Synergies in Combining Value and Risk Management Studies resulting in a VRM Study for Projects

Published in Australian Institute of Project Management Journal by Mr D Jain Executive Director of Eze Solutions Pty Ltd

SUMMARY

Value Management (VM) as well as Risk Management (RM) studies are being applied to both infrastructure as well as non-infrastructure projects with great outcomes. However, combining VM and RM studies into a single VRM study provides synergies resulting in benefits greater than those provided by the separate stand-alone studies. This is because VRM simultaneously optimises functionality and reduces risks. The VRM process provides a real opportunity to pro-actively minimise risks inherent in any project as well as obtain best "value for money." This approach results in projects with appropriately balanced functionality, risk and life cycle cost.

This paper provides a practical approach to integrating value and risk management into one study and describes the enhanced project outcomes.

INTRODUCTION

Value Management and Risk Management are generally applied separately to projects, which doesn't enable an "optimum outcome." In a "stand alone" Risk Management Study, risk treatment strategies may not have been subjected to "value analysis/management" thereby not obtaining the "best value." On the other hand in Value Management during "creative idea generation and evaluation" the identification and analysis of risks cannot be ignored.

The combination enables a multiplier effect resulting in building value and reducing costs.

RISK ANALYSIS/MANAGEMENT

In accordance with AS/NZS 4360 Standard of Risk Management, steps involved in risk management are:

A. **Establish the Context.**
In this step, the strategic, organisational and risk management context in which the overall risk management process will take place is established.

B. **Risk Identification**
The main aims in risk identification are to establish what can happen and how and why it might happen

C. **Risk Analysis**

The third stage in the process of risk management is risk analysis. The steps involved is risk analysis are:

- Determination of existing controls;
- Determination of likelihood;
- Determination of consequences;

- Combination of consequences and likelihood, within the context of existing controls, to yield a measure of risk (risk level).

D. **Risk Evaluation**

The fourth phase of risk management is prioritisation of risks. After risks have been identified, analysed and a measure of the severity of each of those risks has been established they are ranked in order of severity, using pre-agreed criteria. This is called risk evaluation.

E. **Risk Treatment**

The risk treatment process consists of:

- Identification of risk treatment options
- Evaluation of risk treatment options
- Preparation of risk treatment plans
- Implementation of risk treatment plans

Risk treatment options include:

- Risk avoidance
- Risk acceptance and establishment of a risk financing plan
- Reduction in the likelihood
- Reduction in the consequences
- Risk transfer
- Retention of residual risk

F. Action Planning, Monitoring and Review

- Preparation of a Risk Management Plan must be followed by preparation of an Action Plan as well as monitoring and review of the Risk Management Plan at agreed intervals.

VALUE MANAGEMENT

Value Management is a structured, systematic and analytical process, which seeks to achieve value for money by providing all the necessary functions at the lowest total cost consistent with required levels of quality and performance. It separates 'needs' from 'wants' and can be applied to infrastructure as well as non-infrastructure projects.

One outcome of a value study is the preparation of a "shopping list" of alternative options to achieve value improvement. The starting point is "business objectives" to be achieved rather than any pre-determined "project-objectives." The basis for the generation of ideas and options is encompassed by the following questions:

- How else may the required function be performed?
- What else will perform the required function?
- What will the alternative cost be?

It is important to add to the above dot points:

- What are the risks faced and what are their likelihood and consequences
- Methodology for Value Management following the Australian Standard AS4183 involves six steps, as follows:

1. Information phase: Overview of the context and goals
2. Functional analysis: Identification of key functions – the purposes of each component, why it exists, the cost of providing the function, the worth, what it must do, what can it do.
3. Creative ideas and generation: Generation of creative alternatives through brainstorming and other creativity techniques – can we simplify, combine or eliminate etc.
4. Evaluation and development: Comparison of ideas and short-listing the most promising for further investigation.
5. Action plan: Team to agree on an action plan.
6. Recommendations for implementation: Team provides recommendation for implementation

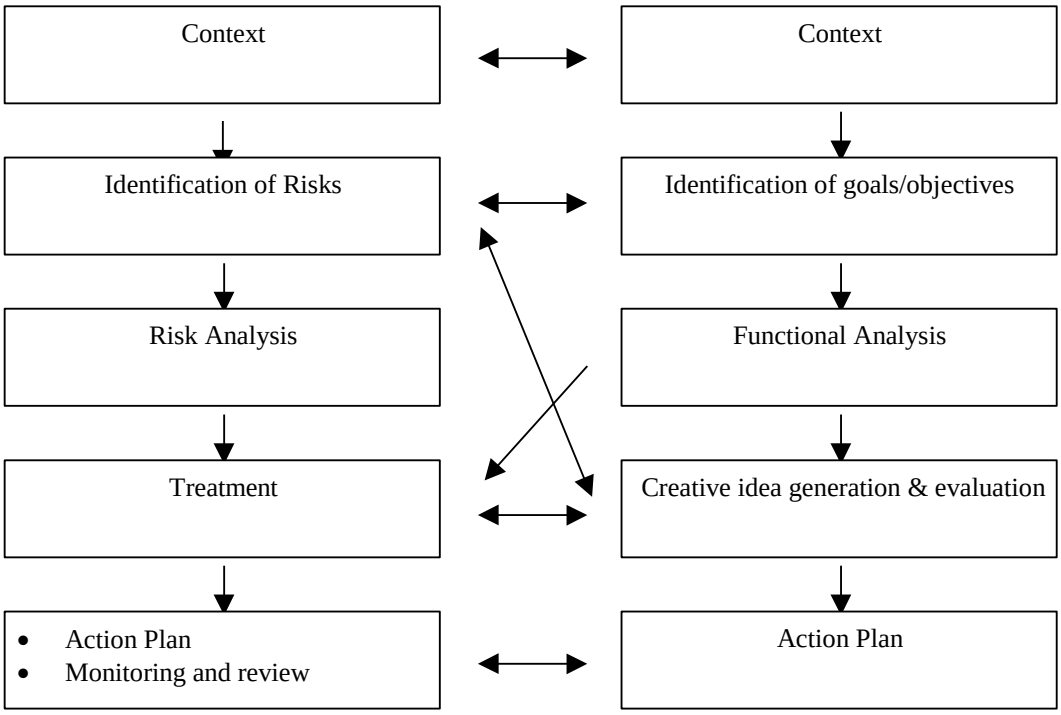
COMBINATION OF VALUE MANAGEMENT AND RISK MANAGEMENT

The diagram below shows how the two can be linked together.

RISK MANAGEMENT **VALUE MANAGEMENT**

Linkage of RM and VM

As can be seen from above, project context objectives and goals need to be common feature.



Whereas in risk management, risks have to be identified in the context of project goals and objectives, it is important to identify and evaluate these in value management at the creative idea generation and evaluation stage. On the other hand risk treatment options need to be subjected to "value analysis/management" to get the best value for money. The case studies below establish this.

CASE STUDIES

CASE STUDY I: Applying VM in RM of a Car Park Structure

A steel framework supports a two storey brick and concrete car park over several freight train lines. There is a rail junction, crossover as well as several catch points under it. The car park structure is at risk of collapse over the train if a derailment occurs in or around the junction or crossover resulting in collision with the supporting column(s) of the car park structure. The objective of the risk management plan was to identify and analyse the risks posed and recommend appropriate risk mitigation strategies.

It was found that selecting one of the following four risk mitigation options, mitigated most of the risks with high or above risk levels:

- Selective protection of columns – Option 1
  - deflection wall
  - beams that would allow some columns to be taken out
- Install guard rails – Option 2
- Demolish car park – Option 3
- Full column protection – Option 4

With the overall goal being to avoid train accident and objective(s) being to mitigate the associated risks, these options were evaluated using value management technique.

In summary, the VM process that followed RM exercise in this case comprised:

1. An evaluation criteria as follows, was agreed in a stakeholder workshop:
   - Ensure safety of train operations and public safety.
   - Solution should be cost-effective.
   - Solution must provide smooth and efficient train operations.

2. Using paired comparison technique and value judgement weightages were applied to the evaluation criteria on a scale of 1 to 10, with 10 being the most preferred criteria.

3. Options were then evaluated in a stakeholder workshop, against the evaluation criteria on a scale of 1 to 10, with 10 marks being given if that Option fully satisfies that criterion.

"Demolish Car Park" came out to be the most preferred Option. I might add here that in absence of the VM Study, site engineers were planning to go for Option 4 – Full Protection of Columns, because as engineers this appeared to them as the best "engineering solution".

In this case, the outcome clearly, was:

Reduced

- safety risks
- Capital cost
- Design and construction time

Increased

- Safety of train operations
- Functional efficiencies (speed restrictions of trains done away with)

Ensured

- input by all stakeholders
- acceptance by train operators
- optimisation of resources to be used

Clearly, using value management with risk management enabled applying stimulating ideas, improved functionality and resulted in building value and reducing cost.

CASE STUDY II: Applying RM in VM of an Electrical Upgrade Project Background
In the early 1950's electrification of the corridor was undertaken. The project was progressively commissioned during the period between 1955 and 1957.

The substations and sectioning huts were constructed utilising identical equipment and the construction strategies suited the operational requirements of the era. Existing transmission lines, which were built in the late 1930's, were relocated where required to suit the "new" substations. At that time, they traversed areas of relatively low population.

Today, much of the original equipment is life expired. Some of the Direct Current Circuit Breakers (DCCB) have exceeded the manufacturer's design life of 2,000 operations by a factor of four (4). Spare parts can only be procured through special, high cost, limited production runs, or by "cannibalising" other equipment.

Because of the population growth that has taken place over the years, the route of the transmission line now traverses heavily populated area. The area is also prone to severe bush fires.

The operational and protection methods of the high voltage transmission lines need immediate review in order to minimise the risk exposure, especially with reference to:

1) line fault starting a bush fire, and/or electrocuting members of the public, and
2) reclosing to sectionalise a fault on the line in heavily populated areas.

A Value Management Study was commissioned to seek a solution to these multifaceted problems.

Function Analysis
An analysis of core functional requirements resulted in identifying the following functions:

- Supply traction power.
- Protect the line by sectionalising the faulty portion of the line.

Project Risks
The following major risks in upgrading and maintenance of the electrical system were identified:
Bushfires

- Bushfire caused by fallen conductors.

Damage to Equipment

- Lightening strike.
- Aged equipment.
- Surges caused by supply interruptions.

Loss of Supply to Traction System

- Stop trains.
- Lose customers.

Community

- $7.10 per hour delay cost per customer.
- Political/media exposure.

Protection Risk

- Fault on one part of system impacts in whole system.
- Protection scheme does not meet current operating practice.
- Current protection system requires too many reclosing to locate a fault – level of risk is unacceptable.

Options Considered

Sectioning Huts

It was established that there are 6 sectioning huts affected by the proposal to upgrade. The following options were considered:

Option

1. Base Case - do nothing.
2. Repair existing hut + new equipment + brick cubicles between DCCB's
3. Repair existing hut + new equipment + sheeting between DCCB's
4. New Sectioning Huts + all new equipment

The evaluation of these options was carried out using the standard VM methodology as in Case I, and keeping in focus the need to minimise risks.

Recommendation

Options were preferred in the following order:

1. Option 4 (most preferred)
2. Option 2
3. Option 3 (least preferred)
4. Option 4 was the most preferred as it minimised the risks and provided best value for money.

Substations

Options

The following options were considered for substations:

1 New substations (this will include pilot wire protection of the 66kV transmission lines).
2 Repair existing building plus all new equipment (this will include pilot wire protection of the 66kV transmission lines).
3 Pilot Wire protection only.
4 Replace D.C switchgear only.
5 Options 3 & 4.
6 Replace 66kV HV switchgear (this will include pilot wire protection of the 66kV transmission lines).
7 Do nothing.

Recommendation

Options were ranked in order of preference, as follows:

1. Option 1 (most preferred)
2. Option 2
3. Option 5
4. Option 6
5. Option 3
6. Option 4 (least preferred)

Again option 1 was the most preferred as it minimised the risk and provided best value for money.

CONCLUSION

Clearly the two case studies established that neither RM nor VM in isolation can provide the "best solution." A combination of the two results in the "best solution" which provides the greatest "value for money" at the minimum risk exposure.

In the first case "full protection of columns" that was planned in absence of VM would have been much more costlier and would still require speed restrictions on trains under the Car Park, compared to "demolish car park" which was cheaper and ensured 100% risk mitigation.

In the second case a stand-alone VM may have ensured all functionality has been met at least possible cost, but in absence of Risk Management input, the Option selected may not have been the one with the least risks.

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