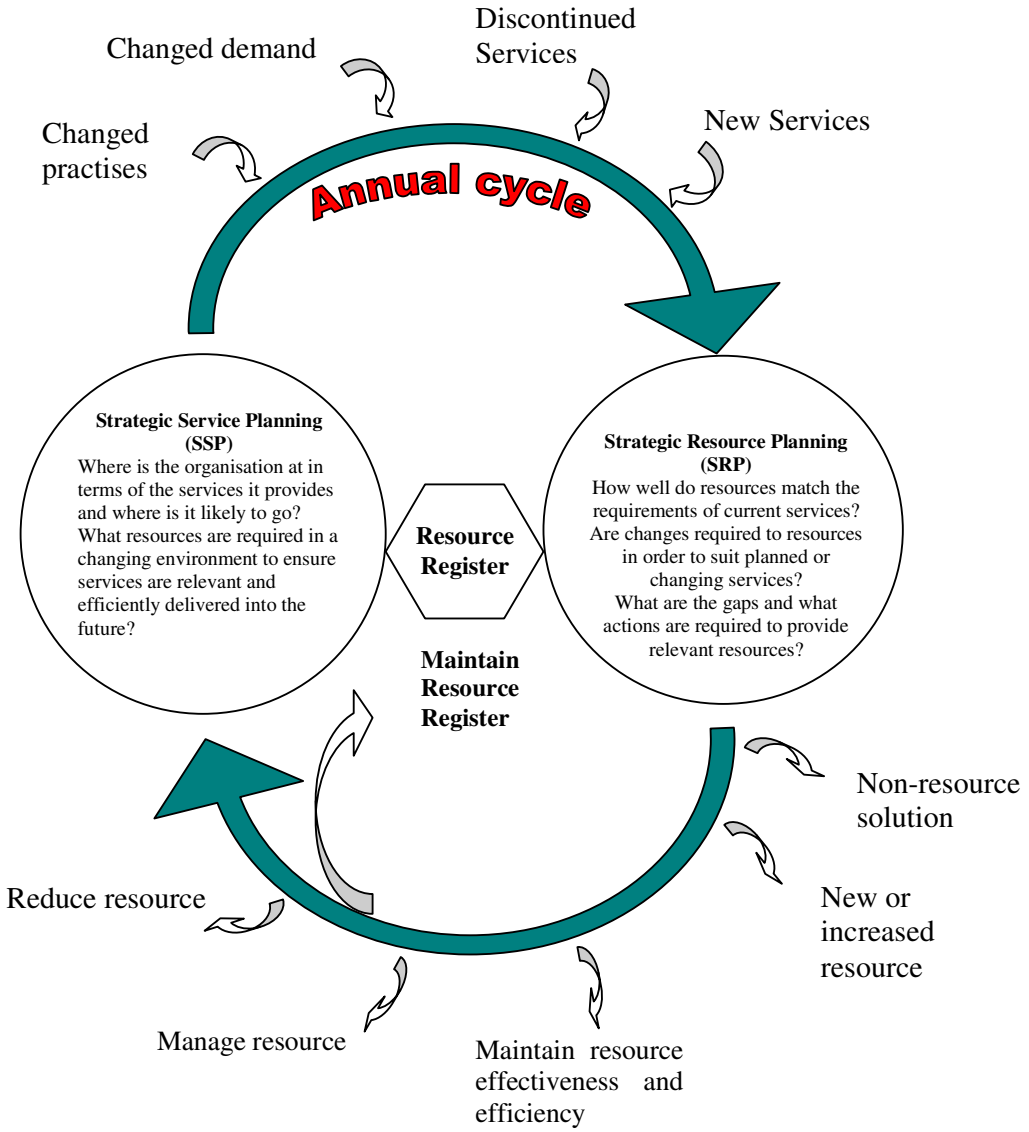
Some outcomes of SRP include strategies for managing, maintaining, reducing and increasing resources to meet service requirements. A strategy to increase resources may include a new capital resource such as that being discussed here.

It should be noted that SRP outcomes that are fed back into the SSP process may cause a rethink of business strategies. For instance, it may not be possible to increase resources to satisfy new demand; for one reason or another. *This is likely to impact on planned business and service outcomes and is why it is essential the two processes are linked in a never ending cycle.*

If VM and RM can be employed to find innovative ways to increase, change, or develop services without increasing resources, then a better value outcome has been found; this is often referred to as a "non-resource" solution and is shown on the diagram as a valid outcome of SRP.

If the processes outlined above are part of an organisation's culture and the benefits of effective VM and RM are employed, then service changes will be more predictable and the right resources will be available when needed. Lack of, or inadequate SSP and SRP commonly results in last minute responses to a resource need and increases the risk of the wrong resource being procured.

Periodic Cycle of Strategic Planning linking Resources to Services



Selecting a best value solution to an identified need

If a new resource is justified then VM and RM techniques can reduce losses by assisting stakeholders to select the right resource by:

- Confirming why – the reason for doing it;
- Confirming necessary functions and their relative importance to stakeholders;
- Confirming what other functions stakeholders are prepared to pay for;
- Developing viable options for delivering the functions;
- Considering the value of options from a functional perspective;

- Considering risks associated with the options and their possible effect on value;
- Selecting the best value option; and
- Managing risks for the life of the project as appropriate.

It is often the case that several viable alternatives are presented that will satisfy resource needs and to decide which is best, all stakeholders must agree on service criteria that will define a successful outcome - they must also agree the relative importance of each criterion.

VM and RM can be used to develop and prioritise rational decision-making criteria and apply them to the options. It is important that all relevant criteria are considered and it is convenient to group them into two main groups. One relating to output (or service) functions and the other to risk or other, possibly non-negotiable, issues. The first set, if correctly identified, will allow participants to rank alternatives from best to worst in terms of how well a solution meets functional needs; the second set and other "filters" may require a change in the preferred order.

Service criteria

In the case of a capital project we pay for functions like "accommodate", provide transport", "provide icon", "provide access", "provide storage", etc.

Experience suggests that all service (functional) criteria can be sorted into 4 groups:

1. Supports required output functions;
2. Assists in meeting service demand;
3. Supports long-term business strategies; and
4. Improves operating efficiency and effectiveness

For example, *Supports required output functions* may include: "be a civic icon", "provide administration space", "provide storage space", "provide access" etc. Each criterion has to be mutually exclusive and at the correct level in the function hierarchy because it is not possible to compare say "reduced operating costs" with "improved efficiency" or "accommodates a cyclist lane" with "supports required service functions".

Risk criteria

Finding the best value solution also requires a consideration of risk and other "filters" which may affect the outcome of an alternative - even if it is functionally "perfect".

Risks that need to be considered at the developmental stages of a project are generally different in character to those that come later. These early risks can be thought of as *development* risks and may vary from enterprise to enterprise. Recurring risks of this type include:

1. Does not support long-term government/board policy;
2. Loss of stakeholder/shareholder/political confidence;
3. Impacts on design/construction/operation/safety;
4. Consistency of (cost/benefit/needs) analysis;
5. New but unproved business opportunity/investment strategy; and
6. Risk to continued service (failure or interruption of existing facilities).

Consideration of such risks when evaluating a set of alternatives may reveal that some options should be eliminated. For example, an alternative may not be acceptable if it requires cutting an essential or important service for an unacceptable period of time.

Other decision making criteria
This paper focuses on value and risk relationships but they are not the only criteria for deciding which option to progress along the project initiation path, others include:

Statutory requirements: If an option can not be made to comply with statutory requirements then it should not be considered a viable alternative. However, there are examples of projects that do meet minimum standards and yet losses due to unforseen or underestimated risks still occur.

Cost: Cost should not be a criterion for choosing the most *suitable* alternative but instead looked upon as a "filter" to help decide how much desired functionality and how much risk management (or risk avoidance) can be afforded.

Cost comparisons should be based on life cycle costs (LCC), inclusive of capital, operating and disposal costs. Getting most function for the least cost and within acceptable risk limitations for the life of a project is one way of defining *best value.* At the end of the day, proposals that are unaffordable tend to stay on unfunded forward works programs until they are superseded by a later, functionally acceptable alternative that *is* affordable.

VM/VE and RM in the project initiation process

SRP and SSP utilising VM and RM assist in identifying the right resource but depending on a project's complexity it could take several years to come on stream. Without a structured process of development and approvals, the benefits gained in using VM and RM to find the best value option can be lost in design rework, construction problems and cost overruns.

A lot has been written in recent years as to how best to ensure a project stays on track for delivery within cost and time constraints. Most large organisations utilise a Project Initiation Process (PIP) involving several distinct phases and to progress from one phase to the next, several outcomes and an approval are required.

The table below summarises a typical PIP process and where, in the opinion of the writer, value management and risk management and their derivatives can be used to assist in delivering safe and stakeholder "friendly" assets that are worth the money and other resources that go into them.

It will be noted that as a project moves through the PIP process the nature of risk changes from high level (risks to services, funders, other stakeholders and the like) to that of the more familiar risks associated with development, design, construction and operation of the project.

RID – Risk Identification RM – Risk Management VM/VE – Value Management/Engineering.

PIP Phase	VM	VE	RM
Pre-PIP Strategic service and resource planning	To assist stakeholders to make best value strategic business and resource decisions.		(RID) focuses on risks to political/business/service outcomes (see list above).
Concept	To assist stakeholders to develop innovative, best value options to meet a resource need and establish an evaluation brief.		(RID) focuses on identifying high-level risks to the funder, stakeholders and services

Evaluation	To assist stakeholders to evaluate and choose a best value option that will deliver required outcomes.		(RID) still focuses on high-level risk but risks associated with design and delivery emerge.
Definition	To assist stakeholders to develop a delivery brief based on agreed functional requirements.	To assist stakeholders to look for innovative ways to add value to designs and ensure all functional needs have been met.	(RID)/(RM) reviews and updates project risk identification and management.
Delivery	To assist stakeholders to choose best value procurement methods, develop contracts and deliver partnering agreements.	To assist stakeholders develop innovative, value adding ways of achieving construction programs and project outcomes.	(RM) reviews and updates project risk identification and management for the project and its operation.
Review	To assist stakeholders to learn functional and contracting lessons from post occupancy and post construction studies.		(RID) reviews and compiles risks encountered in project delivery and operation.

Identifying and assessing risks

Risk management requires the identification, assessment and management of risks and it is convenient to think of it as a two part process: "identify and assess" and "manage". This approach has advantages if undertaken in a VM style workshop environment.

There are two key factors in risk assessment: *the likelihood of a risk occurring* and *the consequences for the project if it does*. For the purposes of comparing the impact of risks these factors are each given a score and a *risk factor* is calculated (product of likelihood and consequence scores).

Different organisations may have their own approach to RM but after a review of available literature and listening to the views of well-informed workshop participants, the following suggestions are made for assigning likelihood and consequence scores. Likelihood scores are linear ranging from 1 (rare) to 5 (almost certain) as shown but in the case of consequence, a non-linear score better reflects the need for management of high consequence risks. For this purpose, consequence scores fall generally on a parabolic curve and range from 1 (insignificant) to 20 (catastrophic).

Likelihood Scores

Level	Likelihood	Score
Rare event	Only occur in exceptional circumstances	1
Unlikely	Unlikely to occur but could	2
Possible	Might occur at sometime	3
Likely	Likely to occur in some circumstances	4
Almost certain	Very likely to occur in most circumstances	5

Consequence Scores

Level	Consequence	Weighted score
Insignificant	Very low effect on project objectives	1
Minor	Some easily managed effects	3
Moderate	Moderate effect requiring management effort	5
Major	Major effects on project objectives requiring significant management effort	10
Catastrophic	Unacceptable effect preventing project objectives being met and/or resulting in unacceptable human or material losses	20

The highest possible risk rating based on the above tables is 100 but it is recommended a dedicated management approach be applied to risks with a *rating* of 20 or more. A score of 20 or more includes any risk deemed likely to happen and requiring management but it would also include a risk thought to be a rare event but which would have catastrophic consequences; such risks should be seriously addressed in the planning, design and construction of a project.

It is also useful to group risks by category to indicate where a risk impacts on the business plan and where in the process of planning, project initiation and delivery, a risk is likely to occur; suggested categories are:

Category	Examples
Cost	budget, adequacy, funds, source of funds, ETC accuracy
Time	program, schedule, milestones
Project definition	justification for project, scope, how well defined, required outcomes
Client and community	experience of client, relationship, community interest, approvals
Procurement	complexity, consultants, tender, contractor (availability/competency)
Project features	uniqueness, location, site, occupation, hazards, security

Managing risks

Risk identification and assessment is just the beginning – risks that have the capacity to reduce the value of outcomes need to be managed until they become irrelevant or are appropriately dealt with. To be effective, risk management should be incorporated in all phases of project management and project delivery. The key elements of a risk management plan are:

- Identify the risk, its risk factor and the category the risk fits;
- List the action required to manage the risk;
- List the person responsible for carrying out the actions;
- List the date by which the action should be carried out;
- List the status of the risk (dealt with/not dealt with)
- List the outcomes of the actions; and
- As appropriate list contingency plans.

Risk management plans need to be revisited throughout the life of the project so that risks needing management are regularly reviewed. For this purpose, IT methods can be effectively utilised at workshops to produce automated reports that provide a "living" risk management plan thus eliminating the need for many paper reports and saving time and effort for project managers.

The World Trade Centre – value and risk reflections

The title of this paper is a play on words to illustrate that possibly unrecognised or underestimated risks can result in catastrophic events that greatly influence the value of outcomes – *at some time*. The debate on the failure of the twin towers still prevails but it is likely the buildings would still be standing and many of their occupants still alive today, if they had not been deliberately impacted by

large, fully fuelled, commercial jet aircraft. It is always easier in hindsight to be wise but we can learn from this disaster and better understand the influence that risk can have on the value of outcomes.

No doubt a factor in the design of the twin towers was the need to make the best and highest use of one of the most valuable building sites in the World. To this end the designers and builders created two enormous, almost monumental, towers that provided an appropriate iconic presence in the financial district of New York.

Height, structural limitations and (internal) transportation issues called for an *innovative* design that resulted in a very efficient structural system that permitted high floor areas and building volumes compared with other methods of construction. Although lightweight, the structures were strong and designed to resist all *expected* floor, earthquake, wind and other loadings. It is likely the finished product represented very good functional value for the owners and other key stakeholders.

And yet, these great 110 storey structures, after suffering the aircraft impact and fires at high level, each collapsed in seconds to a pile of rubble a few storeys high and killing around 3,000 people in the process. After collapsing, the great iconic structures were not worth much more than the value of the site and it is reasonable to ask "could the destruction of the buildings and many of the deaths have been avoided by better understanding the risk/value equation"?

The designers no doubt considered all reasonable risks to the buildings, including the possibility of bombings and even an aircraft hitting them "by accident" but the idea of someone deliberately crashing fully laden aircraft into both buildings with the purpose of destroying them may have been so preposterous that these questions may not have been asked:

"What if"…

... a large jet aircraft was intentionally flown into the building;
... the aircraft had full fuel tanks;
... fire protection systems were damaged/disrupted; and
... fire protection systems could not prevent the structure being affected by heat?

Before 911, if the above questions were considered, the likelihood of it happening would probably be assessed as "rare and only likely to occur in exceptional circumstances" and depending on the assessment of damage, it would likely be concluded that the consequences could be either "major" or "catastrophic". A maximum risk factor score of 20 (according to the scoring system suggested earlier in this paper) would result, which is borderline in indicating whether the risk needed to be managed.

Post 911 the likelihood of it happening would probably score at least "possible" (because we now know it *is* possible) and the consequences almost certainly regarded as "catastrophic" thus resulting in a minimum risk factor score of 60, putting it into in a range that demands a dedicated management approach.

Could the disaster have been avoided if the risk in question had been managed throughout the planning, design and construction process? Were there measures (maybe requiring only minor design changes) that may have given occupants more time to get out and allow time for effective fire control to get to the heart of the fires? Could the buildings have incorporated some functional and or cost compromises that would have allowed them to remain standing after the impacts and fires?

The purpose of this paper is not to suggest ways of counteracting or managing risks but to show that the value of outcomes for capital projects also depends on risks. The paper seeks to demonstrate that undiscovered or underestimated risks have the capacity to cause losses that reduce or even totally destroy resources that on the face of it provide excellent functional value for money.

Combined VM and RM studies

In Australia the two-day VM workshop has been a standard for more than 10 years and takes into consideration the requirements of busy executives but 2-days is considered by some to be too long.

If proper function analysis is undertaken at a VM workshop, and reasonable time is allowed for developing and considering each new speculative idea in terms of value and cost there is generally little time available to consider risks and develop a management plan. However, to decide whether a new, perhaps innovative idea represent better value, it *must* also be assessed for risk.

There is an efficiency advantage in combining value and risk in a single workshop but an allowance of up to 3 days needs to be made for a combined VM/RM workshop, with risk dealt with in detail on the third day. However, if participants are well prepared and technology can be used to advantage, then depending on the stage of the project it is possible to incorporate RM into a two day VM workshop (allowing about ½ day for dedicated risk management). In theory, consideration of risk should be easier to integrate with VM at the earlier PIP stages where value and risk deal mainly with project outcomes rather than project detail.

The following set of minimum requirements for integrating RM into the VM/VE job plan is presented for readers to consider (note: only risk outcomes are shown in the table as it is assumed all requirements of VM/VE will be achieved at each stage and note also that combining VM and RM necessitates the last stage of the workshop becoming the Value/Risk Development phase.):

VM/VE Stage	Integration of RID/RM
Information	Distribute workshop risk aids and risk prompts. Outline risk identification and assessment method. Knowledge transfer among participants as per VM
Analysis	Identify risks associated with functions as appropriate.
Speculation	Risk *speculation* follows 5-stage VM plan .
Judgement	Tag value adding ideas *deemed worthy of development* with risk implications as appropriate.
Value/Risk Development	Risk ID (speculation) and assessment (calculate risk factor) Determine if risks need to be managed. Notate risks associated with speculative ideas. Develop a risk management plan to be incorporated in VM report.

In closing

In the process of developing and delivering a capital project, risk and value should not be considered as separate issues; they are twin powers. This paper suggests that functional innovations, which may offer increased service value can, in an overall system sense, introduce susceptibility to risks that have the capacity to cause loss of life and/or property. It is important that such risks are identified, assessed for impact and managed as appropriate, within the framework of value management; otherwise there exists an opportunity for the expected value of outcomes to be compromised sometime in the life of the project.

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