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VALUE SOLUTIONS – A PATH TO SUSTAIN INFRASTRUCTURE
Incorporating Risk into Value Engineering

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ABSTRACT

This paper reviews where the construction industry is now with Value Management and Risk Management, and the incorporation of Risk into Value Management (VRM).

It explores a brief history of the development of the VRM approach in recent times.

It looks at how Risk can be considered at the various stages of a Project from inception through to design and construction and operation and maintenance.

It looks at how Risk is being incorporated into the Value Methodology, again at each stage of a project, with more detailed consideration for the Detailed Design and Construction Stages (Value Engineering).

INTRODUCTION

Since its inception in the late 1940s, Value Management has not involved Risk Management in a structured manner within its methodology, although without a doubt, most Value Practitioners will have taken risk into account implicitly in any proposals, to a greater

or lesser extent. This is still the case, the choice of whether or not to include risk considerations being very much the decision of those involved in the Value Management process.

Equally, the Construction Industry has not, until within the last 15 to 20 years, practised as a matter of routine a structured Risk Management approach to its projects. It has been my experience that within Project Teams in the United Kingdom, the formal development of Risk Registers for projects has only become routine during the past five to ten years, mainly on larger projects. Even now, the development of well structured Risk Management / Mitigation Plans for critical and significant risks, and their regular monitoring to the conclusion of each risk is limited, although, more and more project teams are beginning to do this.

How many of us, having taken the trouble to set up a Risk Register and Management / Mitigation Plans for the critical and more significant risks, has actually seen those plans taken to a conclusion, and compared what those risks have actually cost against what it was predicted they would cost?

There have been several very major and prestigious projects, some connected with the celebration of the Millennium, that have lacked formal or effective application of either Value Management or Risk Management. In the United Kingdom, one particularly notable project which it is believed cost some £800 million (approximately CAN \$ 2,000 million) of mainly Government and public funds to build, now stands empty after only 12 months of use. Some of its components had a design life of 25 years. We can draw our own conclusions as to whether this project was value for money, or indeed, whether any form of Value and Risk Management was ever conducted. Had anyone stopped to consider during its inception the “what if scenarios”, and in particular, that no one would find a use for the building after the Millennium celebrations were over?

It is a poor reflection on our industry that most of us can think of other, similar projects throughout the World. How willing is the industry to learn from the mistakes of others?

EARLY THOUGHTS ON VRM

To illustrate early thoughts, I have taken a few instances where VRM has been debated or indeed practised.

In his paper to the SAVE Conference of 1995 (now SAVE International), Martyn Phillips, in challenging the Project Management Paradigm, stated that *“the Value Management approach encourages earlier than usual participation of all interested parties and agreement of values to be assigned to a range of project parameters. This ensures a higher degree of confidence that risk management goals are defined and achieved.”* He distinguished between risk considerations during the concept / feasibility stages of a project and risk considerations during the VA stage. He made the point that *“Value / Risk Management is a comparative, decision-making process in which the ranked results from a particular risk assessment study can be integrated with economic, environmental, political, technical and social considerations.”*

VEAMAC (Value Engineering Analysis and Management Academic Community), which was started at Oxford Brookes University in 1997 debated over the Internet in 1998 whether Combined Value and Risk Management has a place in the Briefing Stage of a Project. The

debate involved some prominent figures in the Value world internationally, including academics and practitioners.

The debate had come about because of a view expressed that it did not seem appropriate to introduce structured Risk Management activities at the earliest briefing stages when a client’s value system is still being formed. The demarcation between risk and value management seemed quite blurred and any decision on value would probably implicitly consider risk. It was contended that the mindsets required for both “disciplines” are so radically different that they cannot effectively be brought together at the earliest stages to offer focused service within severe time constraints.

During the debate that followed, the overwhelming consensus was that value and risk management do have a place at the briefing stage of construction projects. It was considered that there were *“few academic grounds for differentiating between Risk and Value Management. The notion of two distinct disciplines that may or may not be combined to provide desired results is a misleading one. The main purpose of making a distinction is the very practical one of providing a service that clients of VRM want. To this end, the line between them is moveable and determined by the emphasis on risk that clients want and expect”*. It was considered appropriate to combine VM with aspects of RM, full RM probably only being appropriate in the context of project delivery.

Reflecting on this, the size and the nature of the project and its influence on stakeholders, including the general public, must have relevance to the position of that line between Value and Risk Management.

At the SAVE International Conference in Montreal (June 2004), a workshop was held on the subject of “Better Use of Risk Management in Value Management”, lead by Scot McClintock of The Team Focus Group.

Although official records of this workshop do not exist, considerable debate took place, which was not dissimilar in many ways to the VEAMAC Debate in 1998, except that it covered the entire project spectrum. Not surprisingly there were many different points of view, ranging from *“Risk Management should be a separate workshop from Value Management”*, to *“VRM is being*

used successfully on some projects, because of RM and VM having many similar activities which can be undertaken concurrently as a large team". Some caution was raised on this, because VM and RM can have different focuses, so care must be taken. The earlier VEAMAC debate had suggested that VM requires a positive approach whereas RM could require a negative frame of mind. However, it is my experience that there is every reason that once identified, risks should be managed positively, so that they are addressed in the best possible way to minimise their influence on a project, and even to enhance the value of the project.

Some said at the SAVE International workshop that they have held VE Sessions after plans and specifications had been approved, to focus on risk as part of constructability analysis. Some have used Failure Mode Analysis where Risk, Uncertainty and Ignorance are defined, in order to define desired outcomes.

It was pointed out that the choice of Construction Contract is a big factor on how risk is managed, and its significance to the management of the project.

The conclusion to be drawn from the two debates, the first in 1998 (VEAMAC) and the second in 2004 (SAVE International) is that the

industry has not yet established how to deal with risk in Value Management (including Value Engineering) in a structured or consistent manner, although many individuals and businesses are practising VRM and have been doing so for quite a long time.

The reason for continuing the debate is that there is considerably more interest in VRM now than there was 6 or 8 years ago. There is the view that it is time for it to be introduced formally and routinely into project management procedures.

VRM AT VARIOUS PROJECT STAGES

In order to understand how risk may be introduced into Value Management, it is necessary to understand to what extent risk analysis and subsequent management should be introduced into projects at their various stages. Being mindful of the many different terminologies used in Project Management, the main stages of a project are defined for the purposes of this paper as follows:

1. Inception (including Briefing, Strategic and Conceptual thinking and Master Planning)
2. Feasibility and Preliminary Engineering Design
3. Detailed Design and Contract

Project Stage	Inception (Strategic and Conceptual)	Feasibility and Preliminary Design	Detailed Design	Construction	Operation and Maintenance
Risk Assessment					
Qualitative Analysis	Potential reasons for the Project	Balance between Best Value and Least Risk	Constructability Failure Mode Analysis?	Constructability Failure Mode Analysis?	Reliability Failure Mode Analysis?
Risk Categories Considered:					
•Management					
•Environment					
•Third Party					
•Design					
•Construction					
•Operation & Maintenance					
•Safety					
Quantitative Analysis	Probabilities & Consequences. Estimate: ± 50% (if relevant)	Probabilities & Consequences. Estimate: ± 25% Risk allowance prediction by Root Mean Squared?	Probabilities & Consequences. Estimate: ± 10 - 15% Risk allowance prediction by Monte Carlo?	Probabilities & Consequences. Estimate: ± 5% Risk allowance prediction by Monte Carlo? Feedback of actual costs.	Probabilities & Consequences. Estimate: ± 5% Risk allowance prediction by Monte Carlo?

Table 1

- Development
- 4. Construction (including Commissioning)
- 5. Operation & Maintenance, including period Refurbishment

- Resulting from the **Design** at the Design and Construction stages – 2 no. (5%)
- Resulting from **Third Parties** during Operation – 1 no. (2%)

These are entirely arbitrary.

Value Analysis would relate to Stages 1 and 2, and possibly 3 (particularly if the Value Methodology had not been introduced in the earlier stages and there is a need to go back), and Value Engineering would relate to items 3, 4 and 5.

Risk Management would apply to all stages as well, but the extent of any assessment and analysis of the risks (Qualitative and Quantitative), and their management, will depend on the stage in the project, for example, as illustrated in Table 1.

As indicated in the table, there is different emphasis on the categories of risk (their ultimate sources), at the different stages of a project. It should be remembered that there is a distinction between Risk and Uncertainty, the former usually being definable and quantifiable, the latter un-measurable.

It makes sense to distinguish between

- *Strategic Choice* (Stages 1 and 2 in the table) – *through strategic focusing, formulation of clear, unambiguous, strategic direction to enable approvals, funding and subsequent orientation of the development / implementation team.*
- *Value Enhancement* (Stages 2 and 3 in the table) – *through value engineering – continuing value improvement for finessing to optimum quality, functionality and cost parameters.*

(Martyn Phillips, ICE Proceedings May 2002)

I was involved in the Red River Floodway Expansion Project, Winnipeg (August 2002), at the Strategic Choice stage when a Value Study was undertaken. The most significant risks identified during the study (as opposed to uncertainties) related to the following risks:

- Resulting from the **Management** of the project – 19 no. (45%)
- Resulting from the **Operation** of the Project – 12 no. (29%)
- Resulting from the **Construction** – 8 no. (19%)

It can be seen that the emphasis on that particular project at that stage was mainly on risks arising from the Management of the Project and its Operation during the Operation and Maintenance Stage, with some Construction issues also. Other risk categories tend to have more significance as the design is advanced towards construction.

As suggested by CIRIA Special Publication 125: "Control of Risk" (1996), "*Risk and opportunity go hand in hand. For this reason, there is usually a commercial benefit, or 'added value', from risk control measures.....*" This same publication noted that "*risk assessment does not need to be exact to be useful*", particularly during the early stages of a project as was demonstrated at Red River. "*The level of uncertainty can indicate a need for action*".

LINKING RISK TO VE

When considering risk in a Value Study, it is natural to link the risk considerations to the Job Plan and its various Phases. The extent to which risks may be assessed will depend on the Stage of the Project as indicated in Table 1.

"Much of the power of value and risk management methodology lies in the rigorous, disciplined approach and the ability of team members to focus collectively, both inwardly and outwardly on a broad range of topics."

(Martyn Phillips, ICE Proceedings May 2002)

What follows is an outline of how risks can be considered at each Job Plan Phase (see Table 2 below).

There may be many other considerations that have not been listed in Table 2.

Taking the VEAMAC view that the line between Value and Risk Management is movable, the extent to which any risk analysis is carried out during a Value Study should be down to the judgment of those involved in the study, to achieve the best and most appropriate results.

JOB PLAN PHASE	RISK CONSIDERATIONS	Table 2
<u>Information Phase</u>	<ul style="list-style-type: none"> •Listing of known risks, issues, problems associated with the project •The Project may have been initiated as a result of a problem or risk 	
<u>Function Analysis Phase</u>	Some functions may address or be influenced by known risks	
<u>Creative Phase</u>	Ideas may address how to get round known or possible risks	
<u>Evaluation Phase</u>	Evaluation criteria should include risk items to eliminate ideas which have a very high risk associated with them	
<u>Development Phase</u>	<ul style="list-style-type: none"> •Risk allowances associated with each proposal at all stages of a project, especially during the construction and operation and maintenance will give a better comparison of proposals during any cost / benefit analysis using whole life costing •Time implications 	
<u>Presentation Phase</u>	The risk that not everyone will sign up to the preferred proposal and how to deal with it	

CONSIDERING RISK DURING VALUE ENHANCEMENT (VALUE ENGINEERING)

In the undertaking of a Value Enhancement study, particularly at Detailed Design Stage, each item under consideration should assess the following:

- The options available to us to achieve the Value Enhancement
- The associated secondary risks which could be introduced by those options
- The residual risks associated with the Value Enhancement (which will never go away)
- The preferred / proposed action to achieve the Value Enhancement using the preferred option, by whom and in what timescale
- The ownership and management of the Value Enhancement
- The cost or saving implications associated with the Value Enhancement

This is presented in tabular form, as Table 3 (see the final page of this paper).

The more detail in which the proposals for Better Project Value are considered by the VR Manager, particularly with respect to

- the measures available to achieve better project value,
- the corresponding secondary risks associated with such measures, and
- potential value enhancement resulting, the better the value enhancement and cost benefit.

CONCLUSIONS

The conclusions to be drawn from the above are as follows:

- It is a poor reflection on the construction industry that Value and Risk Management in a structured manner is not as yet an automatic consideration in the development of projects, although this is improving.
- Many consider that Value Management and Risk Management are different entities and should be kept separate. However, there is the majority view that Value and Risk Management should be brought together in a flexible (non rigid) manner, if we are to achieve Best Project Value. The one should not be considered without the other.
- Whereas VRM has been under consideration for some years, and practised rigorously by some for 10

years or more, it has not as yet been formalised in a manner that is recognised by the industry as a whole.

- The reason that this is being debated now is that many in the industry recognise the greater benefits that can be achieved by bringing Value Management and Risk Management together, the not least being an outcome that provides better value for money, better reliability and a better fit for the client's needs both in the short term and in the longer term.

Let us now draw on the good practice that has been used in the past to develop a structured and formal procedure for VRM which will be used to achieve Best Value in our Projects as a matter of course.

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CIRIA: Special Publication 125 "Control of Risk – A Guide to the Systematic Management of Risk from Construction" – Dr Patrick Godfrey (1996)

SAVE Proceedings 1995: "Challenging the Project Management Paradigm – Integrating Strategic Value with Project Development and Execution" – Martyn R. Phillips.

Table 3

Value Enhancement / Saving Management Report		
Project:	Form filled in by:	Proposal No.:
Section of Works:		Date:
		File:
Proposal for Better Project Value: <i>(Full description)</i>		
Priority:		
Possible Measures to be carried out: <i>(Itemise options)</i>		
1.		
2.		
3.		
Possible Value Enhancement resulting: <i>(For each item, what value enhancement?)</i>		
1.		
2.		
3.		
Possible Secondary Risks as a result of saving measures: <i>(New risks that could arise)</i>		
1.		
2.		
3.		
Residual risks that may still exist after measures implemented:		
1.		
2.		
3.		
Who owns the original value / saving:		Who owns the residual risks:
Action Plan:	By whom:	By when:
Estimated cost and time implications of actions and comments:		