

The Business has looked hard at the way in which its projects are initiated and implemented and found considerable scope for the application of VM throughout the project delivery process. Against this background its Directors and Senior Managers have identified in particular, that VM is a means by which resources can be optimised to achieve the Business's target of a 20% reduction in delivery costs over 10 years without sacrificing quality or safety considerations.

The implementation of VM and its related processes however has required a significant mind-shift away from a short term focus on cost towards quantifying the interaction between individual project variables such as time, cost and quality, ultimately leading to the enhancement of value.

When deciding to adopt VM the Business's expectations centred around the following :

- The ability to link more directly, tactical or project related objectives with strategic corporate value related goals.
- An overall improvement in the briefing process and in particular the justification for projects.
- Elimination of unnecessary cost without detriment to performance, quality and safety criteria.

By involving its user clients and operational staff in the process, LUL also expects VM to improve its project delivery by facilitating a better appreciation of the impact a particular project will have on the ongoing operation and maintenance of existing facilities.

GETTING STARTED

VM/Value Engineering (VE) has been referred to within LUL for some time, a number of ad-hoc studies have been undertaken by individual managers. It was not however until two years ago that the company first introduced a procedure which required that all projects demonstrate before an independent panel that the project met the brief, confirmed the business case, was technically competent and that project delivery costs were at an acceptable level. The panel, known within LUL as "Strike Force" recommended that VM be formally applied to all projects.

Project Management Services, a business group

within the LUL Engineering Directorate was tasked with evaluating and implementing VM on a strategic basis across the Directorate. In keeping with the VM philosophy the first stage to be undertaken was research (the information phase).

Research was undertaken on three fronts:

- A study of Mass Transit and other large utilities in the USA.
- A study of UK systems and approaches.
- Collation of all ad-hoc studies previously undertaken by LUL.

Interviews with the American Utilities confirmed that it is the norm for funding authorities to require VM techniques to be applied to all major projects usually by building it into the programme approval process. A typical example being the "UMTA (Urban Mass Transportation Administration) management guidelines for grantees". UMTA encourages the use of VM techniques on all projects insisting on it's application on major projects before agreement of full funding.

Funding agencies call for "Peer Reviews" (review of plans at the completion of preliminary design utilising the expertise of other transit operators who provide services under similar circumstances). VE is largely accepted as a way of life and not as a separate process. It is also worthy of note that there are licensed VE practitioners in the USA so it is seen as a professional discipline.

The UK research looked at three key groups :

- Academics
- Practitioners
- Users

It became quickly evident that the UK approach to value study leans heavily on shorter workshops with greater emphasis on the internal team rather than the use of independent experts. It was equally clear that there is inconsistency in the advice given as to the recommended timing of workshops and the terminology used. More encouragingly every user claimed to have derived significant benefit from the process.

A further trend also become apparent, it was noted that whichever approach was taken with regard to the timing and duration of the workshops there was consensus that value techniques should be applied at two levels. The first at or around conceptual design

stage where higher order goals are considered, to be followed later at some point in the full design stage by the more traditional lower level study of the method/functionality of the product design.

LUL APPROACH

Given the nature of LUL's operations and the numerous interfaces between its discrete business and operating units, it was decided to create a bespoke system for the tactical implementation of VM techniques, drawing on what was deemed to be the best practice derived from the research..

In particular it was agreed to focus on the design and project teams for study workshops, supplemented by external facilitators and independent specialists where appropriate.

The Business was also mindful of the need to link tactical issues relating to the delivery of Value for Money with more strategic issues relating to its Corporate Mission and business objectives.

Accordingly the following hierarchy was developed :

- **Value Planning**
- **Value Management**
- **Value Engineering**

Each of the above terms are defined as:

Value Management:

The generic term for the process by which the Business and its managers consider optimum value in the context of the Corporate Mission and its objectives within the Capital Programme. Value Planning and VE are the two component parts of the process.

Value Planning:

Value Planning is concerned with defining what value means to the Business in meeting its needs. In general any programme of projects or a single project seeks to satisfy the differing requirements of several parties. Value Planning provides a structured framework for the examination and discussion of these requirements.

Strategic Value Planning is concerned with a process by which the Business and its senior managers consider value in the strategic

sense against a background of the Corporate Mission and business objectives.

Project Value Planning is concerned more tactical issues and defines what value means to the Business in meeting a specific need. It provides a structured framework for the identification and examination of such requirements to reach a consensus before the Brief is finalised.

- **Value Engineering:**

A structured analytical technique occurring later in the project development that seeks to provide key project functions at the optimum total cost without detriment to stipulated safety, quality, performance and delivery targets.

To structure the inputs at each of the above stages a process diagram was developed which is illustrated in **Appendix 1** and summarised as:

- Inception Phase: PRD1 (Concept Brief).
- Feasibility Phase:
PRD2 (Feasibility Brief-
VP1 (Concept Validation).
- Outline Proposals/Scheme Design
Phase:
PRD3 (Design Brief)
VP2 (Project Verification)
- Detailed Design Phase: VE1
(Functional Analysis of Elements).
- Procurement/Implementation Phase: VE2
(Functional Analysis of Elements and Components).

PRD1 (Concept Brief)

At the commencement of any LUL project initiative, the appointed project manager is required to prepare an outline of requirements and a future action plan. This is known as the Project Requirements Definition (PRD) and is comparable to a typical project brief used throughout the Construction and Engineering industries.

Value Planning Study VP1

The Value Planning Study 1 is to validate the requirement for and concept of the project and also enables the key stakeholders to buy into the fundamental project objectives.

The study is typically chaired by an independent facilitator and utilises core members of the project team. Tools such as Job Plans and Function Diagrams are used to provide the ultimate Business and User Clients with an appraisal of the project and a recommendation which together determine the form in which the project will proceed, ensuring that it is feasible functionally, technically and financially.

PRD2 (Feasibility Brief)

The results of Study VP1 are incorporated within the project brief which is amended to form PRD2.

The regular review of the project PRD is a particularly significant feature of the Business's Value Management activities and ensures that the fundamental project requirements and objectives are regularly addressed throughout the Inception, Feasibility and Scheme Design phases.

Value Planning Study VP2

Study VP2 is undertaken during the Outline Proposals/Scheme Design phases and is principally concerned with considering a range of alternative options whilst verifying that the fundamental project objectives remain valid.

The study team and facilitator together determine the general approach to layout, design, specification and construction whilst still optimising value for money.

Job Plans and Function Diagrams are again used to assist in functional analysis and option appraisal.

PRD3 (Design Brief)

The results of Study VP2 are incorporated within the project brief which then forms the basis of the project authority package which comprises :

- Project Estimate
- Project Programme
- Phased Expenditure Profile
- Recommended Procurement Route

Value Engineering Study VE1

Study VE1 is undertaken at a point between 10% and 35% of the detailed design phase.

At this stage the requirement for the project will have been established and will not be reconsidered except in very exceptional circumstances.

The study team and facilitator are required to analyse in detail the project's elements and components, specification, estimate/cost plan, programme and procurement strategy.

In addition to Job Plans and Function Diagrams, decision matrices are typically utilised in conjunction with sensitivity analyses to optimise the value for money characteristics of each selected element or component.

Study VE1 enables the project team to develop selected options to a level of detail and accuracy at which the works can be implemented with a minimum of commercial, technical, safety, quality and programme risk.

Value Engineering Study VE2

Study VE2 is undertaken during the Procurement phase after tenders have been submitted and evaluated but before the appointment of a contractor.

The study team examines the tender documents and possible alternative specifications proposed by contractors to ascertain whether savings can be made or performance enhanced by minimal modifications to documentation or selection of valid alternatives.

Given the advanced stage of the project the emphasis is very much on the analysis of elements and components. In addition however significant thought is given to the project delivery process and the impact the project will have on both the ongoing operation and maintenance of existing facilities.

The Study also acts as a further team building initiative before commencement of the works.

In addition to the specific stages outlined above there are a number of features which characterise the system that LUL has developed.

Factors which are common to all LUL Value Management initiatives include :

- Pre workshop briefing sessions for all participants.
- Use of workshop style studies.
- Utilisation of Job Plans and Function Diagrams to structure the analysis and evaluation of proposals.
- Significant emphasis on team building given that the existing design/project teams utilised rather than an external replacement team.
- The examination of both capital and longterm maintenance and life cycle cost The factors which vary, however, dependant upon the nature of the project's specific requirements include the following :

Study team participants.

Timing of study both in terms of its duration and the stage at which it occurs in the design and implementation process.

A further significant feature of LUL's system is a built-in check to ensure that outputs from the respective Value Planning/Engineering studies are taken on board and implemented as part of the design and procurement process.

This verification is achieved by the use of a standard report format which includes tabulated summaries of the outputs from each of the studies which are indexed such that their incorporation in the design, for example, can be checked and ascertained.

By adopting the procedures and techniques outlined above the Business distinguishes its VM initiatives from more traditional cost planning and estimating activities.

STRATEGY FOR INTRODUCTION AND IMPLEMENTATION OF VM

Having prepared an LUL VM process the PMS team considered how VM should be introduced as a strategic mandate. The diversity of projects undertaken by the Engineering Directorate precluded implementation of any strict regime, indeed the approach taken was to be as free from prescription as possible whilst ensuring a reasonably consistent approach between projects of similar nature, size and complexity.

A key objective was to introduce a VM culture. It was therefore deemed inappropriate to set parameters where VM did not apply or where it could be inferred that it was not important.

The strategy adopted was as follows :

- Devise and issue a VM procedure for ownership by the Project Manager for adoption on projects in an acceptable, flexible and non-prescriptive manner and which meets the requirements of the Business Client.
- Provide VM co-ordination support from a central support area.
- Where appropriate appoint Facilitators to lead VM studies. Facilitators initially to be externally sourced, with the intention of training internal staff to supplement this need.
- Devise and issue a procedure for ensuring that project learning points and feedback is transmitted to the strategic level via the Business Client and corporate centre for use on future VM Studies and for Capital Programme Management purposes.
- Provide education and training programmes for LUL Senior Management generally but particularly for Business Clients, Programme Managers, Project Managers, Facilitators and other project staff likely to be involved on projects.
- Introduction of the VM programme to projects. Initially via pilot projects with a key date published for full adoption.

Outline the areas for further development particularly in strategic value planning for future years investment, and it's relationship with other corporate initiatives.

VM is considered to be an integral part of the project control process and is built into the Group Management System. This provides maximum flexibility and visibility to the process.

The Procedures have been structured as follows:

LEVEL 1: The Group Procedure incorporating the 'what', 'why', 'where', 'when' and 'who' of the process.

LEVEL 2: The Work Instructions incorporating 'how' the process is implemented including all standard forms.

LEVEL 3: The Support Manual which includes material relevant to the LUL process e.g. references to published articles, books and

papers on the subject, worked examples of components of the process and explanations of the constituent parts of the process.

PROGRESS / PROBLEMS / SOLUTIONS

At the time of preparing this report LUL has completed the pilot study phase and is about to embark on the full scale implementation of VM across all projects. The full feedback from the pilot studies will be the subject of a separate paper. Some key outputs have been consistently identified from the formal workshop reports and the response to the participants questionnaire which all attendees are asked to complete.

In an organisation which is severely constrained by legislative, safety and operating considerations it is perhaps not surprising that existing design and specification standards are difficult to challenge in the short term. The savings so far achieved in this area are modest. The greatest benefit to LUL lies where it is more difficult to quantify the improvements that VM has brought about, indeed some of these may not be realised until the project is well into the implementation phase. It is too early for LUL to put a price on this advantage, it is however confident that the cost of the studies is more than off-set by the team building aspects alone.

The most significant real problem is training and education. To generate the greatest benefit from VM LUL believes that it is essential that all participants have received some form of training and enlightenment. It is also necessary that Project Managers (in house and consultant) are sufficiently knowledgeable about the VM process, procedures and techniques to understand the level of application appropriate to his project at the appropriate time. In a large organisation employing many external consultants lack of training and awareness presents a real barrier.

The most significant perceived problem is cynicism. The pilot studies being out of sequence with the training programme have required the participants to be made aware of VM as part of the study. This may be the case generally with VM studies, however it has been very useful in obtaining feedback regarding the cynicism at the start of the study compared with the enthusiasm by the end of the study. It is worth noting that the most cynical at the start is often the most enthusiastic by the end.

- (1) Better Engineering solutions are proving difficult to drive out.
- (2) Significant improvements have been identified where the user has been able to introduce his in-depth local knowledge. This has been of particular benefit in identifying potential problems and conflicts on site, and deriving better working methods.
- (3) The effect on team building has been very positive.

Participants generally believe that what they are about to do is what they have already done and is what they have always done. Feedback questionnaires have indicated that a high percentage of participants would recommend the process for other projects on which they may be involved. The best way LUL have found of convincing team members of the benefits of VM is to carry out a study.

Other sensitive issues such as professional pride, suspicion of hidden agendas and the like also seem to take second place once the team dynamics come into play during the study. Team building as one of VM's major benefits has been confirmed.

Although the LUL process is intended to be owned by the Project Manager and be non-prescriptive it does enable a standard structural approach to be adopted. This allows Facilitators to use their 'pet' tools and techniques within the framework of the process whilst maintaining effective and consistent implementation. The use of competent independent Facilitators has proved to be very important in undertaking a successful VM exercise.

RELATIONSHIP WITH OTHER CORPORATE INITIATIVES

Strategic Value Planning referred to earlier is intended to introduce VM techniques to future programmes of work. In this respect it will be specifically aimed at improving synergy between assets and asset maintenance. It will also consider operational and economic advantages deriving from single locations, shared possessions and shutdowns. It is hoped that this will produce other benefits such as resource levelling particularly where there is limited supply.

Risk Management (RM). LUL embraces Quantified Risk Assessment and Hazard Analysis for all projects in respect of health and safety. These studies form an integral part of the business case analysis for every scheme and are used for developing project safety plans. Risk Assessment is also used for the identification assessment and control of economic risk. The challenge for the VM process is to co-ordinate the VM studies with the QRA and RM exercises, and to usefully use the data generated by these studies. LUL have begun to address this interface by establishing the nature and format of RM studies, relating them chronologically with the VM exercises. Further work has yet to be undertaken to establish the most appropriate use of the RM data.

Supplier Management. LUL made a conscious decision when preparing the VM procedure that it would not specifically incorporate an opportunity for the contractor or supplier to contribute to the VM process. It does not however exclude such involvement, this being a matter for each Project Manager to determine with regard to his own particular project.

Traditional procurement techniques particularly in Construction and Engineering dictate that the contractor and supplier are unknown at the critical concept, feasibility and design stages of the project. There is no benefit to the contractor to spend further time involving himself in any form of VM exercise (some might cynically suggest that any change after the contract is awarded may give rise to a claim opportunity).

LUL is seeking to understand what good supplier management involves and how it can work in LUL. Senior management has made a commitment to the concept "the pro-active selection and development of

the best suppliers for LUL to get its best long term quality, performance and value from the supplier base".

LUL is seeking to move towards collaborative relationships with its suppliers at the strategic and tactical (project) levels.

VM is complementary to this process in that a collaborative rather than adversarial approach is adopted. This is the essence of supplier management.

Suppliers will be project stakeholders and will be involved in strategic planning as well as project planning. Suppliers will participate in the VM process at all stages and provide specialist supplier advice.

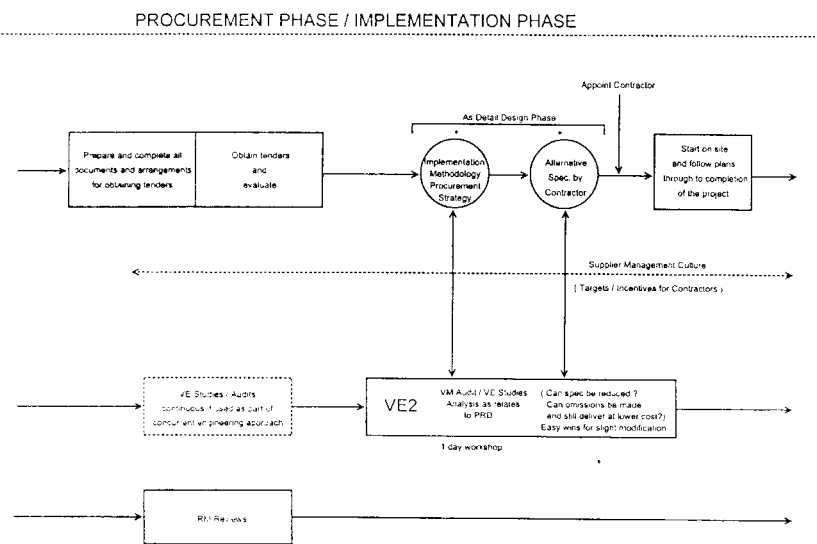
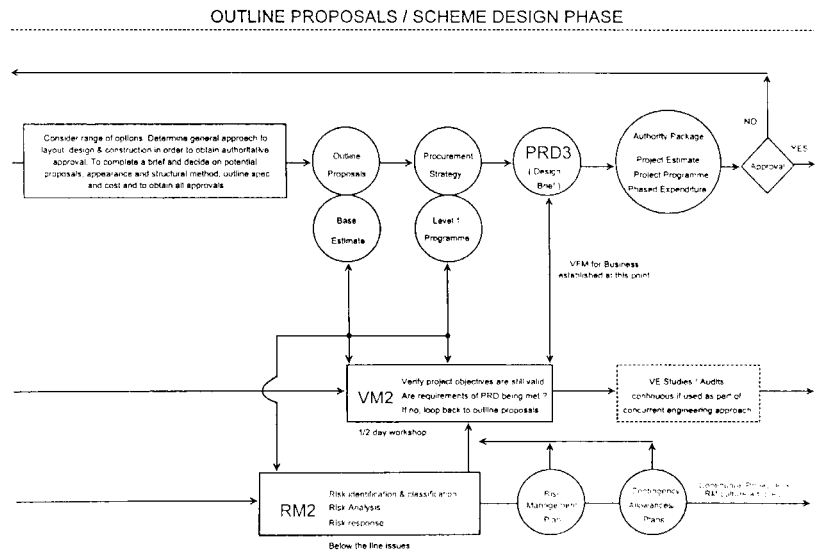
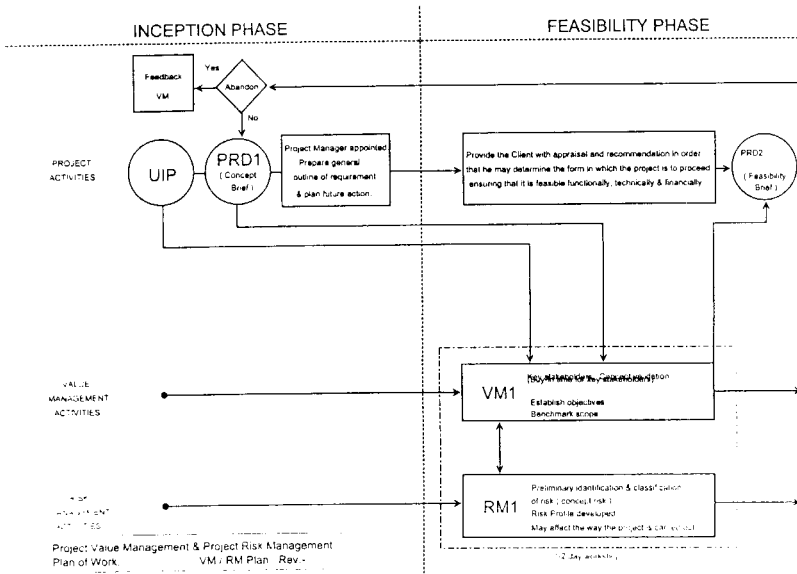
Supplier management and VM share some common benefits :

- Pro-active
- Co-operative
- Trust
- Two-way information
- Joint design
- Shared understanding of risk
- Team orientated
- Common objectives.

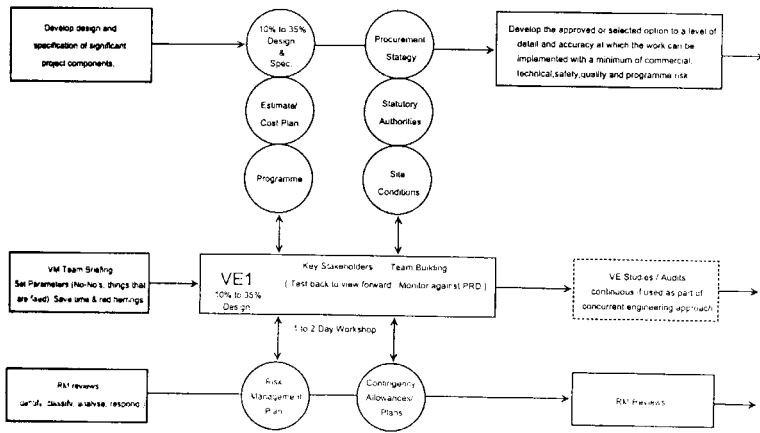
CONCLUSION

In creating its VM system LUL intends to move away from a more short term focus on capital cost and cost reduction exercises and place a far more significant emphasis on consideration of whole or life cycle costs. It has highlighted the need to optimise project value characteristics by creating a culture which is more orientated towards the identification and quantification of project function.

SAVE PROCEEDING 1995



DETAIL DESIGN PHASE



CLOSE-OUT PHASE

